ABSTRACTS

RESEARCH

CONFERENCE

VOLUME 9

Arkansas Crop Protection Association

November 28 and 29, 2005

Clarion Inn

Fayetteville, Arkansas

PROGRAM

Monday, November 28, 2005

10:00 a.m. Board Meeting

12:00 noon Registration

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

01:00 p.m. **Pest Management: Looking Ahead Requires Looking Back.** Robert N. Wiedenmann, Department of Entomology, University of Arkansas, Fayetteville, AR. 1

01:15 p.m.** **Identification and Characterization of Two New Viruses in Blackberry.** James Susaimuthu, Department of Plant Pathology, University of Arkansas, Fayetteville; Ioannis E. Tzanetakis, Department of Botany and Plant Pathology and Center for Gene Research and Biotechnology, Oregon State University, Corvallis, OR; Rose C. Gergerich, Department of Plant Pathology, University of Arkansas, Fayetteville; and Robert R. Martin, Department of Botany and Plant Pathology and Center for Gene Research and Biotechnology, Oregon State University, Corvallis, OR. 1

01:30 p.m. **ALS Inhibitor Herbicide-Resistant Ryegrass is Not Resistant to ACCase Inhibitor Herbicides.** Yong In Kuk and Nilda R. Burgos, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 2

01:45 p.m.** **Evaluation of Slow-Release Nitrogen Fertilizers for Rice.** Bobby R.

Golden, Nathan A. Slaton, Richard J. Norman, Russell E. DeLong, and Charles E. Wilson, Department of Agronomy, University of Arkansas, Fayetteville, AR. 2

02:00 p.m.* **Efficacy of Selected Insecticides for Control of Heliothines in Conventional Non-Bt Cotton 2004-2005.** Jarrod T. Hardke, Gus M. Lorenz, Kyle Colwell, and Craig Shelton, University of Arkansas Cooperative Extension Service, Little Rock, AR. 3

02:15 p.m.* **Effects of Tank Mixes of MON 3539 and Selected Compounds in Roundup Ready Flex Cotton - 2005.** Jarrod T. Hardke, Gus M. Lorenz, Kyle Colwell, and Craig Shelton, University of Arkansas Cooperative Extension Service, Little Rock, AR. 4

02:30 p.m.* **Rice Cultivar Response to Glyphosate Drift as Influenced by Growth Stage.** Jason R. Meier, Ken L. Smith, Ryan C. Doherty, and M.B. Kelley; University of Arkansas Division of Agriculture, Monticello, AR., and Robert C. Scott; University of Arkansas Division of Agriculture, Little Rock, AR. 4

02:45 p.m.* **Efficacy of Ignite and Ignite 280 Programs on Weeds in Arkansas Cotton**. Ryan C. Doherty, Jason R. Meier, M. B. Kelly, and Ken L. Smith; University of Arkansas Division of Agriculture, Monticello, AR. 6

03:00 **Break**

03:30 p.m.** **Effects of Environmental Conditions on Osprey** (mesosulfuron) **Efficacy.** Jason L. Alford, Lawrence R. Oliver, Chad E. Brewer, and Mohammad T. Bararpour, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville,AR. 6

03:45 p.m.* **Efficacy and Selectivity of KIH-485 in Cotton.** Griff M. Griffith, Jim L. Barrentine, and Marilyn R. McClelland, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville. 7

04:00 p.m.* **Use of Roundup Ready® Soybeans and Row Spacing to Control Red Rice.** Jeremy A. Bullington, Nilda R. Burgos, Ken L. Smith, Vinod K. Shivrain, Bree A. Pearson, Jason R. Meier; University of Arkansas, Fayetteville, AR. 9

04:15 p.m.* **Impact of Selected Insecticides on the Beneficial Anthropod Complex Found in Arkansas Cotton.** Adam Chappell, Gus Lorenz and Tim Kring, Department of Entomology, University of Arkansas, Fayetteville, AR. 10

04:30 p.m.** **Utility of Residual Herbicides in RoundUp Ready Soybean.** Chad E. Brewer, Lawrence R. Oliver, and Mohammad T. Bararpour, Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 10

04:45 p.m**.*** **Early Season Soybean as a Trap Crop for Stink Bugs in Arkansas.** John F. Smith, Jeremy Greene, and Randy G. Luttrell, Department of

Entomology, University of Arkansas, Fayetteville, AR. 11

Tuesday, November 29, 2004

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

08:00 a.m.* **Influence of Seeding Rate and Glyphosate Timing on Weed Management in Soybean.** Nathan V. Goldschmidt, Lawrence R. Oliver, Chad E. Brewer, Mohammad T. Barbarpour, and Jason A. Alford, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 12

08:15 a.m.** **Flowering of Red Rice Biotypes and CL Cultivars as Affected by Planting Dates.** Vinod K. Shivrain[1], Nilda R. Burgos[1], David R. Gealy[2], Howard L. Black[2], Leopoldo E. Estorninos[1], Ken L. Smith[1], and Jason R Meier[1], Department of Crop, Soil, and Environmental Sciences[1], University of Arkansas, Fayetteville, AR, USDA- ARS, Suttgart[2], AR. 13

08:30 a.m.** **Using Pheromone Traps to Examine the Distribution of Tobacco Budworms and Bollworms in Arkansas.** Clint Allen and Randy G. Luttrell, Department of Entomology, University of Arkansas, Fayetteville, AR. 14

08:45 a.m.* **Evaluation of Sampling Efficiency and Treatment Threshold for Tarnished Plant Bug (*Lygus lineolaris*) in Cotton.** Chase Milligan, Jeremy Greene, Gus Lorenz, and Glenn Studebaker. 14

09:00 a.m.* **Options for Controlling Newpath-Resistant Red Rice in Soybean.** Bree A. Pearson, Nilda R. Burgos, Jeremy A. Bullington, and Vinod K. Shivrain, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 15

09:15 a.m.* **Response of Light Interception and Yield of Ultra-Early Soybean Cultivars Differing in Leaflet Number.** Thomas M. Seversike, and Larry C. Purcell, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 15

09:30 a.m.* **Evaluation of Conventional and Clearfield® Herbicide Programs in Tillage Systems.** Drew T. Ellis, Ron E.Talbert, and Brian V. Ottis, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 16

09:45 a.m **Evaluation of New Fungicides on Soybean under Arkansas Field Conditions.** Michael Emerson, Cliff Coker, Kevin Lawson and John Rupe, Department of Plant Pathology, University of Arkansas, Fayetteville, AR. 17

10:00 a.m. **Break**

10:15 a.m. **Control Options for Tarnished Plant Bug in Southeast Arkansas –** Chuck Capps[1], Jeremy Greene[1], Chase Milligan[2], Gus Lorenz[3], Kyle Colwell[3] and Glenn Studebaker[4], University of Arkansas Monticello[1], University of Arkansas Fayetteville[2], University of Arkansas Cooperative Extension Service Little Rock[3], and University of Arkansas Keiser, AR[4]. 18

10:30 a.m. **Biological Control of Japanese Beetle Larvae in Arkansas**. Donald C. Steinkraus, Department of Entomology, University of Arkansas, Fayetteville, AR. 19

10:45 a.m **Efficacy of Selected Compounds for Two-Spotted Spider Mite (Tetranychus urticae), Control in Arkansas 2005.** Craig Shelton, Gus M. Lorenz, Kyle Colwell, Jarrod Hardke, Jenny Stacks, Craig Allen. University of Arkansas Cooperative Extension Service, Little Rock, AR. 19

11:00 a.m. **Efficacy of Insecticides Against Tarnished Plant Bug in Northeast Arkansas.** Glenn Studebaker, Department of Entomology, NEREC, Keiser, AR. 19

11:15 a.m. Scholarship Recipients
Graduate Paper Awards
* Denotes MS
** Denotes Ph.D.

11:45 noon **ADJOURN**

Pest Management: Looking Ahead Requires Looking Back.

Robert N. Wiedenmann, Department of Entomology, University of Arkansas, Fayetteville, AR.

"Both indirect and direct control (of insects) depends upon a more or less intimate knowledge of the insect's life history, seasonal history and habits, and also upon how the insect responds to its environment. Such knowledge is necessary if measures are to be applied at the time when they are most effective…" Although the quote sounds contemporary, it was written by Dwight Isely in the Third Edition (1946) of his book, "Methods of Insect Control." Yet his statement is even more true today than it was 60 years ago. As we contemplate the future of pest management, we need to remember how we got to this point in history and remember those aspects of insect biology that are requisite to understand as we develop sound, sustainable, pest management strategies. In other words, looking ahead requires looking back.

Identification and Characterization of Two New Viruses in Blackberry.

James Susaimuthu[a], Ioannis E. Tzanetakis[b], Rose C. Gergerich[a] and Robert R. Martin[b]
[a]Department of Plant Pathology, University of Arkansas, Fayetteville, 72701, U.S.A.
[b]Department of Botany and Plant Pathology & Center for Gene Research and Biotechnology, Oregon State University, Corvallis, OR 97331, U.S.A.

Symptoms of progressive vein yellowing, reduction in fruit quality, die-back of floricanes, and bush decline were attributed to mixed infection of blackberry by two or more viruses. This disease is an emerging threat to blackberry producers as it can cause substantial yield loss. The aim of this study was to identify and characterize the new viruses affecting blackberry. Based on nucleotide sequence analysis, *Blackberry yellow vein associated virus* (BYVaV), a crinivirus, was identified and found to be present in symptomatic plants using RT-PCR. BYVaV-specific primers amplified a ~500 bp viral RNA from symptomatic and, surprisingly, non-symptomatic 'Chickasaw' blackberry and other cultivars. Testing of additional plants revealed that BYVaV is latent in 'Chickasaw' blackberry which suggested that a mixed infection of two or more viruses might explain the symptoms in field-grown plants. Electron microscopy revealed potyvirus-specific inclusions in symptomatic blackberry plants, and sequence analysis suggested the presence of a novel potyvirus, which has been named *Blackberry virus Y* (BVY). Non-symptomatic, BYVaV infected 'Chickasaw' plants were placed in a production field that contained symptomatic 'Chickasaw' blackberry for two-week periods spanning the growing season. Ten of these 150 sentinel plants exhibited yellow vein and decline symptoms. Both BYVaV and BVY primers amplified specific PCR products from these plants. Studies to determine the source and means of transmission of these viruses are underway.

ALS Inhibitor Herbicide-Resistant Ryegrass is Not Resistant to ACCase Inhibitor Herbicides.

Yong In Kuk and Nilda R. Burgos, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Diclofop-resistant ryegrass (*Lolium* spp.) is a major weed problem in wheat production worldwide. This study was conducted to determine the resistance pattern of diclofop-resistant ryegrass accessions to recently recommended herbicides for ryegrass control in wheat, pinoxaden and mesosulfuron, and determine alternative herbicides for control of resistant ryegrass. Ten ryegrass accessions from Arkansas and Louisiana, including standard resistant and susceptible accessions were used in this experiment. Eight of nine accessions were confirmed resistant to diclofop. The diclofop-resistant accessions were also cross-resistant to the ACCase inhibitor herbicide, pinoxaden. Three of eight diclofop-resistant accessions exhibited multiple-resistance to chlorsulfuron. Accession #03-1, which is resistant to chlorsulfuron, exhibited cross-resistance to other ALS inhibitor herbicides, mesosulfuron, sulfometuron, and imazamox. Accession 03-1, however, was not resistant to ACCase inhibitor herbicides, diclofop, fluazifop, clethodim, sethoxydim, and pinoxaden. Mutiple-resistance to glyphosate was not observed. These results suggest that diclofop-resistant ryegrass can be controlled by the newly recommended herbicide, mesosulfuron. However, it has to be used with caution because we have confirmed a mesosulfuron-resistant ryegrass accession. This means that not all ryegrass populations in Arkansas are susceptible to mesosulfuron. There is a need for more thorough profiling of herbicide resistance in ryegrass.

Evaluation of Slow-Release Nitrogen Fertilizers for Rice.

Bobby R. Golden, Nathan A. Slaton, Richard J. Norman, Russell E. Delong, and Charles Wilson Jr., Department of Agronomy, University of Arkansas, Fayetteville, AR.

Nitrogen fertilization of rice (*Oryza sativa* L.) in the direct-seeded, delayed flood production system is usually performed by aircraft. The ability to apply N-fertilizer with ground equipment before seeding is performed would benefit rice producers by reducing application costs associated with N fertilization. The primary research objective was to compare preplant application of several slow-release urea fertilizers with the standard practice of applying urea preflood for rice production in the delayed-flood production system.

Studies were conducted at the Pine Tree Branch Station (PTBS) on a Calhoun silt loam, and at the Rice Research and Extension Center (RREC) on a Dewitt silt loam in 2005. Agrium ESN (Environmentally Smart N) and two additional coated urea fertilizers (3.5 and 4.0% coatings) were applied at total N rates of 45 to 180 lbs N ac^{-1}

and incorporated immediately before drill seeding 'Wells' rice (100 lbs seed ac^{-1}). Before flooding at the 5-leaf stage, urea was applied at the same total-N rates as the slow-release fertilizers and followed by flooding. Each site also contained an unfertilized control (0 lbs N ac^{-1}). Total, aboveground N uptake was determined near the panicle differentiation (PD) stage and at early heading (HDG) for all rates of urea and Agrium ESN. Grain yield, adjusted to 12% moisture, was determined by harvesting the middle rows of each plot. Each experiment was arranged as a randomized complete block, 3 or 4 (N source) % 4 (total N rate) factorial design plus an unfertilized control. Each treatment was replicated four times. Yield data from each location was analyzed separately. Mean separations were performed by Fisher's Protected Least Significant Difference method at a significance level of 0.10.

Rice grain yields were not affected by the N-source % N rate interaction at the PTBS (P = 0.2098) and at the RREC (P= 0.3812). However, rice grain yield was significantly effected by the main effects of N source and N rate at both PTBS (P <0.0001) and RREC (P <0.0001). All N sources, averaged across N rates, produced significantly greater yields than the unfertilized control at each location. Urea applied preflood produced the greatest overall mean yield of all N sources and was significantly greater than the mean yields of Agrium ESN and the 4.0% coated urea N sources at RREC. At the PTBS, Urea applied preflood produced the greatest overall mean yield, but the mean yield was not different from that of the 4.0% coated urea, which produced similar yields as Agrium ESN. Grain yield, averaged across N sources, increased linearly as N rate increased with the rate of increase common to all sources within a location.

The data consistently showed that the preplant-incorporated, slow-release N sources evaluated were less efficient than the standard practice of urea applied preflood. Plant growth and yield data suggest that N release from the slow-release fertilizers may have been too rapid.

Efficacy of Selected Insecticides for Control of Helitohines in Conventional Non-Bt Cotton – 2004-2005.

Jarrod T. Hardke, Gus M. Lorenz, Kyle Colwell, and Craig Shelton, University of Arkansas Cooperative Extension Service, Little Rock, AR

Field experiments were conducted in 2004-2005 in Jefferson County, Arkansas to evaluate efficacy of selected insecticides to control bollworm, *Helicoverpa zea*, and tobacco budworm, *Heliothis virescens*. The insecticides selected for these studies were both traditional and experimental. In the 2004 study, the selected insecticides were Steward (indoxacarb), a Steward (indoxacarb) and Asana XL (esfenvalerate) tank mix, S-1812, V-10132, Tracer (spinosad), a Tracer (spinosad) and Capture (bifenthrin) tank mix, Denim (emamectin benzoate), Diamond (novaluron) and bifenthrin tank mix, Karate Z (lambda-cyhalothrin), Leverage (imidachloprid + cyfluthrin), and a Karate Z (lambda-cyhalothrin) and Steward (indoxacarb) tank mix. In the 2005 study, the selected insecticides were Steward (indoxacarb), KN-128 tank mixed with Penetrator Plus (nonionic oil concentrate), KN-128, Tracer (spinosad), Bidrin (dicrotophos) tank mixed with Discipline (bifenthrin), Experimental 1, and Double Threat (bifenthrin and spinosad). In both studies, significant differences were observed among treatments in regard to heliothine damage and heliothines found.

Effects of Tank Mixes of Mon 3539 and Selected Compounds in Roundup Ready Flex Cotton – 2005.

Jarrod T. Hardke, Gus M. Lorenz, Kyle Colwell, and Craig Shelton, University of Arkansas Cooperative Extension Service, Little Rock, AR

Field experiments were conducted in 2005 at a single location in Arkansas to evaluate potential weed control interactions when MON 3539 (glyphosate) was applied with several insecticides and a plant growth regulator. Applications were made at the 1-3 leaf stage, the 6-8 node stage, and at the 12-14 node stage. Different combinations of tank mixes were used in each of the three applications. In the first application, all plots received the same treatment: MON 3539 (glyphosate) at a rate of 0.75 lb ae/a. For the second application, in regard to phytonecrosis, only the MON 3539 (glyphosate)-Dimate (dimethoate) mixture significantly increased crop injury 7 days after treatment two (DAT2) when compared with MON 3539 (glyphosate) alone (20 vs. 13% injury). Bidrin (dicrotophos), Trimax (imidachloprid), Mustang Max (zeta-cypermethrin), Karate Z (lambda-cyhalothrin), Baythroid (cyfluthrin), Intrepid (methoxyfenozide), Steward (indoxacarb), Denim (emamectin benzoate), or Mepichlor (mepiquat chloride) in combination with MON 3539 showed less than 8% crop injury at 7 DAT2, which was significantly less than MON 3539 applied alone (13% injury). For the third application, in regard to phytonecrosis, only the MON 3539-Mepichlor (mepiquat chloride) mixture significantly increased crop injury at 7 days after treatment three (DAT3) when compared with MON 3539 alone (13 vs. 5% injury). None of the remaining treatments in the third application significantly differed from that of MON 3539 alone in regard to phytonecrosis.

Only the MON 3539 (glyphosate) + Centric (thiamethoxam) mixture significantly reduced weed control at 15 DAT2 when compared with MON 3539 (glyphosate) alone (72 vs. 84% control). MON 3539 (glyphosate) tank mixed with each of the following significantly differed from the 95% rating of MON 3539 (glyphosate) alone at 14 DAT3: Bidrin (dicrotophos) at 75%, Centric (thiamethoxam) at 72%, and Denim (emamectin benzoate) at 79%.

Rice Cultivar Response to Glyphosate Drift as Influenced by Growth Stage.

Jason R. Meier, Ken L. Smith, Ryan C. Doherty, and M.B. Kelley; University of

Arkansas Division of Agriculture, Monticello, AR., and Robert C. Scott; University of Arkansas Division of Agriculture, Little Rock, AR.

Glyphosate resistant crop acreages continue to increase in Arkansas as well as drift injury to non-glyphosate resistant crops, especially rice. A study was conducted to identify potential differences in tolerance between several rice varieties to low levels of glyphosate. The experiment was conducted at the Southeast Research and Extension Center in Rohwer, AR on a Sharkey clay soil in 2005. Drew, Lagrue, Cocodrie, CL-161, CL-XL8, Wells, Bengal, Katy, Banks, and Francis cultivars were grown under normal rice culture and treated with 0 lb ae/A, 0.04 lb ae/A and 0.08 lb ae/A glyphosate at the 3-4 leaf, ¼ inch internode elongation (IE), and boot stages of growth. Glyphosate applied was the formulated product, Roundup WEATHERMAX® at 0 oz/A, 1.1 oz/A, and 2.2 oz/A. Applications were made using a backpack sprayer equipped with 8002 flat fan nozzles. Plots were set up in a split-split plot design. Visual injury (0-100%), % heading by date, and flag leaf length (cm) were recorded for all treatments. Yields were obtained using a small plot combine.

At the 3-4 leaf application timing, visible injury of Drew, Lagrue, CL-161, CL-XL8, Bengal, Katy, Banks, and Francis increased as the rate of glyphosate increased. Cocodrie showed no difference in visual injury between the 2.2 and 1.1 oz/A rate. Wells showed no difference in visual injury between the 1.1 oz/A rate and the untreated check. Yield was unaffected by glyphosate rates at the 3-4 leaf application timing in all varieties with the exception of Katy. Katy yield was greater at the 1.1 oz/A rate, but was reduced by the 2.2 oz/A rate which was no different from the untreated check. Flag leaf length and heading date were unaffected in any variety by glyphosate rates at this timing.

At the ¼ inch IE timing, visual injury increased as the rate of glyphosate increased within varieties with the exception of Bengal, which showed no difference in visual injury between the 2.2 and 1.1 oz/A rate. Heading date was delayed as the rate of glyphosate increased at this application timing with the exception of Francis which was delayed by both glyphosate rates but showed no difference in heading between the 2.2 and the 1.1 oz/A rate. Flag leaf length was unaffected by glyphosate applications in Drew, Lagrue, CL-161, Katy, and Francis. Flag leaf length was similar between the 1.1 and 2.2 oz/A rates, but shorter than the untreated check in Cocodrie, CL-XL8, Wells, and Banks. Flag leaf length in Bengal decreased as the rate of glyphosate increased. Yield of Drew, Lagrue, Cocodrie, CL-XL8, Katy, Banks, and Francis was unaffected by glyphosate rates at this application timing. CL-161 yield was similar in the untreated check and 2.2 oz/A rate, but reduced by the 1.1 oz/A rate. Yield of Wells was higher following the 2.2 oz/A rate and lowest in the 1.1 oz/A rate. The 1.1 oz/A rate produced the lowest yields in the Bengal variety. Some yield data in this trial may be confounded due to severe lodging caused by hurricane winds and heavy rains just prior to harvest.

At the boot application timing, visual injury increased with increased rates of glyphosate in Drew, Cocodrie, Bengal, Katy, and Banks. There was no visual injury rate response between the two higher rates of glyphosate in Lagrue, CL-161, CL-XL8, Wells, and Francis. Delayed heading was greater in Drew, Lagrue, Cocodrie, CL-161, Bengal, Katy, Banks, and Francis as the rate of glyphosate increased. Although heading dates

Efficacy of Ignite and Ignite 280 Programs on Weeds in Arkansas Cotton.

Ryan C. Doherty, Jason R. Meier, M. B. Kelly, and Ken L. Smith; University of Arkansas Division of Agriculture, Monticello, AR.

Three trials were conducted in 2005 at Rohwer AR to evaluate broadleaf and grass control in Liberty Link cotton. Ignite and Ignite 280 alone at 0.417 lb ai/a provided > 90% control of morningglory 15 DAT. Adding Cotoran , Caporal PRE, or Dual Magnum EP did not improve morningglory control over that provided by Ignite or Ignite 280 alone. Cotoran and Caporal applied PRE followed by Ignite or Ignite 280 at 3-4 and 6-8 leaf cotton improved pigweed and barnyardgrass control to greater than 93% over the less than 54% provided by Ignite or Ignite 280 alone at the same application timings. The addition of Dual Magnum to the 6-8 leaf application of Ignite or Ignite 280 did not improve control of pigweed and barnyardgrass over Ignite alone. Similar control of pigweed, barnyardgrass, and morningglory was provided by Ignite and Ignite 280 formulations when sprayed at equal rates ai/a. Applications of Ignite alone at .417 lb ai/a applied at 2lf and 8 lf timings provided 54%, 50%, 90% control of barnyardgrass, pigweed, and morningglory, respectively 21 DAT, while the addition of a 12 lf application provided 85%, 90%, 95% control of barnyardgrass, pigweed, and morningglory, respectively 21 DAT. Although a third application of Ignite improved control over the currently labeled two applications, this data indicates a system approach combining a soil residual herbicide with Ignite is needed to provide acceptable control of barnyardgrass and pigweed.

Effects of Environmental Conditions on Osprey (mesosulfuron) Efficacy

Jason L. Alford, Lawrence R. Oliver, Chad E. Brewer, and Mohammad T. Bararpour, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Herbicide efficacy can be affected by environmental conditions, such as temperature and soil moisture. Environment before or directly after herbicide applications can leave control results less than desirable and even lead to crop injury due to stressful growing conditions. Wheat trials were conducted in 2001-02 through 2003-04 at the Arkansas Agriculture Research and Extension Center in Fayetteville, AR. The experiments were conducted to evaluate Osprey efficacy on Hoelon (diclofop)-resistant Italian ryegrass (*Lolium multiflorum*) and crop tolerance as compared to several herbicides and tank mixtures. The study was established in an area with a uniform, natural infestation of Italian ryegrass (±28 plants/ ft^2). Plots were arranged as a randomized complete block design with four replications. Treatments were: Osprey at 0.043 lb ai/A + MSO at 0.75 qt/A + UAN 28% MPOST (2- to 3-leaf wheat), Osprey at 0.043 lb/A + MSO + UAN LPOST (4-leaf to 2-tiller ryegrass), Axiom (flufenacet/metsulfuron) at 0.425 lb ai/A EPOST (1- to 2-leaf wheat), Sencor (metribuzin) at 0.25 lb ai/A MPOST fb Sencor at 0.25 lb/A LPOST (2- to 3-tiller wheat), Finesse (chlorsulfuron/ metsulfuron) at 0.023 lb ai/A PRE, and Finesse at 0.023 lb/A PRE fb Osprey at 0.043 lb/A + MSO + UAN LPOST.

In 2002 and 2004, Finesse PRE fb Osprey LPOST controlled 88% of diclofop-resistant ryegrass for the 3 years tested. Osprey LPOST, Axiom EPOST, and Sencor (EPOST fb LPOST) provided equivalent ryegrass control (average 85%) compared to Finesse PRE fb Osprey LPOST. However, Axiom EPOST was the only treatment that provided wheat yield equal to Finesse PRE fb Osprey LPOST. The plots that received Finesse PRE fb Osprey LPOST and Axiom EPOST produced 51 and 48 bu/A wheat yield, respectively. Italian ryegrass interference reduced wheat yield to 12 bu/A in the check. Osprey EPOST in 2003 reduced Italian ryegrass control from 93% (average of 2002 and 2004) to 10% and wheat yield from 58 bu/A (average of 2002 and 2004) to 3 bu/A. Environmental conditions were warm and wet in 2002 and 2004 and cold and dry in 2003. Average environmental conditions were 51 F and 2.3 in. rainfall (2002 and 2004) versus 42 F and 0.04 in rainfall (2003) over the 18 days after application. In general, Italian ryegrass control (* 81%) and wheat yield (* 43 bu/A) in 2003 were much lower than the average of 2002 and 2004.

In conclusion, Osprey is a safe, effective herbicide for diclofop-resistant Italian ryegrass control in wheat. Under normal environmental conditions, Osprey is equivalent to competitive products, such as Axiom, Finesse, and Sencor. However, untimely changes in weather conditions, cold and dry, reduced herbicide effectiveness, especially directly after herbicide applications.

Efficacy and Selectivity of KIH-485 in Cotton.

Griff M. Griffith, Jim L. Barrentine, and Marilyn R. McClelland, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

KIH-485 is an experimental herbicide developed by Kumiai Chemical Industries. KIH-485 has activity similar to that of metolachlor, inhibiting growth of seedlings after germination. In over 100 trials, corn has shown excellent tolerance to KIH-485. Soybeans, cotton, and sunflower have shown tolerance to this herbicide and are currently being tested. KIH-485 has environmentally favorable use rates, six to eight times lower than many current commercial herbicides. A broad-spectrum herbicide, KIH-485 controls numerous grass and broadleaf weeds and has substantial residual control. Current field research objectives are centered on confirming use rates and evaluating crop tolerance and efficacy on difficult-to-control weeds.

Experiments were established in Marianna and Fayetteville, AR, to evaluate cotton response and weed control at different use rates of KIH-485 applied preemergence (PRE) and postemergence (POST). Cotton tolerance was evaluated using KIH-485 at 100, 125, 200, and 250 g ai/ha applied PRE and POST. KIH-485 treatments were compared with Dual II Magnum (metolachlor) at 712 and 1423 g ai/ha applied PRE and at 1423 g/ha applied POST at 3- to 4-lf cotton. KIH-485 was also applied POST with Touchdown Total (glyphosate). Weed control was evaluated using KIH-485 applied alone at 100 and 200 g/ha PRE and at 100 g/ha mixed with Cotoran (fluometuron). KIH-485 was applied POST in tank mixtures with MON 3539 (glyphosate). Treatments were applied with a tractor-mounted or backpack sprayer at 15 (Fayetteville) to 20 (Marianna) GPA. Cotton injury and weed control were rated visually on a scale of 0 to 100 %, with 0= no injury and 100= death of the plant. Weeds rated were annual grasses (*Gramineae* spp.), Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), prickly sida (*Sida spinosa*), and velvetleaf (*Abutilon theophrasti*). Cotton yield was taken at Marianna.

Limited rainfall at Marianna prevented adequate activation of the herbicides; therefore, cotton was not injured at Marianna by PRE treatments. Rainfall at Fayetteville was adequate to activate the herbicides, and cotton injury from KIH-485 applied alone or with Cotoran ranged from 16 to 26% at 2 weeks after treatment (WAT). Injury from KIH-485 at 100 to 200 g/ha was still 16 to 21% 6 WAT. Injury from 250 g/ha was 43%. Injury from Dual II Magnum was 0 by 6 WAT. At both Fayetteville and Marianna, cotton injury from POST applications was 25 to 31% at 1 to 2 WAT, and no rate response was noted. Cotton stunting was 20 to 28% at 3 WAT. Stunting was not evident by 8 WAT, except for cotton treated with KIH-485 at 125 g/ha + Touchdown Total at 840 g ae/ha, which was stunted 14%.

Control of all weed species with PRE treatments at Fayetteville was excellent until 6 WAT (91 to 100%). The Dual II Magnum comparison treatments controlled annual grasses and Palmer amaranth at least 99%, but control of pitted morningglory, prickly sida, and velvetleaf was poor (<65%). Activity of Dual II Magnum + Cotoran was equal to activity of KIH-485, and all weed species were controlled. Even though KIH-485 activation was poor at Marianna, control of Palmer amaranth and annual grasses was 85 to 88% at 5 WAT. (The experiment was oversprayed with glyphosate at 5 weeks after PRE treatments, so KIH-485 activity could not be evaluated after this time.) KIH-485 applied alone POST (only at Fayetteville) had limited activity (<40% control of all weeds). At Marianna, control of annual grasses and Palmer amaranth was better with KIH-485 + MON 3539 than with MON 3539 alone.

In conclusion, KIH-485 appears to have good PRE activity, although POST activity is poor when applied alone. However, cotton is sensitive to KIH-485 applied at either PRE or POST at the rates we used.

Use of Roundup Ready® Soybeans and Row Spacing to Control Red Rice.

Jeremy A. Bullington, Nilda R. Burgos, Ken L. Smith, Vinod K. Shivrain, Bree A. Pearson, and Jason R. Meier, Department of Crop, Soil, and Environmental Science, University of Arkansas, Fayetteville, AR.

Red rice (*Oryza sativa*) has always been a major weed problem to rice producers in the Mississippi River Delta. Red rice is also a concern in soybean production fields. Roundup Ready technology in soybeans provided more options for red rice control. Although glyphosate is very effective in red rice control, some escapes of red rice are inevitable. Cultural practices are also crucial factors in any weed management practices. The objectives of this study were to determine the effects of row spacing, maturity groups of soybeans, and timings of glyphosate application on red rice control and soybean yield.

Experiments were conducted at the Southeast Research and Extension Center, Rowher and at the Rice Research and Extension Center, Stuttgart, AR in summer of 2005. Experimental design was split-split plot with four replications. Row spacing, cultivar, and treatments were main, sub, and sub-sub plot, respectively. Row spacings used were 22.5 and 7 in. Soybeans were planted at 50 lb/A in both row spacing. The cultivars were a mid-group four (DK4461) and a mid-group five (DK5465). Herbicide application timings were 1) single application 4 weeks after planting (WAP); 2) sequential application at 4 and 6 WAP; and 3) sequential application at 4 WAP and at red rice flowering. The last application was an attempt to prevent red rice seed production. The rate of glyphosate used was 0.75 lb ae/A. In the narrow row spacing, red rice was planted using a 7-row drill @ 20 lb/A. Data from both locations were analyzed separately because of variation in stand count of soybeans and red rice.

Cultivar and row spacing did not affect red rice control. There was no interaction effect between cultivar and row spacing on red rice injury at both locations. Therefore, the overriding factor was timing of glyphosate applications. Averaged over cultivar and row spacing, red rice control was 52% at Rohwer and 79% at Stuttgart late in the season. The sequential application at 4 and 6 WAP provided 80 to 87% late-season red rice control on average in both locations. The 4 WAP followed by late application of glyphosate provided the best red rice control at Stuttgart (95%), but was less effective in Rohwer (80%). This is probably because red rice in Rohwer was bigger than that in Stuttgart, at the time of the late application. Seven of the 12 treatments had red rice escapes which produced seed 2.69 g/plant on average in Stuttgart and 2 of the 12 treatments had red rice escapes, which produced seed at 1.75 g/plant on average at Rohwer. Very few of the surviving plants produced seed. Red rice seed production was reduced drastically wherever it occurred. Soybean yields from both cultivars were similar and were not affected by treatments at both locations. However, soybean yield was generally higher at Rohwer compared with yield at Stuttgart, primarily due to better plant stand at Rohwer.

Impact of Selected Insecticides on the Beneficial Arthropod Complex Found in Arkansas Cotton.

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The beneficial arthropod complex found in Arkansas cotton is vital to the suppression of secondary or induced pests such as *Aphis gossypii* (Homoptera: Aphididae). Three insecticides were evaluated for their negative impact on beneficial arthropods at a time when they are providing the greatest aphid control. Imidicloprid (1.5 oz./A), thiomethoxam (1.5 oz./A), and novaluron (9 oz./A) were delivered at a rate of 10 GPA and compared to an untreated check. The test was organized in a RCBD with four replicates and plots were 0.87 acres each. Data were collected one day before treatment, three and seven days after treatment. There was a significant treatment affect among groups of predators, (e.g. the aphidaphogus group, which included insects from Coccinellidae and Chrysopidae). Less mobile predators were also significantly affected by treatment and included the immature stages of all of the predators, as well as spiders.

Utility of Residual Herbicides in Roundup Ready Soybean.

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Since the introduction of Roundup Ready® soybean, the question has often been raised about whether preemergence or residual herbicides should be used with glyphosate. Trials were conducted from 2002 through 2005 at the Northeast Arkansas Research and Experiment Station at Keiser on a clay loam soil and at the Pine Tree Branch Station on a silt loam soil. Each year trials were established on a randomized complete block design with four replications. Data included visual weed control ratings taken at 2, 4, 6, 8 and 10 weeks after emergence (WAE) and soybean yield. Herbicide treatments included chlorimuron + sulfentrazone preemergence (PRE) followed by (fb) glyphosate + chlorimuron 28 days after emergence (DAE), sulfentrazone + metribuzin PRE, sulfentrazone + metribuzin PRE fb glyphosate at 2- to 4-inch weed regrowth, clomazone + sulfentrazone + metribuzin PRE, clomazone + sulfentrazone + metribuzin PRE fb glyphosate at 4- to 6-inch weed regrowth, glyphosate at 2- to 4-inch weeds fb glyphosate at 2- to 4-inch weed regrowth, glyphosate + chlorimuron at 2- to 4-inch weeds fb glyphosate + chlorimuron at 2- to 4-inch weed regrowth, cloransulam + flumetsulam + glyphosate at 2- to 4-leaf weeds fb glyphosate at 14 days after treatment (DAT), and cloransulam + glyphosate at 2- to 4-leaf weeds fb glyphosate 14 DAT. Each herbicide rate was optimized for soil type and weed size. The data were analyzed with years and locations as random variables to allow broader inferences concerning herbicide efficacy.

Early-season weed control was enhanced by the use of PRE herbicides. Clomazone + sulfentrazone + metribuzin PRE and sulfentrazone + metribuzin PRE provided >70 % control of hemp sesbania (SEBEX), >85 % control of pitted morningglory (IPOLA) and entireleaf morningglory (IPOHG), and >90 % control of prickly sida (SIDSP) and barnyardgrass (ECHCG) at 2 WAE. At 4 WAE, SEBEX control was >90 % by a tank mixture of glyphosate + chlorimuron compared to 80 % by glyphosate alone. IPOLA and IPOHG control was also enhanced by the use of PRE herbicides and tank mix partners. SIDSP and ECHCG control at 4 WAE was >90 % control for all treatments, except chlorimuron + sulfentrazone PRE fb glyphosate at 28 DAE (77%) and sulfentrazone + metribuzin PRE (87%). At 6 and 8 WAE all species were controlled >85 % with slightly higher control by using PRE herbicides and tank mix partners compared to glyphosate fb glyphosate. Late-season control of IPOLA and ECHCG was enhanced by the use of residual PRE and residual + glyphosate tank mixtures to >90 % compared to 87 % control of both species by glyphosate alone.

Although there were differences in weed control, there were no differences in soybean yield among treatments of glyphosate fb glyphosate alone and the highest yielding conventional system or glyphosate plus residual tank mix. The highest yields averaged over eight site-years ranged from 49 to 51 bushels per acre for glyphosate fb glyphosate, cloransulam + glyphosate fb glyphosate, sequential applications of chlorimuron + glyphosate, clomazone + sulfentrazone + metribuzin PRE fb glyphosate, and chlorimuron + sulfentrazone PRE fb glyphosate. Although the use of residual herbicides and tank mixtures may be warranted in certain scenarios, timely applications of glyphosate on small, actively growing weeds can provide adequate weed control and crop yield.

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

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Early season soybean was studied as a trap crop for a complex of stink bugs (*Nezara viridula, Acrosternum hilare, and Euschistus servus*) attacking agronomic crops in Arkansas. Field research in 2002-2004 demonstrated a strong preference of stink bugs for early season soybean in reproductive stages R4-R7. Studies in replicated production fields in 2004 suggested that the spatial scale of the trap was critical and that management strategies must address the impacts of other crops in the local landscape. The focus of 2005 experiments was investigations of trap crop effectiveness at the farm or community level instead of individual field-scale experiments. Paired fields of MG IV and V soybean were positioned inside larger environments, with a radius extending

0.5 mile from the perimeter of the paired fields. In order to measure and control stink bug migration from nearby early-soybean fields, both treated and untreated trap crops were nested within environments containing either treated or no MG IV soybean and untreated MG IV soybean. Having treated and untreated trap environments has allowed us measure a trap crop's ability to punch a hole in local bug populations. This research is providing insight into the role of early soybean as a host for stink bugs and the scale of management units needed to reduce late season populations of bugs.

Influence of Seeding Rate and Glyphosate Timing on Weed Management in Soybean.

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Since the release of Roundup Ready® soybean technology, producers and researchers alike have experimented with timings of glyphosate applications, observing overall weed control throughout the season. Unlike researchers, who are mostly concerned with the efficacy of treatments, producers usually have only one question: What is the cost? Because of this, the economics of using multiple treatments at various rates is important. Most often, glyphosate is applied twice during the season; however, many timings have been used through the years. It may be possible to alter soybean seeding rates in order to achieve maximum yield and adequate weed control with less input cost. The objective of this study was to compare glyphosate timings and soybean seeding rates to find a less expensive practice for soybean production without compromising yield or suffering losses from weed interference. The study was conducted in 2004 and 2005 at the Pine Tree Branch Station near Colt, AR. The experimental design was a two-factor factorial arrangement of treatments with eight replications. The experiment involved three drilled soybean populations: 75,000, 150,000, and 300,000 plants/A; and three glyphosate treatments: 0.375 lb ae/A at V2 followed by (fb) 0.375 lb/A as needed, 0.75 lb/A at V3 fb V6, and 0.75 lb/A at V3 and V6, and 0.375 lb/A at first weed flower. The as-needed glyphosate treatment, applied twice in 2004 and once in 2005, was applied when weed control fell below 80%. Armor 53K3 Roundup Ready® soybean were planted into 6- by 9-m plots. Visual ratings of herbicide efficacy were taken at 14-day intervals after first treatment. Control of broadleaf signalgrass (*Brachiaria platyphylla*), Palmer amaranth (*Amaranthus palmeri*), and pitted morningglory (*Ipomoea lacunosa*) was excellent (approximately 98%) at soybean maturity. However, at the low soybean population and reduced glyphosate rate, early-season visual control values were approximately 8% less than the other treatment combinations. The slightly lower control values did not influence soybean yield since all treatment combinations gave equivalent soybean yield. In conclusion, a soybean population of 150,000 or 300,000 plants/A improved early-season control through interference, but the lowest soybean population (75,000 plants/A) provided equivalent soybean yield with lower seed cost.

Flowering of Red Rice Biotypes and CL Cultivars as Affected by Planting Dates.

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Clearfield™ (CL) rice provides the best technology thus far for red rice management. However, sustainability of this technology will depend on the extent of outcrossing between CL cultivars and red rice biotypes. Disparity in CL cultivars, planting time, and flowering time of red rice biotypes in fields may have significant impacts on gene transfer. Our objectives in this study were to 1) evaluate the flowering behavior of red rice biotypes and CL rice cultivars with respect to planting dates, 2) to determine yield losses in CL cultivars due to different biotypes of red rice, and 3) to determine outcrossing rate between CL cultivars and red rice biotypes.

The experiments were conducted at the Southeast Research and Extension Center, Rohwer and at the Rice Research and Extension Center (RREC), Stuttgart, AR in summer of 2005. Only Stuttgart experiments are discussed in this paper. Experimental design was split-split plot with three replications. Planting time, CL cultivar, and red rice biotypes were main, sub, and sub-subplot, respectively. Planting times were April 16, April 27, May 13, and May 26. CL cultivars, CL161 and hybrid CL-XL8, were planted at 30 and 90 lb/A, respectively. Twelve red rice accessions representing red rice from 10 counties in Arkansas (strawhull – 7, blackhull – 3, and brownhull – 2) were used. The accessions represent an assortment of characteristics: short and tall, awned and awnless, and early and late to flower. Each red rice accession was planted in the middle of 9-row, 10-ft long plots with four rows of rice on both sides. Data on emergence, flowering, agronomic traits, and yield were recorded. At maturity, red rice plants were bagged and harvested to collect seeds for outcrossing rate determination.

Strawhull red rice in general emerged faster than brownhull and blackhull red rice. Red rice emergence varied from 10 to 35 days after planting (DAP) among and between biotypes across planting dates. Earlier planted CL rice and red rice biotypes took longer to flower than later planted ones and vice-versa. Flowering period of red rice biotypes ranged from 88 to 128, 87 to 117, 79 to 118, and 71 to 116 DAP, in the first, second, third, and fourth planting, respectively. On average, CL-XL8 flowered 3 to 5 days earlier than CL161, although flowering was over within a week in all plantings in both CL cultivars. In all plantings, there was synchronization in flowering (50 %) between both CL cultivars and at least six red rice biotypes. Red rice produced 50% less tillers in CL-XL8 than in CL161 plots, causing higher yield losses in CL161. Red rice biotypes caused different degrees of yield reduction in CL rice cultivars. In general, yield loss of up to 54 and 66% in CL-XL8 and CL161, respectively was observed. The yield reduction was lower in earlier plantings, and it increased with later planting time in both CL-XL8 and CL161. To determine outcrossing rate, collected red rice seeds will be screened using imazethapyr. Survivors of screening will be confirmed as hybrids using simple sequence repeat (SSR) primers.

Using Pheromone Traps to Examine the Distribution of Tobacco Budworms and Bollworms in Arkansas.

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The polyphagous nature of *Heliothis virescens* (F.), the tobacco budworm, and *Helicoverpa zea* (Boddie), the bollworm, cause these insects to be pests of multiple agronomic crops. A better understanding of the temporal and spatial distribution of these insect species is important for population and resistance management options over large-scale farm units. Pheromone trap captures have been used to monitor populations of these insects for more than two decades. Increases in captures may be used to alert farmers or consultants of possible increased oviposition on cotton and also provide a rough idea of the species composition of immature stages in a particular field.

During the last three years, 24-27 trap locations with at least one trap of each species were established in Drew and Desha Counties in Southeast Arkansas. Moths were collected and counted on a weekly basis from June-September during each year. The relationship among moth trap captures and the surrounding crop structure was examined. Trap captures in Southeast Arkansas were also compared to those in other parts of the state with different cropping environments.

Evaluation of Sampling Efficiency and Treatment Threshold for Tarnished Plant Bug (*Lygus lineolaris*) in Cotton.

Chase Milligan, Jeremy Greene, Gus Lorenz, and Glenn Studebaker

Six sampling methods used to obtain a population estimate of the tarnished plant bug (*Lygus lineolaris*) in cotton were compared for efficiency. Of the methods used, three were insect based samples and three were plant injury samples. The insect based samples were the sweep net, shake sheet, and a modified whole plant search. The plant injury samples were damaged squares, blooms, and bolls. This test was conducted at four locations in southeast Arkansas. At each site a stopwatch was used to record the length of time required to obtain and process a sample using each method. In addition, three treatment threshold tests were conducted in two other locations. One was based on tarnished plant bug density and was sampled using the shake sheet. Another was based on percentage of “dirty” squares found per 100 plants as well as number of plant bugs per 100 whole plant searches. The third test was treated at predetermined timings regardless of insect density. Combining sampling efficiency and treatment threshold data is an effective tool for making sound tarnished plant bug management decisions to optimize lint yield while minimizing insecticide cost.

Options for Controlling Newpath-Resistant Red Rice in Soybean.

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Gene flow has recently become an issue with the introduction of Clearfield rice into commercial rice production. Clearfield rice can crossbreed relatively easy with red rice and produce hybrids, which inherit Newpath resistance. The persistence of Newpath-resistant red rice hybrids in rice production can complicate and make red rice management more difficult. One method suggested to reduce hybrid populations is using a soybean rotation following Clearfield rice production. Soybean herbicides may effectively control red rice, even those with Newpath resistance.

Studies were established at the University of Arkansas Cotton Branch Research Station in Marianna, AR, and the University of Arkansas Rice Research and Extension Center in Stuttgart, AR, in 2005 to evaluate options for controlling Newpath-resistant red rice in soybean. Each study consisted of two experiments, one using single herbicide applications and one using sequential herbicide applications. Eleven soybean herbicides were evaluated for efficacy, applied alone and in tankmixes. Most of the herbicides gave 90% control or better in both locations. Python provided the lowest overall control, from 0 to 48% control when applied alone. Dual and Outlook, or any tankmixes containing one of these, were the best treatments. Applied alone, Dual and Outlook had from 93 to 98% control.

Using soybean rotation following Clearfield rice would be effective in controlling Newpath-resistant hybrids. However, careful consideration should be given in choosing herbicides, as not all soybean herbicides were effective in controlling resistant hybrids. Proper cultural practices in conjunction with good weed control could help Clearfield technology continue to be beneficial for producers in the future.

Response of Light Interception and Yield of Ultra-Early Soybean Cultivars Differing in Leaflet Number.

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Drought is typical in the Midsouth during flowering and seed filling stages for soybean, and providing adequate irrigation to crops is an increasing concern on many farms. Soybean cultivars from maturity groups (MG) I through III can be used to substantially decrease the irrigation needed compared to traditionally grown MG V and

VI cultivars, but they require high population densities to intercept sufficient light to give optimal yields. We hypothesized that experimental 5- and 7-leaflet soybean varieties would reach canopy closure sooner and accumulate more light during the season than near isogenic 3-leaflet varieties when sown at similar populations. The objectives of this research were to: (i) evaluate yield response to population density for 3-, 5-, and 7-leaflet soybean isolines, and (ii) measure and compare the cumulative amount of intercepted photosynthetically active radiation (CIPAR) from emergence to the full seed stage (R6) of development for 3- and 5-leaflet isoline pairs, and 3- and 7-leaflet isoline pairs. At Fayetteville, AR, plots for experimental lines from MG 00 to II were split into isoline pairs and drilled at seeding rates ranging from 5 to 50 seeds m^{-2}. The fraction of light intercepted (FLI) by 3-, 5-, and 7-leaflet soybean plants was measured using digital imagery approximately every 7 days from seedling emergence to growth stage R6. The FLI values were used to estimate daily light interception, and these values were cumulated to determine CIPAR. When data for 3-, 5-, and 7-leaflet genotypes were combined, yield response to CIPAR was described well (adj. $R^2 = 0.68$) by an exponential equation. This exponential equation predicted that 90% of the asymptotic yield (419 g m^{-2}) would be reached at 650 MJ m^{-2} of CIPAR, regardless of leaflet number. Multiple regression analysis predicted that when the duration from emergence to R6 was 60 days, 5-leaflet genotypes had the highest CIPAR values for the full range of populations (5 to 50 plants m^{-2}). There was little difference between 3-, and 7-leaflet genotypes for CIPAR values. As the length of days from emergence to R6 increased to 80 days, CIPAR values for 7-leaflet genotypes surpassed those of 5- and 3-leaflet genotypes over the population range from 5 to 50 plants m^{-2}. Both 5- and 7-leaflet isolines successfully intercepted more light than their corresponding 3-leaflet isolines, so these genetic traits may prove to be useful tools for reducing plant populations required in early season soybean production systems.

Evaluation of Conventional and Clearfield® Herbicide Programs in Two Tillage Systems.

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In 2004 and 2005 trials were conducted to evaluate the use of conventional herbicide programs in both a conventional-tillage system (CVT) and a stale-seedbed (SSB) tillage system in rice. Trials were also conducted in 2002, 2004, and 2005 in CVT and SSB systems to evaluate the effectiveness of imazethapyr in Clearfield® (imazethapyr-resistant) rice in CVT and SSB tillage systems. Glyphosate (1.0 lb ai/A) was applied as a burndown herbicide 14-day preplant (14-DPP) on all SSB plots. The conventional herbicide programs consisted of clomazone (0.4 and 0.8 lb ai/A) and quinclorac (0.25 lb ai/A) each applied alone, with glyphosate at 14-DPP fb propanil, mixed with propanil (3.0 lb ai/A), followed by (fb) propanil, pendimethalin (3.0 lb ai/A) was applied alone, fb propanil, and tank mixed with quinclorac and/or propanil. Herbicides were applied at 14-DPP, preemergence (PRE), delayed preemergence (DPRE), and early post (EPOST). In the Clearfield® system, imazethapyr (0.063 lb/A) was applied 14-DPP fb POST (SSB only), preplant incorporated (PPI) fb POST (CVT only), PRE fb POST (both tillage systems), and POST applications at various sequential timings of 2- lf, 4- lf, 5- to 6- lf, and 7- lf rice growth stages. Natural populations of barnyardgrass (*Echinochloa crus-galli* (L.) Beauv) and broadleaf signalgrass (*Brachiaria platyphylla* (Griseb.) Nash) were evaluated in both studies.

In 2004, the conventional herbicide programs in the CVT controlled >95% of both species. In SSB, treatments of clomazone or quinclorac 14-DPP fb propanil, and quinclorac + pendimethalin applied DPRE controlled >85% of both species through the season. However, in SSB, conventional herbicide programs applied after rice emergence controlled only 25 to 76% barnyardgrass and broadleaf signalgrass throughout the season. In 2005 all conventional herbicide programs applied before rice emergence controlled >90% of both species throughout the season. Control (4 WAE) was lower for EPOST treatments of clomazone + propanil (54 to 82%), quinclorac + propanil (63 to 74%), pendimethalin + propanil (45 to 63%), and pendimethalin + quinclorac + propanil (65 to 75%). By 6 WAE, these EPOST treatments controlled both species 63 to 100%. Rice was not injured by any treatment. Yields in the conventional rice program were taken only in 2005. Rice yields in SSB plots were equal to or better than rice yields in corresponding CVT plots

Every year in SSB and CVT tillage systems, imazethapyr controlled >85% of both species throughout the season, and rice was not injured. Yields in Clearfield® rice were taken in 2002 and 2005. In both years, yields from the SSB plots were greater than or equal to yields from corresponding CVT plots. These data indicates that the use of a conventional herbicide program and the Clearfield® system in a stale-seedbed tillage system can work as well as or better than the conventional herbicide program in a conventional-tillage system.

Evaluation of New Fungicides on Soybean under Arkansas Field Conditions.

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The discovery of Asian soybean rust (ASBR) in Arkansas and 8 other southern states during November 2004 created dramatic interest in the use of fungicides on soybean in the Mid-South. An ongoing national Section 18 effort by many states resulted in emergency registrations for more than a dozen new fungicides to help control this potentially devastating plant disease. However, all data for the use of these products were collected in Brazil, South Africa or other countries where ASBR had become established in recent years. No local data were available to advise growers in the U.S.

The University of Arkansas Division of Agriculture established a Soybean Rust Working Group to help coordinate the overall research and education response to this problem in 2005. Part of the planned response was the establishment of a Soybean Fungicide Evaluation Program to assess relative efficacy of most of the new fungicides under Arkansas growing conditions along with potential phytotoxicity and other issues.

During 2005, field trials were established at the Southwest Research and Extension Center (SWREC – Hope); Southeast Research and Extension Center (SEREC – Rohwer); Cotton Branch Experiment Station (CBES – Marianna); and the Northeast Research and Extension Center (NEREC – Keiser). The test cultivar in each trial was Armor 47G7 (MG IV) or Armor GP513 (MG V) or both, depending on location. Up to 30 fungicide treatments were included with principal fungicides being pyraclostrobin, propiconazole, trifloxystrobin, azoxystrobin, tebuconazole, myclobutanil, chlorothalonil, flusilazole, famoxadone, thiophanate – methyl, cyproconazole, flutriafol, and tetraconazole alone or in various combinations. Fungicides were applied using backpack or motorized plot sprayers. Most trials were conducted using a randomized complete block design with 6 replications.

Although ASBR was not detected in Arkansas during the 2005 growing season, field trials were carried to completion and assessed for other diseases, phytotoxicity and yield. While data are still being collected and analyzed, phytotoxicity was noted for fungicides containing tebuconazole. Symptoms were similar to sudden death syndrome disease and varied according to variety, location, stage of growth and possibly other factors. Effect on yield is still being determined but limited, if any, significant differences have been noted thusfar. Foliar disease intensity was low at all test sites due to the extremely dry conditions that prevailed during much of the growing season. Yield and quality effects will be discussed since treatment conditions were such that potential benefit from fungicide applications in the absence of heavy disease pressure could be addressed at multiple sites.

Control Options for Tarnished Plant Bug in Southeast Arkansas – 2005

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Efficacy trials were conducted in 2005 to determine the effectiveness of new and existing chemistries in controlling the tarnished plant bug (TPB), *Lygus lineolaris.* Two early season trials were conducted, but no differences in treatments were observed due to a lack of TPB pressure.

In mid-to-late season trials, industry standards such as acephate (Orthene), dicrotophos (Bidrin), oxamyl (Vydate), thiamethoxam (Centric), and imidacloprid (Trimax) provided adequate control of TPB. Newer chemistries such as novaluron

(Diamond) and flonicamid (Carbine), along with numbered compounds, provided control of TPB in these mid-to-late season trials as well. Enhanced control was also observed by tank-mixing pyrethriods with other compounds such as organophosphates.

Biological Control of Japanese Beetle Larvae in Arkansas.

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Japanese beetles have become an important new pest in Arkansas over the past few years. They are rapidly expanding their range and damage turf in the grub stage and foliage of horticultural plants as adults. Several biological control products are being sold in Arkansas for control of the grubs, including a milky spore product based on a bacterium that slowly kills grubs. We tested commercially available milky spore against Japanese beetle grubs in a field test in Arkansas and found no increase in grub mortality or milky spore infection in treated plots.

Efficacy of Selected Compounds for Two-Spotted Spider Mite (*Tetranychus urticae),* **Control in Arkansas 2005.**

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The two-spotted spider mite, *Tetranychus urticae*, is an economic threat to cotton acreage in Arkansas. Frequent evaluation of the performance of commercial miticides is necessary for two-spotted spider mite suppression. Arkansas 2003 yield loss estimates for spider mites, accountable for 3% yield loss, the seventh most economically damaging pest in cotton (Williams 2003). The study was conducted in Poinsett County, Arkansas during the 2005 growing season.

Efficacy of Insecticides Against Tarnished Plant Bug in Northeast Arkansas

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The tarnished plant bug (*Lygus lineolaris)* has become one of the major pests of cotton in Arkansas and the Mid-South. In 2004 it was the number one pest of cotton in Arkansas causing more yield loss than any other single pest of cotton that year. Foliar applied insecticides are the main option for control of this pest. The efficacy of several foliar insecticides and insecticide combinations against tarnished plant bug was evaluated at the Northeast Research and Extension Center in Keiser, AR. In the first trial, no significant control was observed until 9 day after application with acephate, dicrotophos, thiomethoxam and some rates of chlorpyrifos. After 2 applications, all materials tested gave significant control with the exception of oxamyl. However, control broke down by 7 days. Diamond insecticide, a growth regulator, showed very poor control at first. However, after 7 days, it was comparable to the other materials tested. Diamond only has activity against immature plant bugs and is somewhat slow acting, which explains the delay in measurable control. The two standard materials, acephate and dicrotophos had the lowest overall numbers, which has been the case in previous years. No significant differences in yield were observed.