RESEARCH CONFERENCE ABSTRACTS

VOLUME 26

Arkansas Crop Protection Association

November 29-November 30, 2022

STUDENT COMPETITIONS SPONSORED BY:

BASF

Corteva Agriscience

Gowan USA

Syngenta Crop Protection

Adama USA

Valent USA

Tuesday, November 29, 2022

MODERATOR: Donna Frizzell/Garrett Felts
Student Contest Chair: Tommy Butts
Audio-Visual Coordinator: Ben Thrash

†Denotes General ‡Denotes Poster †Denotes Undergraduate *Denotes M.S. Student **Denotes Ph.D. Student

Tuesday, November 29, 2021 (cont.)

MODERATOR: Donna Frizzell/Garrett Felts

2:45 p.m. **Biomass accumulation and total nutrient uptake in Irrigated Cotton.**
C.A. Followell[*,1], T.L. Roberts[1], K. Hoegenauer[1], C. Ortel[1], A. Smart[1], and C. Kirkpatrick[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 4

3:00 p.m. **Break.**

3:15 p.m. **Development of a Soybean Leaf Sampling Protocol to Monitor In-Season Potassium Status.**
C.C. Ortel[**,1], T.L. Roberts[1], K.A. Hoegenauer[1], A.M. Poncet[1], G.L. Drescher[1], C.A. Followell[1], and A.D. Smartt[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 4

3:30 p.m. **Are See and Spray™ and Standard Broadcast Programs Comparable in XtendFlex Cotton?**
T.H. Avent[**,1], J.K. Norsworthy[1], M.C. Castner[1], W. Patzoldt[2], L.M. Schwartz[2], and M.M. Houston[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Blue River Technologies, Sunnyvale, CA. 5

3:45 p.m. **Assessment of Residual Palmer amaranth Control with Soil-applied Herbicides in Dryland Systems.**
M.C. Castner[**,1], J.K. Norsworthy[1], T.A. King[1], and M.C. Woolard[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 5

4:00 p.m. **The Impact of Irrigation Strategy on Nitrogen use Efficiency in Rice.**
K.A. Hoegenauer[**,1], T.L. Roberts[1], G.L. Drescher[1], J.T. Hardke[2], and C.C. Ortel[1]. [1]Dept. of Crop Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences. University of Arkansas, Stuttgart, AR. 6

4:15 p.m. **What Are the Residual Herbicide Options to Control Glufosinate-Resistant Palmer amaranth in Cotton and Soybean?**
P. Carvalho-Moore[**,1], J.K. Norsworthy[1], M.C. Souza[1], M.C. Castner[1], S. Pritchett[1], S. Noe[1], A. Godar[1], and T. Barber[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR. 6

4.30 p.m. **Toxicity of Flupyradifurone and Sulfoxaflor Systemic Insecticides to *Osmia lignaria* and Detoxification Mechanism.**
O. Kline[**,1], L. Cuthill[1], P. Phan[1], and N.K. Joshi[1]. [1]Dept. of Entomology and Plant Pathology University of Arkansas, Fayetteville, AR. 7

4:45 p.m. **Residual Herbicides for Broad- Spectrum Weed Management Programs in Mississippi Peanut.**
T. Bararpour[†,1]. Dept. of Plant and Soil Sciences, Delta Research and Extension Center, Mississippi State University, Stoneville, MS. 7

†Denotes General [‡]Denotes Poster [†]Denotes Undergraduate *Denotes M.S. Student **Denotes Ph.D. Student

Tuesday, November 29, 2021 (cont.)

MODERATOR: Donna Frizzell/Garrett Felts

5:00 p.m. **End Oral Presentations Day 1/Begin Poster Viewing Session.**

Wednesday, November 30, 2021

MODERATOR: Taylor Ibbotson/Andrew Plummer

†Denotes General ‡Denotes Poster †Denotes Undergraduate *Denotes M.S. Student **Denotes Ph.D. Student

MODERATOR: Mathew Mann/Chase Floyd

11:30 a.m. **Awards, Announcements, and Closing Remarks**

12:00 p.m. **Adjourn**

†Denotes General ‡Denotes Poster †Denotes Undergraduate *Denotes M.S. Student **Denotes Ph.D. Student

ABSTRACTS

Use of Metolachlor in Fenclorim-Treated Rice on a Clay Soil.

S.C. Noe*[,1], J.K. Norsworthy[1], T.H. Avent[1], M.C. Castner[1], T.R. Butts[2], and L.B. Piveta[1]. [1]Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR; [2]Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Lonoke, AR.

Barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] is a highly problematic weed in flooded rice that can result in significant yield losses when left unchecked. To preserve high yields in Arkansas rice production, new methods of barnyardgrass control will be needed. Metolachlor is a chloroacetamide herbicide that targets grasses and small-seeded broadleaf weeds; therefore, an experiment was conducted in Keiser, AR to evaluate the efficacy of metolachlor in a rice system in conjunction with a fenclorim seed treatment to mitigate crop injury. Three rates of *S*-metolachlor (0.5, 1.0, and 1.5 lb ai/A) were applied delayed-preemergence to 'Diamond' rice that was treated with fenclorim at 0 or 2.5 lb ai/1000 lb seed. Injury to rice and control of barnyardgrass were evaluated throughout the season. While rice injury initially was high around 70% by 35 days after treatment (DAT) without fenclorim, the low rate of metolachlor combined with a fenclorim seed treatment caused less than 15% injury. The low rate of metolachlor provided 82% barnyardgrass control 35 DAT, which was similar to the level of control observed at the middle rate of metolachlor. Overall, the presence of fenclorim reduced injury to rice at each rate of metolachlor, while not having an impact on weed control. When averaged over herbicide rate, rice in fenclorim-treated plots yielded 95% of the weed-free control compared to 69% without fenclorim. However, increasing rates of metolachlor reduced yield. The combination of a low rate of metolachlor with a fenclorim seed treatment provided a high level of barnyardgrass control while providing adequate rice tolerance. If metolachlor becomes labeled for use in rice, this would provide an alternative site of action for weed control without requiring a herbicide-resistance trait.

Comparison of Transgenic *Bacillus thuringiensis* Technologies in Arkansas Cotton Systems for Control of Cotton Bollworm, *Helicoverpa Zea*.

Z. Murray*[,1], B.C. Thrash[2], N.R. Bateman[3], W.A. Plummer[2], M. Mann[4], T Ibbotson[2], S.G. Felts[3], C.A. Floyd[2], T. Newkirk[1], A. Whitfield[1], and T. Harris[1]. Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [4]Dept. of Entomology and Plant Pathology, University of Arkansas, Keiser, AR.

A widely used method of controlling bollworm (*Helicoverpa zea*) in cotton is the use of transgenic *Bacillus thuringiensis (Bt)* technologies. Resistance has recently been documented in bollworm to dual gene cotton cultivars, and results indicate that dual gene cultivars may require supplemental foliar applications to manage high populations. There is some evidence that, while more efficacious against bollworm, three-gene cotton cultivars yield less than dual-gene cultivars. Despite this yield gap, growers could have greater profits using three-gene cultivars due to lower input and production cost. Research was conducted in 2022 in Drew County, Arkansas, to evaluate the efficacy of several *Bt* technologies and the economic value of Bollgard II and Bollgard 3 technologies. Results suggest sprayed dual-gene cultivars had similar levels of damage to unsprayed three-gene cultivars.

Nutrient uptake, partitioning, and remobilization in modern rice cultivars in Eastern Arkansas.

G.H, Bessa de Lima*[,1], T.L. Roberts[1], G.L. Drescher[1], C.C. Ortel[1], C.A. Followell[1], K.A. Hoegenauer[1], A. Smart[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Rice (*Oryza sativa L.*) is essential food source for more than half of the global population and nutrient management represents one of the highest input costs for successful rice cultivation. Modern rice cultivars paired with improved agronomic practices may have affected the accumulation of nutrient uptake since the last broad studies were published. The objective of this research is to investigate nutrient uptake among different modern rice cultivars. The experimental design utilized was a randomized complete block design with a 2x4 factorial arrangement. Factor A being fertilizer rate and factor B as rice cultivars, respectively, with four replications. The trial locations were situated on silt loam soils at the Pine Tree and Rohwer Research Stations located in the Arkansas delta. The fertilizer recommendations were 100% and 125% of the soil test-based rate recommendations, respectively and the rates applied were N (120 or 145 lb N/A); P (50 or 62.5 lb P_2O_5/A); and K (120 or 150 lb K_2O/A). The rice varieties grown were Diamond, RT 7521, Titan, and CLL 16. Plants were sampled at 2 growth stages (V3 and V5/6 or immediately preflood) and the total aboveground nutrient uptake was determined. At the sampled growth stages, there were no statistical differences in nutrient uptake among the fertilizer rates or cultivars. There were statistical differences in yield among the cultivars and across locations. Nutrient analysis of the other rice growth stages is pending. The results of this research will provide important data on the nutrient uptake and partitioning of modern rice cultivars to enhance fertilizer rate and timing recommendations for grain production.

Optimizing a Clomazone and Oxyfluorfen Mixture for Barnyardgrass Control in a ROXY® Rice Production System on a Silt Loam Soil

C.H. Arnold*[,1], J.K. Norsworthy[1], M.C. Castner[1], T.C. Smith[1], and T.R. Butts[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR.

Oxyfluorfen (ALB2023) is not currently labeled for use within the ROXY Rice Production System; however, the herbicide is effective for control of barnyardgrass. Therefore, oxyfluorfen could be an option for rice growers to combat herbicide-resistant barnyardgrass when using the ROXY Rice Production System, which provides a non-GMO trait for resistance to oxyfluorfen. A field trial was conducted at the Rice Research and Extension Center near Stuttgart, AR in 2022 to determine the optimal rates of clomazone and oxyfluorfen for residual barnyardgrass control in the ROXY Rice Production System. Herbicide treatments included clomazone at 0.25 and 0.3 lb ai/A, and ALB2023 (oxyfluorfen) at 0.6 and 0.75 lb ai/A. Herbicide treatments were clomazone alone applied sequentially at either 0.25 or 0.3 lb ai/A preemergence (PRE) and postemergence (POST), sequentially applied oxyfluorfen at 0.6 or 0.75 lb ai/A, and sequential combinations of both herbicides as mixtures (0.25 + 0.75 lb ai/A or 0.3 + 0.6 lb ai/A). Barnyardgrass control with clomazone was 94 and 99% at 21 days after the PRE application at 0.25 and 0.3 lb ai/A. Oxyfluorfen provided 93 and 97% barnyardgrass control at 0.75 and 0.6 lb ai/A, respectfully. Treatments containing both clomazone and oxyfluorfen resulted in 100% barnyardgrass control 21 days after the PRE application, regardless of the rate. Barnyardgrass control was ≥94% through 35 days after the POST application with all treatments. At 42 days after the POST application, the combinations of clomazone and oxyfluorfen provided ≥95% barnyardgrass control. Barnyardgrass control at 42 days after POST never exceeded 79%, regardless of oxyfluorfen rate when applied alone sequentially. Oxyfluorfen could potentially be used as an additional herbicide option for barnyardgrass control in the ROXY Rice Production System but will likely need to be mixed with clomazone or other herbicides as a part of a complete program.

Tillage, No-till, and Intercropping Effects on Soil Properties, Water Use, and Yield in a Furrow Irrigated Corn System.

J.P. Pimentel*[,1], C.G. Henry[2], and T.L. Clark[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Stuttgart, AR.

A study was conducted to understand the relationship between soil physical properties and no-till, no-till with cover crops, and tillage in irrigated Maize. Twelve undisturbed soil samples in a complete randomized plot design with 4 replications were collected in a Furrow-Irrigated continuous Maize system at Rice Research and Extension Center in Stuttgart, Arkansas, USA. Available water, field capacity, wilting point, bulk density, porosity, and yield were compared between management treatments of tillage, no-tillage, and no-till cover crop soil management. There was no significant difference in bulk density, porosity, and field capacity among the agronomic practices. However, there was a significant difference (P=0.001) in wilting point and available water. The cover crop treatment yield was significantly 3,243 kg ha^{-1} less than no-till and 3,548 kg ha^{-1} less compared to tillage treatment, due to additional weed competition. The tillage treatment required 1474 mm-ha ha^{-1} of additional irrigation over the growing season while cover crop and no-till required less water, 1353 mm-ha ha^{-1}, and 1232 mm-ha ha^{-1}, respectively. The no-till treatment used 6% less water compared to the tillage treatment whereas the cover crop used 3% less, and consequently, the water-use efficiency of the tillage treatment at 7 kg mm^{-1} was less than the no-till treatment at 8 kg mm^{-1}. Even though intercropping can increase available water and reduce water use, it may also reduce yield due to weed pressure. By switching from tillage to a no-till system, farmers can reduce the amount of labor required, and increase water use efficiency without yield penalty.

Influence of Cultivar and Drill Row Width on Weed Control in Flooded Rice.

N.H. Reed*[,1], T.R. Butts[2], J.K. Norsworthy[1], J.T. Hardke[3], L.T. Barber[2], J.A. Bond[4], H.D. Bowman[4], B.M. Davis[2], T.W. Dillon[2], C.H. Arnold[1], and K.B.J. Kouame[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR. [3]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Stuttgart, AR. [4]Dept. of Plant and Soil Sciences, Mississippi State University, Stoneville, MS.

Problematic weeds such as barnyardgrass (BYG) in a rice production system cause complications like yield loss, increased input costs, and difficulty with harvest. The fast evolution of herbicide resistance in weeds and further restrictions on herbicides have emphasized the need for cultural management strategies such as drill row width manipulation and the use of more competitive cultivars. The objective of this research was to document the effect of drill row width and rice cultivar on weed management and crop canopy development. A field experiment was conducted in 2021 and 2022 at Lonoke, AR as a randomized complete block split-plot design. Four rice cultivars [medium-grain (CLM04), long-grain in-bred (CLL16), and two long-grain hybrids (RT7301 and RT7521 FP)] were drill-seeded in four drill row widths (5-in, 7.5-in, 10-in, and 15-in). Weed density was assessed at the 5- to 6-leaf rice stage (preflood) and preharvest. Aerial imagery from a small unmanned aerial system (sUAS) was also taken at the 5- to 6-leaf stage and panicle differentiation rice stage and analyzed using Field Analyzer. All data were analyzed using JMP Pro 16.1 and subjected to ANOVA using Tukey's HSD (P=0.05). No interaction between drill row width and rice cultivar was observed, regardless of the response variable. For 2021 at the 5- to 6-leaf rice stage, there was a 38% reduction of barnyardgrass in the standard 7.5 in row spacing than the 10 and 15 in and a 40% reduction of BYG in the 2022 year. A 31-percentage point increase in BYG control was observed for the 7.5 in spacing over the 15 in spacing at the preharvest stage for the 2021 year and a 40-percentage point increase in control occurred for the same row widths at the rice stage for the 2022 year. Based on the sUAS imagery at panicle differentiation, there was a 20% reduction of canopy coverage from the 15 in spacing than the 7.5 in. The standard rice row width of 7.5 in still shows to have the greatest weed control over larger widths like the 15 inch and in general a narrower row suppresses more weeds than a wider width.

Evaluation of Thryvon Technology for Control of Tarnished Plant Bugs in Cotton.

A.Y. Whitfield*[,1], B.C. Thrash[2], N.R. Bateman[3], W.A. Plummer[2], M. Mann[4], T Ibbotson[2], S.G. Felts[3], C.A. Floyd[2], T. Newkirk[1], Z. Murray[1], and T. Harris[1]. Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [4]Dept. of Entomology and Plant Pathology, University of Arkansas, Keiser, AR.

Tarnished plant bug (TPB) is the most important pest in mid-south cotton production causing square loss, deformed flowers, and damaged bolls, ultimately reducing yield. TPB is difficult to control with growers averaging 4-6 insecticide applications per year. Field studies were conducted in 2022 to evaluate Thryvon, a new transgenic trait in cotton producing the Bt protein Cry51Aa, for TPB control. The trial consisted of Thryvon and non-Thryvon cotton that was either left untreated or sprayed at 1x, 2x, 3x the currently recommend University of Arkansas threshold. Based on our standard threshold, Thryvon required less applications for TPB when compared to non-Thryvon cotton. Yields in unsprayed Thryvon were no different than any of the sprayed Thryvon treatments. Results from this study indicate that Thryvon may be a valuable tool in TPB management.

Biomass accumulation and total nutrient uptake in Irrigated Cotton.

C.A. Followell*[,1], T.L. Roberts[1], K. Hoegenauer[1], C. Ortel[1], A. Smart[1], and C. Kirkpatrick[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Cotton (*Gossypium hirsutum L.*) varieties grown in the Arkansas delta have undergone tremendous genetic and cultural management changes in recent years, which has led to the need to re-evaluate the nutrient requirements and accumulation in these modern cultivars. This research aims to determine the nutrient requirements, dry matter production, and yield, of two modern cotton cultivars (Deltapine 2038 and NexGen 4936). Research was conducted in 2021 at two locations in the Arkansas Delta, at the Lon Mann Cotton Research Station in Marianna, AR on a Memphis silt loam soil, and at the Rohwer Research Station on a Hebert silt loam. Treatments including two rates of fertilizer applied at pre-plant (Marianna: 36 lb. A^{-1} N, 50 lb. A^{-1} P, 95 lb. A^{-1} K, and 45 lb. A^{-1} N, 62.5 lb. A^{-1} P, 119 lb. A^{-1} K; Rohwer: 36 lb. A^{-1} N, 50 lb. A^{-1} P, 40 lb. A^{-1} K, and 45 lb. A^{-1} N, 62.5 lb. A^{-1} P, 50 lb. A^{-1} K), and at early squaring (74 lb. A^{-1} N and 92.5 lb. A^{-1} N). The fertilizer rates used were based off the University of Arkansas Soil Testing Laboratory recommendations, using a 100% and a 125% rate recommendation.

Development of a Soybean Leaf Sampling Protocol to Monitor In-Season Potassium Status.

C.C. Ortel**[,1], T.L. Roberts[1], K.A. Hoegenauer[1], A.M. Poncet[1], G.L. Drescher[1], C.A. Followell[1], and A.D. Smartt[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Spatial variability of leaf potassium (K) concentrations in soybean (*Glycine max* (L.) Merr.) must be considered when collecting tissue for nutrient diagnosis. Five commercial soybean fields were sampled at a 1-acre grid resolution throughout reproductive growth to quantify the trifoliolate tissue-K concentration. The objectives of this study were to identify the potential field variability in soybean leaf tissue-K concentrations in Mid-south irrigated soybean production systems, evaluate interpolation methods, and develop a sampling protocol for in-season tissue monitoring. No spatial dependencies were found in all fields and across sample times indicating that leaf samples should be collected according to the producer's preferred management strategy instead of a specific grid size. One composite sample consisting of at least 18 of the upper-most fully expanded trifoliolate leaves from throughout the delineated management zone are needed to consistently measure within the 95% confidence interval of the area's average leaf tissue-K concentration. These new sampling protocol guidelines coupled with the recently developed dynamic critical tissue-K concentration curve will provide producers with the ability to effectively monitor soybean for potential hidden hunger and verify K deficiency symptoms in-season.

Are See and Spray™ and Standard Broadcast Programs Comparable in XtendFlex Cotton?

T.H. Avent**[,1], J.K. Norsworthy[1], M.C. Castner[1], W. Patzoldt[2], L.M. Schwartz[2], and M.M. Houston[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Blue River Technologies, Sunnyvale, CA.

Increased input costs and demand for improved environmental stewardship has led to the development of technologies that facilitate precision application of pesticides. John Deere recently released See & Spray™ Ultimate, the latest commercial platform for precision applications of herbicides in-crop. John Deere claims See & Spray Ultimate will reduce herbicide inputs while providing comparable or improved weed control. A study was conducted in 2022 in Keiser, AR to evaluate XtendFlex cotton herbicide programs with See &Spray Ultimate compared to a standard broadcast program. The standard broadcast program consisted of a preemergence application of paraquat at 0.64 lb ai A^{-1}, fluometuron at 0.75 lb ai A^{-1}, prometryn at 0.75 lb ai A^{-1}, and nonionic surfactant; early-postemergence (EPOST) dicamba, clethodim, and *S*-metolachlor at 0.5, 0.09, and 1.24 lb ai A^{-1}, respectively, with a volatility and drift reducing agent and nonionic surfactant; and mid-postemergence (MPOST) glufosinate, glyphosate, and *S*-metolachlor at 0.53, 0.78, and 1.24 lb ai A^{-1}, respectively. Variations of the broadcast program included substituting clethodim with glyphosate or removing *S*-metolachlor at the EPOST timing. The See & Spray Ultimate has a targeted spray tank and broadcast tank enabling further deviations that included glyphosate in either tank MPOST. No differences in Palmer amaranth [*Amaranthus palmeri* (S.) Watson] control, barnyardgrass [*Echinochloa crus-galli* (L.) P. Beauv] control, or cotton tolerance were observed among treatments. Contrasts were used to evaluate various groups for PRE and EPOST applications. See & Spray applications of paraquat with simultaneous broadcast applications of fluometuron and prometryn reduced input costs by \$7.89 A^{-1}. Except for applications of dicamba in the See & Spray tank and *S*-metolachlor broadcasted in conjunction with clethodim, treatments occurring EPOST followed similar trends. In general, See & Spray programs reduced herbicide inputs for the total program cost. Results from this study demonstrate the performance of See & Spray Ultimate to provide reduced herbicide use without compromising weed control in XtendFlex cotton; however, this study was evaluated with specific detection settings and results may vary depending upon weed densities, weed species mixtures, and sensitivity levels.

Assessment of Residual Palmer amaranth Control with Soil-applied Herbicides in Dryland Systems.

M.C. Castner**[,1], J.K. Norsworthy[1], T.A. King[1], and M.C. Woolard[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Palmer amaranth has been regarded as one of the most troublesome weeds for Midsouth row crop producers for almost two decades, primarily due to the prolific nature of the weed and its tendency to evolve resistance to herbicides. One of the key proponents of reducing postemergence selection for weed resistance is use of soil-applied herbicides; however, the time it takes to receive moisture activation (0.5 in) of the herbicide may limit effectiveness of the application. To evaluate the influence of incidence of activating rainfall on residual herbicide activity and overall performance (Balance Flexx®, Dual Magnum®, Ticor®, Valor®, XtendiMax®, and Zidua®), five bareground experiments were conducted in 2021 and 2022, in Fayetteville, AR. Treatments were arranged as a single-factor (herbicide) randomized complete block design with four replications. In addition to visible weed control evaluations, a WatchDog® weather station was placed in the field to monitor rainfall for the duration of each 28-day experiment. For most of the evaluated herbicides, a delayed activating rainfall reduced initial weed control over instances where immediate (within a few days) activation occurred. At 14 days after treatment (DAT), without adjusting for rainfall, box and whisker plots indicate that 4 out of 6 herbicides have minimal variation with comparable levels of Palmer amaranth control (above 85%). Greater variation in control was observed with Balance Flexx and XtendiMax, with data points as low as 50 and 40%, respectively. Trends in the results at 28 DAT were similar to 14 DAT, however; variation in control began to increase for all herbicides, which indicated the environment influenced the residual activity over time. Overall, rainfall soon after an XtendiMax application reduced performance, unlike the other herbicides evaluated. For most soil-applied herbicides, choosing the appropriate herbicide and timeliness of an activating irrigation event is imperative to optimize weed control.

The Impact of Irrigation Strategy on Nitrogen use Efficiency in Rice.
K.A. Hoegenauer**[,1], T.L. Roberts[1], G.L. Drescher[1], J.T. Hardke[2], and C.C. Ortel[1]. [1]Dept. of Crop Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences. University of Arkansas, Stuttgart, AR.

Alternative rice (*Oryza sativa* L.) irrigation strategies have gained popularity in recent years as a way for producers to potentially reduce labor, water usage, and negative environmental impacts. With this increase in popularity comes increased concern for a reduction in nitrogen use efficiency (NUE) and yield loss. A study was designed to test the NUE, N requirement, and yield of two cultivars across four irrigation methods. The four irrigation methods evaluated in this study were: intermittent flood, flush, full season continuous flood, and continuous flood with one draining event during late reproductive growth for prevention of straight head as guided by the DD50 rice program. Within each irrigation treatment, the cultivars RiceTec XL753 and LaKast were planted and six preflood N treatments (0, 30, 60, 90, 120, 160 lb N acre^{-1}) were applied as urea. Across the two years of this study, no significant effect of irrigation strategy on total N uptake could be found ($P = 0.6936$). As expected N application rate significantly influenced total N uptake ($P < 0.0001$) and each N rate resulted in a significantly different amount of N taken up by the rice plants. The hybrid rice cultivar took up more N than the pureline cultivar ($P < 0.0001$); however, there was no significant interaction between cultivar and N rate ($P = 0.3305$). There was also no significant interaction between irrigation method and N rate ($P = 0.6465$) meaning the irrigation strategy did not affect total N uptake differently for any given N rate. These results suggest that producers can implement alternative irrigation strategies and see no reduction in total N uptake when compared to a traditional continuous flood system if the irrigation is closely managed and implemented properly.

What Are the Residual Herbicide Options to Control Glufosinate-Resistant Palmer amaranth in Cotton and Soybean?
P. Carvalho-Moore**[,1], J.K. Norsworthy[1], M.C. Souza[1], M.C. Castner[1], S. Pritchett[1], S. Noe[1], A. Godar[1], and T. Barber[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR.

Resistance to glufosinate in Palmer amaranth was first reported in 2021 in Arkansas, and amplification and overexpression in the target gene were determined to be the resistance mechanism in one highly resistant population (MSR2). Alternative control methods are highly sought to avoid the spread of this problematic resistant weed across the southern region of the United States. Therefore, an experiment was designed to determine the effectiveness of preemergence herbicides labeled in cotton and soybean for control of glufosinate-resistant Palmer amaranth. The preemergence (PRE) treatments were imazaquin (0.12 lb ai/A), pendimethalin (1 lb ai/A), diuron (1 lb ai/A), metribuzin (0.67 lb ai/A), flumioxazin (0.063 lb ai/A), saflufenacil (0.045 lb ai/A), fomesafen (0.25 lb ai/A), trifludimoxazin (0.045 lb ai/A), acetochlor (1.124 lb ai/A), *S*-metolachlor (1.24 lb ai/A), pyroxasulfone (0.129 lb ai/A), and fluridone (0.15 lb ai/A). Seeds of a highly glufosinate-resistant Palmer amaranth accession (MSR2) were spread and incorporated on the field prior to the preemergence application. Over-head irrigation in the amount of 1 inch was applied after application to ensure activation of herbicides. A postemergence (POST) treatment with glufosinate at 0.585 lb ai/A was applied twenty days after preemergence treatments to confirm presence of the glufosinate-resistant accession in the trial site. A randomized complete block design with four replicates was used with a nontreated control for comparison. Control (%) was rated and biomass collected at twenty-one days after POST treatment. Biomass reduction (%) was calculated in comparison to the nontreated. Highest control was obtained with trifludimoxazin (98%), pyroxasulfone (98%), fomesafen (97%), and metribuzin (95%). Highest biomass reduction was obtained with fomesafen (99%), pyroxasulfone (99%), trifludimoxazin (99%), and metribuzin (98%). The lowest control and biomass reduction were observed in treatments that received only glufosinate POST or imazaquin preemergence due to resistance to these herbicides. Trifludimoxazin, under the trade name Tirexor®, is the newest protoporphyrinogen IX oxidase inhibitor option to be launched in the coming years, and it is a promising option to control the herbicide-resistant Palmer amaranth evaluated here. The overlapping of multiple effective modes of action via residual herbicides along with POST-applied herbicides is one the best approaches to manage glufosinate-resistant Palmer amaranth in Arkansas.

Toxicity of Flupyradifurone and Sulfoxaflor Systemic Insecticides to *Osmia lignaria* and Detoxification Mechanism.

O. Kline**,[1], L. Cuthill[1], P. Phan[1], and N.K. Joshi[1]. [1]Dept. of Entomology and Plant Pathology University of Arkansas, Fayetteville, AR.

Several insect pests have developed resistance to older, commonly used insecticides, including many within the neonicotinoid class. Two novel insecticides, sulfoxaflor and flupyradifurone were recently registered and approved for use against sucking pests and have been effective against neonicotinoid-resistant insects. Both sulfoxaflor and flupyradifurone are approved for applications during bloom time, however, which increases the risk that foraging pollinators could be exposed to higher doses of the insecticides. Most research into the effects of pesticides on bee health has focused on honey bees (*Apis mellifera*). Because non-*Apis* bees can differ in their response to pesticide exposure, it is important to study the effects of novel pesticides on solitary bee species, as well. An important pollinator in North America is the blue orchard bee (*Osmia lignaria*), a native solitary species that is managed for its efficient pollination of fruit trees and vegetable crops. In this study, we exposed *O. lignaria* to doses of sulfoxaflor and flupyradifurone equal to or below the field use concentrations, in order to calculate the LD_{50} values of these insecticides. We also examined detoxification of these systemic pesticides in *O. lignaria*. Results of these studies will be discussed.

Residual Herbicides for Broad- Spectrum Weed Management Programs in Mississippi Peanut.

T. Bararpour†,[1]. Dept. of Plant and Soil Sciences, Delta Research and Extension Center, Mississippi State University, Stoneville, MS.

One of the most promising ways to eliminate early season weed interference is by applying a pre-emergence herbicide with strong residual control. A field study was conducted in 2021 at the Delta Research and Extension Center, in Stoneville, Mississippi, to evaluate Brake, Valor, and their tank-mixture combinations with residual herbicides for broad-spectrum weed management programs in Mississippi peanut. Peanut (Georgia-06G) was planted at a seeding rate of 8 seeds ft-1 on June 17, 2021 and emerged on June 23. Plot size was 13 ft wide by 20 ft long. The plot area contained Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), prickly sida (*Sida spinosa*), broadleaf signalgrass (*Urochloa platyphylla*), and hemp sesbania (*Sesbania herbacea*). The study was designed as a randomized complete block with 15 treatments and four replications. Herbicide treatments were as follows (rate in oz/a): 1) Brake at 16; 2) Brake at 32; 3) Valor (flumioxazin) at 1.5; 4) Valor at 3; 5) Brake at 16 + Valor at 1.5; 6) Brake at 16 + Valor at 3; 7) Brake at 32 + Valor at 1.5; 8) Brake at 32 + Valor at 3; 9) Valor at 3 + Dual Magnum (S-metolachlor) at 32; 10) Strongarm (diclosulam) at 0.45 + Dual Magnum; 11) Brake at 16 + Dual Magnum; 12) Valor at 3 + Brake at 16 + Dual Magnum; 13) Valor at 3 + Dual Magnum + Strongarm; 14) Valor at 3 + Dual Magnum + Strongarm + Brake at 16; and 15) nontreated check. All treatments were applied preemergence (PRE). Peanut injury was 5 and 1; 20 and 11; 0 and 0; 5 and 0; 0 and 0; 6 and 0; 5 and 0; 5 and 0; 4 and 0; 0 and 0; 4 and 0; 5 and 0; 3 and 0; 4 and 0 from treatment 1 through 14 at 2- and 3- weeks after emergence (WAE), respectively. There was no peanut injury after 4 WAE. Palmer amaranth control was 81, 84, 89, and 89% for treatment 1, 2, 10, and 12 at 10 WAE, respectively. Treatment 9, 13, and 14 provided 99 to 100% control of Palmer amaranth. The other treatments provided 91 to 97% Palmer amaranth control. Pitted morningglory control was 85, 89, 89, 89, 82, 94, 85, 93, 95, 93, 89, 96, 100, and 100% from treatment 1 through 14 at 10 WAE, respectively. All herbicide treatments provided 93 to 100% control of prickly sida except Brake at 16 fl oz/a (86%). Broadleaf signalgrass was a difficult weed to control. Treatment 1 through 14 provided 61 and 48; 78 and 49; 76 and 54; 80 and 56; 83 and 63; 87 and 75; 84 and 71; 83 and 66; 90 and 90; 83 and 78; 91 and 88; 85 and 77; 100 and 100; 98 and 100% control of broadleaf signalgrass at 6- and 10-WAE, respectively. Treatment 6, 9, and 11 provided comparable results as treatment 13 and 14 in terms of Palmer amaranth, pitted morningglory, hemp sesbania, and prickly sida control (except broadleaf signalgrass control). Based on this study, treatments 13 (Valor at 3 + Dual Magnum + Strongarm) and 14 (Valor at 3 + Dual Magnum + Strongarm + Brake at 16) were the best applications in terms of longer residual activity and broad-spectrum weed control.

Potential for Redekop™ Harvest Weed Seed Control in Arkansas Rice.

L.B. Piveta[‡,1], J.K. Norsworthy[1], C.T. Arnold[1], D. Smith[1], T. Barber[2], and T. Butts[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR.

Barnyardgrass and Palmer amaranth are difficult-to-control weeds in furrow-irrigated rice, especially as herbicide resistance continues to evolve throughout the Midsouth. Most growers that use only chemical weed management programs are looking for alternative methods to limit soil weed seedbank replenishment from escaped weeds. The objective of this experiment was to evaluate the large-scale use of a Redekop™ seed destructor as a non-chemical management strategy for harvest weed seed control (HWSC) of barnyardgrass and Palmer amaranth in furrow-irrigated rice. The experiment was designed as a strip-plot (550 by 25 ft) with eight replications, in Keiser, Arkansas, in 2022. Half of the total number of plots were harvested conventionally, and the other half using the Redekop seed destructor. In plots where the Redekop seed destructor was used, seedbank replenishment was reduced by 67 and 69 percentage points for barnyardgrass and Palmer amaranth, respectively, based on initial exhaustive germination conducted in the greenhouse; however, final exhaustive germination assessments are still ongoing. Based on initial evaluations, the Redekop seed destructor could be an asset for rice producers. As HWSC methods become available for commercialization, additional parameters need to be further evaluated, specifically shattering of weed seed before crop harvest and the height distribution of seed on targeted weed species. Incorporation of HWSC may allow producers searching for a systems approach, to better manage difficult-to-control weeds by diminishing the number of viable seeds placed back into the soil-seedbank over time.

Management of Tarnished Plant Bug (*Lygus lineolaris*) in Cotton.

A. Plummer[‡,1], T. Ibbotson[1], M. Mann[2], B.C. Thrash[1], N.R. Bateman[3], S.G. Felts[3], A. Whitfield[4], C.A. Floyd[1], T.B. Newkirk[4], Z. Murray[4], and T. Harris[4]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Keiser, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [4]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR.

Tarnished Plant Bug (TPB), *Lygus lineolaris*, is the number one insect pest in Mid-South cotton production. TPB feeding causes square loss, deformed flowers, and damaged bolls ultimately resulting in reduced yield. TPB is a difficult pest to manage in cotton, with growers averaging 4-6 insecticide applications per year. A regional Mid-South study was conducted from 2017 through 2020, to evaluate the efficacy and residual control of insecticides currently available for TPB control. These trials are also used to monitor for potential resistance issues in the Mid-Southern U.S. Insecticides evaluated included: Transform (sulfoxaflor), Centric (thiamethoxam), Vydate (oxamyl), Orthene (acephate), Brigade (bifenthrin), Bidrin (dicrotophos), Couraze Max (imidacloprid), Carbine (flonicamid) and Diamond (novaluron). Treatments were initiated when a threshold of 3 TPB per 5 row feet were observed in the test area. At 7 days after the first application, all treatments reduce TPB numbers below the untreated. However, only Centric kept TPB densities under threshold, so a second application was made at 7 days after treatment (DAT). Following the second application all treatments reduced TPB densities compared to the untreated check, but many of the tested insecticides failed to provide consistent control. Results from this study indicated that Diamond, Transform, Orthene, and Brigade + Orthene performed consistently better than the other insecticides.

Impact of Defoliation on Conventional Rice.

S.G. Felts[‡,1], N.R. Bateman[1], B.C. Thrash[2], C.A. Floyd[2], T.B. Newkirk[3], A. Plummer[2], T. Ibbotson[2], M. Mann[2], Z. Murray[3], A. Whitfield[3], and T. Harris[3]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR.

Armyworms are commonly found in rice fields in the mid-southern US, and have the potential to cause severe defoliation to the rice crop. The two main armyworm species observed in rice in this region are true armyworms and fall armyworm. It is common to see infestations occur at all growth stages of rice. The current threshold for armyworms in rice is based on the number of larvae per square foot. A defoliation based threshold would provide growers and consultants with a simple way to make economically sound decisions for controlling armyworms in rice. Studies were conducted from 2019 through 2021 where rice was mechanically defoliated at 0, 33, 66, and 100% with a weed eater at two-three leaf, early tiller, late tiller, and green ring growth stages across three planting dates. No yield loss was observed at the 2-3 leaf or either tillar stage. However, large amounts of yield loss were observed when plants were defoliated either 66 or 100% at the green ring growth stage. A delay in heading was also observed when plants were defoliated at 66 or 100% during any growth stage in 2019. Maturity delays were also observed in 2020 and 2021, but was not as severe as what was observed in 2019. Yield loss and delays in heading were greater for the May planting date compared to the April or June planting date. This data has helped to develop a defoliation-based threshold in rice to keep rice growers profitable.

Toxicity of Insecticides Pirimiphos-methyl and Deltamethrin to *Sitophilus oryzae* Infesting Stored Corn.

A. Twaibu[‡,1], N. Phan[1], G. Studebaker[2], B. Thrash[3], N. Bateman[4], and N. Joshi[1]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [4]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR.

Food grains and legumes comprise most of the consumed and common stored food products globally. Insect such as *Sitophilus oryzae* (commonly known as rice weevil) cause significant damage to stored food grains. *Sitophilus oryzae* is capable of penetrating kernels of grains and lay eggs inside. The whole lifecycle is completed inside the kernel while damaging the grain. This result in loss of germination as well as market value. Currently different insecticides are used to control *S. oryzae;* however, they are known to develop resistance against some of these insecticide chemicals that are frequently used. The overall goal of our research is to evaluate the toxicity of commonly used pesticides to *S. oryzae*. In this study, we conducted laboratory bioassays where adult *S. oryzae* were exposed to two different formulations of insecticides (i.e., pirimiphos-methyl and deltamethrin) separately at different concentrations. Distilled water was used in the control group. We determined the resulting mortality of *S. oryzae* from single direct exposure of these pesticides at 24, 48, 72 and 96-hours after treatment. Additionally, lethal concentration of both insecticides was determined. Results from these bioassays will be presented.

Impact of Water Hardness on Chlorantraniliprole.

T. Davis[*,1], B.C. Thrash[2], N.R. Bateman[3], T. Ibbotson[2], W.A. Plummer[2], S.G. Felts[3], C.A. Floyd[2], T. Newkirk[1], A. Whitfield[1], and Z. Murray[1]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR.

Insecticide efficacy often varies by location and year. Many factors can influence an insecticides'efficacy, but an often-overlooked factor is the quality of water in a carrier solution. Multiple experiments were conducted to evaluate the impact of water on insecticide efficacy. In the first experiment, leaf dip assays were conducted with chlorantraniliprole on corn earworm (Helicoverpa zea) using soybean [Glycine max (L.) Merr.] leaves. Serial dilutions were used to achieve a concentration of 6 ng/ml of chlorantraniliprole, in 4 different water samples with hardness's of 10.9, 20, 178, and 430 ppm, respectively. Larvae were place on leaves after drying and larval mortality was rated at 24 hours and 48 hours. In the second experiment, chlorantraniliprole 14 oz/a. was mixed with 3 different water samples with hardness's of 10.9, 178, and 430 ppm, respectively, then applied to soybean plants. Leaves were pulled from each plant at 1, 7, 21, 28, 35 days and larvae were placed on the leaves and checked for mortality at 24 and 48 hours. Results will be discussed.

Comparative Efficacy of a Diflufenican Mixture for Residual Palmer Amaranth Control in Soybean.

M.C. Woolard*[,1], J.K. Norsworthy[1], L.B. Piveta[1], M.C. Souza[1], C.H. Arnold[1], and T.R. Butts[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR.

Palmer amaranth has been confirmed to be resistant to nine sites of action (SOA). Diflufenican is a group 12 herbicide, which can potentially provide growers with an additional SOA in soybean, targeting Palmer amaranth. An experiment was conducted in 2022 at the Northeast Arkansas Research and Extension Center in Keiser, AR to determine the length of residual control provided by a diflufenican (DFF) mixture compared to commonly used preemergence-applied herbicides on a clay soil. Additionally, visible soybean injury was evaluated. Treatments included Fierce MTZ (1.5 pt/A), Boundary (2.5 pt/A), Warrant (3 pt/A), Tricor (32 fl oz/A), a DFF mixture (components cannot be revealed at this time), a DFF mixture plus Tricor (21.8 fl oz/A), and a DFF mixture plus XtendiMax (22 fl oz/A) along with a nontreated check. At 2 weeks after treatment (WAT), Palmer amaranth density in plots containing Fierce MTZ, the DFF mixture, and the DFF mixture plus Tricor was lowest among the treatments evaluated. The DFF mixture was more effective on Palmer amaranth than Warrant (3 pt/A) at 2 WAT. By 4 WAT, cumulative Palmer amaranth emergence in plots treated with Fierce MTZ and the DFF mixture plus Tricor was least among the evaluated treatments. Fierce MTZ was superior to all treatments in reducing Palmer amaranth emergence by 6 WAT. The DFF mixture caused 31% injury to soybean 2 WAT whereas the DFF mixture plus Tricor injured soybean 40%. The observed injury was transient, with the DFF mixture caused only 8% injury by 6 WAT. Future research should determine whether early season injury caused by the DFF mixture negatively impacts soybean yields. As an alternative SOA not currently labeled in soybean, the DFF mixture appears to be an additional tool for controlling Palmer amaranth.

Evaluation of Cotton Tolerance to Over-the-Top Application of Herbicides Coated Fertilizer.

S.P. Pritchett*[,1], J.K. Norsworthy[1], M.C. Woolard[1], P. Carvalho-Moore[1], M.C. Souza[1], and L.T. Barber[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR.

Arkansas cotton producers rely on residual and postemergence herbicides for season-long control of economically important weeds. Cotton injury is a concern to producers when making early-season herbicide applications. This study was designed to evaluate herbicide injury when coated on granular fertilizer and applied over-the-top of cotton at the 6- to 8-leaf growth stage. The experiment was planted May 11, 2022, at the Milo J. Shult Agricultural Research and Extension Center in Fayetteville, Arkansas. The fertilizer blend utilized in the experiment consisted of 175 lbs per acre of urea and muriate of potash at 100 lbs per acre. The evaluated herbicide treatments included: Zidua SC at 3.5 fl oz/A, Direx at 24 fl oz/A, Loyant at 16 fl oz/A, Cotoran at 24 fl oz/A, Valor EZ at 3 fl oz/A, Brake at 16 fl oz/A, Reflex at 16 fl oz/A, Sharpen at 3 fl oz/A, Dual Magnum at 1.3 pt/A, Fierce EZ at 6 fl oz/A, Verdict at 5 fl oz/A, and a combination of Sharpen at 2 fl oz/A plus Zidua SC at 2.5 fl oz/A. All plots were maintained weed-free, and a non-treated control was included for comparison. Cotton injury was assessed at 7, 14, 21, and 28 days after treatment (DAT), and seedcotton yield was collected. Cotoran, Direx, Zidua, and Dual Magnum caused ≤5% injury to cotton at 7 DAT. All protoporphyrinogen oxidase inhibitors, including Sharpen, Reflex, Valor, Fierce, Verdict, and the Sharpen plus Zidua combination, injured cotton 19 to 30% at 7 DAT, with the injury manifesting as necrosis of leaves associated with fertilizer prills. Brake and Loyant caused 8 and 16% injury, respectively, at 7 DAT. Injury from the treatments was transient, with no more than 5% observed by 28 DAT. There were no differences in seedcotton yields among treatments, with all yielding comparable to the non-treated control. These findings demonstrate there is high potential for utilizing herbicide-coated fertilizer in cotton production based on tolerance of the crop to the applications. Additional site years are needed to support or refute these findings.

Examining Pyrethroid Resistance in Arkansas Rice Stink Bug, *Oebalus pugnax* Populations.

T.B. Newkirk*[,1], N.R. Bateman[2], B.C. Thrash[3], N.K. Joshi[4], S.G. Felts[2], W.A. Plummer[2], T. Ibbotson[3], C.A. Floyd[2], A. Whitfield[1], Z. Murray[1], and T. Harris[1]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR.

Rice stink bug (RSB), *Oebalus pugnax* is the most damaging pest to heading rice, feeding on developing kernels. Limited number of labeled insecticides are accessible to rice growers for RSB control options. Lambda-cyhalothrin (Lambda) is the most widely used insecticides applied for RSB management, providing sufficient control at a low cost. Lambda is applied to over 90% of Arkansas rice acres on a yearly basis, intended for RSB control. Alternative options, namely, Tenchu (Dinotefuran), are efficacious for control but not at an aggressive price rate. The reliance on Lambda for RSB management, and control matters observed in Louisiana and Texas, creates concern for RSB resistance in Arkansas. New insecticides for RSB control need to be assessed in preparation for resistance to Lambda. Efficacy field trials were performed in 2020, 2021, and 2022 to compare insecticides for efficacy and residual control of RSB. Sweep net samples were performed at 3, 7, 10, and 14 DAT to monitor RSB efficacy. Additionally, assays were carried out over various RSB populations in 2022 throughout the growing season. RSB adults were collected, Lambda was applied to petri dishes at five different rates with an untreated check for comparison purposes and replicated ten times. After Lambda application, dishes were allowed to dry before inserting five RSBs to each dish. Mortality ratings were recorded at 24 hours post infestation. Throughout the growing season, 80% mortality was never achieved with any rate. On average, over the sampled locations the 4X rate achieved 70% mortality. The 1X and 2X rates reached 66% and 67% mortality. Results from these studies suggest resistance to Lambda is becoming an issue in Arkansas. Resistance issues are concerning, increasing awareness of this developing issue and educating growers and consultants in respective management tactics.

Characterizing the Area of Influence of Palmer Amaranth in Furrow-Irrigated Rice.

T.A. King*[,1], J.K. Norsworthy[1], M.C. Castner[1], T.H. Avent[1], M.C. Woolard[1], L.T. Barber[2], and T.R. Butts[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR.

Arkansas rice producers face a growing concern when transitioning to a furrow-irrigated rice system. The lack of a continual flood allows for Palmer amaranth emergence throughout much of the growing season and creates an environment conducive for growth of the weed throughout the year. Existence of Palmer amaranth in furrow-irrigated rice may cause increased potential for reduced rice yields and greater need for additional herbicide applications. A field trial was conducted at the Milo J. Shult Agricultural Research and Extension Center in Fayetteville, AR, in 2022 to assess the impact of Palmer amaranth on furrow-irrigated rice as a function of emergence date of the weed. Newly emerged Palmer amaranth plants were marked every 7 days for 6 weeks after hybrid rice emergence in a furrow-irrigated system. Palmer amaranth biomass decreased by 1.5 oz., on average, every 7 days that emergence of the weed was delayed relative to rice. At 4 weeks after rice emergence and beyond, most Palmer amaranth plants that emerged failed to survive until rice harvest. Averaged over emergence times, female plants weighed more than male plants, which may result in greater interference with rice for limited resources. Rice yield data are still being processed and relationships between yield loss and emergence timing will be presented along with Palmer amaranth seed production data. These results clearly show that Palmer amaranth plants that emerge during the three weeks after rice emergence will have the greatest potential to negatively affect rice.

Detection of Fungicide Resistance in Populations of *Corynespora cassiicola* in Arkansas.

R. Zaia*[,1], T. Faske[2], T. Spurlock[2], and A. Rojas[1]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR.

Fungicides are an important tool used to control foliar pathogens such as *Corynespora cassiicola* in soybean and cotton in Arkansas. For some time, farmers have had access to a range of effective chemistries that are active at low doses and provide disease control. However, it is suspected that resistance within fungal populations has developed. A total of 35 isolates were collected from six different Arkansas counties in 2020 and 2021 from soybean fields. A mycelium growth poison plate assay was used to calculate EC50 values using commercial grade azoxystrobin (FRAC 11) with doses ranging from 0 to 50 mg/L including salicylhydroxamic acid (SHAM) at 60 mg/L. Tests were conducted in a completely randomized design with three replicates for each fungicide concentration, where each plate was an experimental unit and EC50's ranged from 3 to 20 mg/L (mean = 2.72 mg/L). Fungal DNA was extracted, and a fragment of the *Cytochrome b* gene was amplified using primers cc-cyt-F/cc-cyt-R and based on *cytb* nucleotide sequences, six isolates are characterized as QoI-sensitive and twenty-nine were determined to be QoI-resistant with a G143A mutation in the *Cytochrome b* gene. During the 2022 season, fungicide trials were established at eighteen locations in Arkansas to determine foliar diseases that impacted soybean and cotton, yield losses associated with these diseases, and the value of foliar fungicides applied. Symptomatic leaves with target spot symptoms were collected from these trials, disinfested, and plated on acidified potato dextrose agar (APDA). Isolates have been cleaned and purified using hyphal tipping. A total of 190 isolates have been isolated and molecular identification is underway with specific primers GA4-F/GA4-R to determine if all isolates are *C. cassiicola*. To determine fungicide sensitivity, a poison plate assay using discriminatory doses of technical grade pydiflumetofen (FRAC 7 - SDHI) and azoxystrobin (FRAC 11 – QoI) will be made with all isolates to determine the frequency of resistance. Resistance will be confirmed by sequencing target genes for the presence of the QoI and SDHI mutations using PCR assays with specific primers. Data will be mapped to the county level. This ongoing monitoring program will aid in the development of improved integrated disease management in Arkansas soybean and cotton.

Evaluating Broad Mite (*Polyphagotarsonemus latus*) Sampling Techniques in Blackberries.

J.B. Linn*[,1], A.J. Cato[1], and R.F. Keiffer[1]. [1]Dept. of Horticulture, University of Arkansas, Fayetteville, AR. [2]Dept. of Horticulture, University of Arkansas, Little Rock, AR.

Broad mite (*Polyphagotarsonemus latus*) is a microscopic mite known to feed on the epidermal tissue of new leaves, flowers, and fruits over a wide host range, including blackberry. Broad mite feeding on blackberry can cause leaf bronzing, reduction in leaflet size, downward leaf curling, reduced internode length, shoot dieback, and direct yield loss from bud and flower feeding. Currently, broad mite is sampled by collecting five-leaflets per field and examining leaflets under a microscope to quantify broad mite numbers, with a miticide being warranted at 1-5 mites per leaflet. However, no research was performed to create this sampling strategy and an accurate or efficient sample size needs to be understood to quickly respond to broad mite infestations. Growers often don't utilize this sampling strategy due to the need for a microscope and could more easily use a treatment threshold based on visual symptoms of broad mite feeding. Currently, no correlations between visual damage and broad mite population density have been determined, and are necessary to develop quick and accurate scouting tools. The objective of this study is to evaluate current sampling techniques, including 5, 10, and 15 leaflet sample sizes, along with visual damage assessments to determine the relationship between broad mite population density and damage to plants, to ultimately develop an easy-to-use and efficient scouting tool for broad mite in blackberry. Six commercial blackberry fields were sampled based on preliminary visual symptomology and leaflet samples. Fields were split into six representative transects and 4 replications of 5, 10, and 15 leaflet samples were collected in each transect, in addition to 10 visual assessments of broad mite damage. Broad mites of every life stage (eggs, immatures, and adults) were later counted using a dissecting microscope in lab settings. Visual assessments were recorded using a descriptive rating scale (1-5) on ten random primocanes within each transect. Results from this study will be used to determine an accurate and efficient sample size to utilize in commercial blackberry fields for broad mites. Additionally, a correlation between broad mite population density and visual symptomology of broad mite feeding will provide the data necessary to develop an easy scouting tool to quickly determine when treatment is necessary.

Palmer Amaranth Control in Cotton Utilizing Integrated Weed Management Strategies.

T.C. Smith*[,1], J.K. Norsworthy[1], L.T. Barber[2], R.B. Farr[1], L.B. Piveta[1], and M.C. Woolard[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR.

Palmer amaranth exhibits rapid growth and can evolve resistance to herbicides, making it one of the most troublesome weeds to manage. Because of the prolific nature of Palmer amaranth, crops that require longer durations for canopy development like cotton and soybean, are more susceptible to yield losses associated with this weed. Integrated weed management practices utilize multiple weed management techniques to control problematic weeds, such as Palmer amaranth within the field. In the fall of 2018, a long-term cotton weed control trial was initiated at the Lon Mann Cotton Research and Extension Center near Marianna, Arkansas. The objective of this trial was to evaluate the impact of four integrated management strategies on Palmer amaranth emergence over time. The treatments consisted of tillage, cover cropping with cereal rye, herbicide treatments, and zero-tolerance. In 2018, a one-time tillage event was performed, and the effects were monitored over four years. In 2019, tillage provided a 75% reduction in Palmer amaranth emergence, averaged over other factors. In 2020, 2021, and 2022, Palmer amaranth emergence was reduced by 42, 53, and 57%, respectively, compared to the absence of a one-time moldboard plow event. Findings show that the implications of a one-time deep tillage event in cotton on long lasting effects on Palmer amaranth emergence, reducing selection for resistance to herbicides relied upon within cotton.

Impact of Foliar Insecticides on ThryvOn and non-ThryvOn Cotton for Control of Tarnished Plant Bug.

P.G. Maris*[,1], B.C. Thrash[2], N.R. Bateman[3], W.A. Plummer[2], M. Mann[4], T. Ibbotson[2], S.G. Felts[3], C.A. Floyd[2], A. Whitfield[1], Z. Murray[1], T. Newkirk[1], and T. Harris[1]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [4]Dept. of Entomology and Plant Pathology, University of Arkansas, Keiser, AR.

Studies were conducted during the 2022 growing season at the University of Arkansas Cotton Branch Experiment Station in Marianna, AR to determine the efficacy of multiple foliar insecticides for control of tarnished plant bug in ThryvOn and non-ThryvOn cotton. ThryvOn is a new cotton technology expressing Cry51Aa that has proven to provide some control of tarnished plant bugs. The objective of this study was to determine if better control of tarnished plant bug with foliar insecticides would occur on ThryvOn cotton versus non-ThryvOn cotton. Insecticides tested included bifenthrin (6.4 fl oz/a), acephate (0.75 lb/a), novaluron (6 fl oz/a), sulfoxaflor (1.5 oz/ac), and thiamethoxam (2 oz/a). Plots were sampled at 3, 7, and 11 days after the first application, and 4, 7, and 11 days after the second application. A general trend was observed that better control with all insecticides were seen in ThryvOn cotton versus non-ThryvOn cotton. This same trend was observed for square retention and yield. All insecticides performed better during after the second application as compared to the first application regardless of cotton technology.

Crop Response to Low Concentrations of Diflufenican in Soil.

A.N. Norsworthy[†,1], J.K. Norsworthy[1], M.C. Woolard[1], L.B. Piveta[1], and D. Smith[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Diflufenican is being developed by Bayer CropScience for Palmer amaranth control in soybean. Commercialization of the herbicide will provide soybean growers with a herbicide mode of action that is currently not labeled within the crop. The objective of this research was to understand the tolerance of cotton, corn, grain sorghum, and rice to soil-applied diflufenican because these crops are routinely rotated with soybean in Arkansas. Diflufenican was applied to 4,000 g of an air-dried silt loam soil at 0.0625, 0.0125, 0.25, 0.5, and 1.0 times the anticipated labeled rate of the herbicide. Each crop was seeded into trays inside the greenhouse and crop tolerance assessments were taken at 1 and 2 weeks after emergence. No damage to rice in the form of bleaching was observed at any rate. Injury in the form of bleaching was less than 15% at the highest rate for cotton, corn, and grain sorghum at 1 week after treatment. Injury was transient with less injury observed by the 2 weeks after emergence evaluation. Based on these results, there appears to be low risk for sustained injury to crops rotated with soybean treated with a full rate of diflufenican.

Evaluation of Insecticide Seed Treatment Combinations in Rice.

B.L. Wright[†,1], N.R. Bateman[2], B.C. Thrash[3], [1], S.G. Felts[2], C.A. Floyd[3], T.B. Newkirk[1], W.A. Plummer[3], T. Ibbotson[3], M. Mann[4], A. Whitfield[3], Z. Murray[3], and T. Harris[3]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [4]Dept. of Entomology and Plant Pathology, University of Arkansas, Keiser, AR.

Grape colaspis and rice water weevil are major soil insect pests of rice. Grape colaspis larvae feed on rice roots during the seedling stage prior to flooding. This feeding can cause stunting, plant death and yield loss. Rice water weevil adults are attracted to flooded rice, typically infesting the field shortly after permanent flood establishment. Insecticide seed treatments are the main control strategy for these pests. CruiserMaxx Rice and NipsIt Inside, both noenicitinoids, have shown excellent control of grape colaspis compared to the diamide seed treatments, Dermacor X-100 (chlorantraniliprole) and Fortenza (cyantraniliprole). The opposite trend has been observed for rice water weevil control with diamides providing better control compared to the neonicotinoids. Studies were conducted from 2018-2022 to determine the benefits of combining of insecticide seed treatments for control of both pests in conventional and hybrid rice. Rice water weevil larvae numbers were reduced when a diamide seed treatment was used compared to a noenicitinoid seed treatment. A trend was observed that combinations of a diamide and a neonicotinoid increased control and grain yields over a diamide alone. Combinations of insecticide seed treatments provided excellent control of rice water weevil and higher yields than single product seed treatments in both hybrid and conventional rice.