RESEARCH CONFERENCE ABSTRACTS

VOLUME 24

December 1-2, 2020

STUDENT COMPETITIONS SPONSORED BY:

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Tuesday, December 1, 2020

MODERATOR: Nick Bateman
Student Contest Chair: Tommy Butts
Audio-Visual Coordinator: Ben Thrash

12:45 p.m. **Welcome / Introduction and Announcements**

1:00 p.m. **Effect of Soil Moisture and Flood Establishment on Rice Injury from Florpyrauxifen-benzyl.**

J.W. Beesinger*[,1], J.K. Norsworthy[1], and T. Roberts[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 1

1:00 p.m. **Effect of Soil Moisture and Flood Establishment on Rice Injury From Florpyarauxifen-benzy.**

J.W. Beesinger*[,1], J.K. Norsworthy[1], and T. Roberts[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 1

1:15 p.m. **Efficacy of ChinNPV for Control of Soybean Looper, *Chrysodeixis includens,* in Arkansas Soybean Production.**

C. Rice*[,1], G.M. Lorenz[2], B.C. Thrash[2], N.R. Bateman[3], N.M. Taillon[2], S.G. Felts[3], W.A. Plummer[2], C.A. Floyd[1], and T. Newkirk[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. .....

1:30 p.m. **Chloroacetamide Herbicide Use for Weed Control in Rice.**

T.H. Avent*[,1], J.K. Norsworthy[1], L. Piveta[1], M. Castner[1], and J.W. Beesinger[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR........ 2

1:45 p.m. **Estimating Cover Crop Biomass Accumulation Using Thermal Days.**

M.V. Pessotto*[,1], T.L. Roberts[1], and K.A. Hoegenauer[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 2

2:00 p.m. **Zero Tolerance for Palmer Amaranth: Implications of Integrated Weed Management Strategies in XtendFlex® and LibertyLink® Cotton.**

R.B. Farr*[,1], J.K. Norsworthy[1], L.T. Barber[1], G.L. Priess[1], and J.W. Beesinger[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR........ 3

2:15 p.m. **Effectiveness of Potassium Tetraborate Tetrahydrate as a Dicamba Volatility Reduction Agent and Effect on Weed Control.**

M.C. Castner*[,1], J.K. Norsworthy[1], T.L. Roberts[1], and J.W. Beesinger[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 3

2:30 p.m. **Evaluation of Potential Bacterial Biological Control Agents in Reducing the Impact of Rhizoctonia solani and Fusarium graminerum in Controlled Environments.**

S. Sharfadine*[,1], C. Rojas[1], and A. Rojas[1]. Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. 4

2:45 p.m. **Break**

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

MODERATOR: Nick Bateman

3:00 p.m. **Identifying Antimicrobials to Control Bacterial Panicle Blight of Rice.**
K. Gates[†,1], C. Patrick[1], L. Ortega[1], and C.M. Rojas[1]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. 4

3:15 p.m. **Efficacy of Selected Insecticides for Control of Lepidopteran Pests in Soybean.**
G. Maris[†,1], G.M. Lorenz[2], N.R. Bateman[3], B.C. Thrash[2], N.M. Taillon[2], W.A. Plummer[2], C. Floyd[1], C. Rice[1], S.G. Felts[3], T. Newkirk[1], A. Whitfield[1], and T. Harris[2]. [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

3:30 p.m. **Efficacy of Selected Insecticides for Control of Tarnished Plant Bug, *Lygus lineolaris*, in Arkansas.**
A. Whitfield[†,1], G.M. Lorenz[2], N.R. Bateman[3], B.C. Thrash[2], N.M. Taillon[2], W.A. Plummer[2], C. Floyd[1], C. Rice[1], S.G. Felts[3], T. Newkirk[1], T. Harris[2], and G. Maris[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. 5

3:45 p.m. **Evaluation of Residual Herbicides for Palmer Amaranth and Prickly Sida Control in Xtend® Soybean.**
L.G. Smith[†,1], A.N. McCormick[2], T.W. Dillon[2], L. Collie[2], D. Black[3], and T.R. Butts[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Newport, AR. [2]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Lonoke, AR. [3]Syngenta Crop Protection, Searcy, AR. 5

4:00 p.m. **Evaluation of Moth Trapping Trends in Arkansas.**
T. Harris[†,1], G.M. Lorenz[1], N.R. Bateman[2], B.C. Thrash[1], N.M. Taillon[1], W.A. Plummer[1], C. Floyd[3], C. Rice[3], S.G. Felts[2], T. Newkirk[3], A. Whitfield[3], and G. Maris[3]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Lonoke, AR. [2]Dept. of Entomology and Plant Pathology, University of Arkansas, Stuttgart, AR. [3]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR. 6

4:15 p.m. **Conclude**

Wednesday, December 2, 2020

MODERATOR: Nick Bateman

7:45 a.m. **Welcome / Introduction and Announcements**

8:00 a.m. **Determining Baseline Fungicide Sensitivity in *Cercospora* spp. with DMI and Qol Inhibiting Fungicides.**
A.L. Lancaster*[1], T. Faske[2], J.C. Rupe[1], 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. 6

8:15 a.m. **Tolerance of ACCase-Resistant Rice to Quizalofop Herbicide.**
N. Godara*[1], J.K. Norsworthy[1], L.B. Piveta[1], and M. Houston[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.................... 7

8:30 a.m. **Monitoring Potential *Lambda-cyhalothrin* Resistant Rice Stink Bugs, *Oebalus pugnax*, Populations in Arkansas Rice Production.**
T. Newkirk[1], N.R. Bateman[2], G.M.Lorenz[3], B.C. Thrash[3], N.K. Joshi[1], S.G. Felts[2], N.M. Taillon[3], W.A. Plummer[3], C.A Floyd[1], and C. Rice[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. 7

8:45 a.m. **Sensitivity of Fluazifop-Resistant Grain Sorghum to ACCase-Inhibiting Herbicides.**
J.A. Fleming*[1], JK Norsworthy[1], LB Piveta[1], and T.H. Avent[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.................... 8

9:00 a.m. **Influence of Planting Arrangement on Rice Canopy Formation and Grain Yield.**
M.J. Lytle*[1], J.T. Hadke[2], T.L. Roberts[1], D.L. Frizzell[2], E. Castaneda-Gonzalez[2], T.D. Frizzell[2], J.L. Chlapecka[1], K.F. Hale[2], and T.L. Clayton[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. 8

9:15 a.m. **Loyant Impregnated on Urea Reduces Risk for Off-Target Movement to Soybean.**
B.L. Cotter[1], J.K. Norsworthy[1], and J.W. Beesinger[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 8

9:30 a.m. **Break**

9:45 a.m. **The Impact of AMS Residue and the Addition of K-Salt of Glyphosate in the Tank on Dicamba Volatization.**
M.L. Zaccaro**[1], J.K. Norsworthy[1], and L. Piveta[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. 9

10:00 a.m. **Nitrogen Management Considerations in Furrow-Irrigated Rice on Silt Loam Soils.**
J.L Chlapecka**[1], J.T. Hardke[2], T.L. Roberts[1], T.Clayton[2], D. Frizzell[2], E. Castaneda-Gonzalez[2], K. Hale[2], T. Frizzell[2], and M.J. Lytle[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. 9

10:15 a.m. **Optimizing POST Herbicide Options in the XtendFlex® Technology.**
G.L. Priess**[1], J.K. Norsworthy[1], M.C. Castner[1], R.B. Farr[1], M.L. Zaccaro[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. 10

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Wednesday, December 2, 2020 (cont.)

MODERATOR: Nick Bateman

10:30 a.m. **Evaluation of Insecticide Seed Treatments in Furrow Irrigated Rice for Control of Rice Billbug, *Sphenophorus pertinax*, in Arkansas.**
C.A. Floyd**,[1], G.M. Lorenz[2], N.R. Bateman[3], B.C. Thrash[2], N.M. Taillon[2], S.G. Felts[3], W.A. Plummer[2], C. Rice[1], and T. Newkirk[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. 10

10:45 a.m. **Identifying and Correcting Potassium Hidden Hunger in Arkansas Soybean.**
C. Ortel**,[1], T.L. Roberts[1], N.A. Slaton[1], W.J. Ross[2], and K.A. Hoegenauer[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.. 11

11:00 a.m. **Awards, Announcements, and Closing Remarks**

11:15 a.m. **Adjourn**

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

ABSTRACTS

Effect of Soil Moisture and Flood Establishment on Rice Injury from Florpyrauxifen-benzyl.

J.W. Beesinger*[,1], J.K. Norsworthy[1], and T. Roberts[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Florpyrauxifen-benzyl is a group 4 synthetic auxin used for postemergence broad-spectrum weed control in rice production. Rice injury caused by florpyrauxifen-benzyl has been observed by producers and specialists across the Midsouth in the form of leaf malformation, stunting, tiller reduction, and in some cases, yield reduction. A greenhouse experiment was designed to evaluate the injury caused by florpyrauxifen-benzyl on rice at different soil moistures. To maintain certain moisture levels, 8,000 kg of dry soil was placed in 2-gal buckets. Soil texture and organic matter were determined and used to calculate matric bulk density. Soil moisture levels were set at 40, 60, 80, and 100% of field capacity. Hybrid, long-grain cultivar CL XL745 at a density of 6 plants in a single row was established in each bucket. Soil in buckets was maintained at the assigned level following rice emergence through the V3 growth stage. At the V3 stage, florpyrauxifen-benzyl as Loyant was applied at 16 fl oz/A with 8 fl oz/A of methylated seed oil (MSO). Soil moisture was maintained until 5 days after application, at which time a 2-inch flood depth was established. To test the effect of days between application and flooding, another greenhouse study was conducted in a similar manner, except soil in all buckets was maintained at 60% of field capacity. When rice reached the V3 stage, Loyant was applied at 16 fl oz/A plus MSO at 8 fl oz/A. Soil in buckets were flooded to 2-inch depth at 0, 3, 6, 9, and 12 days after application. The soil in both trials remained flooded until the trial was conducted 28 days after application. Injury ratings were taken every 7 days after application and rice biomass was harvested and dried following the final rating. Results from the soil moisture experiment indicated that field capacity and the application of florpyrauxifen-benzyl were significant ($P<0.001$) for injury ratings 14 days after application. Rice injury was the highest at over 40% when soil moisture was maintained at 100% of field capacity, and injury was the least when soil moisture was 60 or 80% of field capacity. Biomass trends were similar with 70% reduction in dry weight with florpyrauxifen-benzyl at 100% field capacity. In the experiment evaluating the effect of flooding date on injury, treated rice flooded at days 3 days after application was injured 32%, but there was no consistent effect of flooding date on the likelihood of injury. In hindsight, maintaining the soil at higher soil moistures between applications may have resulted in more differences as seen in the previous experiment. Findings from these experiments led to the conclusion that risk for injury to rice from florpyrauxifen-benzyl will increase when saturated conditions occur prior to or near the time of application.

Efficacy of ChinNPV for Control of Soybean Looper, *Chrysodeixis includens,* in Arkansas Soybean Production.

C. Rice*[,1], G.M. Lorenz[2], B.C. Thrash[2], N.R. Bateman[3], N.M. Taillon[2], S.G. Felts[3], W.A. Plummer[2], C.A. Floyd[1], and T. Newkirk[1]. [1]Dept. of Entomology and Plant Pathology, 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.

Synthetic insecticides are the most common and reliable control method for soybean looper, *Chrysodeixis includens.* As soybean looper resistance to synthetic insecticides increases, growers are seeking new control options that are both cost-effective and efficacious. Multiple studies were conducted in 2020 at the University of Arkansas Lonoke Research and Extension Center to evaluate the efficacy of ChinNPV. In the first experiment, Chrysogen (ChinNPV) was applied at 2.5, 3.0, 3.5 and 4.0 oz/a to V3 soybean. After application, plants were infested with 3rd instar soybean looper larvae and mortality ratings were taken daily. At 8 DAT an average of 63% defoliation and 40% mortality was observed across all rates of ChinNPV compared to 98% defoliation with 0% mortality in the UTC.

Additionally, a diet-overlay assay was conducted using four ChinNPV rates equivalent to those used in the first experiment. Each rate was evaluated on neonate, 1st, 3rd,4th, 5th, 6th instar larvae. The desired rates of ChinNPV were combined into 200 mL of water, then 100 µL of the solution were applied directly to insect rearing diet in diet cups. After drying, a single larva of the desired instar was placed upon the diet. Each treatment combination was replicated thirty times and stored in an insect incubator at 29.4 and 25.6 °C, with a light dark ratio of 14:10, at 80% humidity. Larvae were observed daily for mortality. For neonate and 1st instar, 80% mortality was observed for all ChinNPV treatments at 6 and

8 DAT, respectively. In 3rd and 4th instar larvae 80% mortality was achieved only after 14 days with a ChinNPV rate of 3 oz/a or greater. For 5th instar larvae at 14 DAT, 80% mortality was observed in treatments 2 ½ oz/a or greater, while 6th instar obtained 80% mortality in 2, 3, 3 ½ oz/a. These results will help us determine the utility, recommended dosage, and control expectation for ChinNPV on soybean looper.

Chloroacetamide Herbicide Use for Weed Control in Rice.

T.H. Avent*[,1], J.K. Norsworthy[1], L. Piveta[1], M. Castner[1], and J.W. Beesinger[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Acetochlor is not labeled for use in rice in the United States; however, the University of Arkansas Division of Agriculture has researched its effectiveness in controlling problematic weeds in rice such as barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.]. Pretilachlor is another chloroacetamide that is utilized in Asian rice production, only when used in mixture with the safener fenclorim. To test the safening potential of a fenclorim seed treatment, field trials were initiated in spring of 2020 at the Rice Research and Extension Center that evaluated rice tolerance to acetochlor using a fenclorim seed treatment as well as the control of barnyardgrass and weedy rice [*Oryza sativa* (L.)] with a microencapsulated formulation of acetochlor (Warrant). The experiment was a three-factor randomized complete block design. The three factors evaluated included fenclorim seed treatment (none and 2.5 lb ai 1000 lb^{-1} seed), acetochlor application timings (preemergence (PRE), delayed-preemergence (DPRE), spiking, and 1-leaf), and acetochlor rates (0, 0.56, 1.12, and 1.68 lb ai A^{-1}). As the rate of acetochlor increased, injury to rice increased; however, the fenclorim seed treatment reduced injury of rice at 21 days after treatment (DAT) from 33 and 54% to 13 and 20% for acetochlor rates of 1.12 and 1.68 lb ai A^{-1}, respectfully. Likewise, as the rate of acetochlor increased, averaged over application timings and fenclorim use, barnyardgrass control increased 21 DAT with an average control of 65, 71, and 82% for 0.56, 1.12, and 1.68 lb ai A^{-1}, respectively. For weedy rice control, earlier application timings provided greater control for the low and middle rate of acetochlor, but the highest rate of acetochlor was not significantly better at other application timings. Furthermore, the fenclorim seed treatment did not influence barnyardgrass or weedy rice control. From this research, it appears that a fenclorim seed treatment provides enhanced safety for applications of microencapsulated acetochlor in rice without compromising barnyardgrass and weedy rice control.

Estimating Cover Crop Biomass Accumulation Using Thermal Days.

M.V. Pessotto*[,1], T.L. Roberts[1], and K.A. Hoegenauer[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

The inclusion of cover crops in agricultural production systems is an important management practice. This practice can improve soil health, increase plant-available nitrogen (N), and provide surface residue to prevent erosional soil loss. For instance, legume cover crops can provide a significant increase in the plant available N pool of the soil through biological fixation of N. Total biomass production and N fixation are influenced by plant species, weather conditions, and termination date. The present study was conducted to determine optimal termination dates for production systems in Arkansas based on growing degree days (GDD) for eight different cover crop species: Austrian winter pea (*Pisum sativum*), balansa clover (*Trifolium michelianum),* crimson clover (*Trifolium incarnatum*), cahaba vetch (*Vicia villosa*), hairy vetch (*Vicia villosa*), barley (*Hordeum vulgare*), black-seeded oats (*Avena sativa*), and cereal rye (*Secale cereal*). Field studies were conducted at four research stations in Arkansas, to provide differences in climate and rate of GDD accumulation. An area of 1.81 ft^2 was harvested for biomass and total N uptake randomly within each experimental unit biweekly. Biomass production and N content were regressed as a function of GDD for each cover crop treatment. The results show that biomass accumulation and total nitrogen uptake is a triple interaction between cover crop species, location, and GDD.

Zero Tolerance for Palmer Amaranth: Implications of Integrated Weed Management Strategies in XtendFlex® and LibertyLink® Cotton.

R.B. Farr*[,1], J.K. Norsworthy[1], L.T. Barber[1], G.L. Priess[1], and J.W. Beesinger[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Herbicide-resistant weeds, such as Palmer amaranth, have resulted in a need to adopt a multifaceted approach to weed control that reduces selection for herbicide resistance. Previous research has suggested that cover crops, deep tillage, the use of residual herbicides along with postemergence herbicides, and establishing a zero-tolerance threshold for weeds can disrupt the emergence of weeds and reduce weed seedbank populations. To study how these tactics impact weed populations over time, a long-term study was initiated near Marianna, AR during the fall of 2018. This study was arranged as a split, split, split-plot in a randomized complete block design with zero-tolerance being the whole-plot factor, deep tillage the sub-plot factor, cover crops the sub-sub-plot factor, and herbicide programs the sub-sub-sub-plot factor. Weed densities and emergence were measured in four-quarter meter squares per plot at 21, 42, and 63 days after the initial herbicide application and whole plot, inflorescence-producing weed counts were taken at harvest. The use of effective management strategies helped reduce overall Palmer amaranth emergence from the first year to the second year. Plots that utilized zero-tolerance strategies showed a 62% reduction in Palmer amaranth in the second year while the use of a moldboard plow reduced populations by 67%. Net profits were impacted by the use of added integrated weed management inputs such as zero-tolerance and the use of the moldboard plow. In the second year, the use of cover crops increased profitability while a dicamba-based in-crop herbicide program generated higher profits than those without dicamba most likely because of residual control from the dicamba in the absence of rainfall after planting. Results from the first two years of the long-term study have yielded insights into how successful the use of integrated weed management strategies are at reducing Palmer amaranth populations while also portraying some of the economic impacts of these strategies.

Effectiveness of Potassium Tetraborate Tetrahydrate as a Dicamba Volatility Reduction Agent and Effect on Weed Control.

M.C. Castner*[,1], J.K. Norsworthy[1], T.L. Roberts[1], and J.W. Beesinger[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Engenia and XtendiMax with VaporGrip are labeled for preemergence and postemergence control of broadleaf weeds in XtendFlex cotton and Roundup Ready 2 Xtend soybean. Dicamba applications to cotton and soybean have resulted in a record number of complaints regarding off-target movement of the herbicide since the initial introduction in 2017. To counteract the volatility associated with dicamba, the University of Arkansas has pursued potassium tetraborate tetrahydrate (potassium borate) as a tank additive. To investigate the impact of this additive on dicamba, small- and large-scale volatility studies were conducted along with trials to evaluate efficacy of dicamba when mixed with the additive. Diglycolamine (DGA) salt of dicamba plus potassium salt of glyphosate was applied in mixture with potassium borate at six concentrations (0, 0.08, 0.16, 0.32, 0.65, and 1.30 lbs/A boron) to two moist flats placed under each tunnel. For weed control, two dicamba formulations (XtendiMax and Engenia) plus glyphosate were combined with potassium borate at 0, 0.1, 0.2, and 1.3 lbs boron/A. There was trend for reduction of dicamba volatility as potassium borate rate increased based the three evaluated parameters of maximum soybean injury, average injury, and distance traveled. Air sample data closely aligned with qualitative assessments. For weed control, there was no concentration of potassium borate that compromised broadleaf or grass weed control when added to either formulation of dicamba, although some numerical decreases were observed. Overall, the addition of potassium borate to dicamba has great potential in reducing off-target movement of dicamba without sacrificing efficacy on key weed species.

Evaluation of Potential Bacterial Biological Control Agents in Reducing the Impact of Rhizoctonia solani and Fusarium graminerum in Controlled Environments.

S. Sharfadine*[,1], C. Rojas[1], and A. Rojas[1]. Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR.

Rhizoctonia solani, a soilborne fungal plant pathogen, is the most important species within the genus *Rhizoctonia* and has a wide range of hosts, causing diseases in different economically important crops worldwide including rice and soybean(Ayayi-Oyetunde & Bradley, 2018) A particular *Rhizoctonia solani* anastomosis group (AG), AG 1-1A is the causal agent of sheath blight which is one of the most devastating diseases in rice production systems globally, with a potential to cause up 50% yield loss where susceptible cultivar are used(Wamishe et al. 2013) Rice is an important agronomic crop, highly consumed all around the world. *Fusarium graminearum* is the causal agent of Fusarium head blight (FHB), a devastating disease in wheat, barley and other cereal crops which causes significant yield losses around the world (Kazan et al.,2012). Chemical and cultural controls are primarily deployed to manage sheath blight in rice. Resistant cultivars are used to manage Fusarium head blight (Schmale, 2010).

In this experiment in controlled environments, bacterial strains of *Burkholderia cepacia* and *Pseudomonas fluorescens* were used as biological agents in dual culture and seed plate assay methods to evaluate their antagonistic effects against three isolates of *Rhizoctonia solani* and one isolate of *Fusarium graminearum* in controlled environments. Diamond rice cultivar was in this experiment. The 3 *Rhizoctonia solani* isolates used in this experiment are AG 1-1A, AG 4 and AG 7. Of the 4 bacterial strains used, PBL 18 *(Burkholderia cepacia)* and *PBL* 24 *(Pseudomonas fluorescens)* show varying degrees of antagonistic effect against the fungal isolates in dual culture and seed plate assay methods in controlled environments.

Identifying Antimicrobials to Control Bacterial Panicle Blight of Rice.

K. Gates[†,1], C. Patrick[1], L. Ortega[1], and C.M. Rojas[1]. [1]Dept. of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR.

Bacterial Panicle Blight (BPB) of rice, caused by the bacterium *Burkholderia glumae*, causes severe losses in rice production. Currently, there are not effective methods to control the disease. The main objective of this work is to develop biopesticides effective against *B. glumae* using the beneficial bacterium *Pseudomonas protegens* PBL3. *P. protegens* PBL3 was discovered as an antagonistic bacterium against *B. glumae* on Petri plates. Further work showed that the secreted fractions from *P. protegens* PBL3 had antimicrobial activity against *B. glumae*. The development of effective biopesticides derived from *P. protegens* PBL3 requires the chemical characterization of the secreted fraction from *P. protegens* PBL3. The first step is identifying a sub-fraction with antimicrobial activity. The second step is the separation of molecules based on polarity using solid phase extraction (SPE). The third step is to test which of the individual SPE-eluted fractions have antimicrobial activity against *B. glumae.* Eluted fractions with antimicrobial activity will be further characterized using mass spectrometry. Isolating and identifying antimicrobials present in the secretions of *P. protegens* PBL3 will contribute to the development of biopesticides effective to control Bacterial Panicle Blight of rice.

Efficacy of Selected Insecticides for Control of Lepidopteran Pests in Soybean.

G. Maris[†,1], G.M. Lorenz[2], N.R. Bateman[3], B.C. Thrash[2], N.M. Taillon[2], W.A. Plummer[2], C. Floyd[1], C. Rice[1], S.G. Felts[3], T. Newkirk[1], A. Whitfield[1], and T. Harris[2]. [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.

Corn earworm, *Helicoverpa zea* (Boddie), (CEW) is the most economically important insect pest of soybean, *Glycine max* (Merrill), in Arkansas. Feeding can occur at any growth stage prior to physiological maturity on leaves, flowers, and pods. Soybean looper (SBL), *Chyrsodeixis includens* Walker, is also be a major pest of soybean causing defoliation of soybean in Arkansas. Feeding from these pests can result in yield loss if not controlled with foliar insecticides. Trials were conducted in 2020 to evaluate the control of CEW and SBL with selected insecticides to determine which insecticides provided the best control of these pests. Treatments included Prevathon (chlorantraniliprole), Besiege (lambda-cyhalothrin + chlorantraniliprole), Intrepid (methoxyfenozide), Intrepid Edge (methoxyfenozide + spinetoram), Lambda Cyhalothrin + Acephate, Steward (indoxacarb), Lannate (methomyl), Denim (emamectin benzoate) and Hero (bifenthrin + zeta-cypermethrin).

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

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Tarnished Plant Bug (*Lygus lineolaris*) is the number one insect pest in mid-south cotton production. Plant bug feeding causes square loss, deformed flowers, and damaged bolls ultimately resulting in reduced yield. Growers and consultants rely on foliar insecticide applications to control plant bugs, a difficult pest to manage in cotton with growers averaging 4.7 insecticide applications per acre treated. These trials are part of a regional Midsouth study the past four years which are conducted to evaluate the efficacy of insecticides currently labeled for control of this pest. These trials are also used to determine a base level of control to monitor for developing issues of insecticide resistance to individual insecticides, and to serve as a source of data for possible registration of new insecticides that may become available. Also, these data are used to ensure that current recommendations of these insecticides are still viable. Insecticides evaluated include: Transform (sulfoxaflor), Centric (thiamethoxam), Vydate (oxamyl), Orthene (acephate), Brigade (bifenthrin), Bidrin (dicrotophos), Admire Pro (imidacloprid), Carbine (flonicamid) and Diamond (novaluron). Treatments were initiated when a threshold of six TPB per ten row feet was found in the test area, and when a majority of the treatments exceeded threshold after the initial application. Results indicated that Diamond and Transform performed consistently better than many of the other insecticides. Many of the insecticides tested failed to provide any consistent level of adequate control.

Evaluation of Residual Herbicides for Palmer Amaranth and Prickly Sida Control in Xtend® Soybean.

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Weeds continue to be one of the most important pests to control to have a successful, high-yielding crop. Dicamba-tolerant soybean (Xtend®) has been widely adopted across Arkansas. Palmer amaranth (*Amaranthus palmeri* S. Wats.) is the most problematic weed in Mid-South soybean production; however, the shift to Xtend® soybean technology has re-introduced prickly sida (*Sida spinosa* L.) as a troublesome weed species robbing yield potential. The objective of this research was to evaluate preemergence (PRE) herbicides for residual control of Palmer amaranth and prickly sida in Xtend® soybean.

A field study was conducted at the University of Arkansas System Division of Agriculture Newport Extension Center near Newport, AR. The soil type was a silt loam and adequate moisture was obtained to activate residual herbicides. The study was a randomized complete block design with four replications and consisted of 10 total treatments: a nontreated control, a weed-free control, and eight PRE herbicide pre-mixture treatments including Boundary, BroadAxe, Sonic, Fierce XLT, Zidua Pro, and three rates of an experimental herbicide (A23372) from Syngenta. The trial was planted with a John Deere 5100E series tractor and a John Deere 750 no-till drill. An Xtend® soybean variety was drilled at 3.8-cm depth in 19-cm spacing. A single postemergence (POST) application of dicamba and *S*-metolachlor (Tavium) plus glyphosate was applied six weeks after the PRE application as a blanket across the entire trial. All treatments were applied using a Bowman MudMaster with a six-nozzle multi-boom setup. The PRE treatments were applied using AIXR 110015 nozzles while the POST blanket application was applied with TTI 110015 nozzles. All applications were made at 140 LPH. Visual estimations of weed control were taken weekly and plots were harvested and adjusted to 12.5% moisture for soybean grain yield measurements.

Results showed no differences in Palmer amaranth control across PRE residual herbicide treatments six weeks after application and all treatments, excluding Sonic, achieved greater than or equal to 82% control. Four weeks following the POST application, all treatments had greater than 96% control of Palmer amaranth. Six weeks after the PRE application, the low rate of A23372, Sonic, Fierce XLT, and Zidua Pro provided the greatest control of prickly sida (>94%). Four weeks following the POST application, all treatments excluding Boundary (60%) and BroadAxe (58%) provided excellent control of prickly sida (>98%). Overall, several PRE residual herbicides were shown to be effective at controlling both Palmer amaranth and prickly sida within Xtend® soybean. Proper weed identification and field history with subsequent appropriate herbicide selection is key for continued success at controlling these problematic weeds in Arkansas soybean.

Evaluation of Moth Trapping Trends in Arkansas.

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Corn Earworm, *Heliocoverpa zea* (H. zea) is a major pest of corn, cotton (cotton bollworm), grain sorghum (sorghum head worm), and soybean (soybean pod worm). In Arkansas there is a major effort to monitor for this pest in all counties with row crops. Each year traps are strategically placed in crop producing counties to monitor for this pest. In Lonoke and Drew County, the Extension Entomology program runs traps to monitor moth flights. Moths are also collected for insecticide resistance monitoring. Trapping is initiated in late-April and monitored through mid-September. A modified Hartstack trap is placed in areas that are near corn, soybeans, and cotton. Weekly trap counts are reported to growers and consultants through multiple outlets in order for growers and consultants to alert them to developing populations and to help make informed decisions on scouting and treating their crops. Trapping procedures, trends, results and will be discussed.

Determining Baseline Fungicide Sensitivity in *Cercospora* spp. with DMI and Qol Inhibiting Fungicides.

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Cercospora leaf blight is one of the most yield limiting diseases for soybean here in Arkansas and its control is mainly based on the use of fungicides and tolerant cultivars. However, famers have used extensively different fungicide chemistries to manage the disease. The use of fungicides has the potential to induce resistance, leaving this management method useless. The aim of this study was to see if the *Cercospora* spp. found in Arkansas fields had developed resistance against DMI fungicides such as Domark (Tetraconazole) and QoI fungicides like Quadris flowable (Azoxystrobin). The study focused on fungicide resistance in different *Cercospora* species. Symptomatic leaves for frog eye leaf spot or Cercospora leaf blight and seeds with purple seed stain were sampled from fields from six different counties in Arkansas. Isolates were obtained with single spore isolation or hyphal tipping. Once clean, isolates were grown for 7 days and a plug was taken from the edge of the colony and transferred to each of the six different tetraconazole concentrations with three replications each for a total of eighteen plates per isolate. For the azoxystrobin fungicide once the isolates were clean a plug was taken for each of the seven different concentrations with three replications each for a total of twenty-one plates per isolate. Then the plates were sealed and placed in an incubator for 5 to 7 days at 27 degrees Celsius and diameter was measured at both 5 and 7 days to see if there was an increase in growth. The results of this continuing study so far are that *Cercospora* is showing signs of resistance to the Domark (Tetraconazole) and there was a difference in growth from 5 to 7 days. Based on the results found the conclusion is that *Cercospora* species are developing resistance to fungicides and this will cause issues when managing fungicide programs in the fields. It is recommended that farmers alternate the fungicides with other practices in the fields in order to prevent more resistance.

Tolerance of ACCase-Resistant Rice to Quizalofop Herbicide.

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Commercial launch of quizalofop-resistant rice technology in 2019 was followed by injury to the quizalofop-resistant cultivar PVL01 from postemergence applications of quizalofop. A field experiment was conducted in 2020, in Stuttgart, Arkansas to determine the level of injury caused by sequential applications of quizalofop at 120 (1X) and 240 (2X) g ai ha^{-1} to PVL01, PVL02 and RTV7521 cultivars that were planted in April 11 (mid-April) and May 3 (early May). The first application of quizalofop was applied at the 2-leaf stage followed by a second application at the 5-leaf stage before flooding. Analysis of the data showed that 21 days after the second application of quizalifop there was no injury differences between treatments other than the RTV7521 cultivar which showed 40% more injury at the higher rate, averaged over planting date. Similar results were observed at heading where the higher rate of quizalofop caused a heading delay in the RTV7521 cultivar. Even though greater injury and heading delay was observed in RTV7521, it showed a higher overall yield potential compared to PVL01 and PVL02 cultivars. Though PVL01 and PVL02 showed less visible injury than RTV7521, they were not able to show as high of a yield potential as RTV7521 even when injured by quizalofop. For that reason, Arkansas farmers may be willing to tolerate greater injury to RTV7521 knowing that the crop will recover and yields will likely be greater than either PVL01 or PVL02.

Monitoring Potential *Lambda-cyhalothrin* Resistant Rice Stink Bugs, *Oebalus pugnax*, Populations in Arkansas Rice Production.

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Rice stink bug (Oebalus pugnax) is a major pest of rice, feeding on grain as it develops, which can lead to yield and quality losses. Few insecticides are currently available to rice producers for rice stink bug management and those that are labeled, lack residual control. *Lambda-cyhalothrin* (Lambda) has been the most commonly used insecticide for control of rice stink bug, due to it being highly efficacious and cost effective for growers. Other chemical options, such as dinotefuran (Tenchu), are effective for control of rice stink bug but are cost prohibitive for growers. This raises concern for the longevity of products such as Lambda, and resistance monitoring is needed. New control options for rice stink bug need to be evaluated if resistance to Lambda is documented in the mid-South.

A large block experiment was conducted at two locations in 2019, and one location in 2020 to compare Lambda and Tenchu for efficacy and residual control of rice stink bug. Sweep net sampling was performed pre-application, and every 2-3 days post-application for two weeks to monitor stink bug populations. No differences were observed between products at any location in regards to efficacy and residual. Additionally, assays were conducted on select populations of rice stink bug. The tested populations were collected from fields where large numbers of rice stink bugs were found soon after an application of Lambda. Rice stink bug collections were made in Poinsett County in 2019, along with Crittenden and Chicot Counties in 2020. Lambda was applied to petri dishes at five different rates with an untreated for comparison. Each treatment was replicated ten times. Dishes were allowed to dry then five rice stink bugs were placed in each dish. Mortality was assessed at 24 hours after infestation. Preliminary data from 2019 had the 1x rate of Lambda with less than 40% mortality in the tested population, and a 4x rate was required to achieve 100% mortality. In the Chicot county population a 1X rate resulted in approximately 50% mortality, with no increase in mortality observed for the 2x and 4x rates. In the Crittenden county population there were no differences in mortality at any Lambda rate, with an average of ~62% mortality across all rates. These results indicate that resistance or tolerance of rice stink bug to Lambda-cyhalothrin may be a developing issue for rice producers.

Sensitivity of Fluazifop-Resistant Grain Sorghum to ACCase-Inhibiting Herbicides.

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Due to genetic similarities between grain sorghum and grass weeds such as johnsongrass, herbicide options have always been limited and control of grasses in the crop has always been a challenge for farmers. Through a collaboration with Texas A&M University and the University of Arkansas, a bred line of grain sorghum with resistance to the ACCase-inhibiting herbicide fluazifop was developed. A field trial was conducted in 2020 in Fayetteville, AR, to evaluate the sensitivity of fluazifop-resistant grain sorghum to multiple ACCase-inhibiting herbicides. Fluazifop-resistant grain sorghum was sprayed at the 2- to 3-leaf stage with eleven different ACCase-inhibiting herbicides with fluazifop being assessed at 3 different rates and the rest being evaluated at two rates. The goal was to better understand which herbicides may potentially be useful for control of grasses in the future without injuring the crop. Information gained could also be used to determine if there are any ACCase inhibitors which could be used to control volunteer plants in the next cropping season. Overall, a low level of visual injury was observed with applications of ACCase inhibitors within the aryloxyphenoxypropionate (fops) and phenylpyrazolin (dens) groups when applied at a 1x rate. No significant difference was observed between these injury ratings, which did not exceed 10%, other than Fusion (fluazifop+fenoxaprop). Conversely, a high level of visual injury was observed within the cyclohexanedione (dims) group leading to crop death at a 1x rate of clethodim. These data show the potential to use different ACCase inhibitor herbicides over-the-top of fluazifop-resistant grain sorghum.

Influence of Planting Arrangement on Rice Canopy Formation and Grain Yield.

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Drill-seeding on 19-cm row spacing is the most common planting practice utilized by Mid-South rice (*Oryza sativa* L.) producers. Novel approaches to rice planting arrangement to better fit rice plant growth habit should be considered. The introduction of a novel rice planting arrangement and spacing may improve rice management and yield. In 2019 and 2020, experiments were conducted evaluating the influence of rice planting arrangement on canopy formation and grain yield at the Rice Research and Extension Center (RREC) near Stuttgart, AR and at the Northeast Research and Extension Center (NEREC) near Keiser, AR. The study was comprised of a pureline cultivar, Diamond, and a hybrid cultivar, RT XP753. Each cultivar was planted at a range of seeding rates which included, 108, 215, 323, 431, and 538 seed m^{-2} for Diamond, and 43, 75, 108, 140, and 172 seed m^{-2} for RT XP753. Seed was planted using 19-cm row spacing, either in one single pass, or divided over two passes, with the second pass being perpendicular to the first. Canopy coverage images were collected weekly during rice seedling growth stages and canopy coverage analyzed using Turf Analyzer. Grain yield data was collected at harvest. Data analysis is ongoing, and results will be discussed regarding grain yield and canopy formation.

Loyant Impregnated on Urea Reduces Risk for Off-Target Movement to Soybean.

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Following commercial launch of Loyant® (florpyrauxifen-benzyl) in 2018, frequent off-target movement of the herbicide to adjacent soybean fields was observed. Hence, field experiments were conducted in 2020, in Fayetteville, AR, to compare drift rates (0.094 fl oz/A to 3 fl oz/A) of florpyrauxifen-benzyl as a foliar spray and impregnated on urea applied to soybean at the V3 stage. In two separate field experiments, the response of soybean was evaluated when florpyrauxifen-benzyl was applied in wide-row and drill-seeded systems at 7, 14, 21, and 28 days after application. In both experiments, maximum soybean injury from 3 fl oz/A of impregnated urea resulted in 20% and 24% soybean injury in wide-row and drill-seeded soybean, respectively. The maximum soybean injury observed from foliar Loyant® applications at 3 fl oz/A was 100% in wide-row and drill-seeded soybean. At all timings, an equivalent rate of Loyant® on urea caused less injury than that of the foliar applications. Overall, Loyant® impregnated on urea reduced soybean injury 50 to 91 and 61 to 92 percentage points in wide-row and drill-seeded soybean, respectively, across all rating dates when compared to foliar applications. Impregnating Loyant® onto urea appears to substantial reduce the risk for off-target movement of the herbicide onto soybean and future research needs to establish the effectiveness of this application technique on weed control.

The Impact of AMS Residue and the Addition of K-Salt of Glyphosate in the Tank on Dicamba Volatization.

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An increase in the spectrum of weed control is observed when dicamba is applied in combination with glyphosate in the tank. However, studies showed that secondary movement of dicamba is impacted by the addition of tank partners, including herbicides such as glyphosate. The objective of this research was to determine if ammonium sulfate (AMS) residues increased dicamba volatility when applied with potassium (K) salt of glyphosate. Treatments were set as factorial in a randomized complete block design, with 3 replications. Factor-A was the absence or presence of glyphosate, and the factor-B were the rates of AMS (0, 0.005, and 2.5% w/v) in the tank with dicamba. Field experiments were conducted in 2018 and 2019 growing seasons, in which low tunnels measuring 20-ft in length were constructed over two rows of susceptible soybean (*Glycine max* (L.) Merr.). Treatments were applied to soil contained in 20 x 16 x 2 inch-trays in a location approximately one mile away from the research sites. Following the application, the trays were transported to the field and placed at the center of the tunnels beside a high-volume air sampler. The soybean plants were exposed to the treatments for 48 hours, and after that period, the tunnel structures and trays were removed. Visual injury and the distance from the center of the plot until soybean injury was ≤ 5% were evaluated at 14, 21, and 28 days after treatment (DAT). The pH of the tank mixtures was tested, and the concentration of dicamba trapped in the air sampler filters was analyzed in the laboratory. In 2019, the AMS rate in the tank was the only factor that impacted soybean injury at 21 DAT. Average injury was equivalent to 12% for treatments with 2.5% AMS, which was significantly higher than treatments containing 0% or 0.005% AMS, which resulted in 3% and 4% injury, respectively. In 2020, a significant glyphosate x AMS rate interaction impacted soybean injury at 21 DAT. In general, treatments with 2.5% AMS in the tank resulted in higher soybean injury regardless of glyphosate present or absent in the tank (14 to 13% injury, respectively). Dicamba treatments containing glyphosate with 0% or 0.005% AMS resulted in greater injury (8% and 10%, respectively) than treatments lacking the herbicide. Similarly, the presence of glyphosate in the tank with dicamba resulted in a more acidic mixture than the addition of AMS for both site-years. Laboratory analysis of samples collected in 2019, showed that 4380 and 1478 ng of dicamba were detected in treatments with 2.5% AMS with and without glyphosate. Additionally, results indicated that 0% and 0.005% AMS had comparable levels of dicamba in air samples. These results indicated that it is unlikely that dicamba volatilization in the field is a result of AMS residue in the spray tank.

Nitrogen Management Considerations in Furrow-Irrigated Rice on Silt Loam Soils.

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Furrow-irrigated rice (*Oryza sativa* L.) (FIR) acreage has steadily increased in Arkansas since 2017 and the current acreage estimate for the 2020 growing season is 200,000 acres of FIR. This is compared to under 40,000 acres in 2017. Due to the increase in acreage being relatively recent, little work has been done in the Mid-South on nitrogen (N) management in FIR, which will inherently differ from rice grown under flooded conditions. Trials were conducted in 2018, 2019, and 2020 to define the optimum N management regime for FIR on silt loam soils across eastern Arkansas. Ten sites were utilized for small-plot research in a split-plot design, with whole plot factor being location within the field (top vs. bottom of the field) and split plot factor being N management regime. Nine N management regimes were tested in 2018 and 2019 and ten were tested in 2020, ranging from one single application to four-way split applications along with several rate structures. Data across these ten sites show that a variety of N management options have the ability to maximize both grain and milling yield in FIR. All treatments involving more than one N application maximized rice grain yield in at least seven of ten sites. Meanwhile, head rice yield was only maximized consistently by either a two-way split of the typical recommended N rate plus an additional application of 46 lb N ac^{-1} or an excessive single application (40%

above typical recommendations) applied pre-irrigation. Results from these trials will help commercial rice producers weigh their N management decisions when considering FIR on silt loam soils.

Optimizing POST Herbicide Options in the XtendFlex® Technology.

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The perpetuating evolution of herbicide resistance in Palmer amaranth populations have left producers with only dicamba and glufosinate as effective POST herbicide options in some geographies. An experiment was conducted in 2019 and 2020 including a total of six site-years and four locations in Arkansas. The objective of the experiment was to determine the optimal sequence and timing interval of sequential applications of dicamba and glufosinate and to compare the sequential use of two sites of action (SOA) to single and sequential applications of dicamba and glufosinate alone. Data were analyzed by Palmer amaranth size: labeled (<10-cm height) and non-labelled (12.7- to 20.3-cm height). Single applications of dicamba, glufosinate, and dicamba plus glufosinate did not result in greater than 80% Palmer amaranth control, regardless of weed size. Palmer amaranth control with glufosinate followed by (fb) glufosinate and dicamba fb dicamba were optimized at a 7-, and 14- to 21-day interval, respectively. However, a single SOA postemergence system increases the likelihood for selection of resistant biotypes. Sequential applications that included both dicamba and glufosinate were optimized when dicamba was applied before glufosinate. Dicamba fb glufosinate at a 14-day interval was the only herbicide treatment that resulted in 100% control and mortality of Palmer amaranth when weed size was <10 cm. These findings highlight the importance of sequential applications that incorporate two SOA to control Palmer amaranth regardless of size.

Evaluation of Insecticide Seed Treatments in Furrow Irrigated Rice for Control of Rice Billbug, *Sphenophorus pertinax*, in Arkansas.

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Arkansas rice producers have increased furrow irrigated rice production acreage as a cost saving tillage and rotation practice. The elimination of a flood across the field has made rice more susceptible to rice billbug (*Sphenophorus pertinax*). Historically, this insect has been considered a minor pest in traditional flood irrigated production system only on the levees in the field. Rice billbugs feed on the roots and tillers of the rice plants, causing dead tillers and rice panicles to abort, resulting in direct yield loss. As furrow irrigated rice acreage continues to increase in Arkansas, a cost-effective management strategy for billbug is needed.

An experiment was conducted in 2020 to evaluate the effectiveness of insecticide seed treatments on rice billbug. Neonicotinoid and diamide insecticide seed treatments, alone and in combination were included in the study. Rice plots were monitored throughout the year for rice billbug damage. Multiple sampling methods were tested to correlate rice billbug damage and grain yield. When signs of billbug feeding appeared rice was sampled by counting total tillers and damaged tiller in five linear feet per plot. After panicle emergence, the number of blank heads per five linear feet within a plot were also recorded. None of the tested sampling methods showed a relationship between damage and grain yield. However, plots with a seed treatment containing a neonicotinoid in combination with the Fortenza, resulted in yields greater than the untreated check or the neonicotinoid seed treatment Cruisermaxx alone. Seed treatments containing Cruisermaxx in combination with Dermacor, also showed significant yield increases when compared to stand alone treatment of Cruisermaxx.

Identifying and Correcting Potassium Hidden Hunger in Arkansas Soybean.

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Potassium (K) deficiency is not always visually apparent in a soybean (*Glycine max* L. Merr.) crop and may result in significant yield losses if not diagnosed and corrected in a timely manner. Recent findings have defined critical concentrations of K at key growth stages, allowing for an accurate K deficiency diagnosis at any time during reproductive growth. Our objectives were to identify in-season K deficiencies through trifoliate-K concentration (potential hidden hunger) and visual symptomology (classical K deficiency diagnosis), and to capture the tissue-K concentration and grain yield responses to varying fertilizer-K management protocols. Treatments included multiple rates of granular muriate of potash at preplant, first flower (R1), the onset of visual deficiency symptoms, and split applications to include multiple timings. Research was conducted in 2019 and 2020 across multiple fields and soil-test K levels. In 2019, results indicated that soybean responded positively to K fertilization ($P< 0.05$) on low and very low soil-test K sites. Soybean which received an equal rate of 120 lb K $acre^{-1}$ at preplant and split application of 60 lb K $acre^{-1}$ at preplant and 60 lb K $acre^{-1}$ at first flower yielded similarly. However, when the second application of the remaining 60 lb K $acre^{-1}$ was applied only after deficiency symptoms appeared, the yield was significantly reduced with an average 18% yield loss in 2019. Therefore, in-season applications are effective at maintaining yield if applied during early reproductive growth. However, a delay in application timing may jeopardize yield potential to a degree that is no longer profitable to correct. The late onset of visual K deficiency symptoms in soybean limits the ability to use this as a method to identify and correct this yield limiting factor in a timely and effective manner. Our dynamic critical tissue-K concentration threshold for soybean allows producers to confidently identify and correct hidden hunger or a K deficient soybean crop in a timely manner to maximize yield and profit.