RESEARCH CONFERENCE ABSTRACTS

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STUDENT COMPETITIONS SPONSORED BY:

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Tuesday, November 27, 2018

MODERATOR: Nichole Taillon
Student Contest Chair: Taghi Bararpour
Audio-Visual Coordinator: Tara Clayton

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MODERATOR: Donna Frizzell

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Wednesday, November 28, 2018

MODERATOR: Tara Clayton

7:30 a.m. **Upload Presentations**

8:00 p.m. **Delineation of Continuous, Critical Leaf Potassium Concentrations During Reproductive Growth for Monitoring Rice Potassium Status.**
C.E. Gruener*[,1], N.A. Slaton[1], J.T. Hardke[2], T.L. Roberts[1], A.D. Smartt[1], and M.D. Coffin[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............................... 8

8:15 a.m. **Evaluation of Weedy Rice Control in Provisia Systems Using Benzobicyclon.**
J.A. Patterson*, J.K. Norsworthy, H.E. Wright, M.L. Zaccaro, and Z.D. Lancaster. Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.................................... 8

8:30 a.m. **Dicamba Tank-Contamination with Glufosinate and PPO-Inhibiting Herbicides.**
M.C. Castner*, J.K. Norsworthy, O.W. France, and H.E. Wright. Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.. 9

8:45 a.m. **Efficacy of Selected Insecticides for Control of Caterpillar Pests in Soybeans.**
A. Whitfield[†,1], G.M. Lorenz[2], B.C. Thrash[2], N.R. Bateman[3], N.M. Taillon[2], W.A. Plummer[2], A.J. Cato[1], J.K. McPherson[2], and L.D. McCullars[1]. [1]Dept. of Entomology, University of Arkansas, Fayetteville, AR; [2]Dept. of Entomology, University of Arkansas, Lonoke, AR; [3]Dept. of Entomology, University of Arkansas, Stuttgart, AR... 9

9:00 a.m. **Efficacy of Selected Insecticides for Control of Rice Stink Bug.**
T. Newkirk[†,1], N. Bateman[1], G. Lorenz[2], B. Thrash[2], J. Hardke[3], T. Clayton[1], G. Felts[1], A. Cato[4], N. Taillon[2], K. McPherson[2], A. Plummer[2], L. McCullars[4], and W. Plummer[3]. [1]Dept. of Entomology, University of Arkansas, Stuttgart, AR; [2]Dept. of Entomology, University of Arkansas, Lonoke, AR; [3]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Stuttgart, AR; [4]Dept. of Entomology, University of Arkansas, Fayetteville, AR. 9

9:15 a.m. **Efficacy of Preemergence Cotton Herbicides for Controlling PPO-Resistant Palmer Amaranth.**
W. Coffman*[,1], L.T. Barber[2], J.K. Norsworthy[1], Z.D. Lancaster[1], and M.L. Zaccaro[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR; [2]Dept. of Crop, Soil, and Environmental Sciences, Lonoke, AR. 10

9:30 a.m. **The Impact of Fall Armyworm, *Spodoptera frugiperda*, on Growth and Yield of Rice.**
L.D. McCullars*[,1], G.M. Lorenz[2], N.R. Bateman[3], J.T. Hardke[4], A.J. Cato[1], B.C. Thrash[2], N.M. Taillon[2], J.K. McPherson[2], T.L. Clayton[3], W.A. Plummer[2], and G. Felts[3]. [1]Dept. of Entomology, University of Arkansas, Fayetteville, AR; [2]Dept. of Entomology, University of Arkansas, Lonoke, AR; [3]Dept. of Entomology, University of Arkansas, Stuttgart, AR; [4]Dept. of Crop, Soil, and Environemtnal Sciences, Stuttgart, AR... 10

9:45 a.m. **Control of Tarnished Plant Bug in Cotton.**
J. Pace*[,1], G. Lorenz[2], B. Thrash[2], N. Taillon[2], A. Plummer[2], K. McPherson[2], L. McCullars[1], and N. Bateman[3]. [1]Dept. of Entomology, University of Arkansas, Fayetteville, AR; [2]Dept. of Entomology, University of Arkansas, Lonoke, AR; [3]Dept. of Entomology, University of Arkansas, Stuttgart, AR. 10

10:00 a.m. **Spatial Distribution of Foliar Diseases in Soybeans.**
M. Patterson*, T. Spurlock, and A. Tolbert. Dept. of Plant Pathology, University of Arkansas, Fayetteville, AR. 11

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MODERATOR: Wesley Plummer

ABSTRACTS

Does Sensitivity Among Soybean Cultivars Vary to a Low Dose of Dicamba?

O.W. France*[,1], J.K. Norsworthy[1], W.J. Ross[2], M.C. Castner[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.

The resurgence of dicamba in recent years, while providing an effective option for weed control, has also posed several new threats to non-dicamba soybean farmers in the form of physical drift and volatility. Soybean is extremely sensitive to dicamba, even at very low rates, such as when volatility or physical drift occur. The objective of this study was to determine if commercial soybean cultivars exhibit differential tolerance to low rates of dicamba. A field trial was established at the Arkansas Agricultural Research and Extension Center in Fayetteville, Arkansas in 2018. This trial was set up as a factorial containing four replications with a 1/250X rate of dicamba applied to 21 soybean cultivars at the V3 or R1 growth stages. Averaged across cultivars, injury was higher for applications made at R1 than V3, with 35% and 53% injury at 14 days after the V3 and R1 applications, respectively. Several cultivars exhibited less visible injury following the dicamba applications, with those having greatest tolerance being Eagle Drewsoy, UA5014C, and Leland. Maturity and yield data are still being analyzed and will be presented. These findings would indicate that breeders could possibly select for enhanced tolerance to low rates of dicamba, which would be beneficial to growers in areas where the herbicide is widely used.

PSII Herbicide Injury to Corn.

J.T. Richburg*[,1], J.K. Norsworthy[1], L.T. Barber[2], M.L. Zaccaro[1], and M.C. Castner[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.

Atrazine is the most effective and commonly used herbicide in corn weed control programs. As a photosystem II (PSII) inhibitor, atrazine has the flexibility to be applied preemergence or postemergence. The current federal label restricts in-season atrazine applications to no more than 2.5 lb/A/year. Recently, the EPA released a statement regarding its consideration for banning or limiting atrazine use to only 0.5 lb/A/year. Therefore, research was conducted in 2017 and 2018 at the Arkansas Agricultural Research and Extension Center in Fayetteville, Arkansas, as well as on-farm locations near Rohwer and Tillar, Arkansas in 2017 and 2018, respectively, to determine if other PSII-inhibiting herbicides offer similar weed control without injuring corn. Various PSII-inhibiting herbicides were applied, alone or in combination with S-metolachlor or mesotrione, to 12-inch tall Roundup Ready/LibertyLink corn. Site years were considered a random effect to allow data analysis over the four unique environments. Weeds at the trial sites were controlled with glufosinate and S-metolachlor. Fourteen days after application (DAA) the addition of S-metolachlor to prometryn- and linuron-containing treatments caused 43% and 40% injury to corn, respectively. Injury to corn for metribuzin-, propazine-, and simazine-containing treatments was comparable to atrazine-containing treatments (<8% injury). Subsequently, by 28 DAA corn was not injured more than 25% by any herbicide treatment and certain fluometuron- and ametryn-containing treatments did not differ from atrazine-containing treatments. There were no height or stand differences among treatments at any point during the study. Corn yield, averaged across additives with PSII herbicides, was greatest for atrazine-containing treatments, averaging 196 bu/A. Based on this research, corn appears to have some visible tolerance to several postemergence-applied, PSII-inhibiting herbicides. Future efforts should focus on implementing the most promising PSII-inhibiting atrazine replacements into a full-season corn weed control program.

Controlling Thrips in Arkansas Cotton.

N.M. Taillon[1], G.M. Lorenz[1], B.C. Thrash[1], N.R. Bateman[2], W.A. Plummer[1], A.J. Cato[3], J.K. McPherson[1], and L.D. McCullars[3]. [1]Dept. of Entomology, University of Arkansas, Lonoke, AR; [2]Dept. of Entomology, University of Arkansas, Stuttgart, AR; [3]Dept. of Entomology, University of Arkansas, Fayetteville, AR.

As part of a regional Mid-south effort, trials were conducted to evaluate the efficacy of currently labeled insecticides for control of thrips in cotton. With the resistance issues of the neonicotinoid class of insecticides, other treatments are needed to maintain thrips control. Trials were conducted at the Lon Mann Cotton Research Station, Marianna, Arkansas and Tillar, Arkansas to evaluate the efficacy of insecticide seed treatments and in-furrow applications at planting for thrips control in cotton. Results indicated thiamethoxam (Cruiser), a neonicotinoid, had no control of thrips at either location. At the Tillar location in-furrow applications provided a better level of control than seed treatments. Similar trends were observed at Marianna.

Starter Nitrogen Source and Pre-Flood Rate Effects on Rice Grown on Clayey Soils.

L. Martin*[,1], N. Slaton[1], B. Golden[2], J. Hardke[3], T. Roberts[1], and R. Norman[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR; [2]Mississippi State University, Stoneville, MS; [3]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Stuttgart, AR.

Seedling rice (*Oryza sativa* L.) produced on clayey-textured soils generally grows slowly and requires greater preflood-N rates to produce maximal yield as compared to loamy-textured soils. Farmers often apply 'starter' fertilizer N shortly after rice emergence to stimulate seedling growth. Our research objective was to examine the effects of starter N source and preflood-N rate on the grain yield of rice grown on clayey-textured soils.

Research was conducted on soil mapped as a Sharkey/Desha clay and a Commerce silty clay. Four starter N sources including no N (NONE), ammonium sulfate (AMS), diammonium phosphate (DAP), and urea treated with N-(n-butyl) thiophosphoric triamide (UREA) applied at 24 kg N ha-1 were made at the 2-leaf stage with five preflood-N rates (0, 56, 112, 168, 224 kg N ha-1) applied to 5-leaf rice and flooded within 1 day. Two cultivars, one pureline and one hybrid, were grown on each site location. Canopy cover was measured on the Sharkey/Desha clay using the Canopeo program once a week for 5 weeks after starter-N application (WAS).

Canopy closures, on both cultivars, were influenced by starter-N source during one WAS was applied, showing canopy closure percentage for AMS, DAP, and UREA (13-14%) was significantly greater than ($Pr < 0.05$) compared to receiving NONE (9%). During the second and third WAS, similar results with rice receiving starter N developed a more rapid canopy closure than rice receiving NONE. Throughout the fourth and fifth WAS, there was no difference among rice due to starter-N source effects being diminished two weeks after preflood-N was applied.

The grain yield of each trial was affected only by preflood-N rate, averaged across starter-N sources. Grain yield increased significantly with each increase in preflood-N rate with numerical maximal yields of 12,213 kg ha-1 for Diamond and 13,654 kg ha-1 for Gemini 214 CL on Sharkey/Desha clay in addition 9,232 kg ha-1 for CL153 on Commerce silty clay fertilized with 224 kg preflood-N ha-1.

Based on the three trials conducted in 2018, starter-N had no influence on rice grain yield when optimal preflood-N rates were applied at the 5-leaf stage. Canopy closure benefited from starter-N sources by producing more plant growth/vigor for about three weeks following starter N application. The early season growth effect of starter N was no longer visible two weeks after preflood-N application and flooding. Research in 2019 will continue to focus on measuring potential early season growth benefits.

Does Volatility of Enlist One Pose a Risk for Damaging Non-Enlist Cotton?

G.L. Priess*[,1], J.K. Norsworthy[1], Z.D. Lancaster[1], M.C. Castner[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.

An experiment to evaluate the mechanisms of movement of a commercial application of Enlist One to sensitive cotton was conducted on August 8, 2018 at the Lon Mann Cotton Research Station, near Marianna, AR. A one-acre area was treated with Enlist One (2,4-D choline) at 1 qt/A + Liberty (glufosinate) at 1 qt/A in the center of a 10-acre field of XtendFlex (2,4-D susceptible) cotton. Before herbicide application, buckets were placed over marked susceptible plants in 25 foot increments in the downwind direction to edge of the field. The buckets were removed 30 minutes after application. After the application, XtendFlex potted cotton plants were placed in the treated area at 0.5, 24, 48 hours and later removed at 72 hours after application. Aerial photos including RGB and NDVI were taken to mark any drift that may have occurred. High volume air samplers were placed in the center of the treated area and directly outside of the treated area on all four sides of the field 30 minutes after application. Sampling media (filter paper and PUFs) were replaced in the high volume air samplers every 24 hours after application up to 72 hours. The potted cotton plants were evaluated for auxin-like injury symptoms caused by 2,4-D at 14 and 21 days after application and aboveground biomass collected at the final rating. No 2,4-D symptoms were observed on any of the potted plants nor was biomass different from the control plants that were never placed in the treated plot. Likewise, cotton plants in the field in the downwind direction that were covered by buckets up to 30 minutes after application showed no signs of 2,4-D injury whereas uncovered plants were injured 55 to 75%. The NDVI and RGB photos showed that Enlist One did move out of the treated area injuring susceptible cotton only on the downwind side of the field at time of application. Based on these findings, it is concluded that injury to nearby non-Enlist cotton from an Enlist One application is most likely the result of physical and there is little risk for injury caused by volatilization.

Efficacy of Selected Insecticides for Control of Rice Water Weevil.

G. Felts[1], N. Bateman[1], G. Lorenz[2], B. Thrash[2], J. Hardke[3], T. Clayton[1], A. Cato[4], N. Taillon[2], K. McPherson[2], A. Plummer[2], L. McCullars[4], W. Plummer[3], and E. Castaneda-Gonzalez[3]. [1]Dept. of Entomology, University of Arkansas, Stuttgart, AR; [2]Dept. of Entomology, University of Arkansas, Lonoke, AR; [3]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Stuttgart, AR; [4]Dept. of Entomology, University of Arkansas, Fayetteville, AR.

The rice water weevil is a major pest in rice production. Rice water weevil larvae feed on the roots of young rice plants, which can negatively affect yield and become an economic concern for growers. In 2018, a study was conducted at the Pine Tree Research Station to test the efficacy of insecticide seed treatments and foliar sprays for rice water weevil control. Insecticide seed treatments reduced rice water weevil larvae compared to the untreated control. Additional reduction of rice water weevil larvae was observed when multiple insecticide seed treatments were used. Foliar insecticide applications were able to effectively reduce rice water weevil larvae. When foliar applications were made prior to flooding, a greater reduction in rice water weevil larvae was observed compared to applications made after permanent flood establishment.

Assessment of Cotton and Soybean Root Protection by Fluopyram-Treated Seed Against *Meloidogyne incognita*.

T. Hawk*[,1] and T. Faske[2]. [1]Dept. of Plant Pathology, University of Arkansas, Fayetteville, AR; [2]Dept. of Plant Pathology, University of Arkansas, Lonoke, AR.

The southern root-knot nematode, *Meloidogyne incognita*, is one of the most important plant-parasitic nematodes that affect cotton and soybean production in the southern United States. The primary symptom of root-knot nematodes is the presence of galls on infested roots, while above ground symptoms are less obvious and consist of wilting, loss of vigor, and nutritional deficiencies. Nematicides continue to be an important part of an integrated management system in cotton and soybeans, however, with limited options available, new nematicides are needed. An example of a new nematicide is the compound fluopyram. Though fluopyram does affect nematode motility there is limited information on its effect to suppress nematode penetration, infection, and reproduction. The objective of this project is to determine the effect of seed-applied fluopyram to effect *M. incognita* penetration, infection, and reproduction on cotton and soybean. In this study, fluopyram-, abamectin-, or non-nematicide-treated soybean and cotton seeds were planted in *M. incognita* infested soil and maintained in a greenhouse. Plants were sampled at 7, 14, 21, 28, and 35 days after planting and nematodes were stained to facilitate counting using a stereoscope. Nematode root galls and reproduction were quantified at later sampling dates. In one cotton experiment, numerically fewer juveniles were observed inside roots from fluopyram-treated seedlings compared to the non-nematicide treated control. Nematode galling and reproduction were also reduced as result of the fluopyram-treated cotton seed. Similar observations were observed with abamectin-treated cotton seed. In the soybean trial, there was a similar a trend at 7 and 21 days with significantly fewer penetrating nematodes in fluopyram-treated seedlings compared to the non-nematicide control; however, there was no effect of treatment at 14 days. There were significantly fewer galls and less reproduction 35 days after planting in fluopyram-treated seedlings when compared to the control. The degree of seedling protection provided by fluopyram-treated seeds was similar to that of abamectin.

Evaluation of Low-Use-Rate Zinc Fertilization Strategies for Rice.

M.D. Coffin*[,1], N.A. Slaton[1], E.E. Gbur[2], C.E. Gruener[1], A.D. Smartt[1], and L.R. Martin[1]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR; [2]Dept. of Agricultural Statistics, University of Arkansas, Fayetteville, AR.

New fertilization methods using low Zn rates have been developed and marketed for rice (*Oryza sativa* L.) fertilization. Limited research is available to validate the efficacy of these methods. Our research objectives were to evaluate the effect of Zn seed treatment rate combined with six Zn fertilization methods on 1) early season canopy coverage, 2) rice seedling Zn concentration, and 3) grain yield. Seven field experiments were conducted in 2017 and 2018 on soils mapped as a Calloway silt loam, a Calhoun silt loam, and a Sharkey-Desha clay. ‘Roy J’, ‘Diamond’, or ‘LaKast’ rice was treated with 0 or 3.3 g Zn kg^{-1} as ZnO and combined with i) no Zn (UTC), ii) granular $ZnSO_4$ applied at 11.2 kg Zn ha^{-1} (GRAN), iii) 1.68 kg Zn ha^{-1} as MicroEssentials (MESZ), iv) 1.1 kg Zn ha^{-1} as Zn-EDTA a (EDTA), and v/vi) 0.56 and 1.12 kg Zn ha^{-1} of WolfTrax Zn-DDP (DDP). Canopy coverage of seedling rice was measured at six sites and analyzed by site, and four sites were not affected by Zn seed treatment rate or fertilization method. At two sites canopy coverage was significantly affected by Zn fertilization method (P = 0.0020), and a significant interaction between Zn seed treatment rate and Zn fertilization method (P = 0.0578), respectively. Rice receiving MESZ had greater canopy coverage at these sites. When averaged across sites and Zn fertilization methods, application of 3.3 g Zn kg^{-1} increased tissue Zn concentration and yield by 1.6 mg Zn kg^{-1} (P = 0.0003) and 141 kg ha^{-1} (P = 0.0477), respectively. Rice receiving GRAN, increased seedling Zn concentration by at least 4.3 mg Zn kg^{-1} above any other fertilizer used (P <0.0001). Results suggest that low-use-rate Zn fertilizers provide only minimal Zn for rice seedlings, and should be avoided on fields where Zn deficiencies are probable.

Comparison of Weed Control Programs Containing Loyant for Furrow-Irrigated Rice.

H.E. Wright*[,1], J.K. Norsworthy[1], L.T. Barber[2], R.C. Scott[3], and J.M. Ellis[4]. [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]Rice Research and Extension Center, Stuttgart, AR; [4]Corteva Agriscience, Sterlington, LA.

Furrow-irrigated rice acres in Arkansas have seen a 250% increase from 40,000 acres in 2017 to nearly 100,000 acres in 2018. With significant costs savings associated with furrow-irrigating rice compared to flood-irrigation, furrow-irrigated rice acres are expected to increase. While flooding is a common practice used to control weeds in traditional rice production, the lack of a flood in a furrow-irrigated rice production system makes weed control challenging. Florpyrauxifen-benzyl, the active ingredient in the new postemergence (POST) herbicide Loyant™ from Corteva Agriscience, is a broad-spectrum herbicide recently labeled for use in rice. Field experiments were conducted at the Pine Tree Research Station near Colt, AR and the Lon Mann Cotton Research Station near Marianna, AR in 2017 and 2018 to evaluate Loyant-containing weed control programs in furrow-irrigated rice. This experiment was arranged as a factorial with a randomized complete block design, with the first factor being a preemergence (PRE) herbicide combination of Command® 3ME plus Facet® L or League® followed by an early-POST (EPOST) application of Ricestar® HT. The second factor was a mid-POST (MPOST) application of Riceshot® plus Prowl®, Loyant plus Prowl, Loyant plus Clincher® plus Prowl, or Loyant alone. The third factor was a late-POST (LPOST) application of Grasp Xtra® vs. none. Weed control data were collected 2, 4, and 6 weeks after the MPOST application for multiple weed species, including Palmer amaranth and barnyardgrass, with yield data collected at harvest. In Marianna (2017 and 2018) and Pine Tree (2018), treatments containing Loyant controlled Palmer amaranth (>85%) and barnyardgrass (>95%) 6 weeks after MPOST. Additionally, contrasts conducted to compare treatments containing the LPOST of Grasp Xtra to treatments that did not contain the LPOST showed control of both barnyardgrass (P=0.0019) and Palmer amaranth (P<0.0001) was improved by the addition of Grasp Xtra. Yields of Loyant-containing treatments at Marianna (2017 and 2018) and Pine Tree (2018) were higher than treatments without Loyant. Yield data combined with high levels of late season control of troublesome weeds indicates Loyant will be a good fit in herbicide programs for furrow-irrigated rice, providing a much needed option for Palmer amaranth.

Spatial Correlations of Southern Rust and Soil Phosphorus in Corn.

J.D. Bailey* and T.N. Spurlock. Dept. of Plant Pathology, University of Arkansas, Fayetteville, AR.

Southern rust (SR), caused by the fungus *Puccinia polysora*, is the most economically important foliar corn disease in Arkansas. Due to rapid reproduction by the fungus, its initial identification causes concern for growers. Without early accurate detection, the disease can become problematic in a relatively short time. Additionally, scouting and proper fungicide timing can be difficult because farmers typically do not pay a corn scout, so the management decisions are left on the farmer alone. Therefore, it would be beneficial to determine a predictive scouting regime for SR. In 2017, four fields were found to have SR at various growth stages. Fields were spatially marked with a GPS unit at 100, 100, 80 and 73 points near Grady, Pickens, Plumerville, and Long Lake, respectively. The four fields were rated for SR upon detection and then every two weeks after initial rating until maturity of crop. At each GPS points, ratings were assigned (within 3 meters of a single row) below the ear leaf, at the ear leaf, and above the ear leaf. Moran's I and spatial regression models were used to determine spatial distributions and relationships. After harvest, soil samples were taken at each GPS point and processed at the University of Arkansas Soil Testing Laboratory using the Melich-3 method. Spatial analyses indicated that SR spread in an aggregated pattern (P=0.05), and Phosphorus levels (P) within fields varied and were also aggregated (P=0.05). Positive spatial correlations existed between SR and P (P=0.10) at the four independent fields indicating that differences in SR severity could be controlled by plant growth and P could be a component of a SR predictive model. Further research is being conducted in 2018 to better understand the relationship between the two, but the 2017 data provides strong evidence for a predictive scouting model based on soil sampling data.

Comparison of *Bt* Technologies, With and Without Diamide Applications, for Control of *Helicoverpa zea* in Arkansas Cotton.

K. McPherson[1], G. Lorenz[1], B.C. Thrash[1], N.M. Taillon[1], N.R. Bateman[2], A. Plummer[1], and A. Cato[3]. [1]Dept. of Entomology, University of Arkansas, Lonoke, AR; [2]Dept. of Entomology, University of Arkansas, Stuttgart, AR; [3]Dept. of Entomology, University of Arkansas, Fayetteville, AR.

Selected cotton cultivars were evaluated for the control of cotton bollworms. Technologies included: Non-*Bt*, WideStrike, WideStrike 3, Twinlink, Twinlink Plus, Bollgard II, and Bollgard III. Technologies were observed in a split plot design as unsprayed versus sprayed with Prevathon at 20 oz/acre at Drew County and Jefferson County. When compared to the Non-*Bt* and WideStrike technologies, all other technologies recorded significantly less damaged fruit totals in an unsprayed situation across both locations. When treated with a Prevathon application, the Non-*Bt* technology recorded significantly higher damaged fruit totals compared to all other technologies at both locations.

Can See and Spray Technology Reduce Off-Target Movement of Dicamba?

Z.D. Lancaster**,[1], J.K. Norsworthy[1], J.T. Richburg[1], M.H. Houston[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, Lonoke, AR.

The rise of herbicide resistance increasingly challenges current production practices across multiple cropping systems in the Midsouth. Dicamba-tolerant soybean and cotton varieties have been developed to increase efficacy on troublesome weed species, however, over the past two years off-target movement of dicamba has been a major issue for Arkansas producers. Blue River Technologies is currently developing their See & Spray technology which utilizes computer vision and machine learning to make selective herbicide applications to individual weeds. Reduced herbicide product per acre along with proprietary nozzle design could lead to a reduction in off-target movement of herbicides. A study was conducted in the summer of 2018 at the Northeast Research and Extension Center near Keiser, AR to compare the off-target movement of dicamba when applied using See & Spray technology compared to a current standard commercial application. Simultaneously a See & Spray applicator and a commercial sprayer applied Engenia at 12.8 oz/A + Roundup Powermax at 22oz/A to 12 rows by 300 feet of ExtendFlex cotton surrounded by a sensitive soybean variety. Two transects were established in the soybean crop perpendicular to each spray application where visual injury ratings were taken at established distances downwind and upwind from the sprayed area. Buckets were placed over 3 soybean plants at each rating location and removed 30 minutes after application to better observe injury from secondary drift mechanisms. At 14 days after application off-target movement from the See & Spray application did not move further than the 12.7-foot rating location from the sprayed area, with injury ratings no higher than 1%. Off-target movement from the commercial application was observed out to the 50-foot rating location from the sprayed area with injury ratings as high as 33% 12.7 feet from the sprayed area. Overall area of damaged soybean with the See & Spray application averaged only 8.7% of sprayed area compared to 167.6% for the commercial dicamba application. Based on this research See & Spray technology could help reduce the off-target movement of dicamba in the future.

Nitrogen Management in Furrow-Irrigated Rice Production.

J.L. Chlapecka**,[1], J.T. Hardke[2], T.L. Roberts[1], D.L. Frizzell[2], E. Castaneda-Gonzalez[2], K. Hale[2], W.J. Plummer[2], and T. Frizzell[2]. [1]Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville,, AR; Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Stuttgart, AR.

Over the last several years, furrow-irrigated rice production (FIR), or row rice, has gained increasing interest among producers in eastern Arkansas and the Mid-South. More success is expected than in the past attempts with this system due to improvements in cultivars and management practices. Nitrogen (N) management differs from that in a typical flooded rice environment in the Mid-South due to alternating periods of wetting and drying of the soil, allowing for N loss mechanisms, specifically nitrification-denitrification, to exist in a greater capacity.

A study was initiated in 2018 to define the optimum N management strategy for the FIR production system. Urea with an added urease inhibitor (n-butyl thiophosphoric triamide, or NBPT) and SuperU®, urea impregnated with NBPT plus a nitrification inhibitor (Dicyandiamide, or DCD), were examined across multiple rates and timing schemes. Three sites characterized as a silt loam or sandy loam were utilized for evaluation of both urea+NBPT and SuperU®; while one site characterized as a silt loam and two as a clay were utilized for evaluation of only urea+NBPT. Grain yield, milling yield, N uptake, and N use efficiency (NUE) were measured and analyzed by site at harvest. It was hypothesized that a four-way split of SuperU® would result in the greatest yield and N uptake; however, preliminary yield data suggests that more options may be available to obtain maximum yield and NUE. In 2018, a urea+NBPT two-way split plus an additional 100 pounds of urea+NBPT four weeks after preflood provided the greatest yield potential on a clay soil texture, while a two way split of either product optimized yield with several timing schemes on a silt loam soil texture. With the knowledge gained, FIR producers in the Mid-South will be able to utilize the optimum N management strategy to both increase yield and reduce inputs.

The Potential of Dicamba Translocation to Soybean Seeds.

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Dicamba is an effective option for control of broadleaf weed species. The release of new dicamba formulations to be applied over-the-top of Xtend (dicamba-resistant) soybean and XtendFlex (dicamba-resistant) cotton provide a good option to control multiple herbicide-resistant weeds, such as Palmer amaranth. However, applications can be problematic as because of the sensitivity of non-dicamba-resistant soybean in nearby fields. Non-dicamba-resistant soybean is sensitive to dicamba; however, recovery is observed when injury from drift rates occur early season. Previous research indicated that dicamba may damage soybean offspring when the parent is exposed to the herbicide post-flowering. The purpose of this experiment was to determine if dicamba could be detected in seed of non-dicamba-resistant soybean exposed to the herbicide at late reproduction. The experiments were established in 2017 and 2018 at the Arkansas Agricultural Research and Extension Center in Fayetteville, AR where Fiskeby-III (maturity group 00) soybean plants were grown in the greenhouse until R5 growth stage. Plants were sprayed with 1/200X rate of dicamba, with the full labeled rate for dicamba-resistant soybean being 0.5 lb ae/A. Plants were then treated with radiolabeled dicamba at the rate of 387,000 dpm (disintegrations per minute) plant-1. At 14 days after treatment, the plants were divided into sections, samples were dried, oxidized, and then radioactivity in the plants determined using a liquid scintillation analyzer. Preliminary results showed 22% and 17.2% of the radioactivity absorbed per plant was recovered in the pods and seeds, respectively.

Relating Rice Stink Bug, *Oebalus pugnax*, Sampling to Direct and Indirect Yield Loss in Rice.

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The rice stink bug, *Oebalus pugnax*, is the most important pest of heading rice in the southern United States. Although many studies have sought to quantify the amount of direct and indirect yield loss that rice stink bug is capable of causing to rice, no study has directly related rice stink bug densities used to the sampled area in rice fields. The objective of this study was to relate direct and indirect yield loss by the rice stink bug to a defined sampling area using uncaged trials. Field experiments were conducted in 2018 across six locations using a randomized complete block design with 4 replicate blocks per location and 4 treatments. Treatment thresholds included were: untreated, standard threshold, 10 rice stink bugs all season, and 20 rice stink bugs all season. No relationship between direct yield loss and rice stink bug density was observed, among threshold treatments. When considering indirect yield loss, populations averaging 10 rice stink bugs per 10 sweeps without insecticide applications yielded peck levels of 1.8%. When insecticide applications were made at a threshold of 10 rice stink bugs, peck levels did not exceed 2%. A relationship between milled rice yield and rice stink bug density was observed, although no significant relationship was observed for head rice yield. Results from this study confirm the validity of the current Arkansas indirect yield loss threshold of 10 rice stink bugs during the second two weeks of heading.

Delineation of Continuous, Critical Leaf Potassium Concentrations During Reproductive Growth for Monitoring Rice Potassium Status.

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Potassium (K) deficiency can limit rice yield (*Oryza sativa* L.) on soils low in exchangeable K. Our primary objective was to develop critical Y-leaf K concentrations between the R0 and R4 growth stage for flood-irrigated rice. Ten Y-leaves were collected weekly during reproductive growth from selected fertilizer-K rates (0 to 150 kg K ha^{-1}) in five trials having 32 to 109 mg K kg^{-1} Mehlich-3 extractable soil K in the no fertilizer-K control. The Y-leaves were dried, digested and analyzed using traditional laboratory methods. The R1 growth stage was predicted using the DD50 program and rice development at each sample date was expressed as days after R1 stage (DAR1). A multiple regression model was used to predict relative rice yield using Y-leaf K concentration and DAR1. The critical-K concentration across time was defined as the leaf K predicted to produce 95% of maximum yield. Yield differences from K fertilization occurred at two of five trials. In the two K responsive trials, rice receiving no fertilizer K produced 74 and 82% of the maximum yield produced by rice fertilized with K. In general, Y-leaf K concentration in K-sufficient rice was greatest at the R1 stage and declined with rice development suggesting that the critical Y-leaf K concentration should also change across time. A multiple regression model that included DAR1 and Y-leaf K concentration accounted for 45% of the yield variation among all site-year data (n=316). Omission of one site with atypical Y-leaf K concentrations across time increased the model r^2 value to 0.61 (n = 236). The results suggest that the Y-leaf can be used to assess rice plant K nutrition using the accumulation of growing degree days to predict when R1 and R4 stages occur. Additional data is needed to increase the diversity and observations within the database.

Evaluation of Weedy Rice Control in Provisia Systems Using Benzobicyclon.

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Weedy rice (*Oryza sativa*) is particularly difficult to control in rice cropping systems due to its highly competitive and resilient nature along with the large risk for evolution of resistance to herbicides. With further developing herbicide resistance, the need for new modes of action (MOA) in rice production is imperative. Gowan Company is currently pursuing registration of benzobicyclon, a Group 27 (HPPD) herbicide, as a post-flood option in rice. It will be the first HPPD herbicide commercially available in U.S. rice production. In 2018, a trial was conducted at the Pine Tree Research Station near Colt, AR. The trial was implemented as a randomized complete block design with four replications. The objective of the trial was to evaluate benzobicyclon-containing weedy rice control programs, most of which contain Provisia™, in Midsouth rice compared to currently used programs. The herbicides used in the trial included Prowl H20 (pendimethalin), Bolero (thiobencarb), Warrant (acetochlor), pethoxamid, Provisia (quizalofop), and Rogue. The herbicides were applied in various combinations and timings, except all Rogue applications were post-flood. At two weeks after the post-flood application, >80% weedy rice control was observed for treatments sprayed at 4-leaf stage with Provisia followed by a post-flood application of Rogue. At four weeks after the post-flood application, the same treatment improved to >90% weedy rice control. No more than 9% injury was observed from treatments containing Provisia followed by Rogue, and yield from these treatments were 66 bu/A higher than treatments containing Provisia followed by Provisia. All other evaluated treatments severely injured rice or were noneffective. Therefore, the use of benzobicyclon in Provisia rice systems could be a viable rice weed control option moving forward but additional years of research are needed to validate this conclusion.

Dicamba Tank-Contamination with Glufosinate and PPO-Inhibiting Herbicides.
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With recent advancements in crop technology, growers may be given the opportunity to effectively control problematic broadleaf weeds such as Palmer amaranth (*Amaranthus palmeri*) with the Engenia formulation of dicamba applied postemergence (POST) in XtendFlex cotton and Roundup Ready 2 Xtend soybean. Despite its efficacy, Engenia along with other formulations of dicamba, are difficult to completely clean from a spray tank. Without proper tank cleanout, growers spraying non-dicamba-resistant soybean (conventional, LibertyLink, or Roundup Ready) are at high risk for contaminating those sensitive varieties. To evaluate consequences of dicamba-tank contamination on a glufosinate-resistant variety, an experiment was conducted in Fayetteville, Arkansas in 2018. Contamination rates of dicamba at 1/100, 1/1000, and 1/10000X, with 1X being 0.5 lb/A, were applied in various combinations with glufosinate at 0.59 lb/A and acifluorfen at 0.5 lb/A on V3 soybean. Treatments were arranged in a two-factor factorial, with the first factor being herbicide combination and the second being dicamba rate. All treatments at 21 days after treatment (DAT) in combination with 1/100X dicamba showed greater auxin symptomology at 70 to 75% than combinations with 1/1000 and 1/10000X. Treatments with 1/1000X dicamba at 21 DAT demonstrated approximately 60% auxin symptomology regardless of combination, which was greater than all treatments containing 1/10000X dicamba. Weight of 100 seeds was only reduced with treatments containing 1/100X dicamba. An interaction between dicamba rate and herbicide combination was observed for soybean maturity, with glufosinate plus acifluorfen combined with 1/100X dicamba delaying maturity 8 days.

Efficacy of Selected Insecticides for Control of Caterpillar Pests in Soybeans.
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Corn earworm, *Helicoverpa zea*, is the primary pest of soybean in Arkansas (Musser, et. al., 2017). The corn earworm overwinters in its pupal stage, emerges as an adult (moth) in April and May, and progresses through multiple generations by the end of the September. Corn earworm spends the first generation in field corn where they develop in ears before moving into soybeans and other crops. Moths deposit eggs on soybean leaves and stems, eggs hatch into caterpillars in two to three days and develop through six stages (instars), reaching full size in about two weeks. Although corn earworm feed on flowers and leaves through all instars, most damage occurs during the last two instars (5th and 6th) by feeding on the developing pods.

In 2018, many growers experienced multiple flights of corn earworm in soybean, which can result in being re-infested. Insecticides that provide residual control of succeeding populations can become a very important factor in the selection of an insecticide. Studies were conducted in Lonoke County, Arkansas to determine the efficacy of selected insecticides for control of corn earworm in soybeans. These studies indicated only Prevathon (chlorantraniliprole) and Besiege (chlorantraniliprole + lambda cyhalothrin) provided residual control of a succeeding infestation of corn earworm.

Efficacy of Selected Insecticides for Control of Rice Stink Bug.
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Rice stink bug is a major pest of heading rice. Currently rice producers have multiple insecticide options for control of rice stink bug. Knowing knock down and residual differences among these insecticides is critical for rice producers to effectively control rice stink bug. Efficacy trials were conducted in Arkansas, Poinsett, and Faulkner counties to test multiple insecticides for control of rice stink bug. At 3 days and 7 days after application, all insecticide treatments reduced the number of rice stink bugs compared to the untreated control. By 20 days after application only Tenchu, Lambda-Cy, Belay, and an experimental effectively reduced rice stink bug densities lower than the untreated control.

Efficacy of Preemergence Cotton Herbicides for Controlling PPO-Resistant Palmer Amaranth.

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Palmer amaranth (*Amaranthus palmeri*) is the primary weed threat to cotton production. Recently, Palmer amaranth in the state of Arkansas has been identified as resistant to all protoporphyrinogen oxidase (PPO)-inhibiting herbicides, removing another mode of action for growers to control weeds preplant or preemergence (PRE). Additionally, PPO-resistant Palmer amaranth has been observed as more difficult to control with other herbicide modes of action. To determine if PRE herbicides commonly used in cotton were still viable control options for PPO-resistant Palmer amaranth, two field experiments were conducted on-farm in Marion and Crawfordsville, AR in 2018. Treatments were arranged in a single-factor randomized complete block with three replications at Marion and four replications at Crawfordsville. Treatments included Reflex as a PPO herbicide comparison, as well as various combinations of Brake and Cotoran with other common cotton PREs. Treatments were applied to freshly tilled soil at both locations, and after cotton planting at Crawfordsville. Weed control ratings were taken at 14 and 32 days after application (DAA). Weed density m-2 was estimated 32 DAA by counting surviving weeds in two 0.5 m quadrats in each plot. At Crawfordsville, Brake + Cotoran provided 86% control 14 DAA and 76% control 32 DAA. At Marion, Brake + Xtendimax provided 99% control 14 DAA and 95% control 32 DAA. Overall, weed control levels were much higher at Marion than Crawfordsville due to differences in soil type and rainfall received.

The Impact of Fall Armyworm, *Spodoptera frugiperda*, on Growth and Yield of Rice.

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Fall armyworm (FAW), *Spodoptera frugiperda* (J.E. Smith), is a common pest of rice in the Midsouth. Infestations can cause rapid defoliation of rice plants at any time throughout the growing season. However, little is known about the impact of defoliation on rice yields. Actual FAW infestations and mechanical defoliation were evaluated at the 2-3 leaf, tillering, and panicle internode elongation stages at defoliation levels of 25, 50, and 100%. The objective of this study was to determine the impact of defoliation on rice yield and to develop a treatment threshold for FAW if needed on rice.

Control of Tarnished Plant Bug in Cotton.

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Tarnished Plant Bug (*Lygus lineolaris*) is the number one insect pest in mid-south cotton production. This study, conducted as part of a regional Midsouth trial the past two years, was conducted to evaluate the efficacy of insecticides currently labeled for control of this pest. This trial was conducted to determine a base level of control to monitor insecticide resistance to individual insecticides, and to serve as a source of data for possible registration of new insecticides that may become available. These data were also used to ensure that current recommendations of these insecticides are still viable. Insecticides evaluated include: Transform, Centric, Vydate, Orthene, Brigade, Bidrin, Admire Pro, Carbine and Diamond. 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 novaluron (Diamond) and sulfoxaflor (Transform) performed consistently better than many of the other insecticides. Many of the insecticides tested failed to provide any consistent level of adequate control.

Spatial Distribution of Foliar Diseases in Soybeans.

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Foliar diseases are widespread and cause economic losses in soybean each year. Management recommendations involve cultural practices, resistant varieties, and fungicide application after scouting. Unfortunately, scouting is not an exhaustive process. Individually, crop consultants are responsible for more crop land than ever before, with management decisions made from field subsets often not representative of whole field disease severity. Fungicide trials were placed in ten locations in 2017-18. Within strips, GPS points were marked at approximately equal distances, 10 points per strip and foliar disease levels were rated in the top 1/3 of the soybean canopy. Disease levels were determined across replicated treatment strips and disease distributions determined independent of treatments. Foliar diseases tended to be clustered (P=0.05), unlike commonly thought. In theory, these clustered distributions are a first step to possible creation of preferential scouting plans that could save farmers and consultants valuable time and make them more efficient.

Efficacy of Selected Insecticides for Control of *Helicoverpa zea* in Non-*Bt* Cotton.

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Selected insecticides were evaluated for control of cotton bollworm in a conventional cultivar. Treatments included Prevathon at 14 and 20 oz/acre; Besiege at 7 and 10 oz/acre; Intrepid Edge at 8 oz/acre; Brigade 4.5 oz/acre + Prevathon 14 oz/acre; Brigade 6.4 oz/acre + Prevathon 20 oz/acre; Brigade 6.4 oz/acre + Acephate 0.075 lb ai/acre; an Experimental at three undisclosed rates; and, an untreated check. Fruit damage was extremely high in the untreated check and the Experimental. Rate responses were observed for all other insecticides.

Evaluating the Use of Sodium Chlorate as a Harvest Aid in Hybrid Rice.

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Sodium chlorate ($NaClO_4$) is commonly used as a harvest aid on rice in Arkansas. The University of Arkansas Division of Agriculture currently recommends sodium chlorate applications be made when average rice grain moisture is less than 25 percent but greater than 18 percent. This recommendation was developed based on research in the late 1990's on conventional pureline varieties. Since that time, adoption of hybrid rice cultivars has increased substantially. Little is known about the effect of sodium chlorate applications on hybrids in regard to harvest moisture, grain yield, or milling yield. Therefore, a study was conducted in 2018 to assess the effect of sodium chlorate applications on hybrid rice with the current recommended moisture range.

This study took place at the University of Arkansas Division of Agriculture Rice Research and Extension Center near Stuttgart, AR. RiceTec hybrid XP753 was seeded in a randomized complete block with four replications. Sodium chlorate was applied at 6 lb ai/acre when plots reached 25, 23, 22, 20, and 15 percent (%) grain moisture. The plots were harvested 3 or 7 days (d) after application. Means were separated using Dunnett's multiple comparison test within each harvest timing.

Sodium chlorate significantly reduced grain moisture at each application timing with the exception of the 20% 10d harvest timing and the 15% 6d harvest timing. Compared to the untreated control, sodium chlorate application significantly reduced grain yield at 25% 7d, 22% 10d, and 20% 6d. Percent head rice was significantly reduced by the sodium chlorate application at 23% and 15% grain moisture at the 3d harvest interval; and at 25%, 23%, and 15% grain moisture at the 6-7d harvest interval. Total milled rice was only significantly reduced at the 22% 3d timing; however, a trend for reduced total milled rice was observed in 7 of 10 harvest timings. Net return showed a significate decrease in profit for the 25% 7d application and the 23% 7d application.

Impact of Rice Stink Bug on Quality of Rice at Different Stages of Heading.

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The objective of this study was to determine the amount of yield loss and quality loss rice stink bugs cause at different stages of heading. Three management strategies were used in this study consisting of an untreated control, a weekly spray, and a late spray (sprayed the last two weeks of heading). Plots were swept weekly to determine rice stink bug densities. An increase in yield, milling rice yield, and total rice yield was observed for the weekly spray and the late spray compared to the untreated control. A decrease in peck was observed for the weekly spray and late spray compared to the untreated control. When high densities of rice stink bug were observed and insecticide applications were made, rice yield and quality increased leading to more profitability for rice producers.