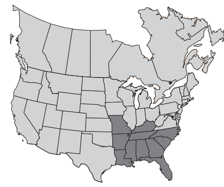
NEWS & VIEWS

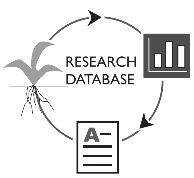
A regional newsletter published by the Potash & Phosphate Institute (PPI) and the Potash & Phosphate Institute of Canada (PPIC)



Dr. C.S. (Cliff) Snyder, Southeast Director
May 2006
Part 1 of 2

2005 Research Program Summaries–Southeast Region: Soybeans, Rice, and Wheat

The objective of the Potash & Phosphate Institute (PPI) and Foundation for Agronomic Research (FAR) program in the Southeast Region is to expand the science and knowledge of optimum plant nutrient management practices, while protecting environmental resources. This work is made possible by the partnership between cooperating scientists, and funds provided by PPI and FAR contributors. This *News & Views* includes reports from a portion of the 24 projects supported in the region in 2005.



These summaries provide a brief overview of each project. Please consider contacting the research project leader for more details. You can also view the full annual reports of each project (current and past), when available, at the website: >**http://www.ppi-ppic.org/research**<. Once at this website, research project information can be viewed by state abbreviation and project title, or by a topic area.

Arkansas

Soybean Response to Phosphorus and Potassium Fertilization in Arkansas

Project Leader: Dr. Nathan Slaton, University of Arkansas, Crop, Soil and Environmental Sciences Department, 115 Plant Science Building, Fayetteville, AR 72701. Telephone: 479-575-3910. E-mail: nslaton@uark.edu

Project Cooperators: R. DeLong, J. Branson, S. Clark, M. Mozaffari, R. Norman, J. Schaeffer, and R. Thompson

Yield response of soybean to phosphorus (P) and potassium (K) on silt loam soils in eastern Arkansas was evaluated in 2005 at six sites. Before or shortly after soybean planting, P (triple superphosphate) or K (muriate of potash) fertilizers were applied at rates of 0, 40, 80, 120, and 160 lb K_2O or P_2O_5/A. At each site, P and K studies were in adjacent plot areas. A composite soil sample (0 to 4 in. depth) was collected from each replicate and extracted with Mehlich-3 solution. Recently matured trifoliate soybean leaves (20) were collected at the R2 growth stage for elemental analysis. Grain yield was measured at maturity. Soybean yields were significantly increased by K fertilization at only one site, which had 72 ppm Mehlich-3 extractable K, the lowest soil-test K of all 2005 research sites. Application of 80 lb K_2O/A increased soybean yields by 24 to 28% compared to the unfertilized control. Leaf tissue K concentrations at the R2 growth stage were significantly affected at 5 of 6 sites by K rate. The leaf K concentrations increased linearly as K rate increased at the two sites with the lowest soil-test K (72 and 103 ppm), where the unfertilized control leaves contained 1.68% K.

Soybean yields were significantly affected by P fertilization rate at only two of six sites. Application of 40 lb P_2O_5/A produced significantly greater yields than the unfertilized control, but soybean receiving 160 lb P_2O_5/acre produced significantly greater yields (and were taller) than all other P rates, except 120 lb P_2O_5/A. Phosphorus concentrations in recently matured trifoliate leaves at the R2 growth stage were significantly affected by P application rate at 3 of 6 sites. Trifoliate leaf P concentrations in the unfertilized control treatment at sites which had the ‘Low’ or ‘Very Low’ soil-test P levels (11 to 16 ppm), were <0.40% and significantly increased by application of P.

The recently revised K-fertilizer recommendations for soybeans appear reasonably accurate in identifying soils that respond to moderate to high rates of K fertilization. Recommendations for P may require some adjustments to

Please refer to the second *News & Views* (Part 2 of 2) for a report from other studies conducted in the Southeast Region in 2005.

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improve their accuracy for predicting soybean yield response to P. Data from these studies will be included in a database that will be used to correlate and calibrate P and K recommendations for soybean. *AR-30F*

Soybean and Rice Response to Boron Fertilization in Arkansas

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Project Cooperators: R. DeLong , S. Clark , M. Mozaffari, J. Schaeffer, and R. Thompson

The objective of four studies conducted in 2005 was to evaluate boron (B) fertilizer application time and rate on the seed yield of soybeans grown on alkaline silt loams in northeast Arkansas. Boron fertilizer was applied before emergence (granular B at 1.0 and 2.0 lb B/A), at the V6 stage (foliar applied B, 0.37 and 0.75 lb B/A), or at the R2 stage (foliar applied B, 0.37 and 0.75 lb B/A) and compared with an unfertilized control. Soybean seed yield was measured at maturity. Recently matured trifoliate leaves (20) were collected at the V6 and R2 stages for B analyses and grain yield was measured at maturity. Soybean yields were not affected by B fertilization at any site in 2005. Although soybean yields were often numerically greater when B was applied, there was no consistent trend indicating that positive responses to B fertilization occurred at any site. Tissue B concentrations were affected by B fertilization at all sites and sample times. At one site, soybean yields were not decreased by application of B at planting, although trifoliate leaf B concentrations were >60 ppm by the R2 stage, which is considered toxic. Granular B applied at planting was still visible on the soil surface 4 to 6 weeks after application due to little or no rainfall. Although the granular B was still visible when trifoliate leaf samples were collected at the V6 stage, the tissue B concentrations of plants receiving 1 or 2 lb B/A were significantly greater than the unfertilized control. By the R2 stage, the B concentration of trifoliate leaves from the unfertilized controls had increased numerically (i.e., not statistically compared) at all sites with the B concentrations considered sufficient (>20 ppm). Boron applied at planting and the V6 stage significantly increased trifoliate leaf B concentrations at the R2 stage. In general, leaf B concentrations were increased more by granular B applied at planting than by B sprayed to soybean foliage at the V6 stage and tissue B increased as B application rate increased.

Collecting trifoliate leaf samples during early vegetative growth is not currently recommended as a means of identifying fields that need B fertilization. Data from the last two years of research suggest that tissue B concentrations may increase or decrease during soybean development, which is due in part to development of the plant's root system and B uptake as a function of soil moisture status. Additional data is needed to gain a better understanding of soybean growth and uptake of B during the growing season to determine whether plant samples collected during early vegetative growth can be used to identify fields that require B fertilization before flowering. *AR-23F*

Influence of Dicyandiamide (DCD) Treated Ammonium Sulfate, Application Rate, and Timing on Grain Yields of Drill-Seeded, Delayed Flood Rice

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Project Cooperators: C.E. Wilson, Jr., D.L. Frizzell, and A.L. Richards

The following treatments were applied to drill-seeded rice on silt loam soils at two sites...The Rice Research and Education Center (RREC) and Lake Hogue...and a permanent flood was established at the 5-leaf stage: 1) control, with no nitrogen (N) fertilizer; 2) urea applied 1 day prior to flooding at 60, 90, and 120 lb N/A; 3) 90 lb N/A as urea, ammonium sulfate (AS), ammonium sulfate + 5% DCD-N, and AS + 10% DCD-N applied 20 days prior to flooding; and 4) 90 lb N/A as U, AS, AS + 5% DCD-N, and AS + 10% DCD-N applied preplant incorporated. All N fertilizer treatments were applied to a dry soil surface. At heading, plant samples were collected for total N determination and grain was harvested at maturity. Grain yields were still increasing with up to 120 lb N/A as urea applied the day before flooding at both locations, but the yield increase from 90 lb N/A to 120 lb N/A was only significant at the Lake Hogue location. At 90 lb N/A, urea applied the day before flooding resulted in the highest yield of 175 bu/A at the RREC. The next highest yields were achieved at the RREC when AS + 10% DCD was applied preplant or 20 days prior to flooding, but these yields were only about 100 bu/A. In general, the yields from the other N sources were not significantly lower than AS + 10% DCD at the RREC, but there was a trend for the N sources to result in slightly higher yields when they were applied 20 days before flooding compared to preplant. The yield data at the RREC for urea applied preplant and 20 days prior to flooding seems unusual when compared to the AS applied at these times. The low rice yield response at both locations to AS + 5% DCD applied 20 days before flooding or preplant probably indicates that 5% DCD is just not enough. *AR-25F*

Assessment of Soybean Response to Boron Fertilization in Growers' Fields

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Project Cooperators: R. Wimberley, R. Klerk

On-going efforts are aiming at finding the most efficient timing, rate, and B application method to prevent and/or reduce potential yield limiting effects of a B deficiency. Although the documented B-deficient symptoms have not been associated with a particular maturity group or soybean variety, the varietal response to B applications is a subject of interest. For the 2005 season, the cultivars Asgrow 5301, DP 5414, Progeny 5250, Armor 47G7, and Pioneer 94M80, were selected to represent different breeding programs. Plant analyses showed tissue B levels at the V4 growth stage were significantly different among cultivars and were in the deficient range, when compared to commonly used sufficiency levels for soybeans at the R1 growth stage. However, levels of other nutrients (N, P, and K) did not show the same variability. Tissue B levels collected 1.5 weeks following a R1 foliar-B application showed a trend to increase with increasing B rates, but erratic rainfall patterns experienced during the 2005 season may have contributed to the abnormally high tissue B levels observed. There were no significant effects of B rate or timing on soybean yields in 2005. *AR-26F*

Glyphosate Effects on Soybean Phosphorus Response and Soil Microbiology

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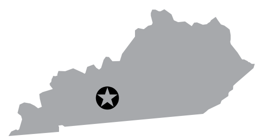
Cooperating Scientist: Mary Savin

Round-Up Ready (RR) crops account for the majority of soybean, corn, and cotton in the U.S. Although glyphosate has no documented effect on yield of RR crops, beneficial microorganisms are sensitive to glyphosate. Our research addresses whether P nutrition is changed due to glyphosate effects on mycorrhizae in roots of RR crops. RR soybean, corn, or cotton seeds were planted in low P (26 lb Mehlich 3 P/A) silt-loam soil in half-gallon pots. There were three levels of P nutrition: i) no additional P (0P), ii) 15 lb P_2O_5/A (0.5xP), and iii) 30 lb P_2O_5/A (1xP), and three glyphosate treatments: i) no glyphosate, ii) glyphosate (1 lb ai/A) applied 10 days after emergence, and iii) glyphosate (1 lb ai/A) applied 10 and 20 days after emergence. Soybean was inoculated with *B. japonicum* (rhizobia bacteria) and did not receive N fertilizer; corn and cotton received 70 lb N/A. Four weeks after emergence, plants were harvested and soil was extracted. Shoots were dried, ground, and analyzed for N and P. Soil C, N, and P pools, and soil phosphatase activity, were measured. Roots were sampled for mycorrhizal infection.

Glyphosate did not affect shoot dry weight of any species, nor was there an effect of P on corn or cotton dry weight. For soybean, P fertilization approximately doubled shoot dry weight compared to the control, but there was no effect of glyphosate or P on mycorrhizal infection. For corn and cotton, P fertilization decreased mycorrhizal infection to less than half the levels measured at 0P. One application of glyphosate decreased mycorrhizal infection in corn by 40%, but mycorrhizal infection in cotton was twice as high following one glyphosate application. Soil and plant analyses are on-going. These results confirm the need to repeat the experiment, emphasizing responses of mycorrhizal infection and P nutrition to glyphosate. *AR-28F*

Kentucky



Effect of Boron on the Milling Properties of Wheat

Project Leader: Dr. Lloyd Murdock, Extension Soils Specialist, Univ. of Kentucky Research & Education Center, 1205 Hopkinsville Street, P.O. Box 469 Princeton, KY 42445. Telephone: 270-365-7541 ext.207.
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Cooperating Scientists: John James and Dottie Call

In 2002, unreplicated milling quality tests on one wheat variety indicated that milling quality may be improved by the addition of B. A similar study was completed in 2003 and milling quality was not effected by B fertilization on a different and single wheat variety. This 2004-2005 study used six different varieties with wide differences in milling quality on a Pembroke silt loam on the University of Kentucky Research and Education Center at Princeton. Across replications, the mean soil pH was pH 6.2, Mehlich 3 extractable P was 76 lb/A and K was 283 lb/A. The hot water-extractable soil B on April 14 was low at 0.6 lb B/A. Warrior insecticide was applied in November and again in March. Tilt fungicide was applied at heading and N was applied at 40 lb N/A at Feekes growth stage 3 and 80 lb N/A at Feekes 5. The treatments were: i) Control (no B added), ii) 0.25 lb B/A foliar applied at initial heading, iii) 0.25 lb B/A soil applied at Feekes 5 to 6, iv) 0.50 lb B/A soil-applied at Feekes 5 to 6, v) 2 lb B/A soil applied at Feekes 5 to 6, and vi) 1 lb B/A foliar applied with split application: one half at initial heading and one half 2 weeks after first application. Granular B (14.3% B) was applied on March 25, by hand, mixed with 350 ml of sand. Boron was sprayed as Solubor (20.5% B) at head emergence (prior to flowering) on April 27 and May 11 for the treatment requiring a second application. Flag leaves were sampled at heading. Grain was harvested and subsamples (500 gm) were sent to the USDA-ARS Soft Wheat Quality Laboratory at Wooster, Ohio, for milling property measurements.

Flag leaf B concentrations at flower initiation showed minimum sufficient levels of 6 ppm in the control treatment in the varieties tested. Soil treatments were less effective in raising the flag leaf concentrations than the foliar treatments at similar rates. In all varieties, the 0.5 lb B/A soil treatment raised the leaf concentrations into the sufficient level, and the 2 lb B/A soil treatment raised the leaf concentrations to high levels. Foliar treatments were very effective in raising the B leaf concentrations. The analyses indicated that the applied B was moving into the plant and increasing the B plant concentrations to high levels at the higher treatment rates. Application of B to the soil and to the foliage did not affect the level of B in the grain except for one variety. Boron fertilization, to the soil or the foliage, did not affect milling quality or quantity with any of the B treatments on any of the varieties. It is concluded from this study that the 2002 data was either an anomaly or the B effect occurs so rarely it may be impossible to predict. *KY-09F*

Louisiana

Soybean Rust Control With Nutrition and Fungicides

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Asian soybean rust (ASR) was first discovered in North America in Louisiana in November 2004 and was confirmed in eight other states within a few weeks of this initial discovery. This disease has been documented to cause in excess of 80% yield losses in Brazil and elsewhere. It is particularly onerous because the pathogen produces airborne spores that can be spread hundreds of miles each day, and there are no resistant varieties. The only weapon available to U.S. producers at this time is fungicides, which have not been evaluated under our environmental and agronomic conditions. Other control or disease mitigation options are desperately needed. The objectives of this field study were to evaluate the effects of K (75 lb K_2O/A as muriate of potash), foliar manganese (Mn, 0.5 lb/A) and foliar B (0.25 lb/A), with and without fungicide applications, on soybean rust and other foliar diseases. The minor elements were applied as foliar sprays at approximately V4 and V10, and fungicides (Headline and Folicur) were applied at R3 and R6.

Rust did not develop until mid-November (late R6). However, *Cercospora* leaf blight was very severe. Treatment with K and Mn+B, without fungicide application, resulted in substantially lower severities of *Cercospora* leaf blight and rust. There were no treatment effects when these materials were applied in combination with fungicides. However, the highest rust incidence was only 3.75% in a treatment that did not receive fungicide applications, so any possible interactions were masked by low disease pressure. These results are promising and indicate a need for further study where rust is likely to be severe. If there is a beneficial interaction between mineral nutrition and fungicide application, it may be possible to reduce the rate or number of fungicide applications.

Unfortunately, Hurricanes Katrina and Rita caused the plants to lodge, and it was not possible to obtain yield data. Soil and tissue analyses are pending. *LA-22F*

Missouri

Sulfur Fertilization of Wheat in a Wheat/Soybean Doublecrop Production System

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Sulfur (S) deficiencies in crops are increasing each year throughout the Mississippi Alluvial Valley. Most of the S in soil is contained in soil organic matter and made available to plants by bacterial action. Release of S from organic matter increases with favorable temperature and moisture. Since winter wheat is a cool season crop, much of its plant development occurs before the soil has warmed and S has been released from organic matter. The University of Missouri recommends applying S only on soils with a cation exchange capacity (CEC) of less than 7.5 milliequivalents/100 grams, but this currently precludes a recommendation for S fertilizer for most wheat fields. This study investigates the appropriateness of the University of Missouri soil testing recommendations for S fertilization of winter wheat.

In 2004 and 2005, a wheat experiment was conducted at the University of Missouri-Delta Center on silt loam soils. The University of Missouri soil testing system did not recommend S for either year. In both years, 100 lb N/A as ammonium nitrate was compared to two rates of ammonium sulfate (50 and 100 lb material/A) + ammonium nitrate with the total amount of N held constant. In 2004, wheat yields were significantly increased with the application of 12 lb S/A as ammonium sulfate. In 2005, no significant differences were found in wheat yields. However both ammonium sulfate treatments produced yields that were numerically less than the ammonium nitrate treatment. Grain test weights and harvest moisture were not affected by S fertilization in either year. The difference in yield response to S fertilization during the 2 years of this study may be related to weather during the growing season. In 2004 wet, cool weather prevailed during March and April. These conditions limit organic matter decomposition and are ideal for leaching any accumulated S. In 2005, hot and dry conditions during March and April promoted S accumulation in the upper soil profile. *MO-29F*

Does Magnesium Effect Potassium Uptake in Flood-Irrigated Rice?

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Proper K nutrition is critical to maximize rice production. Potassium deficiency in rice can reduce grain yields and increase lodging. The interaction of soil applied K and Mg fertilizers with K and Mg uptake in rice plants has not been previously studied. This 2-year study compares the uptake of both K and Mg in rice plants fertilized with KCl or $K_2SO_4 \cdot 2MgSO_4$ (K-Mag®) at equivalent K rates (0, 50, 200 lb K/A). During both years, K fertilization, regardless of source, produced more dry matter accumulation at all growth stages. At the first tiller growth stage, K-Mag® treatments produced more dry matter accumulation than equivalent K from KCl. At subsequent growth stages, however, K source did not affect dry matter accumulations. Potassium fertilization increased K uptake, reflecting increased dry matter and increased tissue K concentration, at all growth stages both years of the study. In both years, K uptake was greater for K-Mag® treatments than corresponding KCl treatments at the first tiller growth stage. In 2004, K uptake at subsequent growth stages was erratically affected by K source. In 2005, K-Mag® consistently produced greater K uptake than corresponding KCl treatments. Yield results were also different between 2004 and 2005. In 2004, all K-Mag® treatments produced yields that were equivalent to the untreated check (168 bu/A). In 2005, however, all K treatments produced yields (130 to 133 bu/A) that were greater than the untreated check (117 bu/A). There was no difference in yield response between K sources in 2005. The K-Mag® had greater grain moisture levels at harvest than the KCl treatments. This indicates that K-Mag® delayed maturity. *MO-28F*

Use of Foliar-Applied Potassium Fertilizers with Fungicides to Improve Soybean Response and Disease Resistance

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Cooperating Scientists: Kelly Nelson, Gene Stevens, and David Dunn

An increased occurrence of K deficiency in soybeans and the potential widespread onset of Asian soybean rust (*Phakospora pachyrhiza*) have stimulated interest in new management practices that may improve K nutrition and lower disease incidence. Among these potential practices is use of foliar fertilizer in combination with fungicide or herbicide applications. The possible benefits of this "weed/disease control and feed" system include reduction in application costs, improved disease suppression and nutrient response, and flexibility in management response to environmental conditions during the growing season. This initial research had the objectives of comparing the yield effects of applying several fungicides at different soybean growth stages and evaluating the effects of applying different K fertilizer sources with and without glyphosate on plant nutrient tissue levels of K, Cl, and other nutrients. Research was conducted in 2004 and 2005 at two sites planted to soybeans in Northeast and Southeast Missouri. Treatments were applied at four rates (0, 2.4, 9.6, and 19.2 lb K_2O/A) of foliar K fertilizer sources (KCl, K thiosulfate, K phosphate, Trisert K+) either sprayed separately on plots maintained weed-free or sprayed as a mixture with glyphosate at 0.75 lb active ingredient (ai)/A on plots with weeds. Soybean leaf samples were collected at initial bloom to determine crop nutrient status. An additional soybean study was conducted in Northeast Missouri in 2005 in which fungicide applications of 6 oz/A of pyraclostrobin (Headline®) or 6.4 oz/A of azoxystrobin (Quadris®) were foliar-applied either at the R1, R2, R3, and R4 growth stages. Rainfall was relatively low in Missouri in 2005 which affected plant growth and yield response to added nutrients and herbicide/fungicide treatments. In general, yields were not improved compared to untreated plots by addition of fungicides at any of the growth stages, possibly due to the low fungal disease pressure observed during the year. The R2 timing had the highest yield response (51.3 bu/A) when Headline® was applied and the R4 timing had the highest yield response (51.4 bu/A) when Quadris® was applied. Differences in weed pressure probably accounted for the 5 to 11 bu/A lower yields observed when different foliar K fertilizer sources mixed with glyphosate were applied, compared to when the K fertilizers were applied without glyphosate and the plots maintained weed-free.

These lower yields due to glyphosate application were generally not observed in Southeast Missouri. Potassium leaf tissue content with 2.4 lb K_2O/A rate of foliar K application with glyphosate was consistently 0.3% higher compared to the control, with the exception of one of the K sources. *MO-32F*

Mississippi

Phosphorus Rate and Timing for Rice in Mississippi

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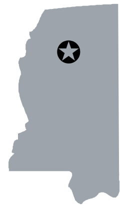
Project Cooperators: J.E. Street, W.L. Kingery, M.S. Cox, J.L. Oldham

Four studies (Aguzzi-1, Aguzzi-2, Gentry-1, and Gentry-2) were conducted in 2005 to determine the optimum rate and application timing of P. The soil pH (1:2 soil/water) ranged from 6.9 to 7.8 and the Lancaster extractable P ranged from 10 to 56 lb/A among the sites. The two treatment factors were P_2O_5 rate (0, 25, 50, and 100 lb P_2O_5 /A) and application timing (1-leaf and 5-leaf rice). A fall application time was also evaluated at the Aguzzi-1 site. In addition to these experiments, an experiment was placed in the same field and adjacent to the Aguzzi-2 site that compared surface-applied, banded fluid 10-34-0 to surface-applied, broadcast 0-46-0 at rates of 25, 50, and 100 lb P_2O_5 /A. All granular P-fertilizer applications were applied to dry soil in this fall application test. The fluid fertilizer was applied at planting with a plot drill modified with knives placed in the center of every other drill row. Rice leaf tissue samples were collected on 14 day intervals beginning 14 days after permanent flood establishment and were analyzed for total P. Rice grain yields, averaged across application timing, were not affected by P_2O_5 rate for any of the four studies. However, for Aguzzi-1 and Aguzzi-2, and averaged across P_2O_5 rate, application timing significantly impacted rice grain yields. For the Aguzzi-1 location, 1-leaf and 5-leaf application timings resulted in 7 and 6% yield increases compared to the control (178 bu/A). A P_2O_5 application in the fall yielded the same as the control (no P fertilization). The 5-leaf application timing (178 bu/A) was superior to both the 1-leaf timing (170 bu/A) and control (168 bu/A) at the Aguzzi-2 location (Lancaster soil P=10 lb/A). Averaged across P rate, both fall banded 10-34-0 and fall broadcast 0-46-0 produced greater yields than the control (148 bu/A). The broadcast treatment increased grain yields by 7% (11 bu/A) above the increase achieved with the banded treatment. *MS-10F*



Evaluation of UAN in Combination with Various Fungicides to Determine the Efficacy on Asian Soybean Rust and Other Foliar Diseases

Project Leader: Dr. Alan Blaine, Mississippi State University, Dorman Hall Rm 153 Box 9555, Mississippi State, MS 39762. Telephone: (662) 325-2311. E-mail: ablaine@pss.msstate.edu

Cooperating Scientists: Normie Buehring, Billy Moore, Dan Poston, Ben Spinks, Brian Ward, Mitt Wardlaw

The objectives of this work were to: 1) evaluate the efficacy of fungicides with the addition of urea-ammonium nitrate (UAN) solution in the control of Asian soybean rust and other soybean foliar diseases, and 2) evaluate the impact of the application timing of fungicides and UAN solution on the level of disease control. Two adjuvant studies were conducted, one in the central delta region and the other in the hill region of Mississippi. Twenty-one different combinations of fungicides and adjuvants were used in these studies along with different application timings. Fungicides were applied in combination with various adjuvants. In the Lee County study (hill region), the field received spring tillage and was planted on May 16, 2005, with DP5634. The R3 stage applications were made on August 9, R5 applications on August 23 and the R5.5 applications on September 2. Visual ratings were made approximately 3 weeks after each application and then bi-weekly for the remainder of the growing season. In the Washington County study (delta region), the field received fall tillage and was planted into a stale seedbed on April 18 2005 with DK4461. Visual ratings for suppression of Frogeye leaf spot of soybean (*Cercospora sojinii*) were taken on August 2, about three weeks after treatment. No other diseases were present at levels that warranted evaluation. Ratings were made throughout the growing season for late season *Cercospora* and other injury.

Fungicide treatments containing UAN had the highest efficacy on late season Cercospora. However, those same treatments with UAN as the adjuvant also had the highest injury ratings. This injury was also reflected in yield. The R3 treatment with UAN had a 6.7 bu/A yield decrease compared to the untreated check, while the R5 treatment had a 14 bu/A yield decrease. In addition, the two highest yielding treatments (Headline SBR @7.8 oz./A with Penetrator Plus @ 8 oz./A, and Headline SBR @ 7.8 oz./A with Tactic at 0.125% v/v) also had the lowest recorded injury. Averaged across fungicides, the three most efficacious adjuvant treatments were Adsee 600 at 0.25% v/v, Penetrator Plus at 8 oz/A, and Agridex at 1% v/v. UAN was the least effective adjuvant. Soybean yields were generally not improved by the use of foliar fungicides. This was somewhat expected since disease pressure was extremely low until late in the growing season. *MS-14F* ■