Mississippi River Delta. Electrical conductivity was determined for each of the three fields with GPS-equipped Veris instrumentation. Using EC soil maps, field topography and NRCS soil type maps, 20 to 22 small areas with different soil traits were identified within each field and sited by GPS. These areas were thoroughly soil sampled to 0- to 6- and 6- to 12-inch depths for analysis of nutrient status. The fields were uniformly planted with cotton in 2009 and data collected weekly in each plot in the three fields for agronomic growth traits. Leaf samples were collected at early flowering and mid-boll fill from each plot for plant tissue analyses. At harvest, cotton lint yields were highly variable within fields ranging from 333 to 1153 lb/ac on the Calloway/Gigger field, 929 to 1397 lb/ac on the Norwood/Moreland field, and 540 to 1296 lb/ac on the Bruin/Sharkey field. Correlations analyses were done relating yield variability to specific field traits of soil texture, pH, organic matter, and soil and plant content for N, P, K, Ca, Mg, S, Mn, Zn, B, Cu, Fe, Mo, Na, Ni, Si, Co and Pb. Soil analyses were also done for nematodes. There were relationships between several of the plant nutrients and yield for each of the fields and also potential deficiencies (and toxicity) of several nutrients, which were affected by field and by location within fields. Reniform nematode infestations were high in two of the fields and a probable cause of some of the yield limitations and variability. Plant leaf analysis did relate to the apparent soil nutrient deficiencies but some of the low soil nutrient values did not result in verifiable plant deficiencies. However, P, S, and Zn were deficient, and Mn levels were excessively high, in plants at the Red River and Macon Ridge field locations. The experiments were repeated on the same fields in 2010 but planted with corn rather than cotton. The 2010 corn results will also be discussed.

Program 16C-2

▸ Evaluation Of Polymer Coated Urea For Use In Southern Row Crop Agriculture

Presented by Dr. Bobby R. Golden
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1Urea ammonium nitrate (UAN) is the predominate N source utilized in Louisiana cotton [Gossypium hirsutum L.] and corn [Zea Mays L.] production systems. Nitrogen loss via denitrification, volatilization, and/or leaching can be great (50% of total-N applied) due to environmental conditions at application or if N applications are mismanaged. Use of controlled-release fertilizers in row-crop agriculture can potentially improve fertilizer nutrient use efficiency and reduce the risk of fertilizer nutrient movement in the landscape. Environmentally Smart N (ESN, 440 g N kg-1, Agrium Inc.) is a polymer-coated urea fertilizer being used for the production of row crops in the Midwest. The research objective was to evaluate ESN-N as an alternative N source for Midsouth cotton and corn production.

1Cotton and corn experiments were established during 2010 at the Red River Research Station on a Caplis very fine sandy loam under dryland and irrigated environments. Soybean [Glycine max L.] and cotton was the previous crop grown for the corn and cotton experiments, respectively. For cotton trials, ESN was broadcast by hand at five total-N rates ranging from 0 to 120 lbs N acre-1 immediately prior to seeding Phytogen 375 WRF at 40,000 seed acre-1. Urea ammonium nitrate was coulter-knife injected at identical total N rates as ESN. At the four true-leaf stage of cotton growth, identical total-N rates of ESN or UAN were applied to plots that did not receive N fertilizer at planting. Seedcotton yield was determined by harvesting the middle two rows of each plot with a Case 1822 picker fitted with a load cell. Approximately 2 lbs of seedcotton was collected from each plot to determine lint percent and fiber quality. Each experiment (dryland or irrigated) was arranged as a randomized complete block with 2 (N source) x 2 (application time) x 4 (N rate) factorial treatment structure and compared to an unfertilized control (0 lbs N acre-1). Each treatment was replicated four times. For analysis, each N source and application time were combined to constitute an N fertilization strategy.

For corn trials, ESN was hand applied at four total-N rates ranging from 0 to 210 lbs N acre-1 immediately prior to seeding Terral TV25BR23 at 30,000 seed acre-1. Urea ammonium nitrate was coulter-injected at identical total N rates as ESN applications to plots designated for UAN treatments. At the four to five-leaf stage of corn growth, identical rates of ESN or UAN were applied to plots that did not receive N fertilizer at planting. Corn grain yield was determined by harvesting the middle two rows of each plot with a small plot combine and adjusted to a uniform moisture of 15.5% for analysis. Each experiment (dryland or irrigated) was arranged as a randomized complete block with a 2 (N source) x 2 (application time) x 3 (N rate) factorial treatment structure and compared to an unfertilized control. Each treatment was replicated four times. All statistical analysis was performed using SAS version 9.1.

Cotton lint yield was unaffected by the N-strategy × N rate interaction, and the main effect of N strategy for cotton cultivated in an irrigated environment. The main effect of N rate positively influenced cotton lint yield. Averaged across N sources, cotton lint yields increased linearly as N rate increased. The greatest numerical lint yield (1506 lbs lint acre-1) was achieved from plots receiving 120 lbs N acre-1. However, N application rates of 60, 90, and 120 lbs N acre-1 produced statistically similar cotton lint yields. Nitrogen application at any N rate (30-120 lbs N acre-1) produced significantly more lint than the unfertilized control (0 lbs N acre-1). Regression analysis indicated that the rate of yield increase per unit of added N fertilizer was uniform among N strategies (1.3 lbs lint/lb N applied). Dryland cotton lint yields were unaffected by the main effects of N strategy, N rate or their significant interaction.

Corn grain yield was not influenced by the N strategy x N rate interaction, or the main effect of N rate when cultivated under dryland conditions. Dryland grain yield was significantly affected by the main effect of N strategy. Averaged across N rates, grain yields followed the numerical order of ESN applied at planting > ESN applied at V4 > UAN applied at planting > untreated control > UAN applied in a split-application. ESN applied at planting produced the greatest overall mean grain yield of all N sources, but mean grain yields were not statistically different from either ESN application at V4 or UAN applied at planting. Corn grain yield produced under an irrigated environment was not influenced by the main effects of N strategy, N rate, or their significant interaction.

Limited responses to N application were observed in both cotton and corn trials cultivated in either dryland or irrigated environments. In general, application of ESN produced similar cotton lint or corn grain yields when compared to UAN applied at similar total-N rates. Additional research is needed to determine if ESN is suitable as an alternative N source for Midsouth cotton and corn producers.

Program 10C-2

▸ Should We Be Worried About Higher Temperatures In Crop Production?

Presented by Derrick Oosterhuis

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With global warming and climate change, high temperature stress has become a major factor affecting crop growth and yield. However, there is uncertainty about how serious this will be on the growth and yield of crops. Temperature is a primary controller of the rate of plant growth, developmental events, and fruit maturation, but extreme temperatures can adversely affect growth and therefore yield. Cotton in its native state grows as a perennial shrub in a semi-desert habitat, and as such requires warm temperatures. It is generally thought that because cotton is a warm season crop it should thrive in hot conditions. However, even though cotton originates from hot climates, it does not necessarily yield best at excessively high temperatures, and a negative correlation has been reported between yield and high temperature during boll development.

The Temperature Range for Cotton

The ideal temperature range for cotton is reported to be 68-86oF, but the average daily maximum temperature in the US Cotton Belt during boll development is almost always well above this.

Once temperatures reach about 95°F, plant growth rate and photosynthesis begin to decrease.