FOLIAR FERTILIZER USE IN COTTON UNDER VARIOUS FERTILITY PROGRAMS

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Abstract

Adequate nutrition for cotton during the reproductive phase is crucial to eliminating stresses that may cause delay in maturity due to nutrient deficiencies (Oosterhuis and Weir, 2010). Foliar fertilization can be defined as the utilization of one or more mineral nutrients via foliar application to supplement soil-applied fertilizers. Yield improvements have led to increased interest in the use of foliar fertilizers in cotton production over the past several decades. The objective of this research was to investigate short term and longer impacts of nutrient uptake in cotton under differing fertility programs with foliar fertilizers.

Studies were conducted in Fort Cobb, OK at the Caddo Research Station and Lubbock, TX at the Texas A&M AgriLife Research and Extension Center in 2019. At Fort Cobb the variety PhytoGen 300 W3FE was planted while at Lubbock the variety Deltapine 1747NR B2XF was utilized. Three levels of soil applied fertility programs were used in this study including residual soil test levels, 100% of the soil test recommendation (100% test recommendations), and 125% of the soil test recommendation, as well as a non-treated control. The residual soil test fertility program received only 135 kg N ha^{-1} pre-plant. 100% test recommendation received 135 kg n ha^{-1}, 56 kg P ha^{-1}, 50 kg K ha^{-1}, and 14 kg S ha^{-1} pre-plant.125% soil test recommendation received 135 kg n ha^{-1}, 84 kg P ha^{-1}, 68 kg K ha^{-1}, and 20 kg S ha^{-1} pre-plant. Five foliar products were utilized in this study and included: foliar potassium (K) at 12 L ha^{-1} (3.6 kg K/ha), foliar phosphorus (P) at 5 L ha^{-1} (.23 kg N ha^{-1}, .80 kg P ha^{-1}, .29 kg K ha^{-1}, .0028 kg Cu ha^{-1}, .04 kg Zn ha^{-1}), foliar mix at 9.5 L ha^{-1} (1.24 kg N ha^{-1}, .99 kg P ha^{-1}, .99 kg K ha^{-1}, .22 kg S/ ha^{-1}, .0028 kg B ha^{-1}, .00067 kg Cu ha^{-1}), foliar macro/secondary at 9.5 L ha^{-1} (1.23 kg N ha^{-1}, .50 kg Ca ha^{-1}, .09 kg Mg ha^{-1}, .15 kg Zn ha^{-1}), and foliar micro at 9.5 L ha^{-1} (.48 kg N ha^{-1}, .119 kg S ha^{-1}, .095 kg B ha^{-1}, .14 kg Cu ha^{-1}, .24 kg Mn ha^{-1}, .35 kg Zn ha^{-1}). Each foliar product listed above was applied to the residual and 100% test recommendations cotton fertility programs at Fort Cobb. In Lubbock each foliar product were only applied to the 100% soil test recommendation fertility program. Foliar applications were made twice during the growing season at late squaring and peak bloom at a volume of 94 L ha^{-1} using XR 11002 flat fan spray tips. Treatments were arranged in a factorial within a randomized complete block design with four replications. Destructive plant sampling was performed at 7 – 10 days after the late squaring application and again when plants reached 50 – 60% open. At each date leaves, stems, and fruit, including squares, flowers, and bolls, were separated, dried, and ground. The samples were analyzed for a complete nutrient profile, which was converted to plant uptake. The same analysis was performed for samples collected at the second sampling date, where open bolls were ginned to separate seed, lint, and bracts, and were included in the second sampling analysis along with leaves, and reproductive branches. At both locations whole plots were harvested and ginned for determination of lint yield. At the time of this conference the ginning had not yet been completed on cotton from the Fort Cobb location, thus a standard non-field cleaned stripper harvested lint percentage of 27% was utilized to convert seed cotton yield to lint yield. Nutrient analysis data from Lubbock was yet available, thus only yield from that location will be discussed. Data were subjected to analysis of variance using PROC Mixed procedure is SAS 9.4. Means were separated using Fishers protected LSD at $p = 0.05$.

No differences were observed in plant data measurements and nutrient analysis results at the first plant sampling date. At the second plant destructive sampling an increase in stem uptake of nitrogen, potassium, zinc, and manganese was observed with the 100% fertilizer program plus foliar mix product. Fiber uptake of calcium and sulfur was greatest in non-treated cotton compared to all other treatments. Although, nutrient uptake effects were observed from the second

sampling date, there was no difference in cotton yield across all treatments in the study. This data suggests that neither the varying soil applied fertilizer nor foliar applied products made an impact on cotton growth, development, maturity, or yield in 2019.

References

Oosterhuis, D. M. and Weir B.L., 2010. Foliar Fertilization of Cotton. J. McD. Stewart et al., (eds.). Physiology of cotton.