MINERAL NUTRITION FOR OPTIMUM COTTON YIELD AND FIBER QUALITY

X. Yin
C. O. Gwathmey
C. L. Main
University of Tennessee
Jackson, TN
A. M. Johnson
University of Tennessee
Knoxville, TN

Abstract

The deficiencies of secondary nutrients such as sulfur (S) and micronutrients, especially zinc (Zn), are recognized as constraints to crop production and productivity. Symptoms of S and other micronutrient deficiencies have been observed in Tennessee cotton in recent years. With little information on the effects of minor nutrients on yield and fiber quality, and few guidelines on minor nutrient fertilization for yield and fiber quality for the mid-South, this study was done to investigate the influence of S and Zn on lint yield and fiber properties, and to develop guidelines for correcting deficiencies. This project was conducted from 2007 through 2010 as a small-plot study of response to S and Zn fertilization in field-grown cotton, and a study of S deficiency induced in container-grown cotton. The S-Zn response study was conducted in a non-irrigated, no-tilled Dexter loam at Jackson, TN that had tested low in these essential elements. Sulfur treatments were 0, 10, 20, and 30 lb S/ac broadcast to small plots before planting as main-plot treatments. Sub-treatments consisted of foliar application of 0 or 0.26 lb Zn/ac during squaring. Mid-season soil testing reflected the 30-lb S application rate, but not the Zn foliar application. Leaf S concentrations were increased by S applications, but leaf Zn was not affected by Zn spray. Application of 20 or 30 lb S/a increased lint yields by about 9 to 11% on average, but foliar Zn spray had no significant effect on yield. Either S or Zn application had no effects on gin turnout, seed index, UHM, uniformity, strength, or elongation. The S-deficiency study was conducted on cotton grown in containers placed outdoors, in which groups of plants were fed nutrient solutions with low (0 or 1 ppm) or high (2 or 20 ppm) S application, plus 11 other essential elements through a drip system. Sulfur treatments were applied from about 29 to 74 days after planting, followed by a recovery phase in which all plants in the low S treatment gradually received S nutrition. As expected, low S application reduced S concentration in leaf, but concentrations of other nutrients tended to be higher in the S-deficient plants. Sulfur deficiency reduced seed cotton weight per plant and weight per boll at maturity. S-deficient plants produced fewer bolls per plant, with a greater proportion of bolls at first position fruiting sites. Low S application reduced locules per boll, seeds per locule, and seed index. In conclusion, S applications are needed for no-till cotton grown on low-testing S soils in Tennessee.