PLANT RESPONSE TO SOIL K LEVEL, BOLL LOAD, AND FOLIAR FERTILIZATION

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Abstract

Cotton (*Gossypium hirsutum* L.) is more sensitive to low K availability than most other major row crops, and will often exhibit deficiency symptoms in soils not considered K deficient. Despite the luxury uptake of K prior to peak demand, late-season deficiencies still occur, and coincide with reduced root uptake during boll development. This study was designed (i) to evaluate the effect of the size of boll load and soil K levels on petiole K sampling and yield, and (ii) to observe plant response time to soil-applied versus foliar-applied K at first flower (FF). The cultivar DPL 20 was planted into a Captina silt loam soil in 1996 and 1997 in Fayetteville, AR. In 1996, mid-season exchangeable soil K at the 0 to 30 cm depth was 112 and 65 mg kg^{-1} in the high and low soil K plots, respectively, and in 1997, 84 and 54 mg kg^{-1}. Boll removal was conducted twice during early boll development to establish the low boll load plots. Petioles were sampled weekly at the fourth (N4) and eighth node (N8) from the terminal beginning one week after FF. Potassium concentration was consistently lower at N8 in all plots throughout the sampling period, except at two weeks after FF in 1997 when levels were higher, possibly indicating a luxury uptake and storage of K. Petiole K levels were lower in the high boll load plots when compared with the low boll load plots, indicating a stronger boll sink in these plots. As expected, petiole K was lower in the plots with low soil K status. When petiole K was below a value of 8.8 g kg^{-1}, yield was reduced by 19%. Low soil K status and high boll load resulted in a reduction in lint yield, boll weight, and number of open bolls at harvest. Plant response time to soil-applied and foliar-applied K at FF was also evaluated. Petiole K levels were consistently higher in the foliar-applied plots in 1996, while the reverse was true in 1997, where petiole K was 5% higher in the soil-applied plots compared with both the control and the foliar-applied K during the first week of sampling. Results from these studies indicate that petiole sampling at N8 may be a better indicator of a pending K deficiency, the size of the boll load influences plant response to soil K status, and a soil versus foliar application of K is dependent upon soil K status, developing boll load size, and weather conditions.

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