WATER DEFICIT AND K DEFICIENCY IN COTTON

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Abstract

Within the past decade, there have been a number of reports on the occurrence of, and ways to ameliorate, K deficiency across the U.S. Cotton (*Gossypium hirsutum* L.) Beltwide. However, limited information exists about the impact of water deficit stress on K use and deficiency in cotton, particularly during boll development. Yield studies were conducted at two locations to test the hypothesis that K use by the cotton plant, the onset of K deficiency in cotton, and the efficacy of foliar-applied K were directly affected by the plant water status. Eight treatment combinations of well-watered or dryland conditions, high or low soil K, and with or without foliar-applied K were arranged in a split-split plot design with six replications. Growth, dry matter, leaf photosynthesis, and K concentration in above-ground organs were measured at key phenological stages [pinhead square, first flower, first flower + 3 weeks, and first flower + 5 weeks]. Final lint yield was determined by mechanical harvest and components of yield were determined by hand harvesting. At first flower + 5 weeks, petiole, lint, and total plant K content had increased ($P \leq 0.05$) in response to foliar-applied K under the high compared to the low soil K level. Soil-applied K increased leaf, petiole and total plant K content under irrigated but not dryland conditions. Foliar-applied K increased the K content of all measured components except carpel wall under irrigated but not dryland conditions. Lint yield averaged over two growing seasons and two locations showed a better response to foliar-applied K under the low versus the high soil K level. We did not observe a difference in lint yield response to foliar-applied K under irrigated or dryland conditions. Lint yield responded to soil-applied K fertilizer under well-watered but not dryland conditions. In our studies, K deficiency in cotton appeared to be exacerbated by water deficit. The natural "inherent" soil K fertility level and plant water status had a major effect on plant response to soil and foliar-applied K fertilizer.

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