

**PHYSIOLOGICAL RESPONSES OF COTTON TO
WATER DEFICIT STRESS AND POTASSIUM NUTRITION**
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Abstract

Potassium (K) nutrient deficiency costs the cotton (*Gossypium hirsutum* L.) producer in terms of fiber yield and quality. However, management details are lacking about K fertility inputs because the effect and relationship of water deficit stress and K deficiency on cotton yield and mid-season physiology is not well understood. Our current field study (repeated in previous seasons) was conducted using eight treatment combinations of well-watered or dryland conditions, high or low soil K, and with or without foliar-applied K arranged in a split-split plot design with five replications. Leaf sugar concentrations, photosynthesis and membrane integrity were measured at key phenological stages. Final lint yield was determined by hand picking seedcotton from a 1m length of each of the two center rows at approximately 90 percent open boll. At three weeks after first flower, leaf glucose, fructose, and sucrose concentrations responded to foliar-applied K in K-deficient and water-stressed plots; whereas, glucose and fructose concentrations in leaves from high K plots were reduced under well-watered conditions. Leaf photosynthesis responded to foliar-applied K under the low-soil K and well-watered treatments at five weeks after first flower. Potassium deficiency increased leaf membrane leakage and reduced photosynthesis under well-watered conditions at five weeks after first flower. Lint yields showed that pre-plant soil K status should be strongly considered when making decisions about foliar-K fertilization. Foliar-applied K appeared to improve lint yield of cotton grown under dryland or irrigated conditions. Soil-applied K showed the greatest potential to increase lint yield of cotton under well-watered conditions. Overall, K deficiency appeared to have a greater effect on mid-season physiology of cotton under well-watered as compared to water-deficit conditions and the relationship seemed to correlate well with yield.