PHYSIOLOGICAL ASPECTS OF POTASSIUM NUTRITION IN COTTON

Craig W. Bednarz
Texas Tech University - Texas Agricultural Experiment Station
Lubbock, TX

Abstract

Potassium (K) fertility recommendations based on cotton petiole diagnostic analysis results have been inconsistent in the past, partly because the lowest acceptable petiole K concentration is unknown. Therefore, cotton was grown in sand filled 8-L pots under two K treatments in a growth chamber at the Altheimer Laboratory in Fayetteville, Arkansas to determine the petiole K concentration that will impact leaf physiology. Chamber-grown plants were watered every second day with nutrient solution and with deionized water on alternate days. At 14 days after planting two treatments were established consisting of (1) continued complete nutrient solution, and (2) nutrient solution containing no K. Measurements were taken 13, 19, and 26 days after treatment establishment (DATE). Organ K concentrations, leaf chlorophyll, photosynthesis, adenosine triphosphate (ATP), and nonstructural carbohydrate concentrations were monitored as plant K deficiencies developed. All organ K concentrations were much lower in the no-K treatment on each analysis date. Visual K deficiencies were first observed at 19 DATE along with reductions in leaf chlorophyll concentration. Leaf photosynthesis was greatly reduced in the no-K treatment beginning at 19 DATE. However, leaf ATP and nonstructural carbohydrate concentrations were higher at 19 and 26 DATE in the no-K treatment, which may have been the result of reduced utilization and translocation of these metabolites. Our studies show that reductions in leaf physiological processes and plant growth did not occur until the petiole K concentration fell below 0.88% on a dry weight basis. Therefore, reductions in lint yield and quality should not develop until this critical petiole level is attained.