POTASSIUM UPTAKE KINETICS OF COTTON AS INFLUENCED BY FOLIAR-APPLIED K

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Abstract

Kinetic parameters of plant species may differ among cultivars due to root morphology, root and plant age and nutrient status. Currently, limited information is available on the influence of foliar K on kinetic uptake parameters that describe K absorption by roots. The objective of this study was to evaluate the effects of foliar-applied K on kinetic uptake parameters of two cotton (*Gossypium hirsutum* L.) cultivars differing in maturity. The cotton cultivars, DP20 (early maturing) and DP90 (late maturing) were grown hydroponically in a growth chamber. At 21 days after planting (DAP), plants were transferred into K free nutrient solution and an equivalent of 10 kg KNO_3/ha was foliarly applied. An equivalent amount of water without K was applied to plants that were non-foliar controls. Kinetic parameters were calculated from nutrient depletions of low K solutions at 25 DAP. Root length, leaf area, total dry weight and K concentration in roots and shoots were determined. The approximate depletion rate for the first 210 minutes of rapid depletion were 0.24 and 0.31 μM/L per min respectively, for DP20 and DP90. The maximum influx (Imax) for both DP20 and DP90 nearly doubled under foliar treatment, suggesting that foliar K application stimulated K absorption by roots. The minimum concentration (Cmin) of K that could be absorbed by roots from solution was decreased by 55% for DP20 subjected to foliar K application, while there was no effect of foliar K application on Cmin of DP90. Foliar K increased the number of squares by 56 and 76% and the shoot tissue K increased by 14 and 26% respectively, for DP20 and DP90. Root length decreased by 13 and 17% respectively, for DP20 and DP90 subjected to foliar K. Our results suggest that, the addition of foliar K to cotton may stimulate uptake of K by roots. Thus, when K is limiting, foliar application of K may enhance K deficiencies. This observation might explain variable responses of cotton plant to foliar K under field conditions.

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