EFFECT OF pH ON THE EFFICACY OF FOLIAR-APPLIED POTASSIUM ON COTTON

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Abstract

The use of foliar-applied potassium (K) has become increasingly popular across the U.S. Cotton Belt to overcome K deficiencies and maximize yield potential. Mid- and late-season foliar applications are often more beneficial than soil applications due to rapid absorption by the leaf and translocation to the developing boll. However, the response to foliar fertilization has generally been inconsistent. A two-year field study was conducted in Arkansas to test the hypothesis that the pH of foliar-applied K fertilizer may affect the degree of foliar burn, K absorption, and lint yield. In 1994 eight K compounds were tested at two pH levels, the standard solution pH and an adjusted pH level. The compounds were KNO_3, KCl, K_2SO_4, $K_2S_2O_3$, K_2CO_3, and KOH. $KHCO_3$ and CH_3COOK were evaluated only at their standard pH. In 1995, the latter two compounds were omitted from the study. Four weekly foliar applications were made beginning at two weeks after first bloom. Twenty-four hours following the spray, the crop canopy was evaluated for foliar burn. Forty-eight hours after the fourth spray, petiole, leaf, and boll samples were taken for analysis of K concentration. Two-meter row samples were handpicked, weighed, and ginned to determine boll weight, lint yield, and percent turnout. Leaf burn was absent or minimal (< 4%) with foliar applications of K_2SO_4, KNO_3, and KCl, at both the standard and adjusted pH levels.. The greatest amount of foliar burn was caused by the KOH, K_2CO_3, and the $K_2S_2O_3$ at their standard pH levels 13.6, 11.6, and 6.8, respectively. The phytotoxicity of KOH and K_2CO_3 was <3.5% when pH was adjusted to 7. In 1994, the phytotoxic effects of KOH, K_2CO_3, and $K_2S_2O_3$ caused a decrease in leaf area, plant height, and lint yield when applied at their standard pH values. KNO_3 and K_2SO_4 solutions at adjusted pH levels (4.0) increased lint yield by 13.5%. The increase was mainly due to an increase in boll number in these treatments. The highest boll weight (4.735g) occurred in the KOH treatment at the standard pH when compared with the untreated control (4.273g). However, there was no clear effect of pH on boll weight among the treatments. Results from the 1995 study were confounded by a combination of weather conditions and lodging within the canopy. However, the pH of the foliar fertilizer solutions appears to play an important role in altering phytotoxic effects and absorption and translocation of K to the developing boll. The study will be repeated in 1996 in order to further examine the effects of pH of foliar fertilizer solutions on cotton.

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