DOES CHLORIDE SENSITIVITY EXPLAIN SOYBEAN RESPONSE TO FERTILIZATION WITH MURIATE OF POTASH?

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ABSTRACT

Potassium (K) is a well-known essential macronutrient for soybean [*Glycine max* (L.) Merr.] growth and development because of its involvement in numerous important physiological functions, including maintaining turgor and facilitating sugar transport. Although K is plentiful in Illinois soils, very little is present in the soil solution in the plant-available form (K^+), and soybean's high K requirement and the high yield potential of modern soybean varieties often necessitates supplementation of K from fertilizers like muriate of potash (MOP). However, in addition to providing K, MOP also contains chloride (Cl), and even though Cl is also an essential plant micronutrient it can be toxic to plant tissues if it accumulates to high concentrations, and this can occur with high rates of MOP fertilizer applications or if soybean is grown in saline soils containing naturally high concentrations of Cl. To facilitate soybean production in saline soils, soybean varieties have been categorized for their sensitivity to Cl as excluders that limit Cl absorption and typically do not exhibit leaf toxicity symptoms or includers that readily absorb Cl and express leaf necrotic symptoms when Cl concentrations are high in the soil. Our objective was to determine if the excluder/includer categorization can also predict the magnitude of a soybean variety's response to MOP fertilization. Five soybean varieties previously categorized as Cl includers and five excluder varieties were evaluated across three distinct environments in Illinois in 2026. Fertilizer treatments included MOP (0-0-60) and Aspire (0-0-58-0.5B) applied at a standard (60 lbs K_2O $acre^{-1}$) and at a high rate (240 lbs K_2O $acre^{-1}$) of fertilization. Although the yield responses to the fertilizer treatments varied across the three sites, on average the excluder varieties exhibited a significant 1.8 bushels $acre^{-1}$ yield advantage over the includer varieties (p = 0.094). These preliminary findings indicate that producers may achieve greater value from K fertilizer applications if planting an excluder variety, and that the Cl sensitivity trait may be one piece of the puzzle in explaining why soybean cultivars differ in their magnitude of response to K fertility.