

NOVOSEL, KAREN M., and KAREN A. RENNER, Michigan State University, Dept. Crop and Soil Sciences, East Lansing, MI 48824. - Nicosulfuron and primisulfuron root uptake, translocation, and inhibition of acetolactate synthase by sugarbeet.

Inherent differences in sugarbeet sensitivity to nicosulfuron and primisulfuron have been noted in field and greenhouse work, with primisulfuron being more detrimental to sugarbeet growth. Radiolabeled herbicide experiments were initiated to determine if the cause of differential sugarbeet sensitivity was due to differences in uptake, translocation, and/or ALS site sensitivity. Sugarbeet uptake of primisulfuron was double that of nicosulfuron in a hydroponic environment. When herbicide rates were increased from 5 to 25 ppb ai, uptake did not increase five times as would be expected if these herbicides were taken up passively. Transpiration was decreased by 41% upon the addition of a herbicide to the nutrient solution indicating that these compounds interfere with xylem transport in sugarbeet. Discrepancies in herbicide uptake could be due to this fact supporting research indicating passive uptake of these compounds. Nicosulfuron moved to the site of action more rapidly compared to primisulfuron but the percentage of herbicide translocated was not significantly different six days after treatment. Solution concentration did not effect translocation patterns. ALS enzyme activity, as determined by acetoin production in greenhouse grown sugarbeets, was decreased more rapidly by primisulfuron. Nicosulfuron increased ALS activity at low concentrations (0.5 and 5.0 nm). This appears to be an expression of the process of a toxin acting as a growth stimulant at low levels of plant exposure on an enzymatic level. ALS activity plateaued between 0.5 and 5.0 nm with primisulfuron. This type of curve is indicative of two isozymes with varied sensitivity to primisulfuron, though this is conjectural until the isozymes are isolated. There was a minimum of a fifteen fold difference in ALS sensitivity with primisulfuron decreasing activity to a greater extent. Uptake and translocation play a minimal role in sugarbeet response to these two herbicides. While metabolism could be a factor, differences in ALS site sensitivity can account for differential sugarbeet tolerance to nicosulfuron and primisulfuron.