

PLANT GROWTH AND NITROGENASE ACTIVITY OF GLYPHOSATE-TOLERANT SOYBEAN IN RESPONSE TO FOLIAR GLYPHOSATE APPLICATIONS

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Abstract

Glyphosate [N-(phosphonomethyl)glycine] inhibits 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), thereby blocking aromatic amino acid synthesis. While glyphosate-tolerant (GT) soybean (*Glycine max* [L.] Merr.) contains resistant EPSPS, the N₂ fixing symbiont in soybean root nodules, *Bradyrhizobium japonicum*, does not contain a resistant enzyme, and glyphosate spray to GT soybean may interfere with the symbiotic relationship. Glyphosate-tolerant soybean was treated with glyphosate at several different stages of development to evaluate N₂ fixation, growth, and yield in a series of greenhouse, growth chamber, and field experiments. Early applications of glyphosate generally delayed N₂ fixation and decreased biomass and N accumulation in the cultivar Terral TV5866RR (TV5866RR) harvested at 19 days after emergence (DAE), but plants had recovered by 40 DAE. The biomass and N content of GT soybean were also decreased by glyphosate in plants grown with available soil N. There were differences in sensitivity to glyphosate among GT cultivars, with biomass decreases in response to glyphosate ranging from 0 to 30% at 40 DAE for the most tolerant and sensitive cultivars evaluated. In growth chamber studies, N₂ fixation was more sensitive to water deficits in glyphosate-treated plants. In field studies, there was no measured effect of glyphosate on GT soybean at Fayetteville, AR, where there was adequate soil water throughout the growing season. However, glyphosate tended to decrease biomass and seed yields under conditions of limited soil water at Keiser, AR.

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