

Abstract

Genotypic Effects on the Response of Soybean (*Glycine max* (L.) Merrill) to Sulfonylurea Herbicides [†]

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Abstract: In soybean cropping, sulfonylurea (SU) herbicides are a potentially useful alternative to glyphosate-based herbicides. Normally, soybeans are susceptible to SU herbicides, but two unlinked non-GMO genes (ALS1 and ALS2), have been identified that confer SU tolerance. In this project, we explored the effectiveness of these genes in Australian soybean genetic backgrounds. Four lines, carrying both ALS1 and ALS2, were derived by backcrossing different Australian genotypes to a SU-tolerance donor line ‘W4-4’ and then using molecular markers, plants homozygous for both ALS genes were selected. The W4-4 donor and the four derived lines were evaluated in a hydroponic system at increments up to 4× the recommended field rate of metsulfuron-methyl. The ALS genes provided high levels of tolerance, with evidence of some minor interaction with the genetic background. To further test whether there was an effect of background, the five lines were crossed together in a half-diallel mating design and the resulting ten F₂ populations were screened hydroponically for tolerance to metsulfuron-methyl herbicide at 4× the recommended field rate. Analyses of seedling dry weight of the five parental lines and their F₂ progeny in response to the herbicide, identified differences among the crosses. These results indicated that the development of commercial varieties with maximum herbicide tolerance requires incorporation of both ALS genes, and if combined with selection in segregating populations in the presence of SU herbicide may capture additional tolerance from background genes of minor effect.

Keywords: breeding; genetic background; herbicide tolerance; selection; epistasis



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