Characterizing Variability in Postemergence Herbicide Tolerance in Peanut Breeding Lines

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Postemergence (POST) herbicide tolerance is a critical component for grower adoption of new peanut varieties. However, POST herbicide tolerance is generally evaluated when the new variety is in the last phases of the breeding program or close to commercial release. This approach has the inconvenience that lines with desirable characteristics such as disease tolerance or oil content might be discarded during the selection process because of low yields caused by high susceptibility to the herbicides used in the breeding program. Also, a variety could be kept in the breeding program until release, but it might be susceptible to herbicides that were not used during the selection phases. These problems can be avoided if the herbicide tolerance of the breeding lines is known since the early stages of selection or even before crosses are made. In this way, specific evaluation and selection strategies that take into consideration herbicide tolerance can be implemented enabling the development of peanut varieties that have a more robust tolerance to key herbicides.

We randomly selected 35 breeding lines from the University of Florida Peanut Mini-Core Collection and evaluated their tolerance to 11 POST herbicides under greenhouse conditions. ‘Florida-07’ and ‘Georgia-06G’ were included in the experiment as standards for comparisons. Plants were treated at the 3 to 5-leaf stage and injury and dry-weight reduction were evaluated at 14 and 40 days after treatment (DAT), respectively. For all evaluated herbicides, there were significant differences in dry-weight reduction after treatment among breeding lines. Injury did not correlate with growth reductions for all herbicides. POST herbicides with limited translocation and systemic action such as metribuzin, paraquat, and flumioxazin showed a positive relationship between injury and growth reduction. Conversely, systemic POST herbicides such as 2,4-D, 2,4-DB, dicamba, chlorimuron, and diclosulam showed no relationship between injury and growth reduction. In most cases, Florida-07 and Georgia-06G were in the middle or the upper level of POST herbicide tolerance among the evaluated breeding lines. These results suggest that significant differences in POST herbicide tolerance exist among breeding lines, and that these differences could be used to increased POST herbicide tolerance of new peanut varieties. Also, this information can be used when designing new crosses to reduce the risk of developing varieties with low POST herbicide tolerance.