

Transgenic Crops: Their Future Role in Weed Management

Stephen O. Duke

Natural Products Utilization Research Unit, Agricultural Research Service, United States
Department of Agriculture, University, MS, USA, sduke@olemiss.edu

Herbicides-resistant (HR) crops represent more than 80% of the 120 million ha of transgenic crops grown annually worldwide. Most of the HR crops are glyphosate-resistant (GR). GR crops have been rapidly adopted in soybean, maize, cotton, canola, and sugarbeet in large part because of the economic advantage of the technology, as well as the simple and superior weed control that glyphosate delivers. Furthermore, the GR crop/glyphosate technology is generally more environmentally benign than the weed management technologies that it replaced, even though gene flow continues to be a potential problem with some crops. In the Americas, except for Canada, adoption has meant continuous and intense selection pressure with glyphosate, resulting in evolution of GR weeds and shifts to weed species that are only partially controlled by glyphosate. This development is jeopardizing the benefits of this valuable technology. New transgenic crops with resistance to other herbicide classes—in some cases coupled with glyphosate resistance—will be introduced soon. If used wisely, these tools can be integrated into resistance management and prevention strategies. Greater diversity in weed management technologies is badly needed to preserve the utility of the GR crop/glyphosate technology. Transgenes that produce more robust crops due to resistance to drought, temperature extreme, and disease should influence weed management by improving crop competition with weeds. In the long term, allelopathy can theoretically be enhanced in crops via transgene technology, perhaps dramatically reducing the use of synthetic herbicides. Work is being done to accomplish this by enhancing sorgoleone production in sorghum. Transgenes will continue to greatly influence weed management in major crops, but without a solution to the gene flow problem, this technology will not reach its full potential.

Suggested reading:

- Cerdeira, A.L. and S.O. Duke. 2006. The current status and environmental impacts of glyphosate-resistant crops: A review. *J. Environ. Qual.* 35:1633-1658.
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- Duke, S.O. 2003. Weeding with transgenes. *Trends Biotechnol.* 21: 192-195.
- Duke, S.O. and S.B. Powles. 2008. Glyphosate: A once in a century herbicide. *Pest Manag. Sci.* 64: 319-325.