

Implications of Glyphosate-Resistant Crops with Emphasis on Wheat in the Western United States

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The herbicide glyphosate has been used successfully for more than 25 years and is the superior herbicide for controlling a broad spectrum of weeds during fallow periods and as a preplant burndown treatment in no-till farming systems. The popularity and widespread adoption of Roundup Ready crops has greatly increased glyphosate usage and is exerting added selection pressure on weed populations causing fears that glyphosate-resistant weeds will appear and threaten the utility of glyphosate and Roundup Ready crops. The merits of Roundup Ready wheat have been vigorously debated. Key benefits across all wheat producing regions include improved in-crop control of many troublesome grass and broadleaf weeds, greater crop safety and flexibility in application timing compared to most currently registered wheat herbicides, and no crop rotation restrictions. Wheat weed management decisions would be greatly simplified. However, there are two major concerns: (1) the probable negative impact that Roundup Ready wheat would have on wheat exports because major foreign customers currently will not accept grain containing genetically-modified (GM) traits, and (2) the lack of effective and inexpensive herbicides to control volunteer glyphosate-resistant wheat plants. For these reasons various segment of the North American wheat industry have expressed reservations or outright opposition to the introduction of Roundup Ready wheat. These views undoubtedly influenced Monsanto's recent decision to defer further development of Roundup Ready wheat until such time that other wheat biotechnology traits can be introduced. Most growers in wheat producing regions are aware of the potential risks of developing glyphosate-resistant weeds and already are tank mixing herbicides having other modes-of-action with glyphosate, and many are practicing crop rotation. Growers would welcome and most will practice science-based recommendations to manage herbicide-resistant weeds. Few growers or weed science professionals in the western United States believe regulations restricting glyphosate use are warranted. Most believe weed resistance is a management and education issue, not a policy issue. This view is supported by results of long-term field research to assess effects of glyphosate use pattern in Roundup Ready crops being conducted at five locations in the central Great Plains. The key finding after seven years, is that glyphosate use of the full labeled rate is especially important in preventing weed spectrum shifts and sustaining excellent weed control. At all five locations, using a half-rate of glyphosate in-crop twice each year as opposed to the full recommended rate, has resulted in a weed shift to species that have higher natural tolerance to glyphosate and, at one location, to species capable of late emergence that escape glyphosate. The most dramatic weed shift has been to common lambsquarters at each of three irrigated locations and to wild buckwheat at two irrigated locations. The continuous use of glyphosate at the full labeled rate has been just as effective in controlling all weeds as rotating glyphosate used at the full recommended rate with conventional herbicides in alternate years. No weeds have developed resistance to glyphosate after seven years of continuous use.