

Managing Glyphosate-Resistant Weeds In Rice

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Glyphosate resistance is a growing problem in Midsouth row crop production. However, glyphosate resistance is now beginning to impact rice production in the region. Glyphosate-resistant horseweed was a tremendous problem in Mississippi in 2007. There were also reports of glyphosate-resistant Italian ryegrass being problematic. Volunteer Roundup Ready soybean has been a problem in Mississippi rice production for a number of years, and this weed is becoming increasingly troublesome.

A number of factors contributed to the prevalence of glyphosate-resistant horseweed and volunteer Roundup Ready soybean in Mississippi rice production in 2007. Glyphosate resistance in horseweed was first documented in Mississippi in 2003. Acreage impacted by this weed has increased since that time due in part to horseweed seed being dispersed by wind, which minimizes the effectiveness of cultural control tactics aimed at resistance management. Furthermore, mild, dry conditions in the winter of 2006-07 contributed to a high level of spring-emergence of glyphosate-resistant horseweed. The majority of rice in Mississippi is grown in rotation with Roundup Ready soybean, predisposing rice to problems with volunteers whose seed over-wintered from the previous year's soybean crop. Finally, there are a limited amount of burndown herbicide options for use in rice.

Burndown herbicide programs in Mississippi usually consist of glyphosate or glyphosate plus 2,4-D applied 3 to 4 weeks prior to planting. However, control from burndown herbicide applications is often incomplete and weeds regrow prior to planting. Furthermore, neither glyphosate nor 2,4-D provide residual control, and rainfall stimulating new emergence between burndown and rice planting is common in Mississippi during the spring.

Research was initiated in 2007 at the Mississippi State University Delta Research and Extension Center in Stoneville to address problems with glyphosate-resistant horseweed and volunteer Roundup Ready soybean that survive burndown applications or emerge between burndown and planting. The objectives of this research were to (1) evaluate the efficacy of rice herbicides on glyphosate-resistant horseweed, (2) evaluate volunteer Roundup Ready soybean control and rice tolerance to herbicides applied at planting, and (3) determine the efficacy of in-season rice herbicides against volunteer Roundup Ready soybean.

The first study was conducted in a fallow field with a history of glyphosate-resistant horseweed. Herbicides evaluated included SuperWham (propanil) at 4 qt/A, Facet (quinclorac) at 0.5 lb/A, a combination of SuperWham plus Facet at 4 qt/A plus 0.5 lb/A, Grandstand (triclopyr) at 12 oz/A, Regiment (bispiribac) at 0.6 oz/A, Grasp (penoxsulam) at 2.5 oz/A, Permit (halosulfuron) at 1 oz/A, and Strada (orthosulfamuron) at 2.1 oz/A. All treatments were applied

to 4- to 6-inch glyphosate-resistant horseweed, and control was visually estimated at 14, 21, 28, 35, and 49 days after application (DAT). At 14 DAT, no treatment controlled glyphosate-resistant horseweed >66%. Control with Grasp was 88% 28 DAT, but control with all other treatments was <75%. Glyphosate-resistant horseweed had begun to regrow by 35 DAT. The greatest control was observed following Grasp and SuperWham plus Facet, which controlled glyphosate-resistant horseweed 70 to 78% and 64 to 66% at 35 and 49 DAT, respectively.

At-planting treatments targeting volunteer Roundup Ready soybean included the maximum labeled rate and one-half the labeled rate of three burndown herbicides. Gramoxone Inteon (paraquat) at 3.75 and 1.88 pt/A, Ignite (glufosinate) at 29 and 15 oz/A, and Harmony Extra (thifensulfuron plus tribenuron) at 0.6 and 0.3 oz/A were applied to volunteer Roundup Ready soybean in the V3 growth stage. Ignite is not currently labeled for burndown in rice, and Harmony Extra received labeling allowing application at planting in 2007. Control was visually estimated at 7, 14, 21, 28, and 56 DAT. Gramoxone Inteon at both rates and Ignite at 29 oz/A controlled volunteer Roundup Ready soybean >94% at all evaluations. Control following Ignite at 29 oz/A was greater than that following the lower rate at all evaluations until 56 DAT. Both rates of Harmony Extra were less effective than Gramoxone Inteon and Ignite at all evaluations. Furthermore, Harmony Extra applications caused rice injury at all evaluations and delayed rice maturity. Rice yield following both rates of Harmony Extra was lower than that following both rates of Gramoxone Inteon and Ignite at 29 oz/A.

In-season herbicides targeting volunteer Roundup Ready soybean were also applied at the maximum labeled rate and one-half the labeled rate. Treatments included SuperWham at 4 and 2 qt/A, Regiment at 0.67 and 0.33 oz/A, Grasp at 2.8 and 1.4 oz/A, Permit at 1.33 and 0.67 oz/A, and Grandstand at 16 and 8 oz/A applied to volunteer Roundup Ready soybean in the V3 growth stage. Control was visually estimated at 7, 14, 28, and 56 DAT. At 14 DAT, the higher rates of all herbicides provided greater control than half rates. With the exception of Permit, all herbicides controlled volunteer Roundup Ready soybean ≥81% 14 DAT when applied at the maximum labeled rate. By 28 DAT, control with both rates of Regiment, Grasp, Permit, and Grandstand was at least 97%. SuperWham at 4 and 2 qt/A controlled volunteer Roundup Ready soybean 88 and 73%, respectively, 28 DAT. By season's end rice yields following all treatments were equivalent and ranged from 161 to 174 bu/A.

Results from 2007 indicate that volunteer Roundup Ready soybean can be effectively managed with herbicides applied either at planting or during the rice crop. Among herbicides currently labeled for application at rice planting, Gramoxone Inteon would be preferred over Harmony Extra for optimizing volunteer Roundup Ready soybean control and rice yield. For in-season applications, Regiment, Grasp, and Grandstand are the best options for season-long volunteer Roundup Ready soybean control. Glyphosate-resistant horseweed management is more problematic. The only herbicide that provided >80% control was Grasp, and this control decreased at later evaluations. The lack of labeled burndown options in rice, combined with the low levels of glyphosate-resistant horseweed control with in-season rice herbicides, dictates the need for more investigation into management of this weed in rice. Δ