

RESPONSE OF A GIANT RAGWEED POPULATION TO GLYPHOSATE. Jeff M. Stachler and Mark M. Loux, Program Specialist and Professor, Dept. of Horticulture and Crop Science, The Ohio State University, Columbus, OH 43210, and Brad A. Miller and Jeffrey B. Taylor, Technology Development Representatives, Monsanto Company, St. Louis, MO 63167

The introduction of glyphosate-resistant soybeans in 1996 provided growers with an effective new tool for management of giant ragweed. Many growers subsequently utilized multiple glyphosate applications in soybeans for control of giant ragweed, to the exclusion of other herbicides. Giant ragweed control has become more variable in recent years, which may be an indication of changes in the sensitivity of giant ragweed populations to glyphosate. Several separate samples of giant ragweed seed were collected in 2004 from a field where glyphosate had been the sole herbicide used for at least four years, and postemergence applications appeared to becoming less effective. Greenhouse and field studies were conducted in 2005 to determine if a biotype of giant ragweed with reduced sensitivity to glyphosate had developed.

In the greenhouse study, the isopropylamine salt of glyphosate (Roundup UltraMAX[®]) was applied at 0, 0.84, and 3.36 kg ae/ha to giant ragweed plants with 3 to 4 nodes and a height of 4 to 10 cm. Treatments included ammonium sulfate at the rate of 2% (w/v). Control of a sensitive biotype was 84 and 91% for glyphosate applied at 0.84 and 3.36 kg/ha, respectively. Control of plants from two suspect samples was reduced by 20 to 26% at 0.84 kg/ha, compared to a sensitive biotype. Control of one of the suspect samples was reduced by 12% at 3.36 kg/ha.

In a small-plot field study, giant ragweed seed of a sensitive biotype and four suspect samples was planted late May in a single 7.6 m-long row in the center of a 2 m by 7.6 m plot. Approximately 40 plants were flagged in each row prior to the herbicide application. Glyphosate was applied at 0.84 kg/ha in late June to giant ragweed plants with 3 to 6 nodes that were 10 to 50 cm tall. Glyphosate provided less than 95% control of 22 to 27% of the individual plants 20 DAT from two samples. A second application of 1.68 kg/ha of glyphosate in late July resulted in 100% control of all plants in the sensitive population, but less than 95% control of at least 10% of the plants in two suspect populations. Glyphosate was applied initially at a rate of 1.68 kg/ha to plants of one suspect sample, which resulted in less than 95% control of 8% of the individual plants after the second application.

Small- and large-plot studies were conducted at the suspect field in Licking County, OH. In the small-plot study, the potassium salt of glyphosate (Roundup WeatherMAX[®]) was applied at rates of 0.84, 1.26, 1.68, and 3.36 kg/ha. Cloransulam at 17 g ai/ha and fomesafen at 0.26 kg ai/ha were applied alone and in combination with glyphosate at 0.84 kg/ha. Treatments were applied to 15 to 36 cm tall plants on June 20, 2005. Twenty individual plants were flagged in each plot prior to the herbicide application. Control of giant ragweed 23 DAT ranged from 56 to 79% for all treatments, and a maximum of 35% of the flagged plants were dead. Exceptions to this included glyphosate at 3.36 kg/ha and fomesafen at 0.26 kg/ha, which killed 63 and 66% of the plants, respectively. A second application of 1.68 kg/ha of glyphosate on July 19, 2005 improved control in all treatments, but control exceeded 90% only where the initial treatment was glyphosate at 3.36 kg/ha, fomesafen, or cloransulam.

In the large-plot study, a commercial sprayer was used to apply the following three treatments: potassium salt of glyphosate at 0.84 and 1.68 kg/ha; and glyphosate at 0.84 kg/ha plus cloransulam at 17 g/ha. All treatments included ammonium sulfate at the rate of 2% (w/v). Twenty individual plants were flagged in each of six patches in each plot. Control of giant ragweed 23 DAT ranged from 70 to 80% among treatments, but only 30 to 49% of the individually flagged plants were dead. On July 19, 2005, glyphosate was applied again at 0.84 or 1.68 kg/ha, so that the total glyphosate applied per plot was 2.52 kg/ha. At least 86% of the flagged plants were dead 23 DAT, but a number of other plants survived and produced viable seed.

The results of these studies may indicate the presence of a biotype of giant ragweed with reduced sensitivity to glyphosate. This biotype survived up to 3.36 kg/ha of glyphosate in greenhouse studies. In field studies, plants survived multiple glyphosate applications, where the total amount applied was up to 5 kg/ha. Surviving plants produced viable seed when treated with up to 3.36 kg/ha glyphosate in the field. Reduced sensitivity of this biotype to glyphosate may be an evolved response, which could be likely to occur in other fields with similar selection pressure.