

POTENTIAL WEED CONTROL ANTAGONISM IN GLYPHOSATE/GLUFOSINATE TANK MIXES

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Abstract

Palmer amaranth (*Amaranthus palmeri*) is the most common weed on the Texas High Plains and remains one of the most difficult to manage. Residual herbicides are typically used in conjunction with glyphosate to control Palmer amaranth in this region, but control of several other weeds is less consistent. GlyTol® + LibertyLink® (GL) cotton offers opportunities to manage weeds that are not consistently controlled with glyphosate while maintaining effective control of Palmer amaranth. However, there are concerns about antagonism between glyphosate and glufosinate when tank-mixed.

Field trials were conducted in Lubbock, TX in 2010 and 2011 to evaluate tank-mix combinations of glyphosate (Roundup PowerMax [RUPM]) and glufosinate-ammonium (Ignite) in GL cotton for control of Palmer amaranth. Field trials included RUPM and Ignite applied at varying tank-mix rates (1X:1X, 1X:0.75X, 1X:0.5X, 1X:0.25X and 1X:0X for each herbicide). The 1X rate of RUPM corresponded to 0.75 lb ae/A (22 oz/A) while the 1X rate of Ignite corresponded to 0.52 oz ai/A (29 oz/A). All treatments were applied postemergence (POST) to 2 to 4 inch weeds. Treatments were made using a CO₂-pressurized backpack sprayer calibrated to deliver 10 gallons per acre. FM 9250GL was planted on May 20 in 2010 and May 23 in 2011 on 40-inch rows. Plots were 4 rows by 30 feet in length with three replications. Weed control was visually estimated based on a standard scale of 0 to 100% where 0 = no weed control and 100 = complete weed control and verified with weed counts.

Greenhouse studies were conducted in 2011 to quantify antagonistic or synergistic effects observed in the field. Glyphosate-susceptible Palmer amaranth was planted in 3 by 3 inch pots and thinned to two plants per pot after germination. Pots were arranged in a randomized complete block design with four replications. Treatments included an untreated control; RUPM at 0.75, 0.5625, 0.375, and 0.1875 lb ae/A; Ignite at 0.52, 0.39, 0.26, and 0.13 ai/A; and all tank-mix combinations of each herbicide rate. Treatments were applied when Palmer amaranth plants were 2 to 4 inches with a CO₂-pressurized spray chamber calibrated to deliver 10 gallons per acre. Fourteen days after treatment, above-ground portions of plants were harvested and dried. Dry weights were recorded and converted to percent growth (calculated as a percent of the untreated control mean). Percent growth values for each rate of the two herbicides alone were then used to calculate expected responses of tank-mix combinations using Colby's Method. Expected values were then compared to observed percent growth values using an augmented mixed-model methodology.

Results of field studies indicated that tank-mixes of RUPM and Ignite were less effective at controlling Palmer amaranth (62-92%) than RUPM applied alone (99%). The addition of Ignite to any rate of RUPM reduced Palmer amaranth control (85-93%) compared to RUPM alone (99%). Greenhouse studies confirmed antagonism seen in the field. All tank-mix treatments except one (RUPM 0.375 + Ignite 0.39) provided less control than calculated expected response values. Tank-mixtures of RUPM and Ignite were highly antagonistic on Palmer amaranth in both field and greenhouse studies. These results indicate that sequential applications of these two herbicides are a better option for Palmer amaranth weed management.