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Control of glyphosate-resistant Palmer amaranth in Michigan

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Palmer amaranth seed collected from a southwest Michigan soybean field was confirmed resistant to glyphosate in 2010. Two field experiments were conducted in 2011 at a grower site in Michigan to evaluate several preemergence (PRE) and postemergence (POST) options for control of glyphosate-resistant Palmer amaranth in soybeans. One experiment evaluated the efficacy of 19 different soil-applied herbicides while the second experiment characterized the optimal herbicides and application timings for postemergence control of glyphosate-resistant Palmer amaranth. Glyphosate was applied alone at 0.84, 1.68, and 3.36 kg a.e./ha and in combination at 0.84 kg a.e./ha with each postemergence tank-mix herbicide partner at 8 cm and 15 cm tall Palmer amaranth. Soybean injury from the soil-applied herbicides ranged from 0 to 32% 14 days after planting (DAP) with the greatest injury observed by products containing flumioxazin. Injury trends remained the same 28 DAP. Flumioxazin alone and flumioxazin plus pyroxasulfone were the only soil-applied products that provided greater than 90% control of glyphosate-resistant Palmer amaranth, 14 DAP. By 28 DAP, Palmer amaranth control was lower with 11 out of the 19 treatments providing less than 50% control. Flumioxazin plus pyroxasulfone was the only treatment that still maintained greater than 90% control of Palmer amaranth at this evaluation timing. Postemergence applications of glyphosate reconfirmed a high magnitude of resistance in this population of Palmer amaranth. In addition, the failure of thifensulfuron and imazethapyr to control glyphosate-resistant Palmer amaranth confirmed this population to have multiple resistance to ALS-inhibitors. At 14 DAT, the addition of lactofen or fomesafen to glyphosate resulted in 90% and 92% control, respectively when applied to 8 cm tall Palmer amaranth. Control of 15 cm tall Palmer amaranth from fomesafen was reduced 36% compared with the same herbicide on 8 cm tall Palmer amaranth. Lactofen applied to 15 cm tall Palmer amaranth resulted in the same level herbicide activity (90%) compared with the 8 cm application timing. However, due to new emergence Palmer amaranth control with lactofen was lower by 28 DAT. When acetochlor or s-metolachlor was added to fomesafen and applied to 8 cm tall Palmer amaranth control was 20% and 17% greater, respectively, compared with fomesafen alone, 28 DAT. The total program of flumioxazin applied PRE followed by fomesafen plus acetochlor applied to 8 cm Palmer amaranth was the only treatment that provided over 80% control 28 DAT. These field experiments demonstrate the significance of herbicide and application timing for control of glyphosate-resistant Palmer amaranth in Michigan. None of the programs we examined provided season-long control of glyphosate-resistant Palmer amaranth. Additional research is necessary to determine how to best manage this new invasive weed in Michigan.

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