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Alternatives to Glyphosate for Palmer Amaranth Control in Wheat Stubble

D.E. Peterson, C.R. Thompson, and C.L. Minihan

Summary

Glyphosate-resistant Palmer amaranth has become a serious weed problem in fields following wheat harvest. A field experiment was established in 2016 near Manhattan, KS, to evaluate herbicide alternatives to glyphosate for Palmer amaranth control in wheat stubble. The two most effective postharvest herbicides for control of Palmer amaranth were Gramoxone (paraquat) or Sharpen (saflufenacil). Clarity (dicamba) and 2,4-D treatments provided suppression of Palmer amaranth, but were inconsistent, and often some plants survived and produced viable seed. The tank-mix of Clarity plus 2,4-D was more effective than either herbicide alone, but not as good as Gramoxone or Sharpen.

Introduction

Glyphosate plus 2,4-D and/or dicamba was a standard treatment for weed control in wheat stubble in the Great Plains region for many years. It was assumed that the 2,4-D and dicamba components were making a significant contribution to broadleaf weed control, but with the development of glyphosate-resistant weeds, especially Palmer amaranth, the treatment is no longer providing the desired level of weed control in many cases. Apparently, glyphosate was ultimately providing much of the weed control in the tank-mix combinations, especially with the modest rates of 2,4-D and dicamba that were typically included in the treatments. Consequently, cost-effective alternative treatments need to be developed to help manage weeds in wheat stubble to maintain the economic viability of no-till cropping systems.

Procedures

A field experiment was established in a wheat stubble field near Manhattan, KS, in August, 2016. Treatments were applied to 4- to 24-inch Palmer amaranth and 1- to 6-inch large crabgrass on August 4 at 85°F, 58% relative humidity, mostly clear skies, and adequate soil moisture for active plant growth. Treatments were applied with a CO₂ back-pack sprayer, delivering 15 gpa at 35 psi through AIXR110015 flat fan spray tips to the center 6.3 ft of 10 by 25 ft plots. The experiment was a randomized complete block design with four replications. Palmer amaranth and large crabgrass control were visually evaluated at 2 and 4 weeks after treatment (WAT).

Results

The two most effective postharvest treatments for control of Palmer amaranth included Gramoxone SL at 3 pt/a and Sharpen at 2 oz/a. Palmer amaranth control with lower rates of Sharpen has not been as effective. Tank-mixing 2,4-D with Sharpen tended to improve control. Herbicide tank-mixes with Gramoxone did not enhance Palmer amaranth control in this experiment because of the high level of control achieved with Gramoxone alone; however, tank-mixes often improve broadleaf weed control with Gramoxone and would be a good herbicide-resistance management practice. Clarity or 2,4-D treatments provided suppression of Palmer amaranth but were inconsistent, and often some plants survived and produced viable seed. The combination of Clarity plus 2,4-D provided better Palmer amaranth control than either herbicide alone. The only herbicide in this experiment that provided good large crabgrass control was Gramoxone. However, grass control with Gramoxone may be inconsistent, especially with larger grasses and thicker weed canopies.

Table 1. Palmer amaranth and large crabgrass control with post-harvest treatments in wheat stubble, Manhattan, KS, 2016

Treatment*	Rate product/a	Palmer amaranth		Large crabgrass	
		2 WAT	4 WAT	2 WAT	4 WAT
		-----(% control)-----			
2,4-D LV4	1 pt	58	63	0	0
2,4-D LV4	2 pt	69	75	0	0
2,4-D Amine 4	2 pt	73	76	0	0
Clarity	0.5 pt	58	66	0	0
Clarity	1 pt	63	69	0	0
2,4-D + Clarity	2 pt + 0.5 pt	83	89	0	0
Sharpen + MSO + AMS	2 oz	95	95	45	40
Sharpen + 2,4-D LV4 + MSO + AMS	2 oz + 2 pt	99	98	48	45
Gramoxone SL + NIS	3 pt	100	100	94	94
Gramoxone SL + 2,4-D LV4 + NIS	3 pt + 1 pt	100	100	96	97
Gramoxone SL + Sharpen + MSO + AMS	3 pt + 1 oz	100	100	94	94
Gramoxone SL + Tricor + NIS	3 pt + 6 oz	100	100	97	97
Least significant difference ($P < 0.05$)		6	6	4	4

* MSO = methylated seed oil applied at 1% v/v; AMS = liquid ammonium sulfate applied at 2.5% v/v; NIS = nonionic surfactant applied at 0.25% v/v; and WAT = weeks after treatment.



Figure 1. Palmer amaranth at treatment time.



Figure 2. Application of 2,4-D LV4, 2 pt/a, at 3 weeks after treatment.



Figure 3. Clarity, 1 pt/a, at 3 weeks after treatment.



Figure 4. Application of 2,4-D LV4 + Clarity, 2 pt/a + 0.5 pt/a, at 3 weeks after treatment.



Figure 5. Sharpen + MSO + AMS, 2 oz/a + 1% v/v + 2.5% v/v, at 3 weeks after treatment.



Figure 6. Gramoxone SL + NIS, 3 pt/a + 0.25% v/v, at 3 weeks after treatment.