Role of Preemergence Herbicides in Roundup Ready® Crops

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Introduction

Roundup Ready® crops provide growers greater flexibility in weed management due to the ability of glyphosate to control larger weeds than other herbicides. Although this is advantageous, it can lead to yield losses if the glyphosate application is delayed too long. Another concern is the risk of selecting glyphosate-resistant weeds due to extensive use of glyphosate. Research was conducted to determine the value of preemergence herbicides in protecting crop yields and reducing selection pressure in Roundup Ready® corn and soybeans.

Materials and Methods

Separate experiments involving corn and soybeans were initiated in 2005. All areas were chisel plowed in the fall and final seedbed preparation was done with a field cultivator. Corn (Golden Harvest H-8224 RR/Bt) and soybeans (Golden Harvest H-2162 RR) were planted on May 10. Plots were 10 ft × 50 ft with four replications.

In corn plots, Harness® Xtra (acetochlor + atrazine) was applied at 0, 0.6, or 1.2 qt/acre. INTRRO® (alachlor) was applied in soybean plots at 0, 1, or 2 qt/acre. In both experiments glyphosate was applied at the V2, V4, or V6 maturity stage at a rate of 0.9 lb ae/acre with 8.5 lb AMS/100 gal water. At the time of postemergence application, weed densities and biomass were measured in each plot.

Results and Discussion

Both Harness® Xtra and INTRRO® reduced weed density and biomass at the time of glyphosate application (Table 1). Harness® Xtra reduced weed biomass more effectively than INTRRO® because it had better activity on large-seed broadleaves.

The impact of preemergence herbicides on selection pressure was evaluated by comparing the weed counts in treated versus untreated plots at the time of glyphosate application. Both rates of Harness® Xtra reduced the number of foxtail, waterhemp and lamb's quarter by at least 80% (Table 2). However, velvetleaf densities were not affected significantly by the rates of Harness® Xtra evaluated. INTRRO® was very effective on foxtail, but the large-seed broadleaves, velvetleaf, and common ragweed were present at significant densities at the time of glyphosate application (Table 3). The preemergence herbicides did not significantly reduce glyphosate selection pressure on large-seed broadleaf weeds. This indicated risk for selection of glyphosate-resistant weeds since the alternative modes of action used in combination with glyphosate were not effective on all weeds present in the field.

Both Harness® Xtra and INTRRO® at relatively low rates reduced the number and amount of weeds present at the time of glyphosate application. However, the low densities of weeds present at Nashua resulted in no yield loss when glyphosate was applied at any of the three application timings, regardless of the preemergence treatment (data not showed). Soybean yield losses due to full-season competition were directly related to end-of-season weed biomass (Figure 1). Preemergence herbicides reduced weed-related yield losses due to full-season competition.

Table 1. Effect of Harness® Xtra (corn) and INTRRO® (soybeans) applied preemergence on weeds present at postemergence glyphosate application.

	Corn		Soybeans	
Preemergence rate	Weed density (number/ft^2)	Weed biomass (g/ft^2)	Weed density (number/ft^2)	Weed biomass (g/ft^2)
Control	11a	2.9a	25a	11.3a[1]
Low	4b	0.5b	10b	13.0a
High	2b	0.3b	7b	5.4b

Table 2. Effect of Harness® Xtra on weed populations exposed to postemergence glyphosate.

Harness Xtra	Number present at post application (plants /ft^2)			
	Foxtail	Waterhemp	Lamb's quarter	Velvetleaf
Control	1.2b	2.5b	1.7b	2.7a
0.6 qt/acre	0a	0.2a	0.1a	2.7a
1.2 qt/acre	0a	0.1a	0a	1.7a

Table 3. Effect of INTRRO® on weed populations exposed to postemergence glyphosate.

INTRRO	Number present at post application (plants /ft^2)		
	Foxtail	Velvetleaf	Com. Ragweed
Control	15.8b	1.3ab	0.7a
1 qt/acre	4.4a	1.4b	1.2a
2 qt/acre	2.6a	0.6a	1.5a

[1]Numbers with the same letter do not differ significantly.

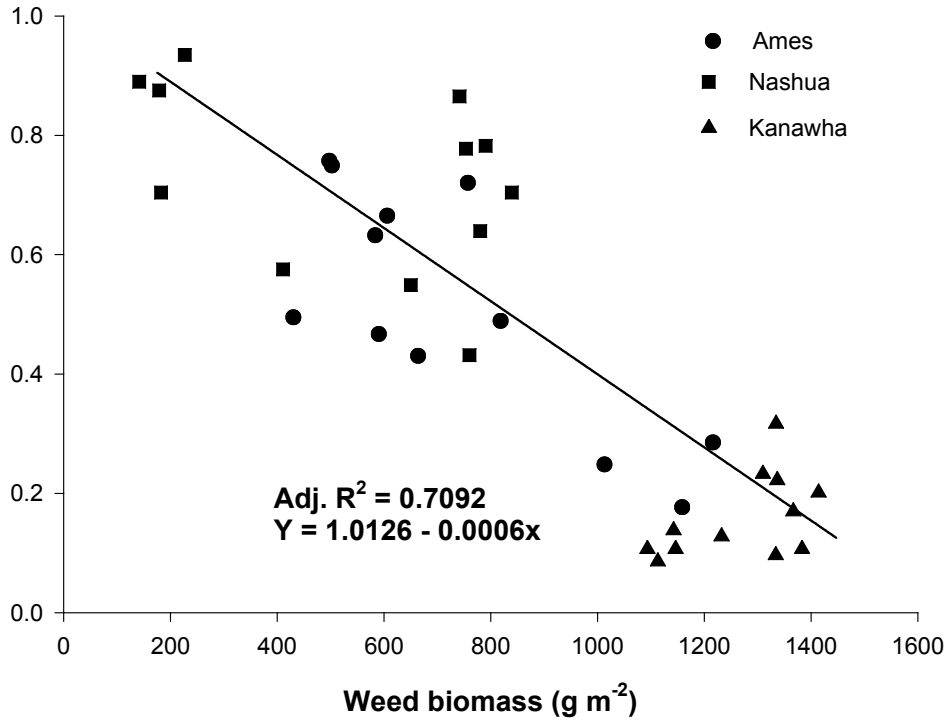

Figure 1. Relationship between end-of-season weed biomass and soybean yields at three Iowa State University Research Farms, 2005.