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Early-Season Weed Competition in Corn

Abstract

Protecting crop yields and preventing increases in weed populations are the primary reasons for controlling weeds. Weed management systems that rely on postemergence control assume that crops can tolerate competition for certain periods of time without suffering yield losses. However, once competition between the crop and weeds begins, the magnitude of yield loss increases rapidly as weed control is delayed. Our inability to accurately predict when weeds first begin to affect yield will always create a level of risk when relying on total postemergence weed control programs. Preemergence herbicides greatly reduce this risk by reducing the populations of weeds that emerge with the crop. The objective of this research was to quantify yield losses associated with delays in controlling weeds that emerge with or shortly following corn.

Keywords

Agronomy

Disciplines

Agricultural Science | Agriculture | Agronomy and Crop Sciences

Early-Season Weed Competition in Corn

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Introduction

Protecting crop yields and preventing increases in weed populations are the primary reasons for controlling weeds. Weed management systems that rely on postemergence control assume that crops can tolerate competition for certain periods of time without suffering yield losses. However, once competition between the crop and weeds begins, the magnitude of yield loss increases rapidly as weed control is delayed. Our inability to accurately predict when weeds first begin to affect yield will always create a level of risk when relying on total postemergence weed control programs. Preemergence herbicides greatly reduce this risk by reducing the populations of weeds that emerge with the crop. The objective of this research was to quantify yield losses associated with delays in controlling weeds that emerge with or shortly following corn.

Materials and Methods

The experimental area was chisel plowed following soybean harvest in 2007 and field cultivated prior to planting. Pioneer 36W65 was planted on May 5 at a rate of 32,500 seed/acre. On May 6, annual ryegrass was seeded at a rate of 2 lb/1,000 ft² to ensure a uniform weed infestation across the experimental area.

Weed control treatments were designed to allow differing periods of weed competition. The weed-free control consisted of 2.5 pt/acre Harness applied on May 6 followed by 22 oz of Roundup PowerMax applied on May 28 (V2) and June 17 (V5). To evaluate early-season competition, Roundup PowerMax was applied at either the V2, V4, or V5 stage of corn development (22, 36, or 43 days after

planting). The V2 and V4 treatments were also sprayed at the V5 timing to control any late-emerging weeds. Also included were two one-pass programs applied at the V2 stage: 22 oz Roundup PowerMax + 1.75 pt SureStart; 3.6 pt Halex. All glyphosate treatments included the recommended rate of AMS.

Eight corn plants were harvested from the border rows at the V2, V4, and V5 growth stage to determine effects of weeds on early-season corn growth, at the same dates weed biomass was harvested in 1 ft² quadrats. Corn was machine harvested and adjusted to 15.5% moisture.

Results and Discussion

Dry weight of corn shoots was affected by the presence of weeds at the earliest postemergence application, indicating that competition between the weeds and corn began soon after crop emergence (Table 1). The impact on corn growth increased rapidly as weed control was delayed, resulting in 70 and 87% reductions in dry weight at the V4 and V5 stage, respectively.

No herbicide treatment relying solely on postemergence herbicides provided yields equivalent to the weed-free control (Harness followed by Roundup PowerMax). Yield reductions of 5, 13, and 75% occurred when weeds were allowed to survive until corn reached the V2, V4, and V5 growth stage, respectively (Table 2). Corn was able to recover from much of the reduction in early-season growth from emergence until the V4 stage; however, in the week between the V4 and V5 stage an additional 117 bushels were lost to competition.

The SureStart and Halex treatments contain both glyphosate and additional herbicides to control weeds that emerge following the post

application. Both treatments suffered lost yield potential due to weed competition prior to the V2 application and from competition of weeds that escaped control. SureStart failed to provide complete control of waterhemp and velvetleaf, whereas giant foxtail and annual ryegrass were the major weeds escaping control in the Halex treatment.

This experiment illustrates the importance of timely weed control. Although the weed infestation was higher than that of most central Iowa fields, the general response between corn yields and control delays should be similar. Of particular importance is the rapid acceleration in yield loss as application

was delayed. Between the V2 and V4 growth stages, an average of 1.1 bushel was lost per day. Between the V4 and V5 stage, the average yield loss/day was 17 bushels. Preemergence herbicides minimize the risk of early-season competition by controlling the first flush of weeds that emerge soon after planting. These weeds are the most competitive, thus controlling them provides much greater flexibility in timing of postemergence control tactics.

Acknowledgements

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Table 1. Weed and corn dry weights at time of postemergence applications.

Days after planting	Corn stage	Weed dry wt (g/ft ²)	Corn Dry Wt	
			Weed free	Weedy ^a
			----- (g/plant) -----	
22	V2	0.7	0.3	0.4*
36	V4	9.7	7.9	2.4*
43	V5	16.1	23.7	3.1*

^a *Indicates weedy corn dry wt different than weed-free at 0.05 level of significance.

Table 2. Effect of different weed management systems on corn yields.

Treatment	Timing	Post timing (DAP)	Corn yield ¹	
			Bu/A	Percent reduction ²
1. Harness fb RU PM ³	Pre + EP+LP	22 + 43	187.8	
2. RU PM fb RU PM	EP + LP	22 + 43	179.4	5
3. RU PM fb RU PM	MP + LP	36 + 43	164.2	13
4. RU PM	LP	43	47.2	75
5. SureStart + RU PM	EP	22	169.1	10
6. Halex	EP	22	160.9	14

¹All treatments were significantly different than the weed-free control (Trt 1) at 0.05 level.

²Percent reduction compared to the weed-free control (Trt 1).

³Roundup PowerMax.