Corn Yield is Influenced by Nitrogen Fertilizer Timing and Giant Ragweed Interference

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PURDUE WEED SCIENCE

Introduction

Environmental concerns regarding the use of nitrogen fertilizer and soil-applied herbicides such as atrazine, and the adoption of glyphosate-resistance corn hybrids will likely cause changes in the dynamics of weed interference in corn. Giant ragweed (GRW) is a highly competitive weed that commonly infests crop production fields in the Midwest. It has the ability to emerge throughout the early growing season making it difficult to control with just a single herbicide application. Previous research evaluating the influence of N application timings and giant ragweed removal timings on in corn has not been published.

Figure 1. Giant ragweed in corn.

Objective

The objective of this study is to determine the influence of three N application timings and four weed interference regimes on corn grain yield and biomass and N accumulation of corn and giant ragweed.

Materials and Methods

A field experiment was conducted at the Purdue University Agronomy Center for Research and Education on Dummer silty clay loam soil. Treatments were established in a split plot design with four replications. Three nitrogen treatments were assigned to the main plots using a 28% UAN solution, and four GRW removal timings were assigned to the subplots (see Table 1). The entire experiment was treated with flumetsulam, dimethenamid, and glyphosate to control other weeds other than GRW prior to crop emergence. Weed free plots were treated with atrazine to control GRW. GRW plants were allowed to emerge with the corn, and GRW density was established at 0.5 plants/10ft^2 at V4 corn and maintained until the appropriate removal timing. Weed free plots were maintained throughout the growing season by hand weeding at biweekly intervals.

Table 1. Nitrogen fertility treatments (main plots) and GRW removal timings (subplots) at West Lafayette, IN in 2004. Sidedress N applied at V5 corn.

Fertilizer Timing	GRW Interference Length
180# N before planting (BPLT)	Weed Free
180# N side dressed (SIDE)	Emergence to 4" tall GRW (V6)
90# N + 90# N (SPLIT)	Emergence to 16" tall GRW (V8-V9)
	Season long interference

Table 2. Dates of various field operations at West Lafayette, IN in 2004.

Operation	Date	Corn V stage
Planted	May 17	
BPLT N	May 17	
SIDE N	June 23	V5
GRW Density established	June 16	V4
4" GRW removal	June 29	V6
16" GRW removal	July 8	V8-V9
Final removal	September 23	
Corn harvest	October 14	

Statistical analysis

►Corn was then harvested for grain and yields were then converted to 15.5% grain moisture. Data were subjected to ANOVA and means were separated with an LSD at the 0.05 level

Results

Figure 2. Nitrogen content of corn, giant ragweed, and soil at the 16" giant ragweed removal timing under three nitrogen regimes.

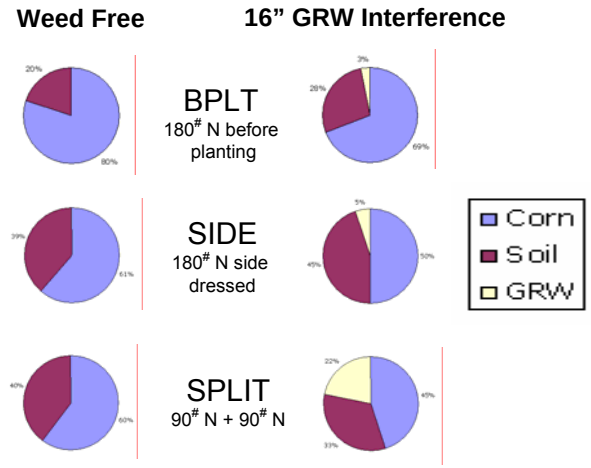

Figure 3. Corn yield (bu/A) at different N application timings pooled over GRW interference periods.

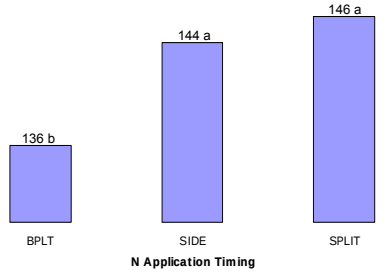

Table 3. Corn yield (bu/acre) by treatment.

	BPLT	SIDE	SPLIT
Weed Free	145 bc	150 ab	159 a
4" GRW removal	138 bcd	152 ab	152 ab
16" GRW removal	133 cd	149 ab	152 ab
Season long	126 d	129 d	130 d

Discussion

►Allowing GRW to reach 16" before removal results in significant reductions in the amount of N in the soil regardless of N fertility regime.

►Higher corn yields occurred in the SIDE and SPLIT N treatments than in the BPLT when GRW interference periods were pooled together. This is possibly due to applying N fertilizer when N need is highest in corn.

►Yields were similar across N fertility regimes under weed free and 4" interference periods. SIDE and SPLIT N fertility regimes allowed corn to compensate for longer GRW interference periods.

►These results are similar to what Helwig et al. reported in 2002, that side dressing N helped overcome some of the yield loss due to grass weed interference.

Conclusions

►Knowing how GRW interferes with corn in different N fertility regimes may play an important role in reducing herbicide and N inputs in corn production in the Midwest.

References

Helwig, K. B., W. G. Johnson, and P. C. Scharf. 2002. Grass weed interference and nitrogen accumulation in no-tillage corn. Weed Sci. 50:757-762.