Effect of Glyphosate-Resistant Volunteer Corn on Glyphosate-Resistant Corn

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INTRODUCTION

In recent years, corn acreage as well as corn-on-corn acres have increased, a trend anticipated to continue in the near future. Combined with wide use of glyphosate-resistant corn, potential exists for glyphosate-resistant volunteer corn to be present in glyphosate-resistant corn. Storm damage, harvesting problems, poor stalk quality, and insect damage are among the factors that can lead to kernel and ear loss, and volunteer corn the following year. Limited information exists regarding the competitive effects of volunteer corn in corn and at what point management is needed to help protect yield. Furthermore, management is complicated because both the crop and volunteer plants are corn and resistant to the glyphosate used for weed management.

OBJECTIVE

The objective of this study was to evaluate the effect of glyphosate-resistant volunteer corn in glyphosate-resistant corn and to determine the potential for this situation to be a management problem.

MATERIALS & METHODS

- A field experiment was conducted the summer of 2007 at the Southwest Research and Outreach Center in Lamberton, MN, and the Southern Research and Outreach Center in Waseca, MN.
- The experimental design was a randomized complete block with four replications.
- Carry-over kernels and ears from a glyphosate-resistant hybrid grown in 2006 were used for the treatments. Kernels were seeded at 2 to 3 times the target population, with the intent to thin as needed.
- Treatments included 7 populations of kernels (target populations of 4046, 8093, 12139, 18209, 24279, 30349, and 36148 plants/acre), 3 populations of ears (target of 650, 1600, and 3200 (Lamberton only) ears/acre), 3 combination treatments (650 ears/acre + 12139, 24279, or 36148 plants/acre), and a control of no ears or kernels.
- A glyphosate-resistant hybrid was planted at 32,000 to 33,000 plants/acre in 30-inch rows.
- Acetochlor plus atrazine was applied PRE fb glyphosate POST.
- Volunteer stand was evaluated at V10 to V12 stage corn.
- ANOVA was used for statistical analysis. Means were separated using Fisher's protected LSD (α = 0.05, 0.10).

RESULTS & DISCUSSION

- Significant interactions were detected across locations, thus data were analyzed separately by location.
- Volunteer corn populations were lower than target populations (Figures 1 & 2). Lower than expected emergence and loss of plants after POST glyphosate application (evidence of segregation of the glyphosate-resistance gene) were contributing factors.
- Volunteer corn plants and ear clumps were 1 to 6 leaf stages behind at Lamberton (Figures 3a & 3b), with similar differences observed at Waseca. Differences continued throughout the season and were attributed to delayed emergence and reduced vigor of volunteer plants.

Figure 1: Established volunteer plants/acre.

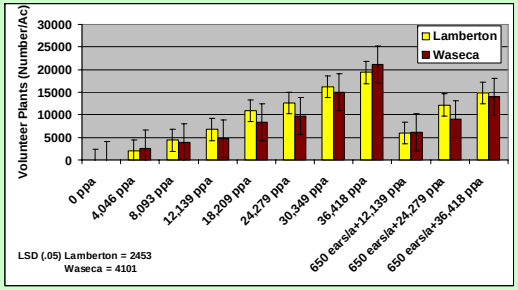
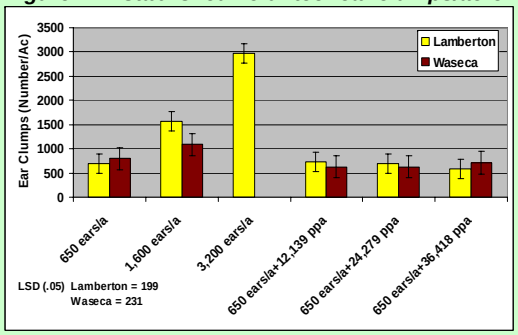


Figure 2: Established volunteer ear clumps/acre.



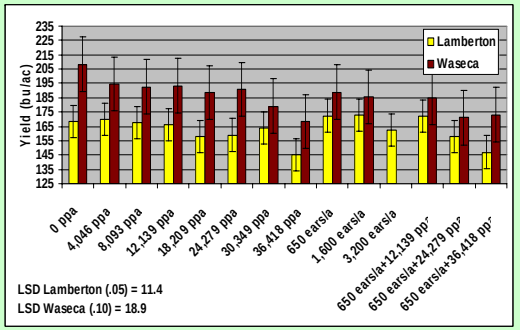
Figures 3a & 3b: Volunteer corn plants and ear clumps at Lamberton on 6/14/07.

3a. Volunteer plants

3b. Volunteer ear clumps

- Compared to the control, corn yield was reduced 23.2 (14%) and 40.2 bu/acre (19%) at the highest volunteer corn population evaluated (Figure 4), which corresponded to a volunteer corn population of 19,348 (Lamberton) and 21,152 plants/acre (Waseca), respectively.
- At Waseca, no difference was found among the ear clump and combination treatments, but all decreased yield compared to the control.
- At Lamberton, treatments consisting of ear clumps only had no effect while yield was reduced in the combination treatments consisting of the mid and high volunteer plant populations. Because ear clumps alone did not affect yield, losses were attributed mainly to the volunteer plants.

Figure 4: Effect of volunteer corn treatments on corn yield.



CONCLUSIONS

- High populations of volunteer corn had a negative impact on yield. No yield impact was observed until volunteer populations averaged at least 10,926 and 8,377 plants/ac at Lamberton and Waseca, respectively.
- Volunteer plants had a greater influence on yield than ear clumps.
- In a corn-on-corn system, management of volunteer corn may be justified when significant populations are anticipated or present. Due to limitations in herbicide control options, tactics such as rotating to a glufosinate-resistant hybrid, a non-corn crop, or cultivation should be considered.

ACKNOWLEDGEMENTS

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