

The replant interval for corn following application of graminicides

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Introduction

Ontario corn producers frequently replant uneconomical crop stands caused by adverse early season weather conditions. If a poor stand is not removed prior to replanting, it becomes a weed with significant yield implications to the replanted corn crop. As the majority of those stands are hybrids tolerant to non-selective herbicides such as glyphosate (e.g. Roundup Weathermax) and glufosinate (i.e. Liberty), alternative herbicides are required. A group of herbicides known as the “graminicides”, which are used in soybeans to control emerged volunteer corn and annual grassy weeds, would appear to be suitable for removing poor corn stands prior to re-planting. However, replant intervals exist for the majority of these graminicides. These replant intervals are based on the highest registered rate of the herbicide, which is often 2 to 3 times higher than the rate required to control volunteer corn. In addition, there is some evidence to suggest that corn injury from these graminicides may be enhanced by the presence of soil applied HPPD inhibiting herbicides such as Callisto, Converge, or Impact.

Objectives

The objective of this study is to determine the risk associated with replanting corn following the application of graminicides at the appropriate dose required to control corn and to determine the replant interval under Ontario conditions.

Conclusions

The graminicides tested in this study can be applied safely as late as 3 days prior to emergence of the replant corn crop. This knowledge will enable Ontario corn producers to make informed crop management decisions in the event of a poor crop stand.

Table 1. Significance of treatment main effects and interactions on corn injury at 4 and 7 DAE, in 2010 and 2011, respectively

Treatment	P value	
	2010	2011
Time of graminicide application	>0.1	<0.01
+/- HPPD herbicide (Callisto)	>0.1	0.1
Graminicide	>0.1	<0.01
Time x HPPD	>0.1	>0.1
Time x Graminicide	>0.1	<0.01
HPPD x Graminicide	>0.1	>0.1
Time x HPPD x Graminicide	>0.1	>0.1



Injury with Venture applied at 0 DBE

Table 2. Effect of graminicide and time of application, averaged over +/- HPPD herbicide on corn injury at 4 and 7 DAE, in 2010 and 2011, respectively.

Treatment	Dose (gai/ha)	2010		2011	
		-----Time of graminicide application ¹ -----			
		1 DBP	3 DBE	1 DBP	0 DBE
-----Injury (%) ² -----					
Assure II + Sure Mix	72 + 1% v/v	0	0	2	10
Excel Super	108	0	0	0	9
Poast Ultra + Merge	400 + 2 L/ha	0	0	3	5
Select + Amigo	60 + 1% v/v	0	0	1	6
Venture L	150	0	0	0	28
No graminicide		0	0	1	4
LSD (0.05)		NS		4	

¹ Days before planting and emergence

² % injury at 4 and 6 days after emergence in 2010 and 2011, respectively

Materials and methods

An experiment was conducted in 2010 and 2011 on a silt-loam soil at the Elora Research Station, ON. The experiment had a split-split-plot design. Time of graminicide application was the main-plot treatment with graminicides applied 1 DBP (days before planting) and 3 DBE (days before emergence) in 2010 and 1 DBP and 0 DBE in 2011. The presence or absence of HPPD inhibiting herbicide was the split-plot treatment with Callisto + Primextra II Magnum (mesotrione + atrazine/s-metolachlor) applied 12 DBP at 280 + 4320 gai/ha, respectively (twice the label rate). Five graminicides plus adjuvant, applied at twice the effective rate to control volunteer corn, and a no graminicide treatment were the split-split plot treatments (see below). Glyphosate-tolerant corn hybrid (Pioneer 39B23) was planted at a density of 79,100 plants/ha on May 5 and May 25, in 2010 and 2011, respectively. All plots were maintained weed-free. Treatments were evaluated for corn injury at weekly intervals until early July at which time final populations were counted. Grain yield was measured at maturity.

Results

- No injury or yield loss resulted when graminicides, at twice the rate required to control volunteer corn, were applied 1 day before replanting corn or 3 days before emergence of the replant crop (Tables 1 - 4).
- Injury resulted when graminicides were applied at the time of emergence of the replant corn crop but did not reduce final corn populations (data not presented) or grain yield.
- When applied at the time of emergence of the replant corn, injury was greater with Venture than with Assure II, Excel Super, Poast Ultra, and Select.
- Contrary to our original hypothesis, the presence of the HPPD inhibiting herbicide Callisto (mesotrione) applied 12 days before planting at twice the label rate, did not enhance injury caused by graminicides.

Table 3. Significance of treatment main effects and interactions on corn yield

Treatment	P value	
	2010	2011
Time of graminicide application	>0.1	>0.1
+/- HPPD herbicide (Callisto)	>0.1	>0.1
Graminicide	>0.1	>0.1
Time x HPPD	>0.1	>0.1
Time x Graminicide	>0.1	>0.1
HPPD x Graminicide	>0.1	>0.1
Time x HPPD x Graminicide	>0.1	>0.1

Table 4. Effect of graminicide and time of application, averaged over +/- HPPD herbicide on corn yield.

Treatment	Dose (gai/ha)	2010		2011	
		-----Time of graminicide application ¹ -----			
		1 DBP	3 DBE	1 DBP	0 DBE
-----Yield (t/ha) -----					
Assure II + Sure Mix	72 + 1% v/v	12.6	12.9	13.3	13.4
Excel Super	108	12.6	12.4	12.8	13.1
Poast Ultra + Merge	400 + 2 L/ha	12.7	12.8	13.6	13.6
Select + Amigo	60 + 1% v/v	12.6	12.7	13.7	13.4
Venture L	150	12.7	12.4	13.8	12.6
No graminicide		12.7	12.6	13.7	13.6
LSD (0.05)		NS		NS	