
The Effects of Hexazinone Rates, Application Timing and Residue Management on Canada Thistle Control and Alfalfa Seed Production

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Abstract

Hexazinone is an effective weed control tool in alfalfa seed production. However, both researchers and producers have had variable success in Canada thistle control with hexazinone. The objective of this study was to determine the effects of hexazinone rates, application timing and residue management on Canada thistle control and alfalfa seed production. Two field trials were established with 'Algonquin' alfalfa near Valparaiso, SK and Carrot River, SK in 1998. The Valparaiso trial was located on a fine-textured soil, high in soil organic matter. The Carrot River trial was located on a coarse-textured soil, low in soil organic matter. Three factors (three rates of hexazinone, three residue management treatments and two application dates) were tested in a randomized complete block design. Alfalfa seed yield and Canada thistle: density, dry matter and seed contamination, were determined in 1999. Alfalfa seed yield and Canada thistle control (density, dry matter and seed contamination) increased with increased rates of hexazinone at Carrot River but not at Valparaiso. No significant interactions between hexazinone rates, application timing and residue management for Canada thistle control were observed. However, residue management by application timing interaction was significant for alfalfa seed yield. Alfalfa seed yield was significantly higher following a spring burn at both sites.

Introduction

Hexazinone is widely used as it is an effective weed control tool in alfalfa seed production. However, with regard to Canada thistle control, both researchers and producers have had variable success with hexazinone. Hexazinone effectiveness is known to be related to soil texture (less active on fine textured soils) and organic matter content (high organic matter reduces activity), but this does not account for all of the observed variability in effectiveness. In addition, there are questions regarding whether surface residue and the ash left from burning would also influence hexazinone activity. The objective of this study was to determine the effects of hexazinone rates, application timing and residue management before application on Canada thistle control in alfalfa seed production.

Materials and Methods

Two field trials were established on 'Algonquin' alfalfa near Valparaiso, SK and Carrot River, SK in 1998. The Valparaiso trial was located on a fine-textured soil (clay), high in soil organic matter (7.4%). The Carrot River trial was located on a coarse-textured soil (sandy loam), low in

soil organic matter (1.7%). Three factors (three rates of hexazinone, three residue management treatments and two application dates) were examined in a randomized complete block design. Hexazinone (0, 0.5 and 1.0 kg ai/ha) was applied in 220 L/ha of water at 275 kPa following three residue management treatments (burn, harrow, check) in October of 1998 and in April of 1999. Canada thistle density and dry matter were determined in August of 1999. Alfalfa seed was harvested in October of 1999. The harvested sample was cleaned to remove trash and weed seeds before being weighed to determine alfalfa seed yield. Alfalfa seed was not harvested from the fall burn plots at Valparaiso due to poor seed production. Canada thistle seed contamination was determined by counting the number of Canada thistle seed per 25 grams of cleaned alfalfa seed. Analysis of variance and contrasts were used to analyze the effects of hexazinone rates, application timing and residue management on Canada thistle control and alfalfa seed production for each site.

Results and Discussion

Alfalfa seed yield and Canada thistle control (density, dry matter and seed contamination) significantly increased with increased rates of hexazinone at Carrot River but not at Valparaiso (Table 1 & 2). Dupont (1994) stated that hexazinone is less active on fine-textured soils, high in soil organic matter. Therefore, the difference in Canada thistle control may be related to differences in soil texture and soil organic matter between the sites.

Table 1. Effect of hexazinone rates on alfalfa seed yield (kg/ha) and Canada thistle: density (#/sq-m), dry matter (g/sq-m) and seed contamination (#/25 g) at Carrot River, SK in 1999.

Rate	Canada Thistle			Alfalfa
	Density	Dry Matter	Seed Contamination	Seed Yield
kg ai/ha	-----#/sq-m-----	-----g/sq-m-----	-----#/25 g-----	-----kg/ha-----
0	8	9	72	57
0.5	6	6	25	79
1	4	4	1	94
Linear	NS	NS	*	**
Quadratic	*	*	**	**

*, ** Significant at 0.06 and 0.01 probability, respectively; NS, not significant at 0.06 probability level.

Table 2. Effect of Rate	Canada Thistle			Alfalfa
	Density	Dry Matter	Seed Contamination	Seed Yield
kg ai/ha	-----#/sq-m-----	-----g/sq-m-----	-----#/25 g-----	-----kg/ha-----
0	16	76	320	123
0.5	17	93	311	111
1	18	120	476	122
Linear	NS	NS	NS	NS
Quadratic	NS	NS	NS	NS

NS, not significant at 0.06 probability level.

No significant interactions between hexazinone rates, application timing and residue management were identified for Canada thistle control (density, dry matter and seed contamination). However, residue management by application timing interaction was significant for alfalfa seed yield. Alfalfa seed yield was significantly higher following a spring burn at both sites (Table 3 & 4). The increase in alfalfa seed yield following a spring burn may be due to a reduction of insect pests (Hanna et al. 1987).

Table 3. Effect of residue management by application timing on alfalfa seed yield (kg/ha) at Carrot River, SK in 1999.

Application Timing	Residue Management		
	Check	Harrow	Burn
Fall	60	74	75
Spring	62	66	124
LSD (0.05) = 18 for Residue Management x Application Timing interaction			

Table 4. Effect of residue management by application timing on alfalfa seed yield (kg/ha) at Valparaiso, SK in 1999.

Application Timing	Residue Management		
	Check	Harrow	Burn
Fall	99	125	0
Spring	123	165	200
LSD (0.05) = 54 for Residue Management x Application Timing interaction			

Conclusions

- * Hexazinone controlled Canada thistle at Carrot River but not at Valparaiso.
- * Increased rates of hexazinone increased Canada thistle control and alfalfa seed yield at Carrot River.
- * Timing of hexazinone application and residue management had no effect on Canada thistle control at both sites.
- * A spring burn increased alfalfa seed yield at both sites.

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