

A three year comparative study of desiccant use on alsike clover seed crops in the Peace River region



Effects of the desiccant Reglone® on alsike clover seed crop, 2013

Introduction

Pre-harvest desiccants, including herbicides with the ability to act as desiccants, are used to aid in crop dry down and to reduce the negative impact that variable maturity can have on plant production and harvest efficiencies (Zhang *et al* 2014 and Zhang 2015). While little information was found specific to alsike clover harvest and desiccant use, other studies of legume crops point to the importance of type (or combination of types) of desiccant/herbicide used and timing of application, all of which may impact seed yield and quality (May *et al* 1996; Zhang 2015). Desiccants should not be applied until the majority of the legume crop has reached physiological maturity as applying too early can lead to lower seed yields (Moyer *et al* 1996; Zhang *et al* 2014). Furthermore, depending on timing of application, the impact of certain treatments may also affect seed quality and stand vigour (the spring after application) (Moyer *et al* 1996). Dual-purpose pre-harvest herbicide and desiccant application may be a more efficient way to treat alsike clover seed fields, however more information is needed regarding effects on forage moisture content, seed yield and seed quality.

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Trials were conducted in 2013, 2014 and 2015 in partnership with the Smoky Applied Research and Demonstration Association (SARDA) and Agriculture and Agri-Food Canada to explore the impacts of five different desiccant treatments on first year alsike clover seed fields. The five treatments included stand-alone application or combinations of Heat®, Roundup Transorb® and Reglone® Ion. This study aimed to examine the potential for the use of Heat® and Roundup® treatment combinations as

alternative desiccants for pre-harvest use on alsike clover. Roundup® helps to control perennial weeds such as Canada thistle and, in combination with Heat®, it was hoped that both effective dry down and weed control could be attained. An additional research goal was to determine the effect, if any, of pre-harvest Roundup application on seed germination. For the purpose of this study post-application percent germination is a key indicator of seed quality.

Table 1. Alsike clover trial desiccant treatment composition, formulation and rates

Treatment	Active ingredient	Formulation	Active ingredient rate (kg/ha)	Product rate (L or g/acre)
Heat+Merge	saflufenacil+Merge	70% WG	0.050	28 g+0.5 L
Heat+Roundup+Merge 1x	saflufenacil+ glyphosate+Merge	70% WG+ 540 g/l	0.025 +0.895	14 g+0.670 L +0.5 L
Heat+Roundup+Merge 2x	saflufenacil+ glyphosate+Merge	70% WG+ 540 g/l	0.050 +0.895	28 g+0.670 L +0.5 L
Roundup	glyphosate	540 g/l	0.895	0.670 L
Reglone Ion	diquat	200 g/l	0.653	1 L
Check				



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Table 2. Applications dates and stages for desiccants on alsike clover seed crop

Site and Year	Application Date	Stage	Harvest Date
Guy 2013	September 1 st	85% brown pods	September 12 th
Girouxville 2014	August 12 th	100% brown pods	August 22 nd
Guy 2015	August 12 th	100% brown pods	September 2 nd

Methods

Trials were conducted on very uniform alsike clover seed fields. The treatments were arranged in a randomized complete block design with four replicates. Plot size was 2m x 20 m. Each trial consisted of five treatments. Table 1 shows detailed information on each treatment. Treatments were applied with a handheld small plot sprayer. Water volume was 200L/ha. Application occurred when the majority of heads were brown. Detailed dates and harvest information are shown in Table 2.

Alsike clover was straight combined with a Winter Steiger combine (combine setting error noted in 2014). Area harvested was 30m². Data collected included forage moisture, seed yields, germination (year of application and following year) and 1000 seed weights.

Growing season precipitation information was sourced from local weather stations and is shown in Table 3. Extremely dry conditions during the 2nd and 3rd years of the study are noted.

Table 3. Growing season precipitation for alsike clover trial (inches)

	Guy 2013		Girouxville 2014		Guy 2015	
	2013	LTA*	2014	LTA	2015	LTA
May	0.7	1.7	0.3	1.7	0.2	1.7
June	2.7	3.2	1.4	3.0	1.2	3.2
July	3.0	2.9	0.9	2.7	1.4	2.9
August	0.3	2.1	0.2	1.9	2.2	2.1
Total	6.7	9.9	2.8	9.3	5.0	9.9
*Long Term Average						

Results

Trials in 2013 showed no significant difference in germination and trials in 2014 and 2015 showed no significant difference in seed yield, germination or seed weight as a result of the five different desiccant treatments when compared among the treatments or to the untreated check (Tables 4-6). Similar results were found in a study on alfalfa seed crop in which no significant impact on seed germination was found as a result of pre-harvest glyphosate treatment (May *et al* 1996). There was, however, a slight trend for decreased germination with the majority of treatments in all years.

There was a significant increase in seed yield with the Reglone® treatment in 2013, as well as a significant decrease in seed weight with Heat® alone (Table 4). There was a slight trend for

decreased seed weight with the treatments in 2015 and a slight trend for increased seed yields with all treatments in 2014.

In 2014 and 2015 forage moisture percentages of alsike clover treated with Reglone® were significantly lower than the check 9 D-A-A (2014) and 3, 6 and 9 D-A-A (2015). Both combination treatments of Heat®+Roundup® as well as Roundup® alone in 2015 significantly lowered forage moisture percentages when compared to the check 6 D-A-A.

Optimum timing (days after application) to obtain lowest forage moisture percentages varied among treatments.

Table 4. Effect of desiccants on alsike clover seed crop—Guy 2013

Treatment	Forage Moisture 4 D-A-A (%)	Forage Moisture 12 D-A-A (%)	Seed Yield (kg/ha)	Germination 2013 (%)	Seed Weight (g/1000)	Germination 2014 (%)
Heat+Merge	26.3	34.8	368 b	94.8	0.791 b	91.0
Heat+Roundup+Merge 1x	27.0	27.0	421 b	95.3	0.807 a	92.3
Heat+Roundup+Merge 2x	24.0	24.0	400 b	95.0	0.817 a	93.5
Roundup	24.0	24.0	402 b	95.8	0.811 a	92.4
Reglone Ion	22.8	26.3	511 a	95.3	0.812 a	92.0
Check	26.3	38.0	410 b	95.9	0.811 a	93.4
CV%	10.1	16.0	9.8	1.6	1.2	4.8
LSD (p=0.05)	NSD	NSD	61	NSD	0.014	NSD

D-A-A - days after application; CV - coefficient of variance; LSD - least significant difference; NSD - not significantly different
a, b, c - results followed by the same letter do not significantly differ (p=0.05, Student-Newman-Keuls)

Results cont'd

Studies have shown that environmental factors (precipitation events, humidity, temperature, wind) have an impact on crop dry down and may affect the efficacy of any pre-harvest treatments.

In 2014 and 2015 Reglone® appeared to have the greatest effect on decreasing forage moisture percentages. Effective, rapid desiccation with diquat has been noted in other studies (Moyer *et al* 1996). While Roundup® treatments were effective in 2015,

Table 5. Effect of desiccants on alsike clover seed crop—Girouxville 2014

Treatment	Forage Moisture 3 D-A-A (%)	Forage Moisture 6 D-A-A (%)	Forage Moisture 9 D-A-A (%)	Seed Yield (kg/ha)*	Germination 2014 (%)	Seed Weight (g/1000)	Germination 2015 (%)	Visual Stand Reduction May 25 2015 (%)
Heat+Merge	45.5	39.5	45.1 a	322	96.1	0.704	95.5	0 b
Heat+Roundup+Merge 1x	46.3	42.1	40.3 a	334	95.6	0.703	91.0	62.5 a
Heat+Roundup+Merge 2x	47.8	40.3	40.5 ab	339	96.1	0.710	95.8	60.0 a
Roundup	42.8	41.3	40.8 bc	346	96.8	0.702	94.5	62.5 a
Reglone Ion	40.3	37.1	38.8 c	336	96.0	0.696	97.0	0
Check	45.5	42.0	42.8 ab	312	96.5	0.703	96.5	0
CV%	7.5	7.2	3.8	6.9	1.1	1.5	3.0	23.7
LSD (p=0.05)	NSD	NSD	2.4	NSD	NSD	NSD	NSD	11.0

* combine not set properly

D-A-A - days after application; CV - coefficient of variance; LSD - least significant difference; NSD - not significantly different
a, b, c - results followed by the same letter do not significantly differ (p=0.05, Student-Newman-Keuls)

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Table 6. Effect of desiccants on alsike clover seed crop—Guy 2015

Treatment	Forage Moisture 3 D-A-A (%)	Forage Moisture 6 D-A-A (%)	Forage Moisture 9 D-A-A (%)	Seed Yield (kg/ha)*	Germination 2015 (%)	Seed Weight (g/1000)	Germination 2016 (%)
Heat+Merge	53.0 a	47.5 a	53.3 a	276	94.3	0.722	98.8
Heat+Roundup +Merge 1x	52.0 a	36.0 b	50.5 a	336	92.3	0.727	98.3
Heat+Roundup +Merge 2x	53.5 a	36.0 b	50.5 a	292	93.5	0.722	96.3
Roundup	52.3 a	36.0 b	50.8 a	297	93.8	0.729	98.5
Reglone Ion	43.5 b	18.3 c	37.0 b	322	95.0	0.722	97.0
Check	52.5 a	46.8 a	54.0 a	330	96.5	0.729	99.3
CV%	5.0	7.5	6.6	8.9	2.1	1.8	1.7
LSD (p=0.05)	3.9	4.3	4.9	NSD	NSD	NSD	NSD

D-A-A - days after application; CV - coefficient of variance; LSD - least significant difference; NSD - not significantly different
a, b, c - results followed by the same letter do not significantly differ (p=0.05, Student-Newman-Keuls)

Result cont'd

visual stand reduction was significant in the spring of 2015 after pre-harvest Roundup® treatments in 2014. Heat® and Reglone® did not have an effect on plant stand the year after application. Previous studies on alfalfa seed crop have shown that following-year stand reduction after pre-harvest glyphosate treatment can be significant (May *et al* 1996).



Effects of the desiccant Reglone® on alsike clover seed crop, 2014

Summary

- Forage moisture percentages of alsike clover treated with Reglone® were significantly lower than the check in 2014 and 2015 (except for 3 and 6 D-A-A 2014)
- Forage moisture percentages of red clover treated with Heat®+Roundup® (1x and 2x) as well as the stand-alone Roundup® treatment were significantly lower than the check 6 D-A-A in 2015
- Heat® alone did not reduce forage moisture content when compared to the check
- No significant difference in germination as a result of the five different treatments in all study years
- No significant difference in seed yield or seed weight in 2014 and 2015 as a result of the treatments
- Significant visual stand reduction in the spring of 2015 after pre-harvest Roundup® treatment application in 2014

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