The Seed Head
Fact sheet # 11

Date:
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A three year study of growth regulator (trinexapac-ethyl) use on alsike clover seed crops in the Peace River region

Effects of trinexapac-ethyl on alsike clover seed crop, Beaverlodge 2013

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See also Seed Head #9 and #10

Introduction

In the past few decades there has been an increased interest in plant growth regulators (PGRs) and their use on grass and legume seed crops. No other studies were found on alsike clover, but studies on red clover have shown that the PGR trinexapac-ethyl (TE) can have a significant impact on plant height reduction, lodging, increased flower production and therefore an increase in seed yield. In general TE has been found to be most effective when applied at early stem elongation (growth stage 30-32)[1], or as a split application between stem elongation and early bud[2]. Seed weights tend to decrease with TE use, though an increase in inflorescence counts and availability of flowers for pollination with TE use is thought to be one of the contributing factors to the greater seed yields noted in many studies[3]. Increased sunlight penetration due to the reduction in plant height may also contribute to an increase in seed yields.

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 in order to explore the impacts of TE use on first year alsike clover seed fields. TE is currently registered in Canada as Parlay™ for use on turf-type perennial ryegrass only. Studies such as this may contribute to its registration for other grass and legume seed crops.

Methods

Small plot randomized replicated trials (2m x 40 m and 4 reps) were set up in each field. Each trial consisted of six treatments (measured in kg ai ha^{-1} TE):

1) 0.140 stem elongation
2) 0.280 stem elongation
3) 0.420 stem elongation
4) 0.210 stem elongation + 0.210 bud
5) 0.280 bud
6) Check

Treatments were applied with a handheld small plot sprayer. Water volume was 100L/ha. Application dates/stages and harvest information are shown in Table 1. Trials were dessicated with Reglone prior to harvest and straight combined. Area harvested was $64m^2$. Data collected included plant heights, flower counts, seed yields, germination and 1000 seed kwts. Growing season precipitation information was sourced from local weather stations and is shown in Table 2.

Table 1. Applications dates and stages for trinexapac-ethyl on alsike clover seed crop

Site and Year	1st Application Date/Stage	2nd Application Date/Stage	Harvest Date
Guy 2013	June 4th/stem elongation	June 17th/early flower	September 12th
Girouxville 2014	June 11th/stem elongation	June 24th//bud	August 22nd
Guy 2015	June 4th/stem elongation	June 15th/early flower	September 2nd

1 Anderson et al 2015a and 2015b, Chastain et al 2014; 2 Anderson et al 2012; 3 Anderson et al 2015a, 2015b and 2012
(Full references for these documents at end of Seed Head fact sheet)

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Table 2. Growing season precipitation for alsike clover trial (inches) (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*						

Photo courtesy of OMAFRA

Results & Discussion

Trials in all three years showed a reduction in plant height in almost every treatment (Tables 3-5). A decrease in lodging was noted in the wetter year. There was a trend for improved seed yields in 2015 only, while significant decreases in seed yield occurred in 2014 which was a particularly dry year (Table 6). Seed germination was not significantly affected by the application of TE. It is thought the overall shorter plant height of alsike clover, when compared to red clover, may have contributed to TE's inefficacy on this type of clover crop.
A field scale trial may be warranted.

Alsike clover

Table 3. Effect of trinexapac-ethyl on alsike clover seed crop - Guy 2013

Treatment (kg ai/ha)	Plant Height (cm)	Flowers (#/0.25m$^{2)}$	Seed Yield (kg/ha)	Germination (%)
0.140 Stem Elongation	72	462	281	96
0.280 Stem Elongation	74	457	286	97
0.420 Stem Elongation	69	612	278	96
0.210 Stem Elongation+0.210 Bud	74	497	241	96
0.280 Bud	74	359	238	96
Check	75	466	287	93
CV%	7.2	17.7	9.1	2.0
LSD (p=0.05)	NSD	NSD	NSD	NSD

CV - coefficient of variance; LSD - least significant difference; NSD - not significantly different

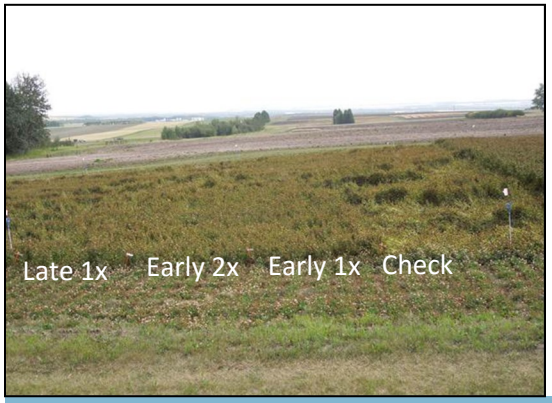
Table 4. Effect of trinexapac-ethyl on alsike clover seed crop - Girouxville 2014

Treatment (kg ai/ha)	Plant Height (cm)	Flowers (#/0.25m$^{2)}$	Seed Yield (kg/ha)	Germination (%)	1000 kwt (g)
0.140 Stem Elongation	32	308	318 a	96.7	0.659 b
0.280 Stem Elongation	30	290	256 b	96.9	0.633 c
0.420 Stem Elongation	29	282	193 c	98.5	0.630 c
0.210 Stem Elongation+0.210 Bud	32	317	152 c	97.6	0.604 c
0.280 Bud	29	319	200 c	97.8	0.607 c
Check	36	264	354 a	98.1	0.692 a
CV%	13.8	14.0	11.9	1.9	2.3
LSD (p=0.05)	NSD	NSD	45	NSD	0.022

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)

Table 5. Effect of trinexapac-ethyl on alsike clover seed crop - Guy 2015

Treatment (kg ai/ha)	Plant Height (cm)	Flowers (#/0.25m$^{2)}$	Seed Yield (kg/ha)	Germination (%)	1000 kwt (g)
0.140 Stem Elongation	47.3 a	159	395	94.0	0.714
0.280 Stem Elongation	42.0 bc	164	391	94.3	0.734
0.420 Stem Elongation	41.6 bcd	183	403	96.0	0.734
0.210 Stem Elongation+0.210 Bud	38.5 d	164	373	95.0	0.726
0.280 Bud	39.0 cd	191	384	93.3	0.729
Check	44.6 ab	190	363	92.8	0.719
CV%	5.3	24.4	7.5	2.4	0.6
LSD (p=0.05)	3.4	NSD	NSD	NSD	NSD



Left: Effects of trinexapac-ethyl on alsike clover seed crop, Beaverlodge 2013

Right: Effects of trinexapac-ethyl on alsike clover seed crop, Girouxville 2014

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Table 6. Effects of growth regulator on alsike clover seed yields, percent of check

Treatment (kg ai/ha)	Guy 2013	Girouxville 2014	Guy 2015
0.140 Stem Elongation	-2	-10	+9
0.280 Stem Elongation	0	-28	+8
0.420 Stem Elongation	-3	-45	+11
0.210 Stem Elongation+0.210 Bud	-16	-57	+2
0.280 Bud	-17	-46	+5

Summary

- Plant height reduction by most treatments in every year
- Decreased lodging in wet year
- Trend for seed yield increase in 2015 only
- Significant decrease in seed weight and seed yield in dry (stressed) conditions of 2014
- No impact on germination
- No further small-scale trials planned but a field-scale trial may be warranted

References (A full list of resources will be available on the PRFSA website)

1) Anderson NP, Chastain TG, Garbacik CJ. 2015a. Irrigation and trinexapac-ethyl effects on seed yield in first- and second-year red clover stands. In Anderson N, Hulting A, Walenta D, Flowers M, Sullivan C, editors. 2014 Seed Production Research Report. Oregon State University: Ext/CrS 151.

2) Anderson NP, Chastain TG, Garbacik CJ, Silberstein TB. 2012. Effect of foliar applications of trinexapac-ethyl plant growth regulator on red clover seed crops. In Young III WC, editor. 2011 Seed Production Research Report. Oregon State University: Ext/CrS 136.

3) Anderson NP, Monks DP, Chastain TG, Rolston MP, Garbacik CJ, Chun-hui Ma, Bell CW. 2015b. Trinexapac-ethyl effects on red clover seed crops in diverse production environments. Agron. J. 107:951-956.

4) Chastain TG, Anderson NP, Garbacik CJ, Angsumalee D, Elias SG. 2014. Irrigation and trinexapac-ethyl effects on seed yield in a second-year red clover stand. In Anderson N, Hulting A, Walenta D, Flowers M, editors. 2013 Seed Production Research Report. Oregon State University: Ext/CrS 150.

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