Effect of trinexapac-ethyl plant growth regulator on seed yield of red clover grown in the Peace River region of Alberta, Canada.

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Introduction

Studies conducted in Oregon showed red clover seed crops to be responsive to applications of the foliar applied plant growth regulator trinexapac-ethyl (TE). Trials conducted in 2011 and 2012 in Oregon showed applications of TE applied at stem elongation to red clover improved seed yields by increasing inflorescence per m^{-2} through a reduction in plant canopy height. (Anderson, 2015). TE did reduce seed weights and promoted earlier maturity.

Trials were conducted from 2013 to 2015 in co-operation with SARDA and AAFC to evaluate the effects of TE on first year production red clover seed yields located in the Peace River Region of Alberta. In 2017, an additional trial was conducted to compare the applications of TE, CCC (chlormequat chloride) and TE+CCC on red clover seed yields applied at stem elongation stage.

Methods

Small plot trials were conducted on first production year red clover fields from 2013 to 2015. The experimental design was a randomized complete block design with four replications. Each plot was 2m x 40 m. Treatments were applied with a handheld 2 m boom small plot sprayer. Water volume was 100 l/ha. Treatments were a combination of TE rates and crop staging. TE rates were 0.140, 0.280 and 0.420 kg ai ha^{-1} and staging was stem elongation (BBCH scale 32), bud stage (BBCH scale 50) and a split application 0.210 kg ai ha^{-1} at both stages. Data collected included plant heights, flower counts, seed yields, germination and 1000 swt. Red clover was desiccated with Reglone and plots were straight cut with a Wintersteiger small plot combine. Area harvested was 64 m2. ANOVA was conducted and means separated by Student-Newmans-Keuls LSD values (P=0.05). An additional trial was conducted in 2017 comparing TE, TE+CCC and CCC applied at stem elongation on first year red clover.

Figure 1. Increase in flowering following the application of TE, Guy 2017.

Figure 2. Severe height and growth reduction following the application of 0.420 kg ai ha^{-1}, Girouxville 2014.

Figure 3. Harvesting red clover seed with SARDA small plot combine.

Figure 4. Ideal stand of red clover for applting TE.

Table 1. Effect of rate and timing of TE on red clover seed (Percent of Check).

Treatment (kg ai ha^{-1})	Beaverlodge 2013	Girouxville 2013	Girouxville 2014	Girouxville 2015	Guy 2017
0.140 Stem Elongation	127	118	100	103	140
0.280 Stem Elongation	110	120	70	104	136
0.420 Stem Elongation	138	114	64	109	
0.280 Bud		112	64	100	
0.210 Stem Elongation+ 0.210 Bud	117	114	79	103	
Check	100	100	100	100	100
Check Seed Yield (kg/ha)	151	417	53*	286	294

*Improper setting on combine

Table 2. Effect of rate and timing of TE, CCC and TE+CCC on red clover seed stand Guy, 2018

Treatment kg ai ha^{-1}	Height cm	Lodging 1-9*	Flower Counts 1/4 m^2	Seed Yield kg/ha	Germ. %	Seed Wt. g/1000
TE 0.140	87.2	1	272	412 a	75.0	1.800
TE 0.280	83.9	1	303	398 a	72.0	1.736
TE 0.140+ CCC 0.588	87.4	1	274	372 ab	71.0	1.768
CCC 1.116	89.2	1	264	304 b	75.8	1.758
Check	90.1	1	244	294 b	68.3	1.758
CV%	3.5		12.3	9.7	6.2	3.1
LSD P=.05	NSD		NSD	65	NSD	NSD

Means followed by the same letter do not significantly differ (P=.05 Student-Newmans-Keuls)

Results and Conclusions

- Plant heights were reduced in each TE treatment in each year (data not shown).
- Seed weight was reduced from the application of TE (data not shown).
- TE did not affect seed germination (data not shown).
- TE reduced lodging in wet years (data not shown).
- Seed yields were increased by the application of TE at 4 of the 5 sites (Table 1 and 2).
- Seed yields were reduced at the high rates of TE in 2014. Moisture conditions following application became extremely dry and the crop was stressed (Table 1).
- TE rate of 0.140 to 0.280 ai kg ha-1 appears sufficient to increase red clover seed yields.
- There was no benefit to using a split application of TE.
- Trial conducted in 2017 showed there was no response to using CCC alone or a benefit to tank mixing TE+CCC (Table 2).
- TE shows strong potential for use on red clover seed fields in the Peace River Region. Field scale trials should be conducted once TE becomes commercially available in Canada.

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