The Seed Head
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A three year comparative study of the plant growth regulator trinexapac-ethyl on creeping red fescue seed crops in the Peace River region

Lodging of creeping red fescue seed crop

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Introduction

Plant growth regulators, in particular trinexapac-ethyl (TE), are commonly used on grass seed crops in the main grass seed growing areas in the world. Studies have shown that TE will reduce the internode length on a grass seed plant which results in reduced plant heights, reductions in lodging and improved seed set and harvesting conditions which increase seed yields (Rolston *et al*, 2004; Chastain *et al*, 2014). On perennial ryegrass, TE was found to be effective at increasing seed yield when applied between BBCH stages 32 (2 node) and 51 (early heading) (Chastain *et al*, 2014). In Canada, TE is currently registered as Parlay™ for use on turf-type perennial ryegrass seed crops only. TE is expected to be registered in Canada on wheat crops in 2019.

Trials were conducted in 2015, 2016 and 2017 at the Agriculture and Agri-Food Canada Research Station at Beaverlodge to evaluate the effects of three rates of TE at two growth stages on creeping red fescue seed crops (Table 1). The study also examined the effects of additional spring applied liquid UAN (28-0-0) with and without one rate of TE.

Methods

Treatments were applied to a first year creeping red fescue stand in 2016 and second year stands in 2015 and 2017. Stands were fertilized with 70 kg/ha of nitrogen in the form of urea the previous fall. The treatments were arranged in a randomized complete block design with four replicates. Plot size was 2 x 10 m. UAN treatments were applied at a rate of 130 l/ha with a hand held plot sprayer and a 2 m boom with four stream jet nozzles. TE was applied with a hand held plot sprayer and 2 m boom with four 8001 TeeJet nozzles using a pressure of 270 kPa. Water volume was 100 l/ha. Application dates for UAN, TE and data collection are listed in Table 2.

Data collected from the trials included plant heights, visual lodging ratings, seed yields, germination and 1000 seed weight. A lodging rating of 10 indicates no lodging. Seed yield data was collected by harvesting 2 rows (30 cm row spacing) by the length of the plots. Area harvested was 6 m^2. The creeping red fescue was cut with a Japanese rice binder and placed in cotton bags. Samples were dried and later thrashed with a stationary thrasher. Seed samples were weighed and cleaned.

Table 1. TE and UAN treatments applied to creeping red fescue seed stands

Treatment	TE Rate Ai (kg/ha)	Growth Stage	Nitrogen as UAN
1	0.200	2 node	-
2	0.300	2 node	-
3	0.400	2 node	-
4	0.200	heading	-
5	0.300	heading	-
6	0.400	heading	-
7	0.300 + UAN	2 node	35 kg/ha
8	0.300 + UAN	heading	35 kg/ha
9	UAN		35 kg/ha
10	Check	-	

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Table 2. Treatment application, measurement and harvest dates for creeping red fescue seed stands

Stand	UAN	TE 2-node	TE heading	Lodging rating	Plant height	Harvest
2015 2nd year	May 8	May 21	June 1	June 25	July 14	July 22
2016 1st year	April 15	May 10	May 26	July 18	July 5	July 28
2017 2nd year	May 5	May 30	June 8	July 7	-	July 26

Table 3. Growing season precipitation (inches), Beaverlodge

	2015	2016	2017	30 Year Long-term average
May	1.2	2.6	2.9	1.6
June	3.6	4.5	4.4	2.5
July	5.8	2.3	1.4	2.8
August	1.9	8.5	1.4	2.3
September	0.8	1.1	0.0	1.7
October	1.1	1.5	1.3	1.0
Total	14.4	20.5	11.4	11.9

Results

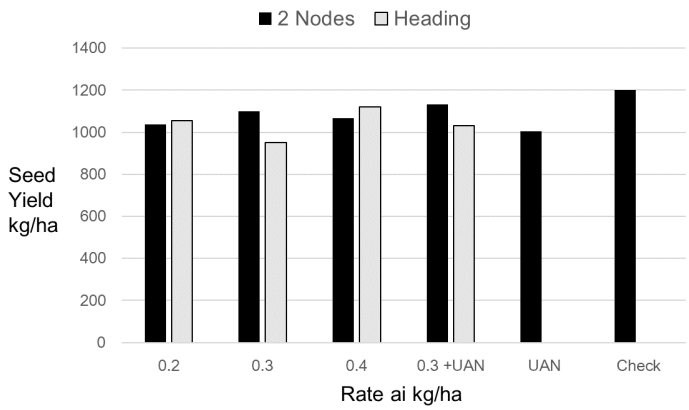
Growing season precipitation was above average in the first two years of the study (Table 3). The application of TE to creeping red fescue showed a trend to reduce plant heights, particularly at the early heading stage (Tables 4 and 5). Lodging in creeping red fescue was only an issue in 2016. The application of TE did not improve lodging in that trial.

There was not a statistically significant difference in seed yield following the application of TE over the check and spring UAN-alone treatments in 2015 and 2016; however, there was a trend for TE to improve seed yields when compared to the check and spring UAN-alone treatments in the 2017 trial (Figures 1 and 2).

Spring UAN-alone did not improve seed yields over the check and may have caused some yield reductions.

The application of TE did not have any effects on seed germination or 1000 seed weight.

Figure 1. Effect of trinexapac-ethyl on a first year stand of creeping red fescue seed crop Beaverlodge, 2016



Effects of TE on second year creeping red fescue seed crop, 2015

Table 4. Effect of trinexapac-ethyl on a first year stand of creeping red fescue seed crop

	2016 results				
Treatment	Plant Height (cm)	Lodging (0-10)	Seed Yield (kg/ha)	Germination (%)	1000 swt (g)
0.200 at 2 nodes	76.8 ab	7.0	1037	92.3	1.257
0.300 at 2 nodes	77.0 ab	7.0	1101	93.3	1.256
0.400 at 2 nodes	74.8 ab	7.0	1067	93.0	1.299
0.200 at heading	74.3 ab	7.0	1055	88.3	-
0.300 at heading	74.0 ab	7.0	950	90.0	1.312
0.400 at heading	72.0 b	7.0	1120	89.5	1.279
0.300 at 2 nodes + UAN	72.8 b	7.0	1134	90.8	1.269
0.300 at heading + UAN	74.0 ab	7.0	1031	94.3	1.319
UAN	79.8 a	7.0	1006	90.3	1.234
Check	76.8 ab	7.0	1202	93.8	1.272
CV%	3.6	-	24.3	4.5	4.6
LSD (p=0.05)	3.8	-	NSD	NSD	NSD

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

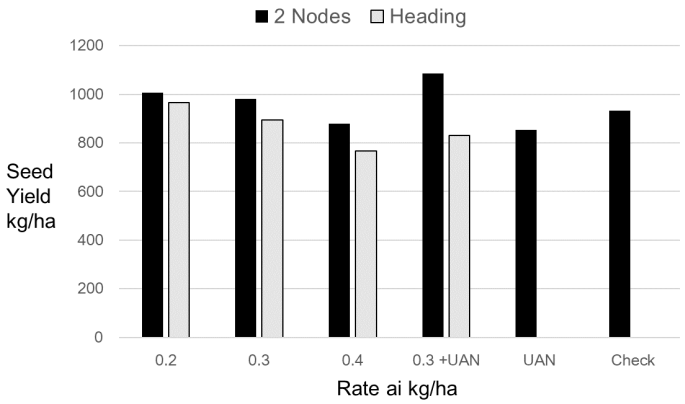
Table 5. Effect of trinexapac-ethyl on second year stands of creeping red fescue seed crop

	2015 results					2017 results				
Treatment	Plant Height (cm)	Lodg-ing (0-10)	Seed Yield (kg/ha)	Germi-nation (%)	1000 swt (g)	Plant Height (cm)	Lodg-ing (0-10)	Seed Yield (kg/ha)	Germi-nation (%)	1000 swt (g)
0.200 at 2 nodes	73	10	1008	94.5	1.202	NM	10	365	97.3	1.391
0.300 at 2 nodes	73	10	980	93.3	1.165	NM	10	270	97.3	1.371
0.400 at 2 nodes	74	10	879	87.0	1.098	NM	10	320	97.0	1.395
0.200 at heading	72	10	967	92.0	1.143	NM	10	301	97.8	1.419
0.300 at heading	66	10	895	89.5	1.116	NM	10	317	98.8	1.419
0.400 at heading	63	10	768	92.3	1.123	NM	10	398	97.8	1.400
0.300 at 2 nodes + UAN	68	10	1086	95.0	1.215	NM	10	216	98.3	1.429
0.300 at heading + UAN	71	10	832	94.5	1.226	NM	10	239	99.5	1.429
UAN	76	10	853	90.0	1.137	NM	10	51	98.8	1.390
Check	71	10	934	93.5	1.185	NM	10	208	99.0	1.359
CV%	7.9	-	14.8	5.7	5.8	-	-	52.1	1.4	3.3
LSD (p=0.05)	NSD	-	NSD	NSD	NSD	-	-	NSD	NSD	NSD

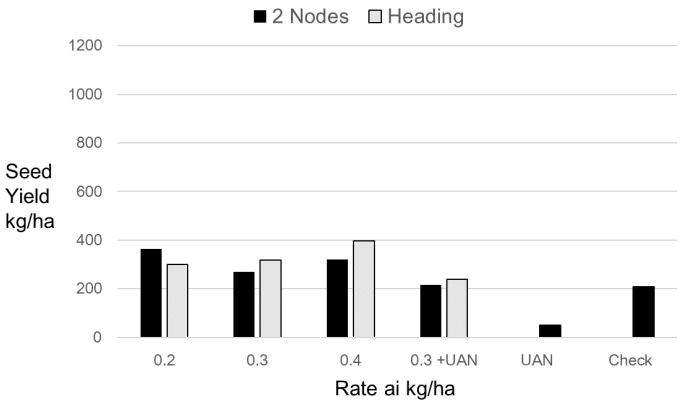
CV - coefficient of variance; LSD - least significant difference; NM - not measured; NSD - not significantly different

Figure 2. Effect of trinexapac-ethyl on second year stands of creeping red fescue seed crop

Beaverlodge, 2015



Beaverlodge, 2017



Summary

- The application of TE to creeping red fescue seed stands was generally not effective. Two of the three trials were conducted on 2nd year stands where lodging was not an issue and yield potential is generally low.
- There was a slight trend for TE to reduce plant height over the check and UAN treatments, particularly when applied at the early heading stage.
- No seed yield response to spring UAN-alone. In all trials, seed yields were lower than the check where UAN was applied alone.
- TE did not have any effects on germination or 1000 seed weight.
- Further data should be collected on the impact of TE on creeping red fescue seed stands in the Peace River region. TE is commonly used on creeping red fescue in Oregon and Denmark.
- TE should also be tested on several creeping red fescue varieties including Boreal, Oracle and a U.S. variety that shows potential in Canada.

References

Rolston, M.P., McCloy, B.L. & Pyke, NB. 2004. Grass seed yields increased with plant growth regulators and fungicides. *Proceedings of the New Zealand Grassland Association 66*:127-132.

Chastain, T.G., Young III, W.G., Silberstein, T.B. & Garbacik, C.J. 2014. *Performance of trinexapac-ethyl on seed yield of* Lolium perenne *in diverse lodging environments.* Field Crops Research. 157:65-70.

Harvesting creeping red fescue trial

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