The Seed Head
Fact sheet # 20

Date:
December, 2018

A three year comparative study of the plant growth regulator trinexapac-ethyl on meadow bromegrass seed crops in the Peace River region

Lodging in meadow bromegrass seed crop

For more information:

Talon 1-877-630-2198
coordinator@peaceforageseed.ca

Calvin (780) 864-3879
Calvin.Yoder@gov.ab.ca

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 meadow bromegrass 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 first year meadow bromegrass stands in 2015 and 2016 and second year stands in 2016 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 meadow bromegrass 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 meadow bromegrass 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	-	

The Seed Head
is published by the
Peace Region Forage Seed Association
more Seed Head fact sheets available soon on our website
www.peaceforageseed.ca

Table 2. Treatment application, measurement and harvest dates for meadow bromegrass seed stands

Stand	UAN	TE 2-node	TE heading	Lodging rating	Plant height	Harvest
2015 1st year	May 8	May 19	June 1	June 25	July 3	July 22
2016 1st year	April 15	May 6	June 26	July 18 Aug 2	July 6	Aug 2
2016 2nd year	April 15	May 18	June 1	July 18 Aug 2	June 28	Aug 4
2017 2nd year	May 5	May 30	June 8	June 28 July 27	-	Aug 3

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 meadow bromegrass reduced plant heights and lodging over the check and UAN treatments in all trials where plant heights were recorded and where lodging was an issue (Tables 4 and 5). There were differences between the two stages of application but this varied between sites.

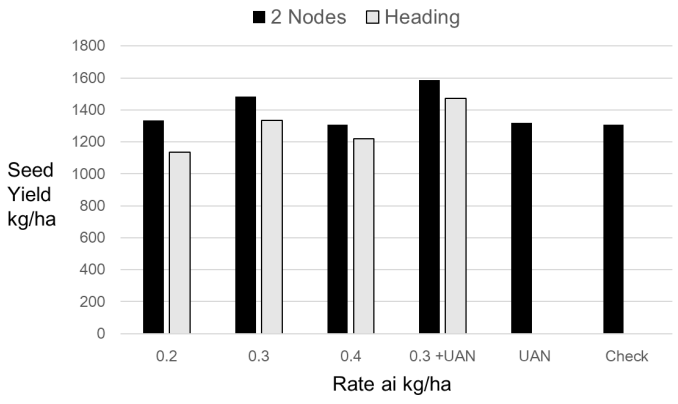
The stands used in 2016 and 2017 were quite variable and as a result seed yield data was also highly variable (Figures 1 and 2). Although not statistically significant, there was a trend for higher seed yields following the application of TE at the 2 node stage when compared to the check and UAN treatments, particularly on first year stands. There was no seed yield benefit from using the highest rate of TE over the two lower rates.

Spring UAN-alone did not improve seed yields over the check and may have caused some yield reductions. There was a trend for TE+UAN treatments to be the higher yielding treatments each year, particularly when TE was applied at the 2 node stage. There was also a very strong trend for higher seed yields when TE was applied with UAN over UAN-alone.

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

Figure 1. Effect of trinexapac-ethyl on first year stands of meadow bromegrass seed crop

Beaverlodge, 2015



Beaverlodge, 2016

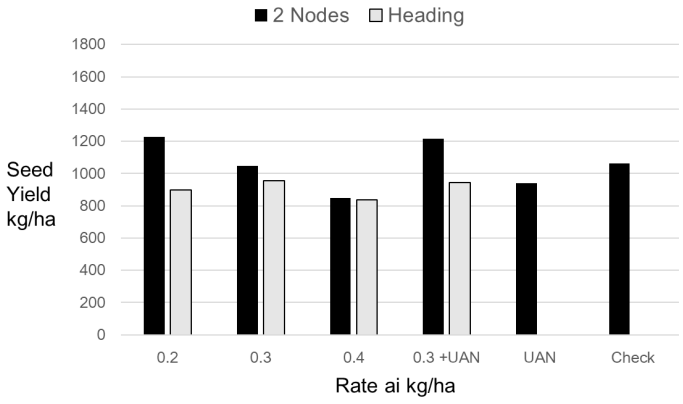


Table 4. Effect of trinexapac-ethyl on first year stands of meadow bromegrass seed crop

	2015 results					2016 results				
Treatment	Plant Height (cm)	Lodging (0-10)	Seed Yield (kg/ha)	Germination (%)	1000 swt (g)	Plant Height (cm)	Lodging* (0-10)	Seed Yield (kg/ha)	Germination (%)	1000 swt (g)
0.200 at 2 nodes	138 ab	10 a	1336	92.5	5.376	125 ab	10/10	1228	46.3	6.055
0.300 at 2 nodes	135 ab	10 a	1484	93.5	5.279	123 ab	10/10	1046	48.5	5.869
0.400 at 2 nodes	122 b	10 a	1308	95.0	5.046	114 ab	10/10	847	47.5	5.989
0.200 at heading	136 ab	10 a	1136	91.0	5.561	122 ab	10/10	896	48.5	6.016
0.300 at heading	128 ab	10 a	1333	95.5	5.414	115 bc	10/10	954	48.8	6.146
0.400 at heading	128 ab	10 a	1218	94.0	5.485	114 bc	10/10	838	47.8	5.874
0.300 at 2 nodes + UAN	133 ab	10 a	1588	92.5	5.370	122 ab	10/10	1217	48.3	6.089
0.300 at heading + UAN	143 a	10 a	1472	92.5	5.605	105 c	10/10	943	49.0	6.137
UAN	140 a	5.3 b	1320	93.0	5.501	127 a	8/8	940	47.0	5.896
Check	141 a	5.5 b	1308	92.0	5.393	130 a	7/8	1063	47.5	5.875
CV%	5.2	3.1	13.6	4.5	2.8	4.5	-	3.4	1.7	2.5
LSD (p=0.05)	10.0	0.49	NSD	NSD	NSD	7.8	-	NSD	NSD	NSD

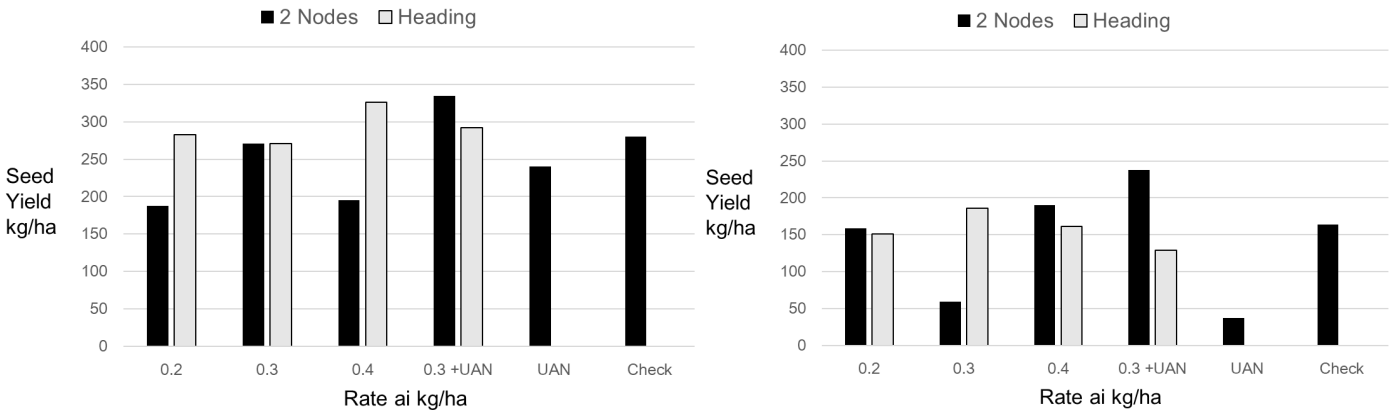
CV - coefficient of variance; LSD - least significant difference; NSD - not significantly different
a, b, c - results followed by the same letter do not significantly differ (p=0.05, Student-Newman-Keuls)
** Visual lodging ratings undertaken on two separate dates (rating from first date/rating from second date). See Table 2 for more information.*

Table 5. Effect of trinexapac-ethyl on second year stands of meadow bromegrass seed crop

	2016 results					2017 results				
Treatment	Plant Height (cm)	Lodging* (0-10)	Seed Yield (kg/ha)	Germination (%)	1000 swt (g)	Plant Height (cm)	Lodging* (0-10)	Seed Yield (kg/ha)	Germination (%)	1000 swt (g)
0.200 at 2 nodes	117 bc	10 a	188	46.3	5.356	NM	10	159 a	97.5	0.420
0.300 at 2 nodes	116 bc	10 a	271	45.3	5.044	NM	10	59 ab	98.5	0.429
0.400 at 2 nodes	102 bc	10 a	195	46.8	5.146	NM	10	190 a	97.0	0.418
0.200 at heading	105 cd	10 a	263	47.0	5.112	NM	10	151 a	99.5	0.422
0.300 at heading	97 d	10 a	271	44.8	5.112	NM	10	186 a	99.0	0.426
0.400 at heading	106 cd	10 a	326	43.0	5.077	NM	10	161 a	96.8	0.437
0.300 at 2 nodes + UAN	120 ab	9 a	335	44.8	5.215	NM	10	238 a	96.8	0.438
0.300 at heading + UAN	102 cd	10 a	292	46.5	5.110	NM	10	129 a	99.0	0.439
UAN	129 ab	6.0 b	240	46.8	5.267	NM	10	37 b	98.5	0.427
Check	132 a	6.8 b	280	45.8	5.335	NM	10	164 a	99.3	0.408
CV%	8.5	- /8.5	6.7	4.6	3.9	-	-	11.8	1.9	3.7
LSD (p=0.05)	10.4	- /1.1	NSD	NSD	NSD	-	-	50.1-135.4	NSD	NSD

CV - coefficient of variance; LSD - least significant difference; NM - not measured; NSD - not significantly different
a, b, c, d - results followed by the same letter do not significantly differ (p=0.05, Student-Newman-Keuls)
** Visual lodging ratings undertaken on two separate dates. See Table 2 for more information. Results from first rating not shown (no lodging noted).*

Figure 2. Effect of trinexapac-ethyl on second year stands of meadow bromegrass seed crop



Summary

- Plant heights and lodging were reduced with TE in all trials where plant heights were recorded and where lodging was an issue.
- The stands in two of the four trials were variable, therefore seed yield data was highly variable. TE did not significantly increase seed yields over the check or UAN treatments. TE+UAN appeared to be one of the higher yielding treatments each year.
- TE appeared to be more effective on first year stands than second year stands.
- No seed yield response to spring UAN-alone. In some cases, seed yields were lower than the check where UAN was applied alone. There was a trend for TE to improve seed yields when applied with UAN over UAN-alone.
- TE did not have any effects on germination or 1000 seed weight.
- TE shows potential for use on meadow brome-grass, particularly in terms of reducing plant height and keeping the crop standing. Further data should be collected, particularly in years where stands are subject to stress conditions.

Effects of TE on first year meadow bromegrass seed crop, 2015

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.

Compiled & Circulated by: Calvin Yoder, Nitya Kahnal, Rahman Azooz, Pat Gansevles, Talon Gauthier and Shelley Kirk in June 2018.

Funded by: all the forage seed levy paying growers in Alberta and British Columbia and matching funds from the AgriInnovation Program administered by AAFC.