The Seed Head
Fact sheet # 22

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A comparative study of application timing, sources and rates of nitrogen on creeping red fescue stands in the Peace River region

Nitrogen application in Valhalla, early September 2013

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Related factsheets:

The Seed Head Factsheet #2: *Nitrogen on creeping red fescue seed: a review of Peace Region trials (Yoder, Fairey and Burton 2011)*

Introduction

Nitrogen fertilizer applications to creeping red fescue fields are necessary to improve seed yields. While there is some flexibility in application timing, late fall or early spring fertilizer applications produce more consistent yield results (Yoder 2000). Within the Peace River region there have been a number of studies that have looked at either the timing, rate and/or source of nitrogen and its effect on creeping red fescue seed yield (Yoder, Fairey & Burton 2011). However, no study within the region has looked specifically at all three factors with respect to early and late fall applications.

On farm trials were conducted from 2014 to 2016 to evaluate the response of creeping red fescue to different timings, rates and forms of nitrogen application. Urea (U), Agrotain®-treated urea (U+Agr), ESN® polymer-coated urea (ESN) and a blend of U+ESN were broadcast at 65 and 100 kg N ha^{-1} in early-September and late-October.

Table 1. Creeping red fescue fertilizer treatment information

Fertilizer type	Rates (kg N/ha)	Timing (early/late fall)	Treatment label
Urea	65 100	Both rates early and late	U-E65; U-L65 U-E100; U-L100
Urea+Agrotain	65 100	Both rates early and late	U+Agr-E65; U+Agr-L65 U+Agr-E100; U+Agr-L100
Urea+ESN	65 100	Both rates early and late	U+ESN-E65; U+ESN-L65 U+ESN-E100; U+ESN-L100
ESN	65 100	Both rates early only	ESN-E65 ESN-E100
Check	-	-	Check

Methods

Trials were conducted on uniform creeping red fescue seed fields that had been rejuvenated the previous year. Treatments were arranged in a randomized complete block design with four replications. Plot size was 1.2 m x 10 m. Soil tests were taken prior to fertilizer application. Fertilizer treatments were applied with a Hege fertilizer spreader (pictured above). Table 1 lists each treatment.

Creeping red fescue plots were harvested using a Japanese rice binder. Area harvested was 6 m^2. Samples were cut and placed in cotton bags and air dried. Samples were thrashed later in the winter. Data collected included seed yields, dry matter yields, 1000 seed weights and germination. Timing of fertilizer application and harvest dates are shown in Table 2.

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Table 2. Nitrogen application and harvest information for creeping red fescue stands

Site and Year	Early Application Date	Late Application Date	Harvest Date
Valhalla 2013/14 1st year	September 2nd, 2013	October 20th, 2013	July 21st, 2014
Valhalla 2014/15 1st year	September 10th, 2014	October 31st, 2014	July 15th, 2015
Valhalla 2015/16 2nd year	September 11th, 2015	October 28th, 2015	July 25th, 2016

Results

First Year Stands (Valhalla 2013/14 and 2014/15)

Overall: All treatments improved seed yields over the check at the Valhalla 2013/14 site. There were no significant differences in seed yield among the actual fertilizer treatments. Seed yield data collected from the Valhalla 2014/15 site showed no statistically significant differences in seed yield among the treatments including the check. None of the treatments at either location had any effects on germination or 1000 seed weight (Table 3 and Figure 1).

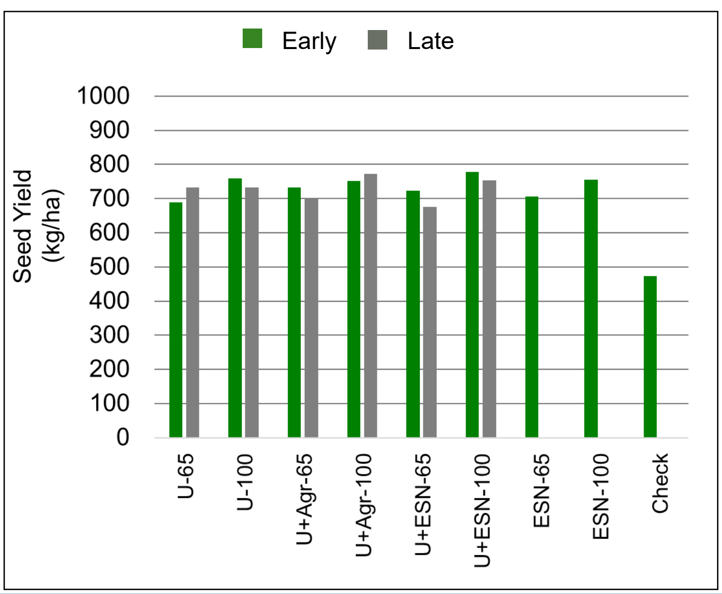
Timing: There were no statistical differences between early and late fall nitrogen fertilizer applications to first year stands.

Sources: There were no statistical differences among the different sources of nitrogen; however, early application of U+ESN or ESN-alone at 100 kg N ha^{-1} showed a slight trend for higher seed yields.

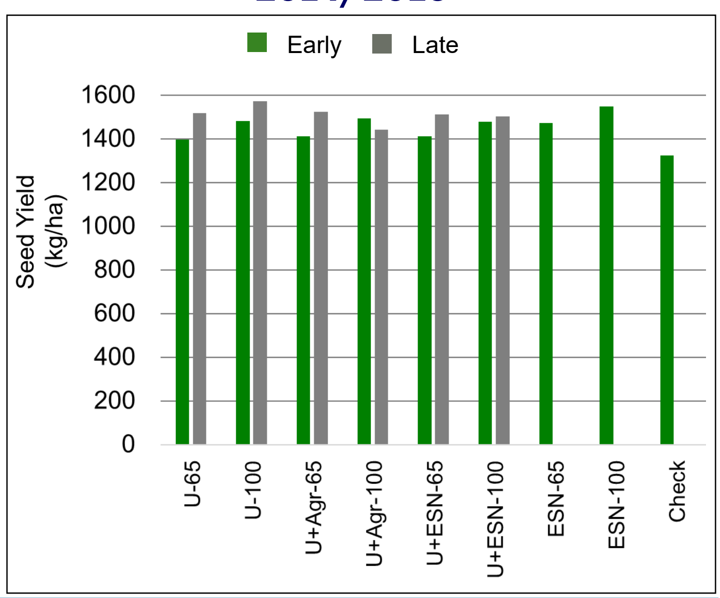
Rates: There was a slight trend for increased seed yields with the 100 kg N ha^{-1} treatments when compared to the corresponding 65 kg N ha^{-1} treatments on first year stands.

Figure 1. Effect of timing, source and rate of nitrogen application on seed yield (kg/ha) of creeping red fescue crop (first year stands)

2013/2014



2014/2015



Results (cont'd)

Second year stand (Valhalla 2015/16)

All fertilizer treatments improved seed yields over the check. Early nitrogen fertilizer applications increased seed yields over late fall applications. Seed yields were also higher with the early application of 100 kg N ha^{-1} as compared to early applications of 65 kg N ha^{-1} (Table 4 and Figure 2). There were no significant differences in seed yield among the different sources of nitrogen regardless of timing. There were no significant differences in seed yield between the two rates of N at the late fall application. None of the treatments had any effects on germination or 1000 seed weight.

Table 3. Effect of timing, source and rate of nitrogen application on creeping red fescue crop (first year stands)

2013/2014

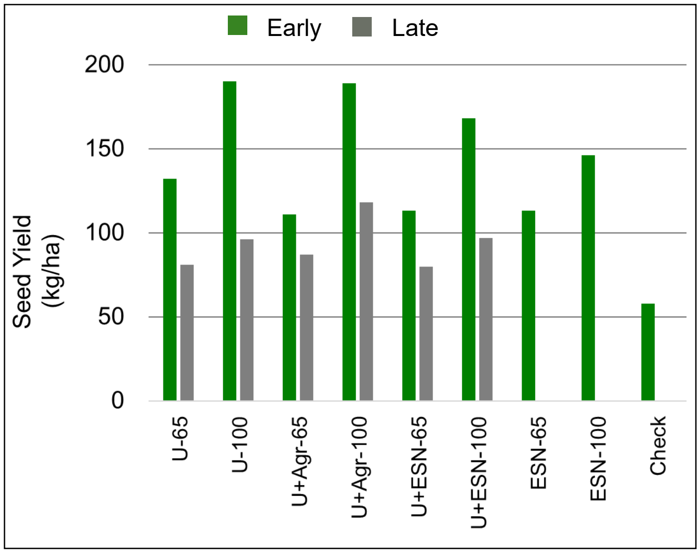
Treatment	2014 Seed Yield (kg/ha)	DM Yield (kg/ha)	Germination (%)	1000 SWT (g)
Check	473 a	2408 a	97.1	1.163
U-E65	689 b	3727 b	97.4	1.136
U-L65	733 b	3866 b	96.8	1.202
U-E100	759 b	3843 b	97.6	1.16
U-L100	732 b	3843 b	95.4	1.173
U+Agr-E65	732 b	3635 b	96.4	1.139
U+Agr-L65	700 b	3797 b	99.1	1.158
U+Agr-E100	752 b	3750 b	98.2	1.158
U+Agr-L100	773 b	3843 b	97.7	1.191
U+ESN-E65	723 b	3635 b	98.2	1.145
U+ESN-L65	676 b	3635 b	96.4	1.195
U+ESN-E100	778 b	3959 b	97.6	1.148
U+ESN-L100	754 b	3843 b	97.5	1.179
ESN-E65	707 b	3264 b	97.2	1.155
ESN-E100	755 b	3797 b	97.8	1.147
LSD P =.05	100	432	NSD	NSD
CV %	9.9	8.3	2.9	2.4

2014/2015

Treatment	2015 Seed Yield (kg/ha)	DM Yield (kg/ha)	Germination (%)	1000 SWT (g)
Check	1323	4288	98.2	1.211
U-E65	1396	4535	98.6	1.217
U-L65	1518	4967	98	1.188
U-E100	1482	4874	98.5	1.205
U-L100	1573	4813	99.7	1.182
U+Agr-E65	1413	4597	98	1.186
U+Agr-L65	1524	4905	98.9	1.206
U+Agr-E100	1493	4998	98.8	1.214
U+Agr-L100	1443	4720	98.3	1.188
U+ESN-E65	1412	4566	97.4	1.202
U+ESN-L65	1513	4967	97.4	1.19
U+ESN-E100	1480	4782	99.3	1.196
U+ESN-L100	1503	4813	97.3	1.205
ESN-E65	1474	4720	99.3	1.192
ESN-E100	1549	5029	99.3	1.219
LSD P =.05	NSD	NSD	NSD	NSD
CV %	6.6	6.3	5.1	2.1

DM - dry matter; 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)

Figure 2. Effect of timing, source and rate of nitrogen application on seed yield (kg/ha) of creeping red fescue crop (second year stand) 2015/2016



Summary

- No benefit to early September nitrogen application on first year stands.
- No noticeable differences among the different sources of nitrogen regardless of timing.
- Slight yield increase with 100 kg N ha^{-1} treatments compared to corresponding 65 kg N ha^{-1} treatments on first year stands.
- Strong yield increase with early September application on second year stand when compared to late October application.
- Increased seed yields with 100 kg N ha^{-1} application compared to 65 kg N ha^{-1} application on second year stand with early September application; therefore, second year crop may benefit from early September application but may need to consider increased nitrogen application.
- Window for nitrogen application in the fall is wider than previously thought.
- Only three trials completed; recommend further investigation regarding early September application of nitrogen on second year stand to generate longer-term data.

Table 4. Effect of timing, source and rate of nitrogen application on creeping red fescue crop (second year stand) 2015/2016

Treatment	2016 Seed Yield (kg/ha)	DM Yield (kg/ha)	Germination (%)	1000 SWT (g)
Check	58 c	938 e	88.8	1.251
U-E65	132 abc	2266 cd	87.5	1.189
U-L65	81 bc	2214 cd	88.5	1.159
U-E100	190 a	3386 ab	82.5	1.162
U-L100	96 bc	2110 cd	91.0	1.201
U+Agr-E65	111 abc	2396 cd	84.3	1.109
U+Agr-L65	87 bc	2005 cd	88.3	1.164
U+Agr-E100	189 a	3568 a	88.5	1.217
U+Agr-L100	118 abc	2500 cd	84.5	1.173
U+ESN-E65	113 abc	2083 cd	85.8	1.119
U+ESN-L65	80 bc	1682 d	93.8	1.278
U+ESN-E100	188 ab	2735 bc	91.3	1.233
U+ESN-L100	97 bc	2344 cd	92.3	1.217
ESN-E65	113 abc	1875 cd	94.5	1.207
ESN-E100	146 ab	2917 abc	91.5	1.196
LSD P =.05	41.2	612	8.1	0.11
CV %	15.1	18.3	6.4	6.5

DM - dry matter; CV - coefficient of variance; LSD - least significant difference
a, b, c, d, e - results followed by the same letter do not significantly differ (p=0.05, Student-Newman-Keuls)

References

Yoder, C. 2000. *Creeping red fescue seed production in the Peace River region.* Agrifax, Alberta Agriculture, Food & Rural Development. Agdex127:15-1.

Yoder, C., Fairey, N. & Burton, S. 2011. *Nitrogen on creeping red fescue seed: a review of Peace Region trials .* The Seed Head Factsheet #2. Peace Region Forage Seed Association.

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