The Seed Head
Factsheet # 2

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Nitrogen on Creeping Red Fescue Seed: A Review of Peace Region Trials

" The best time to apply nitrogen fertilizer to a creeping red fescue seed stand is in the fall prior to freeze-up."
C.R. Elliott, 1967
Beaverlodge, AB

" The optimum amount of N varies depending on the degree of sodding evident, the amount of soil N, soil moisture, size of the previous crop and expected seed prices."
J.L. Dobb, 1991
Dawson Creek, BC

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Effects of Timing and Rates of Nitrogen on Creeping Red Fescue Seed Yields - Review of Trials Conducted in the Peace River Region

Introduction

Creeping red fescue seed crops require nitrogen fertilizer for optimum seed yields. It is a unique crop in that there are many factors that will affect the response of creeping red fescue seed crops to nitrogen fertilizer. When making decisions on fertilizing creeping red fescue, factors to consider include:

1. Previous crop stubble
2. Soil test nitrogen (N)
3. Age of stand and size of plants
4. Timing of N fertilizer application
5. Fall moisture conditions
6. Method of application and source of nitrogen fertilizer
7. Yield of previous fescue crop
8. Price of nitrogen fertilizer and price of fescue.

This factsheet reviews research conducted in the Peace Region on timing and rates of nitrogen (N) fertilizer applications to optimize creeping red fescue seed yields.

Figure 1: Floral initiation showing spikelets in creeping red fescue in late April.

Floral Induction and Initiation

A creeping red fescue plant will go through several stages of development prior to setting seed. Initially, after the seed germinates, there is a vegetative or juvenile stage during which the growing points of grass develop with leaves, roots and tillers. These growing points grow vegetatively during the spring and summer. In the fall or early winter the growing point, after producing several leaves, undergoes chemical change (induction) in preparation for flowering. In response to lower temperatures and shorter days, a tiller is induced to undergo a chemical change and become reproductive. Induction of creeping red fescue is completed in late autumn but only in those tillers with one full season of uninhibited growth. Because of this, spring seedings made without a cover crop usually produce seed the following year, while those sown with a cover crop or seeded mid-summer do not (Elliott, 1967). Many factors affect this induction process, including plant age, nitrogen fertility, planting date, date of tiller formation, clipping or grazing, stage of plant development, plant spacing, temperature and daylength.

Floral initiation is the morphological transformation of the growing point from vegetative to reproductive parts. Initiation of creeping red fescue occurs in the spring shortly after spring thaw, which is five to ten days earlier than most other grasses. The plant requires a period of longer days and lower temperatures for floral initiation. If spring temperatures rise too rapidly in relation to lengthening daylight, floral initiation does not take place (Elliott, 1967). Following floral initiation a seed head will begin to develop.

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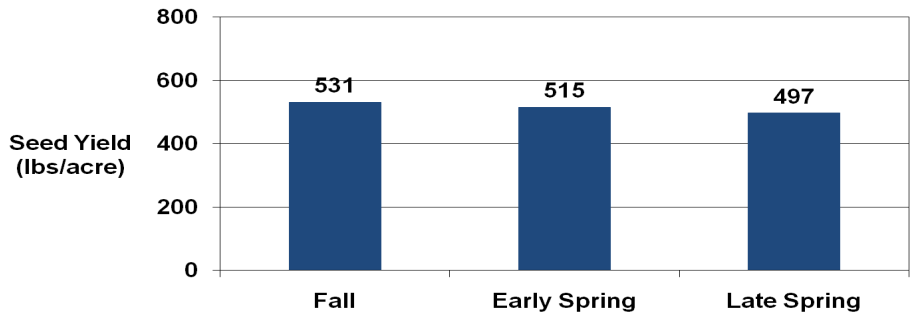
Timing of N Application

A creeping red fescue seed crop has specific requirements for when N fertilizer is required. Results from early research showed N should be applied in mid-Oct prior to freeze up and prior to the plant going through the induction phase. In the late 1950s', Dr. Elliott with AAFC conducted a study over a 4 year period in which N was applied at 14 different dates to a creeping red fescue seed stand. Six treatments were applied in the fall with dates ranging from Aug 15th- Oct 27th and 8 treatments in the spring ranging from May 8th – May 22nd. 34 lb/ac of N in the form of ammonium-nitrate was applied on each date. 1st year stands which were established on summer fallow did not respond to N fertilizer.

Fall N applications increased the number of seed heads, while late fall or early spring applications increased the number of seeds per head. The most effective treatment was when fertilizer was applied on Oct 27th which increased both the number of heads and the number of seeds/head. N fertilizer applied in the spring is too late to increase the number of seed heads but did increase the number of seeds/head by 30%. It may almost double the seed weight following N applications made prior to heading. Dr. Elliott concluded the best time to apply N fertilizer to a creeping red fescue seed stand is in the fall prior to freeze-up. This also ensures nutrients will be available to the plant for early spring growth. Data collected in Oregon indicates that tall fescue and perennial ryegrass seed crops require high levels of N between the stages of stem elongation and head emergence. After head emergence N application did not increase yield or crop N uptake (Sullivan, 1999).

Figure 2: Effects of timing of nitrogen fertilizer on red fescue (applied at 62 lb/ac, average of 6 sites, Fairey, 1990-1994).



Timing of N *cont'd*

Nigel Fairey conducted trials on fescue fields near Beaverlodge comparing 3 different dates of broadcast N application on creeping red fescue seed yields (Fairey, 2000). 62 lb/ac of N was applied at 3 different times:

1. in the fall (just prior to freeze-up in early to mid Oct)
2. early spring (after snow melt but before green-up in late March to mid Apr)
3. late spring (mid Apr to early May).

There were no significant differences in yield among the times of application although there was a slight trend for lower yields as the fertilizer application was delayed from late fall to late spring (Figure 2). It was found that applications of N made prior to spring growth was sufficient to maximize creeping red fescue seed yields which is most readily accommodated by applying N in Oct. The results support the traditional recommendation of applying fertilizer in Oct but also indicated that growers of creeping red fescue for seed have considerable flexibility in the method and timing of N application, provided it is applied before the commencement of vigorous plant growth in the spring (Fairey, 2000).

Forms of Nitrogen (N)

Calvin Yoder conducted one trial in 2007 to examine the effects of 4 different N fertilizer sources applied early and late spring on creeping red fescue seed yields. The trial was conducted on a 2nd year creeping red fescue stand. The 1st production year was 2006 and the fescue seed yield averaged 600 lb/ac. Soil tests taken in the spring of 2007 showed less than 2 lb/ac of N. Nitrogen was broadcast at a rate of 40 lb/ac in the form of ammonium-nitrate, urea+ Agrotain, urea and ESN. The early spring application was May 1st when the fescue was beginning to green up. The late spring application was on May 26th when the fescue was in the stem elongation phase.

All treatments, with the exception of ESN, increased seed yields of creeping red fescue over the check (Table 1). There were no differences in seed yield among the sources of N or the timing of the spring applications. The increase in seed yield from the nitrogen fertilizer treatments was approximately 100 lb/ac. The late spring applications did appear to increase the red fescue seed weight as compared to the early spring applications.

Table 1: Creeping red fescue yields and quality with various forms of N and different timing in spring.

N Sources	Timing	Yield lb/ac	1000 kwt g
Ammonium nitrate	early	406 a	1.22 c
	late	376 a	1.31abc
Urea	early	396 a	1.22 c
	late	391 a	1.31 ab
Urea+ Agrotain	early	395 a	1.24 bc
	late	419 a	1.32 a
ESN	early	285 b	1.26abc
Check		307 b	1.22 c
CV %		11.9	3.3

Methods of Fertilizing N

Nigel Fairey conducted a study from 1994 to 1996 to evaluate the effects of shallow rotary cultivation with vertical tines and 3 different timings of N fertilizer on 2nd and third year seed crops of creeping red fescue. At 4 sites, rotary cultivation treatments (none, low, medium & high tine rotary speed) and 62 lb/ac of N fertilizer applied at 3 different times (early fall, late fall and early fall+late fall) to fescue stands after the 1st crop was harvested. There was no consistent response in seed yields to the different timings of N applications among the 4 site years on both 2nd and 3rd years harvest years. The results from this trial are a further indication of the insensitivity of the reproductive growth of creeping red fescue in the Peace Region to different strategies of N application (Fairey, 2002).

In subsequent creeping red fescue seed N fertility study, splitting the application of N in late fall and early spring did not enhance seed yield over fall only applications (Fairey, 2006).

Rates of Nitrogen (N)

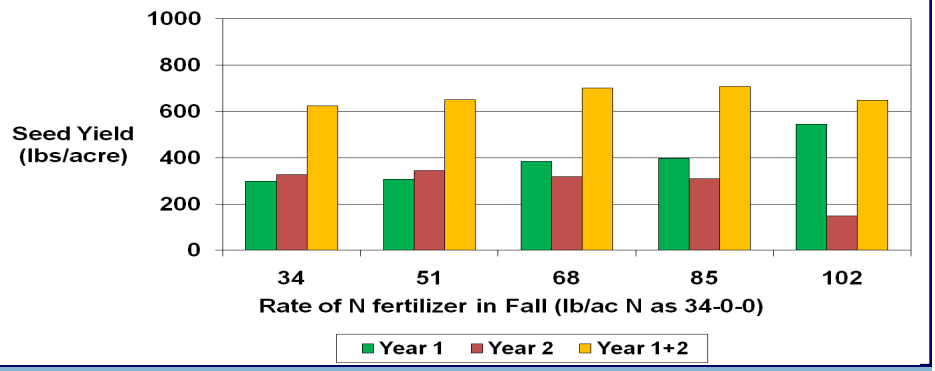
Early studies at Beaverlodge showed creeping red fescue seeded alone in the spring on summerfallow, seldom required N for the 1st seed crop. N is required for subsequent crops or for crops that are seeded alone on crop stubble (Dobb, 1991). If seeded with a companion crop there is no seed crop produced the following year regardless of N fertilizer as the companion crop retards the development of the grass plant and prevents floral induction in the fall of the year of seeding (Elliott and Hennig, 1974). N should be applied in the fall of the year prior to the 1st seed crop.

Elliott summarized that between 30 and 60 lb/ac of N are generally sufficient, but some growers are applying up to 90 lb/ac of N and obtaining good returns (Elliott and Hennig, 1974). The amount actually applied in this range would vary depending on degree of sodding evident, the amount of soil N, soil moisture conditions, size of the previous crop and expected seed prices (Dobb, 1991). Usually, a smaller seed crop can be expected the year following a large crop is harvested. Sod bound stands do not benefit from normal rates of N, particularly when seed yields were high the previous year (Elliott and Hennig, 1974).

Nigel Fairey examined the effects of 10 different fertilizer treatments on 1st and 2nd year creeping red fescue seed crops. Five rates of the N were applied in Oct (34, 51, 68, 85 or 102 lb/ac) while the other five treatments supplied equivalent amounts of N but with 50-80% applied in Oct and the remainder the following Apr of the seed production year (fall+spring lb/ac N being 34+17, 34+34, 51+34, 68+17, and 68+34). (Fairey 2006). Fertilizer was broadcast in the form of ammonium-nitrate. Fertilizer was applied in the fall of 1998 and spring of 1999 and the 1st seed crop harvested in 1999. The same treatments were applied to the same areas in the fall of 1999 and spring of 2000 to support the growth of the 2nd seed crop. The environmental conditions were drier and cooler than normal during the study.

Fall and spring split applications did not increase seed yields over the N applied in the fall. In the 1st production year seed yields increased linearly from 298 to 550 lb/ac as the N rate increased from 34 to 102 lb/ac. of N. In the 2nd production year yields were unaffected by rates of N between 34 and 85 lb/ac of N but decreased at 102 lb/ac of N. When yield data was combined for the 2 years, yield increases were seen up to 68 lb/ac of N but no further yield increases between 68 and 102 lb/ac of N (Figure 3).

Figure 3. Effect of rate of N on seed yields of 1st & 2nd year cr. red fescue.



" Rates of 50-70 lb/ac of N are recommended if growing fescue for two crops.

Higher rates of N up to 100 lb/ac may be considered if only one fescue seed crop is expected to be harvested."

N.A. Fairey, 2006 Beaverlodge, AB

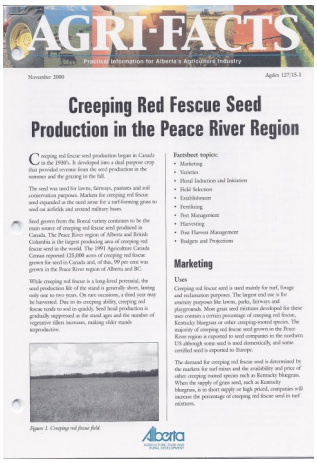
Summary

There are many factors that affect the response of creeping red fescue seed yields to nitrogen fertilizer applications. Because of this, it can be challenging to predict what type of seed yield response may be expected from different timings and rates of nitrogen application.

Nitrogen fertilizer should be applied mid to late October to creeping red fescue seed stands prior to the first seed crop. Early spring applications of nitrogen will be effective at increasing creeping red fescue seed yields but nitrogen applications made the previous fall will result in consistently higher yields. There does not appear to be a benefit to splitting nitrogen fertilizer applications between late fall and early spring.

The amount of nitrogen applied to a creeping red fescue stand will depend on the amount of nitrogen present in the soil, age of stand, fall soil moisture conditions and the size of the previous crop. In general new stands will respond better to higher rates of nitrogen than older stands assuming soil nitrogen levels are low. Rates of 50-70 lb/ac of nitrogen are recommended if growing fescue for two crops.

Higher rates of nitrogen up to 100 lb/ac may be considered if only one fescue seed crop is expected to be harvested. Recent research also suggest that higher rates of nitrogen applied to the first seed crop followed by a lower rate of nitrogen on the second seed crop may be a useful strategy for optimizing nitrogen fertilizer applications although this concept should be studied further.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Creeping Red Fescue Seed Production in the Peace River Region

Factsheet topics:
- Marketing
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- Fertilizing
- Pest Management
- Harvesting
- Post Harvest Management
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Marketing

Uses

Figure 1. Creeping red fescue field.

Alberta

This publication: ***Creeping Red Fescue Seed Production in the Peace River Region*** is available from AARD (Alberta Agriculture) or from PRFSA (Peace Region Forage Seed Association) via the contact information on the front page.

References

Dobb, J. L. 1991. Fertilizing Creeping Red Fescue. BC Ministry of Agriculture, Fisheries and Food Fact Sheet.

Elliott, C.R.1967. Factors Affecting Grass Seed Yields.Beaverlodge, Alberta. N.R.G 67-32, Canada Agriculture Research Station.

Elliott, C.R. and A.M.F Hennig 1974. Fertilizing Grasses for Seed Production. NRG News.

Elliott, C.R. Nitrogen Fertilizer Maximizes Fescue Seed Production. Science and the Land.

Fairey, N.A. and Lefkovitch, L.P. 2000. Effect of method and time of application of nitrogen fertilizer on yield and quality of seed of creeping red fescue. Can.J.Plant Sci. 80:809-811.

Fairey, N.A. and Lefkovitch, L.P. 2002. Effect of shallow, rotary cultivation with vertical tines and nitrogen fertilization on the seed productivity of creeping red fescue. Can.J.Plant Sci. 82:709-719.

Fairey, N.A. 2004. Variety-Specific Management for Seed Production of Creeping Red Fescue. 2004 Winter Issue of Forage Seed News.

Fairey,N.A. 2006. Cultivar-specific management for seed production of creeping red fescue. Can.J.Plant Sci. 86: 1099-1105.

Sullivan, D.M., J.M. Hart and N.W. Christensen. 1999. Nitrogen Uptake and Utilization by Pacific Northwest Crops. Oregon State University, Corvallis, Oregon.

Yoder, C. 2000. *Creeping Red Fescue Seed Production in the Peace River Region.* Edmonton Alberta: Agrifax, Alberta Agriculture & Rural Development.

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