The Seed Head
Fact sheet # 3

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A Technical Look at Seed Production of Fescue

" Fescue is an amazing plant as it can survive and persist almost anywhere under a wide range of conditions."
Bruno Osterwalder, Cecil Lake, BC

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Elk in Franklin Moller's creeping red fescue field in Sexsmith, AB

Introduction

Creeping red fescue (*Festuca rubra* L. var. *rubra*) is commonly grown for seed production in the Peace region of British Columbia and Alberta. The crop is traditionally seeded and harvested for two years before rejuvenation is needed to reduce the density of the stand to promote high seed yields.

In the last 10 years the wild elk population has increased in the Peace region and is becoming a problem for many producers including fescue seed producers. Elk and other wildlife graze the newly rejuvenated/established creeping red fescue fields from the fall through to spring. It is unknown as to the extent of the damage caused by this grazing. A literature review of published papers from studies showing the affects of grazing on seed yields of cool-season grasses was done by the PRFSA.

The timing of grazing and severity of grazing are of major concern in grass seed production. The grass seed physiology section details the stages of plant development necessary to produce seed.

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Grass Seed Physiology

Fescue is a cool-season perennial grass which means these plants are the most actively growing (i.e. topgrowth and reproduction) during the cool moist periods of the growing season which in Western Canada is the spring and fall. The optimum temperatures for growth is 20 - 25°C but slower growth occurs at temperatures as low as 5°C. Plant tillers are the growth points of the grass plant and there is a sequence of stages which it must go through to produce seed. After germination or rejuvenation the grass plant produces a shoot that consists of leaves. These shoots have a growing point which continues to produce leaves and stems under favourable conditions (Elliott, 1978). Tillers have the ability to be vegetative (solely leaves) and reproductive (leaves, stem and seedhead). Reproductive tillers will remain vegetative if they are grazed and lose their growing point. Plants will contain both vegetative and reproductive tillers at the same time (Trlica, 2006).

The determination of seed yield potential takes place during the autumn growth period (Chastain & Young III, 1998). The plant responds to the cooler temperatures (process called vernalization) and decreasing day length and enters primary induction which is the stage where the tiller becomes reproductively active. Factors that would affect a tillers ability to undergo induction include: plant age, variety, nutrient availability, seeding date, severity of clipping or grazing, plant spacing, moisture, temperature and stage of plant development when it is put under stress (Yoder, 2000). A tiller lifespan normally lasts only a year, therefore the plant needs to produce more tillers in the spring and fall to ensure continual growth. In the fall, tillers will only be produced or initiated if there is adequate moisture available (BC Min of Ag, 1994).

Fertilization of creeping red fescue is most effective when done before primary induction. This ensures there are adequate nutrients for spring growth. Fall fertilization also enables the plant to set the maximum number of seed heads whereas spring fertilization only optimizes the number of seeds per head (Elliott). Producers, however, apply their fertilizer early in the spring as there are fewer losses to volatilization of the nitrogen than when applied in the fall (Rueben Loewen, personal communication).

In the spring, the plant undergoes floral initiation (the physical development of the seed head) in response to slowly increasing temperatures. Fescue has the earliest floral initiation of most grasses as it starts right after spring thaw (Yoder, 2000). Once this stage is complete the seed head begins to develop. When seed head development is finalized then anthesis (flowering) occurs which is the releasing of pollen from the flowers.

Exposed fescue plant tiller

Plant Density

Fairey et al (1996) conducted trials at Beaverlodge, Alberta to evaluate whether creeping red fescue seed yields could be optimized by manipulating the initial plant density and plant arrangement. Individual plants were transplanted at 7 densities and 3 row spacing in the field. When only one harvest year is planned an initial density of 12-100 plants/m^2 on a 20 cm row spacing or 12-50 plants/ m^2 on a 40 cm row spacing is needed to optimize seed yield. When two consecutive harvests are planned, an initial density of 6-25 plants/m^2 on 20 cm row spacing or 6-50 plants/ m^2 on 40 cm row spacing is needed to optimize seed yield.

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Review of Published Research

There was no published research showing potential yield losses when creeping red fescue is grazed by elk during the dormancy of the grass or in the spring when the grass breaks dormancy and begins spring growth. There have been some trials involving the use of sheep or cattle grazing grasses used for seed production.

Response of Creeping Red Fescue Seed Fields to Aftermath Grazing By Beef Cattle

Pringle et al (1969) conducted a trial at Beaverlodge using cattle to graze creeping red fescue to determine the influence of grazing on subsequent plant development and seed yield. Yearling steers were used to graze a rejuvenated field of creeping red fescue. The treatments were: 1) no grazing - seed harvested was used as a control, 2) no grazing - aftermath collected as hay after seed harvest, 3) heavy (2.5 AU/ac) grazing from seed harvest to freeze-up, 4) medium (1.5 AU/ac) grazing from seed harvest to freeze-up and 5) spring (1.5 AU/ac) grazing followed by fall grazing(1.5 AU/ac). Fall grazing occurred from early September until early October and the spring grazing took place early to mid May. They found that under fall grazing of moderate intensity, seed yields were reduced by 8%, under fall grazing of heavy intensity seed yields were reduced by 16% and when grazed in the spring and fall seed yields were reduced by 35%. The high reduction in seed yields from spring grazing was attributed to the removal of floral parts by the steers. The reduction in yield from fall grazing was attributed to the removal of vegetation during active growth which limited the root reserves and leaf area of the creeping red fescue when flowering was induced.

Cultivar-specific management for seed production of creeping red fescue

Nigel Fairey (2006) at Beaverlodge studied the effects of post-harvest management on three varieties of creeping red fescue seed yields. Three methods of post-harvest management in late September to early October was used after the first harvest year in 1999: 1) flail mowing to 10 cm and residue removal in the fall after seed harvest; 2) disc mowing to 5 cm and residue removal in the fall after seed harvest and 3) short-duration, intensive grazing by sheep in the fall after seed harvest. These treatments were applied in late September to early October in 1999 and seed yields were determined in the 2000 seed harvest year. Based on one year of assessment Fairey found little difference in the mechanical harvest treatments but found nearly a 50% reduction in seed yield when grazed by sheep. The sheep grazed almost all of the green vegetation but not the stubble from the previously harvested crop. It was felt that the close grazing and the treading by the sheep's hooves removed or damaged the growing points in the crowns of the creeping red fescue. Less intensive grazing may have less of an effect on seed yields. Variety-specific responses to the different management systems was negligible.

Grazing managment for seed production in leafy strains of grasses

Green et al (1956) at the Grassland Research Institute in England showed that in most species the initial seeding year responded to grazing differently than the subsequent years. Removal of some of the top growth in years 2 and 3 may have a rejuvenation affect on some of the species as there was little or no yield loss and in many cases there was a yield increase. Early flowering species such as red fescue suffered the most when subjected to an April grazing as the authors found a reduced number of fertile tillers following the late grazing. They grazed cattle during the seedling year and had seed yield losses of 24% in orchardgrass, 18% in red fescue and 7% in tall fescue but in subsequent years found only minor losses in orchardgrass. Red fescue had consistent losses when grazed in the fall and the winter. When grazed in December, February and March, red fescue had seed losses of 26% and when again in April the losses soared to 80% in the first year and were 52% over the three years of the trial. Winter grazing in areas where cool-season grasses can maintain some growth (England) would be much different than in areas where complete dormancy occurs (western Canada).

Discussion

Pringle et al found an 8 – 35% seed yield loss when the creeping red fescue was grazed by cattle.

Fairey discovered a 50% seed yield loss with creeping red fescue when grazed heavily by sheep in the fall after the seed was harvested.

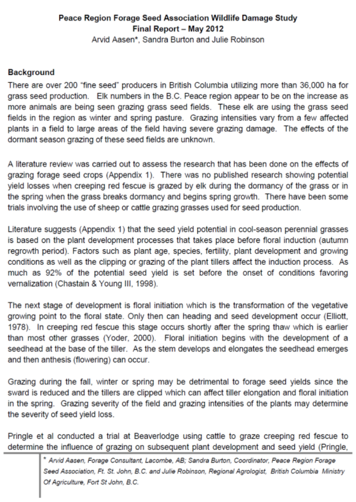
Green et al saw consistent losses in creeping red fescue when grazed in the fall and the winter.

Fairey et al showed that plant density had a major influence on creeping red fescue seed yields.

Elk grazing and elk disturbance may affect plant populations sufficiently to increase or decrease seed yields in a creeping red fescue field. The grazing severity of the creeping red fescue is certainly a factor. As the grazing severity in all these trials increased the seed yields decreased.

Summary

The published research concludes that there can be seed yield losses in creeping red fescue fields when grazed during the fall, winter and/or spring by cattle or sheep. Similar results can be expected when elk graze during these periods as well. Grazing severity, time of grazing, forage dormancy, forage species and the age of the forage will all affect the amount of seed yield losses in grasses grown for seed production.



Peace Region Forage Seed Association Wildlife Damage Study
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Arvid Aasen*, Sandra Burton and Julie Robinson

Background

There are over 200 "fine seed" producers in British Columbia utilizing more than 36,000 ha for grass seed production. Elk numbers in the B.C. Peace region appear to be on the increase as more animals are being seen grazing grass seed fields. These elk are using the grass seed fields in the region as winter and spring pasture. Grazing intensities vary from a few affected plants in a field to large areas of the field having severe grazing damage. The effects of the dormant season grazing of these seed fields are unknown.

A literature review was carried out to assess the research that has been done on the effects of grazing forage seed crops (Appendix 1). There was no published research showing potential yield losses when creeping red fescue is grazed by elk during the dormancy of the grass or in the spring when the grass breaks dormancy and begins spring growth. There have been some trials involving the use of sheep or cattle grazing grasses used for seed production.

Literature suggests (Appendix 1) that the seed yield potential in cool-season perennial grasses is based on the plant development processes that takes place before floral induction (autumn regrowth period). Factors such as plant age, species, fertility, plant development and growing conditions as well as the clipping or grazing of the plant tillers affect the induction process. As much as 92% of the potential seed yield is set before the onset of conditions favoring vernalization (Chastain & Young III, 1998).

The next stage of development is floral initiation which is the transformation of the vegetative growing point to the floral state. Only then can heading and seed development occur (Elliott, 1978). In creeping red fescue this stage occurs shortly after the spring thaw which is earlier than most other grasses (Yoder, 2000). Floral initiation begins with the development of a seedhead at the base of the tiller. As the stem develops and elongates the seedhead emerges and then anthesis (flowering) can occur.

Grazing during the fall, winter or spring may be detrimental to forage seed yields since the sward is reduced and the tillers are clipped which can affect tiller elongation and floral initiation in the spring. Grazing severity of the field and grazing intensities of the plants may determine the severity of seed yield loss.

Pringle et al conducted a trial at Beaverlodge using cattle to graze creeping red fescue to determine the influence of grazing on subsequent plant development and seed yield (Pringle,

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This report:

Peace Region Forage Seed Association Wildlife Damage Study

Can be found on the PRFSA website at: www.peaceforageseed.ca

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