Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

CAP ASC No. 15 – Activity # 3A

Integrating genetic, agronomic & economic approach to improving environmental adaptability & end-use quality of creeping red fescue

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Project objectives

- Re-initiate creeping red fescue breeding for better disease resistance & environmental adaptability (in progress)
- Increase multi-harvest seed yield and seed quality of creeping red fescue through plant growth regulation, plant nutrition and stand health management (in progress)
- Determine the economic profitability of creeping red fescue seed crop management factors included in the study (forthcoming)

What was done in Year 1 (2018-2019)?

Objective 1

- ✓ Sourced Boreal, Oracle and two elite lines from the past breeding work to **create parental base populations**
- ✓ Raised about 1200 potted seedlings (300 of each population) in the greenhouse.
- ✓ Selected most vigorous 160 plants of each population to transplant in the spaced plant nursery with 4 replicates of 40 plants
- ✓ Applied crop residue from old stand to create disease pressure for selecting disease resistant plants

Objective 2

- ✓ Established a 9-treatment integrated crop management (ICM) experiment in the field

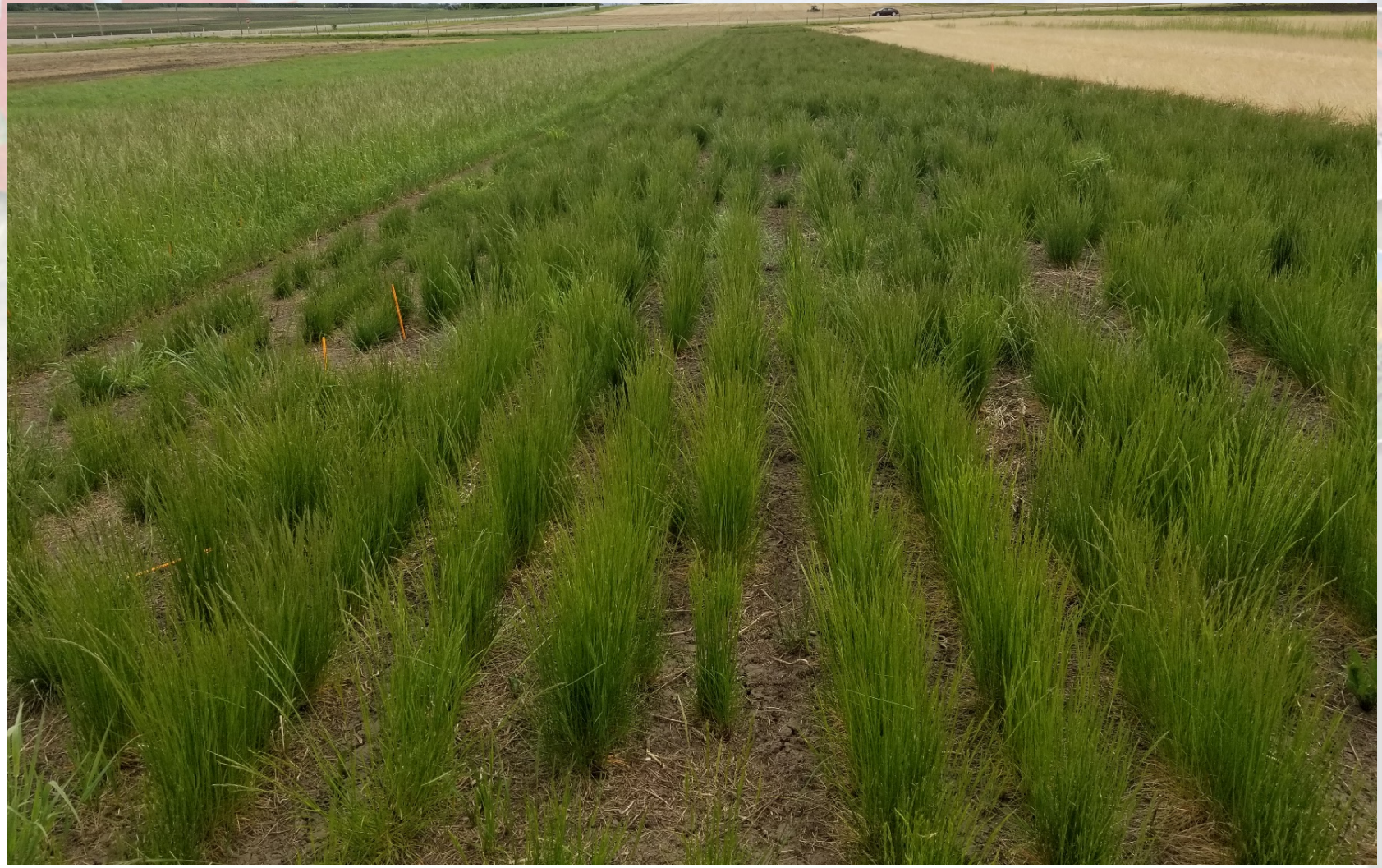
Progress on Year 2 (2019-2020) deliverables

Plan	Accomplishments
Objective 1 Individual plants assessment & preliminary selection in the spaced plant nursery for first production year	A total of 93/640 (=14.5%) healthy plants from 4 populations selected & evaluated for seed yield
Objective 2 Evaluate the effects of various experimental factors for seed yield and other agronomic characters for first production year	Seed yield responses of a 9-treatment experiment with various plant nutrients, growth regulators and fungicide applications analyzed. Seed quality testing is underway.
Annual report	Under preparation

Achieved as planned !

Creeping red fescue breeding nursery in 2019

Creeping red fescue ICM trial in 2019

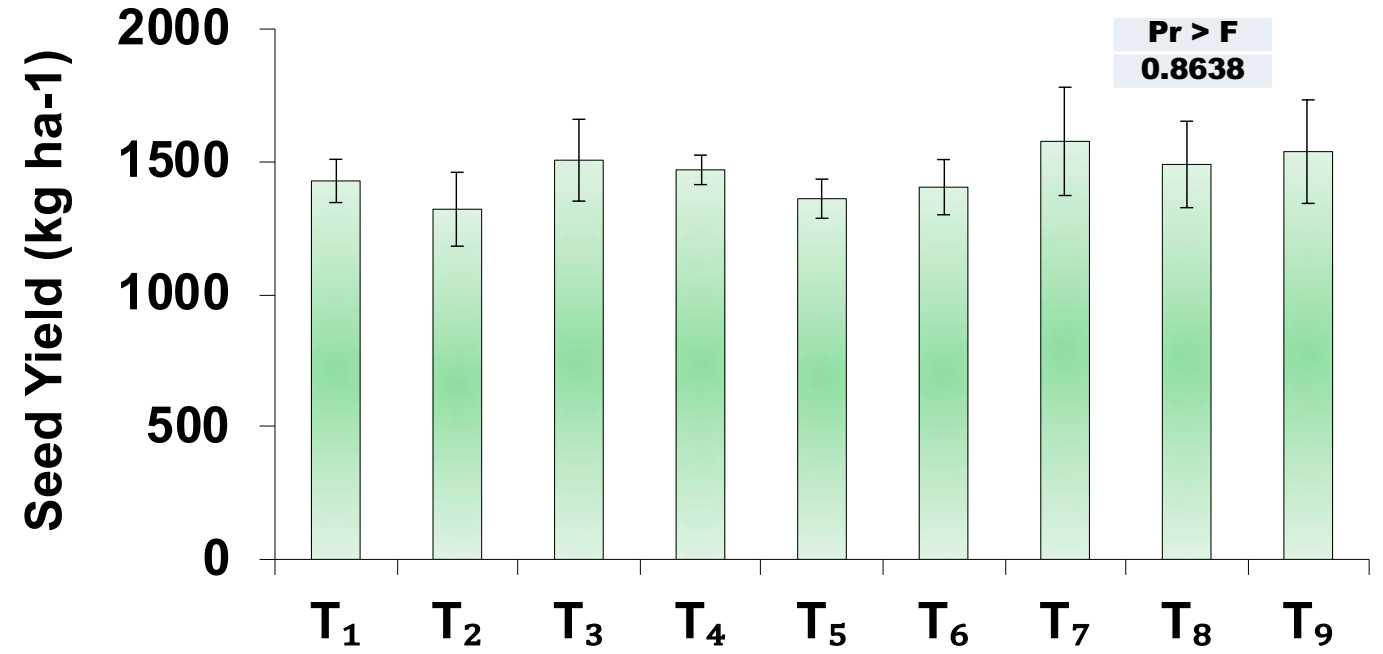


Plant evaluation for seed yields

Population	Selected individual plant average (g plant^{-1})	Population average (g plant^{-1})	Selection differential (%)
Boreal	11.9	11.3	5.6
BRF1	12.1	10.8	12.0
BRF2	9.7	10.8	-10.4
Oracle	11.4	12.6	-9.7

The selection was focussed on healthy plants. Final selection will be made in the coming season for creating a polycross parent population.

Seed yield response to crop management



T_1: Check

T_2: N @ 60 kg/ha - Fall broadcast

T_3: N:P @ 60:32 kg ha^{-1} - Fall broadcast

T_4: N:P:K @ 60:32:30 kg ha^{-1} - Fall broadcast

T_5: N:P:K:S @ 60:32:30:14 kg ha^{-1} Fall broadcast

T_6: N:P:K:S - Fall banding

T_7: N:P:K:S - Fall broadcast + fungicide Prosaro on the autumn regrowth

T_8: T_7 + spring foliar application of boron

T_9: T_8 + foliar application of Trinexapac Ethyl (TE) & Chloremquat Chloride (CC)

Knowledge transfer activities

Solstice Field Tour: June 20, 2019

- hosted at Beaverlodge Research Farm
- > 120 participants (farmers, industry & applied research groups, provincial agrologists, delegates from academic institutions.

Presentations in the regional meetings & conferences

Khanal, N (2019) Forage Seed Production in the Peace Region: Agro-climatic advantages, constraints and research initiatives. An invited presentation in the Production and Marketing Seminar organized by Peace Region Forage Seed Association in Rycroft, Alberta on January 22, 2020.

Khanal, N (2019) Creeping red fescue seed production: Interplay of weather condition and crop management. An invited presentation in a Forage Seed Growers Meeting organized by Nutrien Ag in Montney, BC on December 12, 2019.

Khanal N., Yoder C.L., & Gauthier T.M. (2019) Seed crop agronomy of creeping red fescue in Canada's Peace Region, p 111. In Proceedings of the 10th International Herbage Seed Group Conference, Corvalis, Oregon, USA; 12-19 May 2019.

Issues

Difficulty in hiring graduate and undergraduate summer students

- Advertised 5 times for graduate students
- Co-op work-term opportunities posted multiple times through University job boards

Atypical weather

- It was a cooler, shorter growing season with wetter condition during harvest
- Cold weather caused injury to flowers and developing seeds of some forage crops
- Wet weather prevented harvest of much of the annual crops

Conclusions

- Project activities are in progress as planned
- The growth regulation, disease management and plant nutrient management studies are expected to provide some solutions for seed yield improvement for multiple harvests
- There are opportunities for further studies to understand:
  - yield barriers and their economic significance
  - effect of post-harvest stubble management, vertical tillage and other agronomic manipulation of perennial seed crop stand of the creeping red fescue

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Thank you !

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