

**Crop Sequence Study of Fusarium Head Blight
on Wheat (*triticum aestivum*) and
Barley (*hordeum vulgare*) in the Canadian
Prairies**

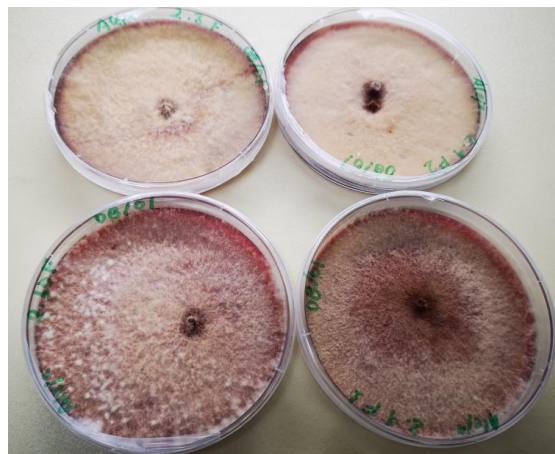
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Fusarium Head Blight

- Caused by several species of *Fusarium* spp.
- Most common *Fusarium graminearum*.
- Affect small grain cereals including canary seed.
- Mycotoxin is produced by the fungus and contaminate the grain.
- Deoxynivalenol (DON) is toxic to humans and animals.



FHB symptoms on Wheat

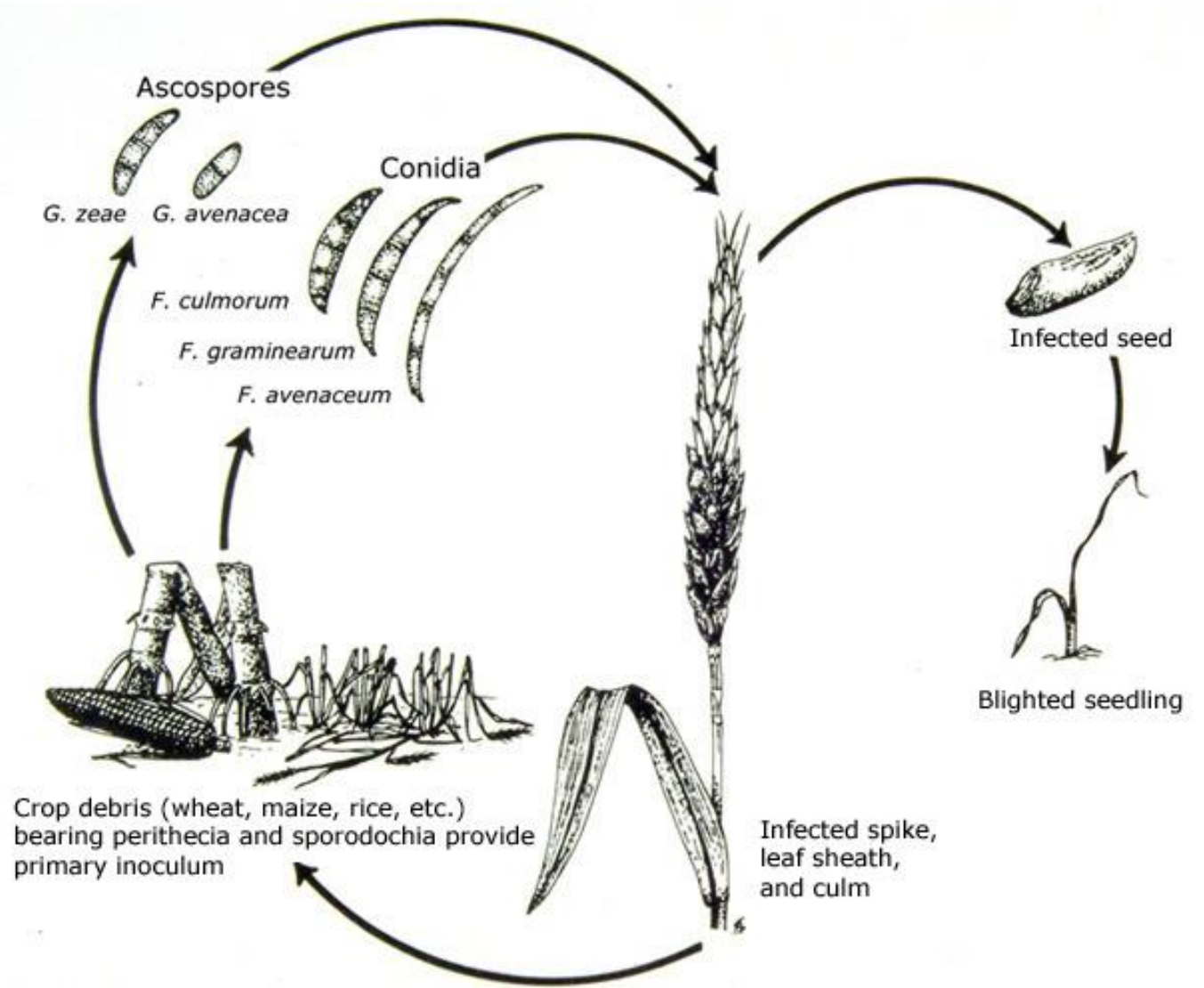


Fusarium spp. isolates



FHB symptoms on Barley

Fusarium Head Blight Life cycle



Crop Rotation

An aerial photograph of a rural landscape. In the foreground, there are large, vibrant green fields. In the middle ground, a yellow house with a brown roof and several windows is visible, surrounded by trees and a fence. The background consists of large, rectangular fields in various colors, including green, yellow, and brown, indicating different crop types and stages of growth. The overall scene is bright and sunny.

- Native Americans used “Three sisters” → maize, bean & squash.
- Pathogens can survive in the soil with specialized structures → Rhizoctonia and Pythium.
- Crop rotation reduce the formation of secondary inoculum in the fields.
- Effects on nutrients, minerals and soil microorganisms.



Research objectives

The main objective of this project is to determine optimum crop sequences to minimize Fusarium head blight of wheat (*Triticum aestivum*) and barley (*Hordeum vulgare*) in the Canadian prairies.

Also evaluate cereal crops for root rot and leaf spotting diseases in sequences that include up to nine of the most widely grown crops in western Canada.



Research Hypothesis

A diverse crop sequence (multiple species in a planned sequence) that does not include corn will reduce FHB incidence and severity in wheat and barley.

Methodology

- Evaluate cereals for leaf and root rot diseases.
- FHB symptoms on cereal spikes.
- Grain yield of crops.
- For cereals TKW, TW and protein %.
- FDK on wheat and barley.
- DON content on grain with HPLC-MS/MS.
- *Fusarium* spp. Identification.



Wheat damaged kernels

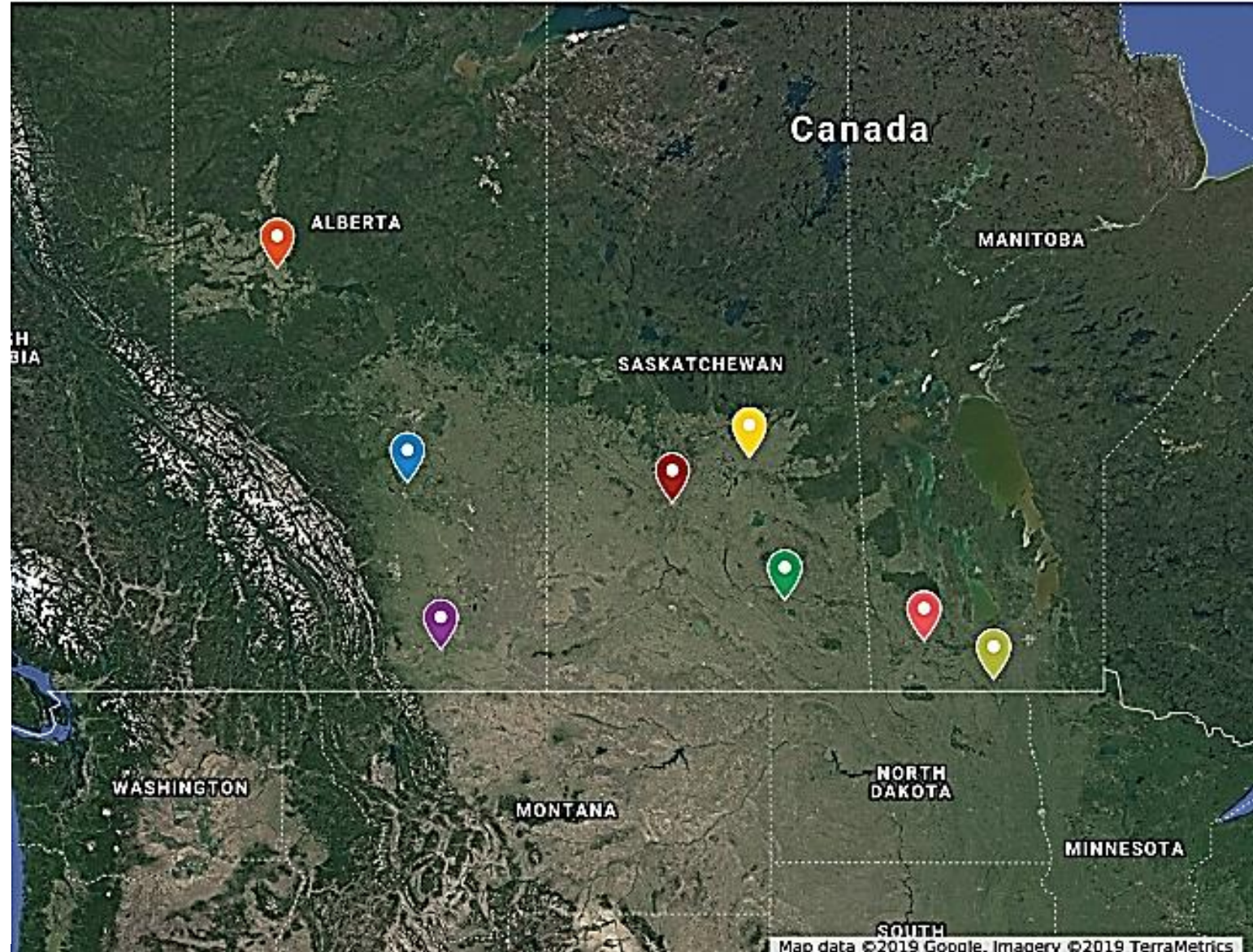


Barley damaged kernels

Research Locations

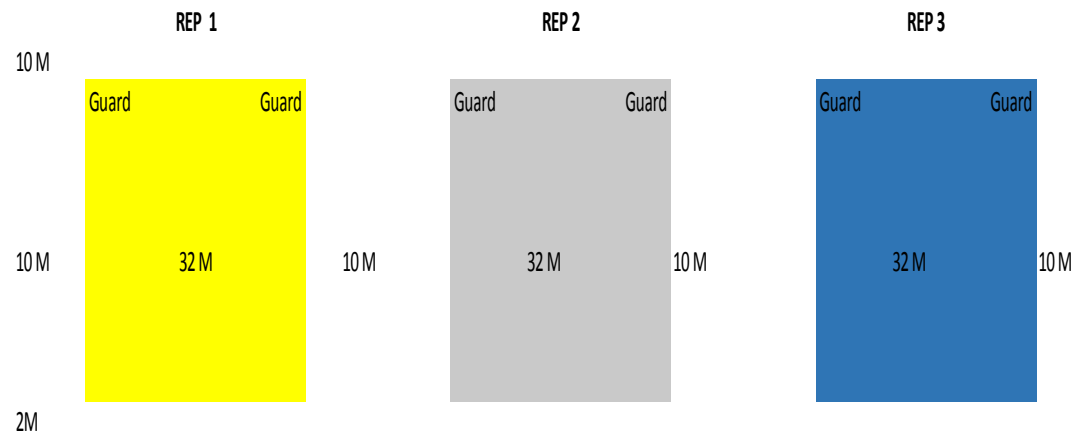
Alberta
Saskatchewan
Manitoba

- Lacombe
- Falher
- Lethbridge
- Melfort
- Indian Head
- Saskatoon
- Brandon
- Morden



Experimental Design

- Split block
 - 36-81 treatments
 - 6 to 9 crops in sequence
 - During 3 seasons: 2018 to 2020
- Yield and Disease data analysis ANOVA
 - PROC MIXED for treatment analysis, stubble type as fixed effect and replicates as random effect.
 - Treatment comparisons LSD test $P \leq 0.05$ SAS® Software.



For most of the locations the plot size will be 32 x 10 M.

Crops



WHEAT



BARLEY



OAT



FLAX



LENTIL



CANOLA



PEA



SOYBEAN



FABA



CANARY SEED



CORN



DRY BEAN



HEMP

**Core set of five crops
durum or bread wheat, barley,
canola, pea and corn**

+

One additional crop

WHEAT

BARLEY

PEA

10
BARLEY

LENTIL / OTHER

WHEAT

CANOLA

CORN

CANOLA

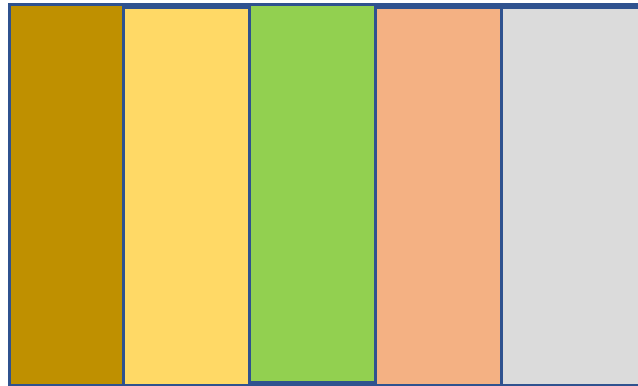
PEA

CANOLA

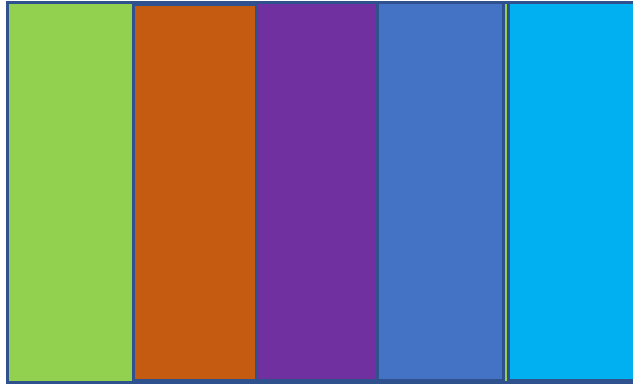
CORN

Plot Plan - Year 2

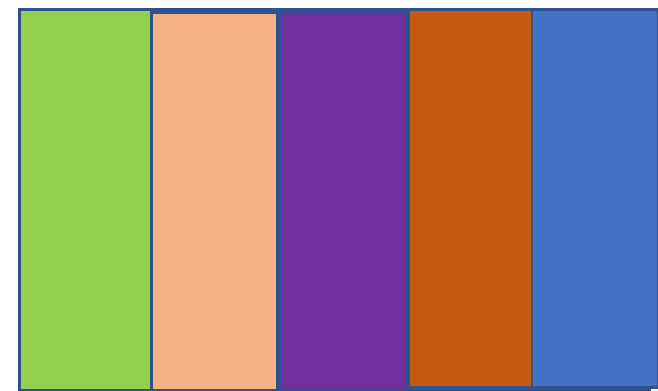
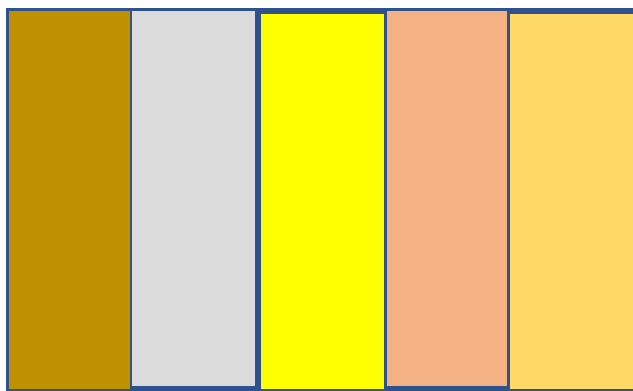
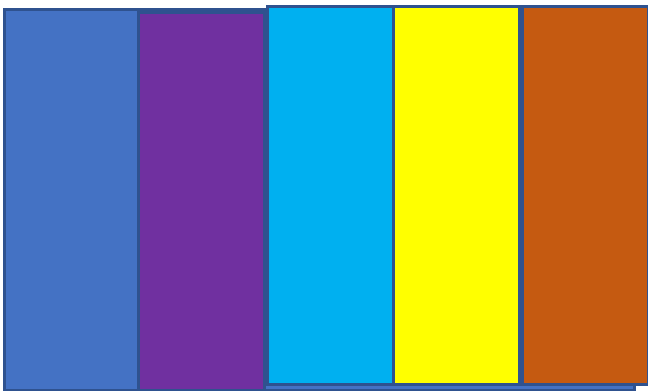
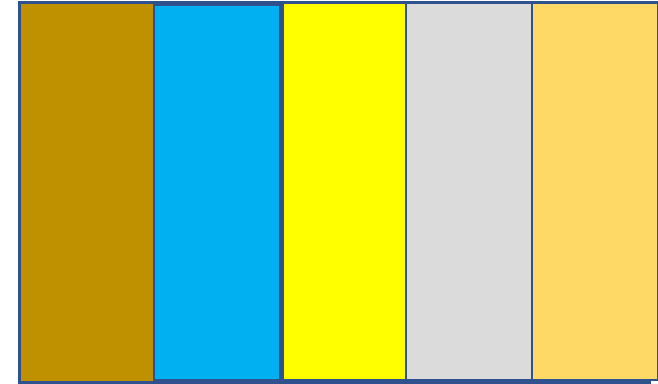
REP 1



REP 2



REP 3



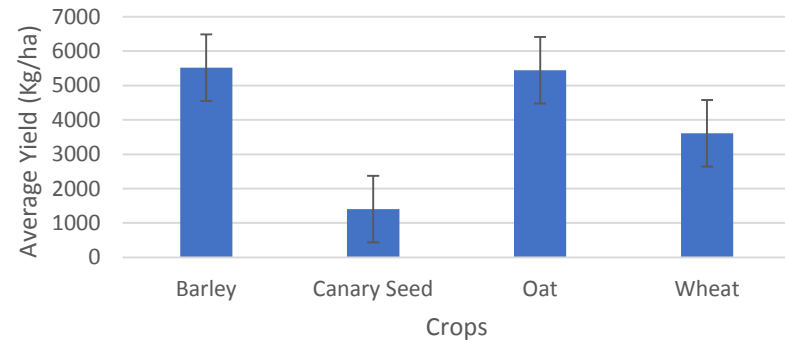
Plot Plan - Year 3

REP 1

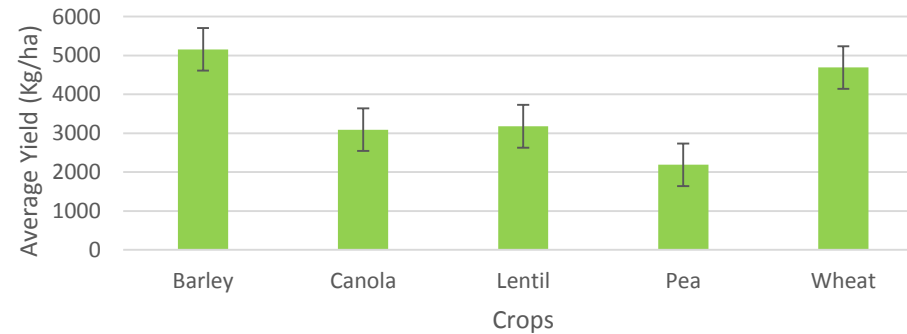
WHEAT/ BARLEY

Yield Results 2018

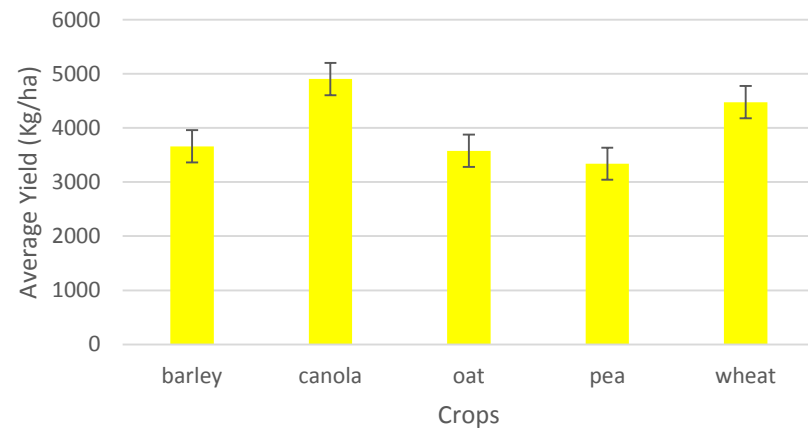
Yield Saskatoon 2018



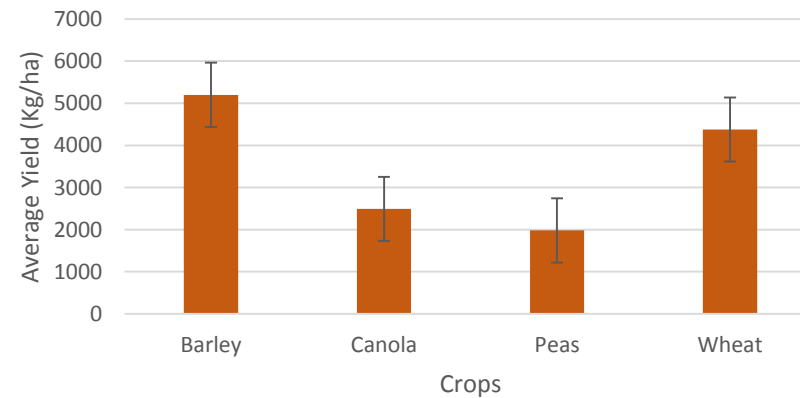
Yield Melfort 2018



Yield Lacombe 2018

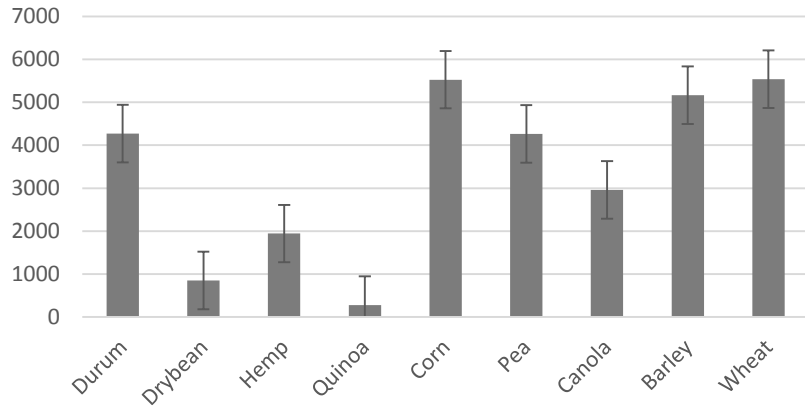


Yield Falher 2018

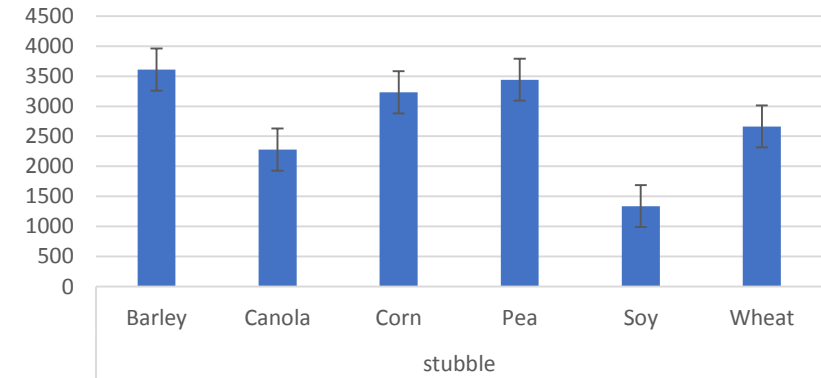


Yield Results 2018

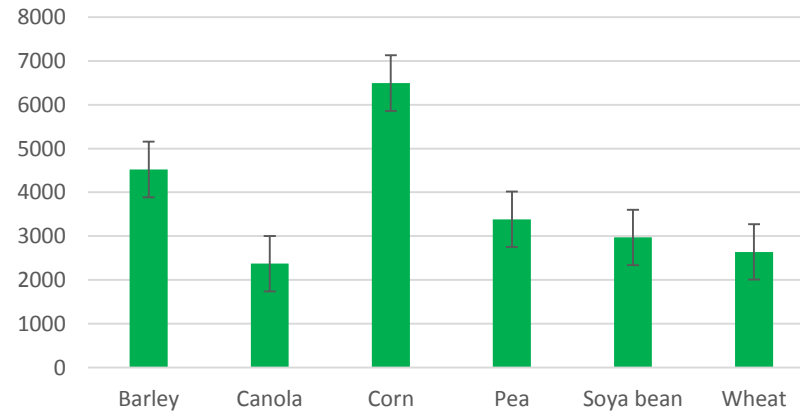
Yield Lethbridge 2018



Yield Brandon 2018

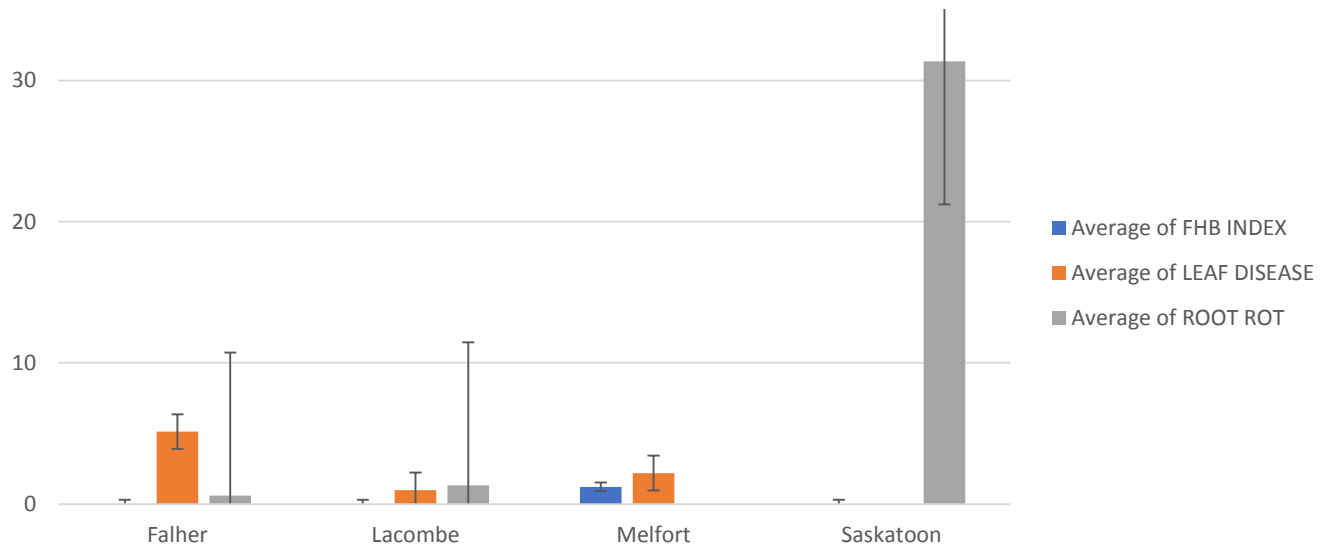


Yield Morden 2018

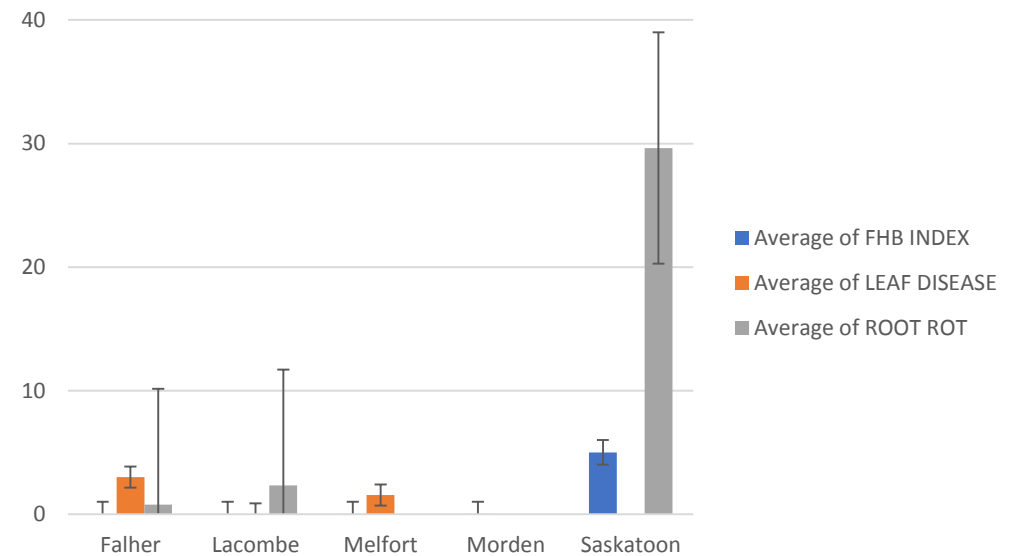


FHB Index, Leaf Disease and Root Rot 2018

FHB Index on Wheat 2018



Barley 2018

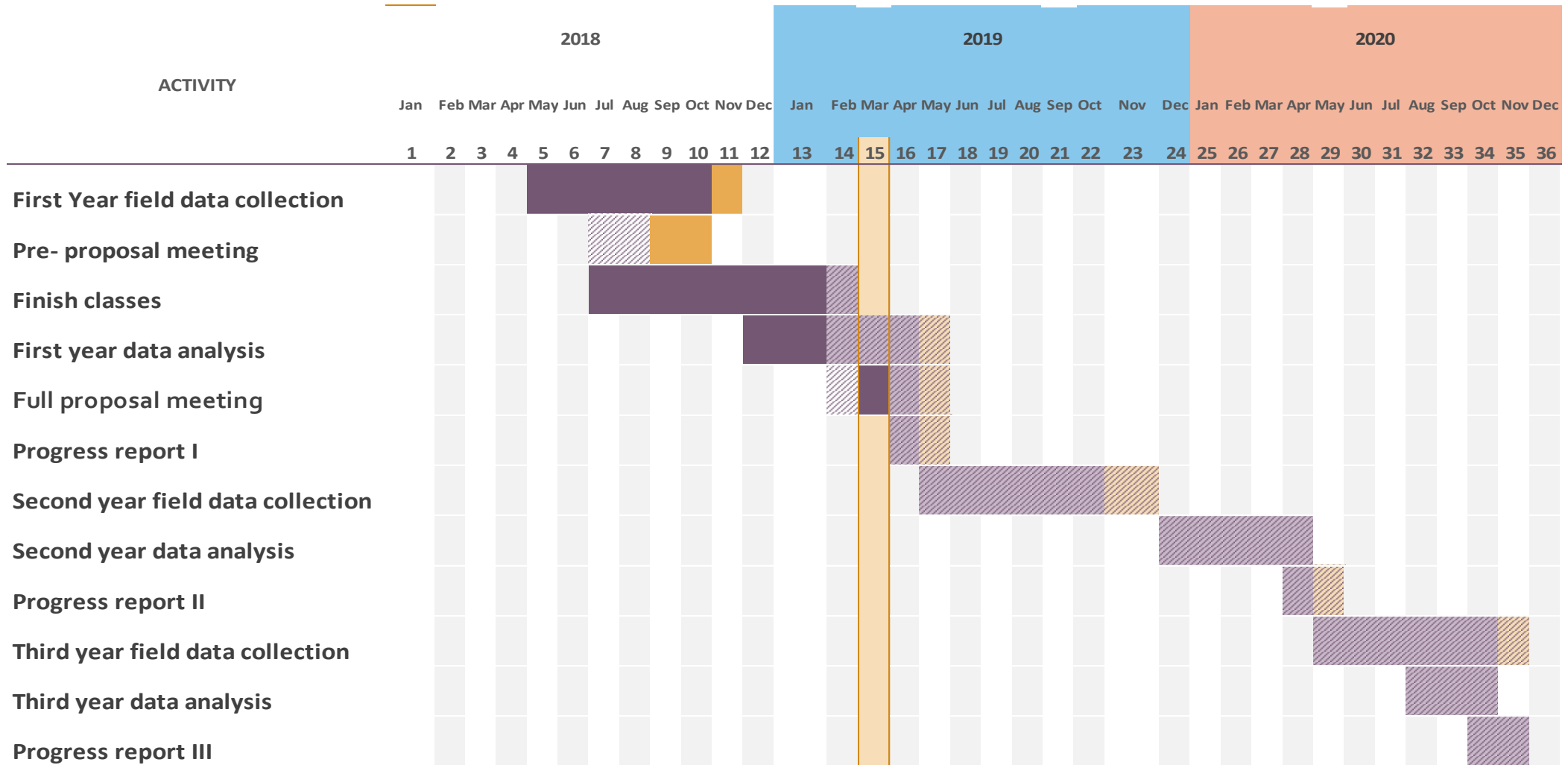




Discussion

- FHB Index from 2018 was low (<5) on cereals in most of the locations.
- Most of the locations present high yield on wheat and barley, as exception of Morden and Brandon.
- The disease index was low and does not have a significant effect on yield.
- Unfavorable weather conditions can affect the presence of FHB on the fields.

Research Activities



Acknowledgements

Dr. Randy Kutcher
Supervisor

Advisory committee:

Dr. Curtis Pozniak (Chair)

Dr. Steve Shirliffe

Dr. Kate Congreves

Thanks to all the members of the Cereals and Flax Crop Pathology

