Saskatchewan AgriARM Applied Research Management

Wheatland Conservation Area Inc.
Swift Current, SK.

Using Good Agronomic Practices to Managing Fusarium Head Blight in Durum Wheat When Using Bin Run Seed

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Final Report

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2015 Report

Abstract

In 2015 a trial was done in Swift Current titled "Using Good Agronomic Practices to Manage Fusarium Head Blight in Durum Wheat when Using Bin Run Seed". The objective of this project is to demonstrate the effects of using higher seeding rates, seed treatments, and foliar fungicides to reduce the impacts of seed bourne diseases and FHB when using bin run durum wheat seed with relatively low levels of fusarium. Even though overall yields and disease pressure were below average in this trial due to drought conditions, we saw that increasing seeding rates led to more main stems and less tillering. With fewer tillers, crop development was uniform creating a very narrow window of infection to harmful pathogens. The treatments with lower seeding rates were more susceptible to disease, due to increased tillering, resulting in higher levels of disease in the harvest sample compared to higher seeding rates.

Project Objectives

The objective of this project is to demonstrate the effects of using higher seeding rates, seed treatments, and foliar fungicides to reduce the impacts of seed bourne diseases and FHB when using bin run durum wheat seed with relatively low levels of fusarium.

Project Rationale

The proposed project demonstrates the feasibility and potential merits of combining higher seeding rates, registered seed treatments and foliar fungicide applications to manage seedling blight and FHB when using bin run durum, even when using seed at relatively low levels of fusarium.

Cereal leaf diseases and fusarium head blight (FHB) has risen in many parts of Saskatchewan and was a primary cause of yield and grade reductions throughout the province in 2014, with CWAD being affected the most. Although breeding efforts are making some headway in the CWRS classes, breeding for resistant durum varieties is lagging behind. With limited options for resistant varieties, producers are sourcing seed from bin run seed harvested in 2014, a year with high disease pressure. Even with higher disease pressure over recent years, significant durum acres were grown without the use of seed treatments or foliar fungicides. Even with limited options for resistant varieties, producers can take advantage of best agronomic practices to combat or manage

disease. Using a registered seed treatment is an effective way to help insure establishment when planting seed with relatively low levels of diseases like seedling blight/root rot. Using higher seeding rates in cereal crops is known to result in fewer tillers and therefore earlier maturity, less within plant variability and a shorter window of infection for FHB and other crop pests such as orange blossom wheat midge. Focussing on the disease aspect, this can theoretically have the dual benefit of reducing the length of time where the crop is susceptible to infection and simultaneously making it easier to time fungicide applications to target this disease due to lower variability. That being said, higher seeding rates also can result in a denser crop canopy that can retain humidity or potentially lodge, which could increase potential for FHB to develop and cause yield or grade reduction.
The proposed project will demonstrate the feasibility and potential merits of combining good agronomic practices to manage seed bourne diseases and FHB in a crop with limited resistant varieties like durum wheat.

Methods

Bin run seed harvested in 2014 from our commercial crop was submitted for seed analysis at Seed Solutions Seed Lab with the following results:
Complete Cereal Screen
Major Pathogens
Common Root Rot – Cochliobolus sativus (%) 3.50
Fusarium graminearum (%) 1.50
Seedling Blight/Root Rot – Fusarium spp. (%) 9.00
Secondary Saprophytes
Alternaria spp. (%) 19.00
Net Blotch/Tan Spot – Pyrenophora spp. (%) 2.00
Stemphylium Botryosum (%) 0.00
Cladosporium spp (%) 0.00
Storage Organisms
Epicoccum spp. (%) 1.00
Penicillium spp. (%) 0.00
Aspergillus spp. (%) 0.00

This seed was seeded in four reps with a combination of 3 different seeding rates (200, 300, 400 seeds/m2), 2 seed treatment variables (with Raxil Pro and without a registered seed treatment) and 2 fungicide treatments (with Caramba and without a registered fungicide for FHB suppression). Fertilizer was applied according to recommended rates and weeds were controlled using registered herbicide.

3 seed rates x 2 seed treaments x 2 fungicide x 4 reps = 48 plots

Plant emergence, heads counts, visual FHB assessment, grain yield, grain protein, thousand kernel weight, test weight were measured and seed analysis for above determinations and FDK.

Other field note were as follows:

Seed Treatment used: Raxil Pro @ 325 ml/100 kg of seed

Foliar Fungicided used: Caramba @ 405 ml/ac
Timing: when 75% of heads are fully emerged until 50% of heads on main stem are flowering.

Fertilitiy: **90 lb/ac of N** (300 lb/ac of 30-15-0-6) side banded at time of seeding

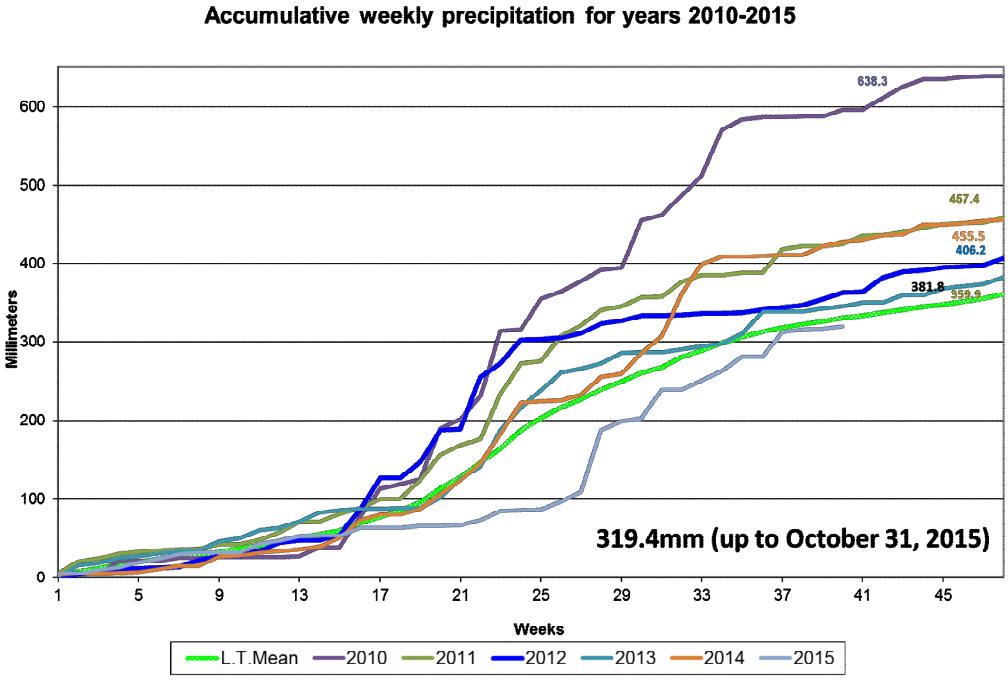
Seeding: Seeded May 19th into canola stubble with
Fabro built plot drill, 9 rows x 9 inch row spacing; atomjet knife openers.

Incrop: Sprayed Liquid Achieve @ 200 ml/ac + Buctril M @ 0.4 l/ac + TurboCharge @ 0.5 L/100 L spray sol.

Foliar applied: July 24th @ milk stage

Harvest: Harvested August 27th. 7 rows harvested.

General Site Conditions



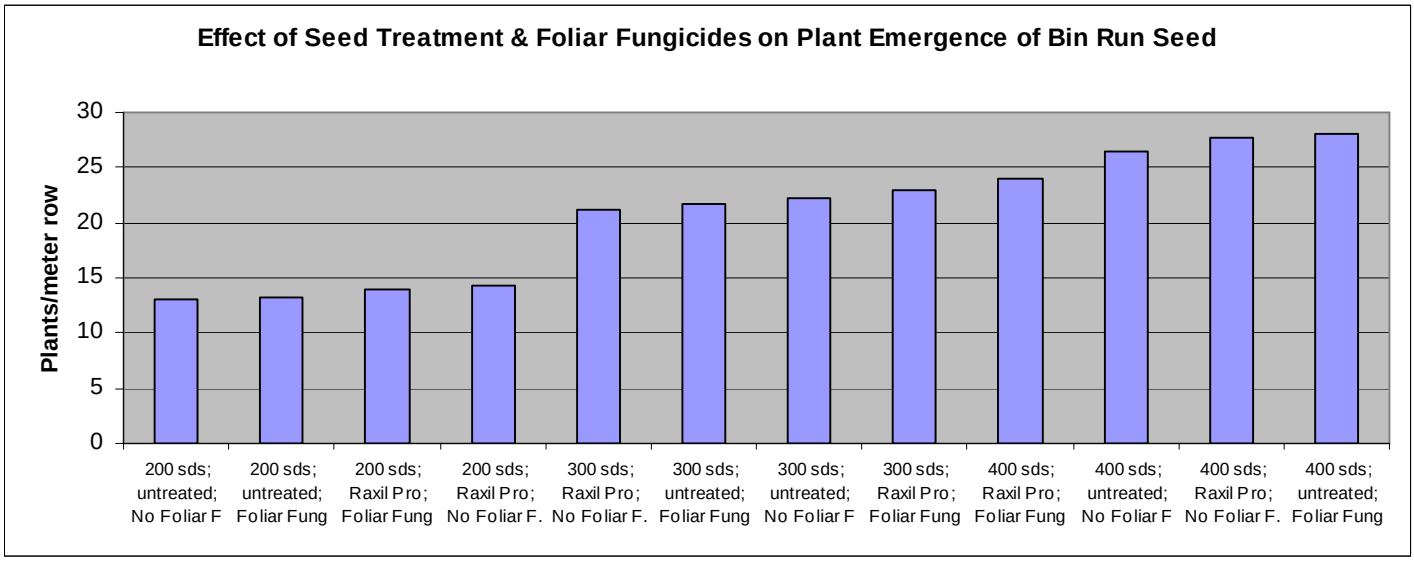
Graph 1. Accumulative weekly precipitation for years 2010-2015.

The site is situated 1 mile south of Swift Current. The soil is classified as a Swinton silty loam. For the most part in 2015, lower than average precipitation in the early growing season had a negative impact for shallow seeded crops. Severe drought like conditions continued through May, June, and July having a negative effect on yield potential and made it difficult to show treatment responses in certain trials. Overall yields for oilseed crops were lower than average due to lack of rain fall. Deeper seeded cereal crops had close to average yields. This was generally the case for area producers who experienced similar conditions resulting in similar yields.

Results

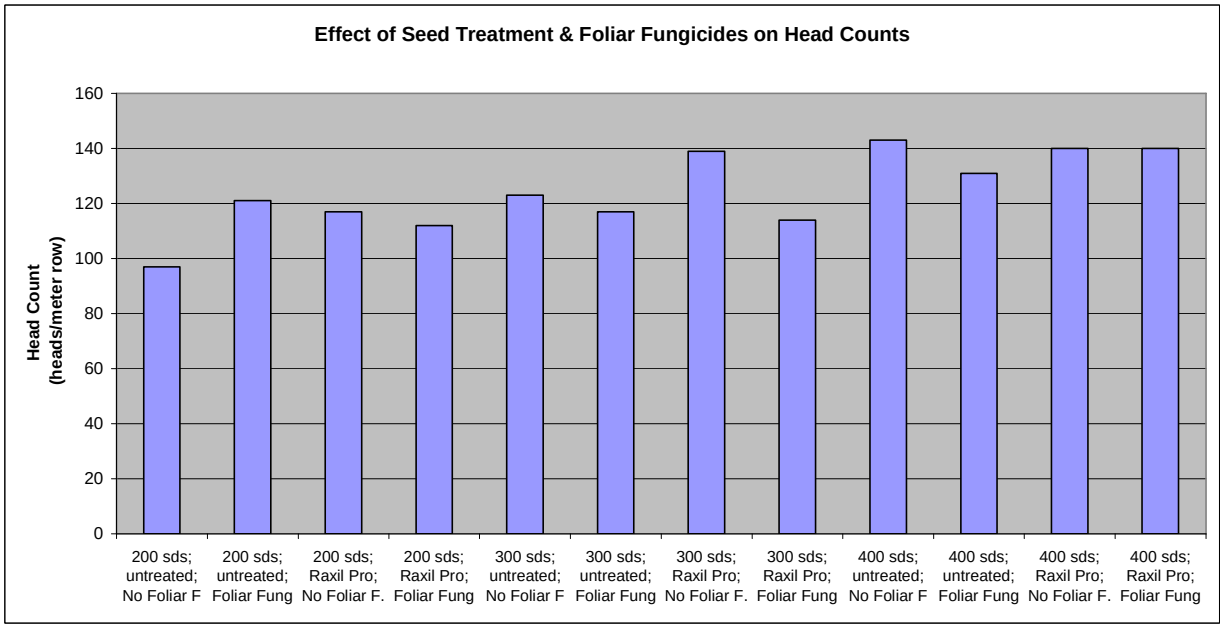
As expected, plant density increased with increasing seeding rates (Graph 2.). Higher seeding rates can result in a denser crop canopy that promote lodging and retain humidity, which could increase potential for FHB to develop. However, due to the very dry growing conditions, the treatments with higher seeding rates and higher plant densities did not develop a thick crop canopy and had no affect on FHB from prolonged humidity or lodging.

Graph 2.



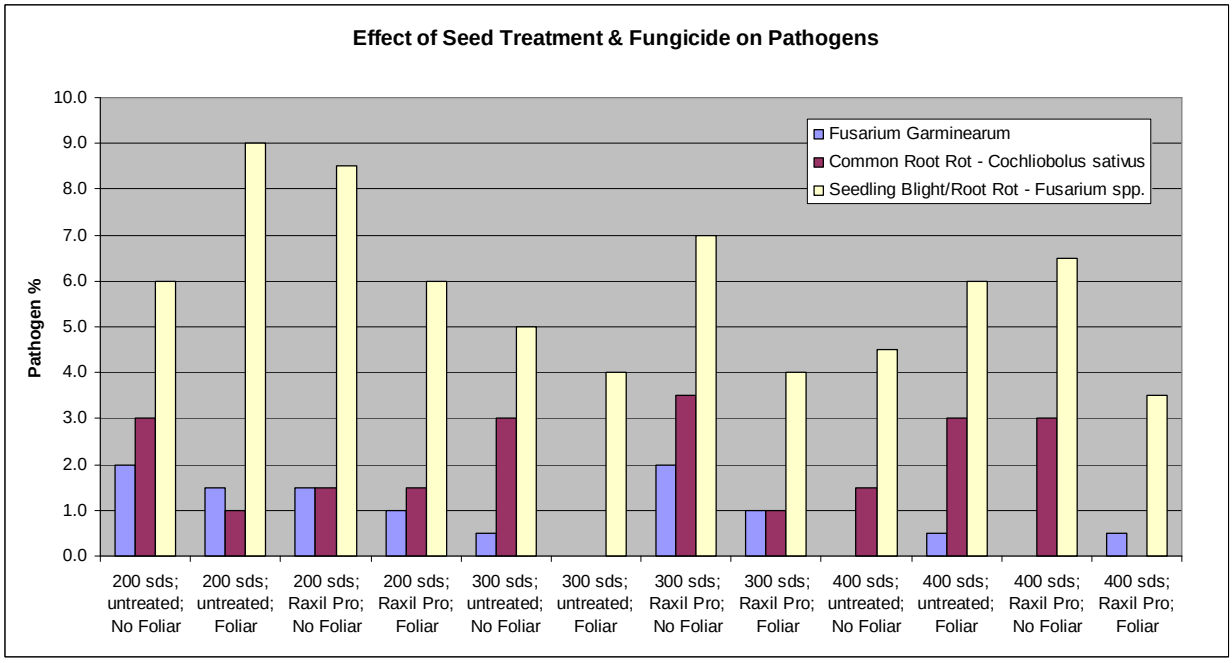
The number of heads per meter row also increased with seeding rate, but to a much lesser extent than the increase in plant emergence counts with increasing seeding rates (Graph 3.). With only a very slight increase in head counts with increasing seeding rates, suggests there is more tillering occurring at lower seeding rates, and more main stems with less tillering at higher seeding rates.

Graph 3.



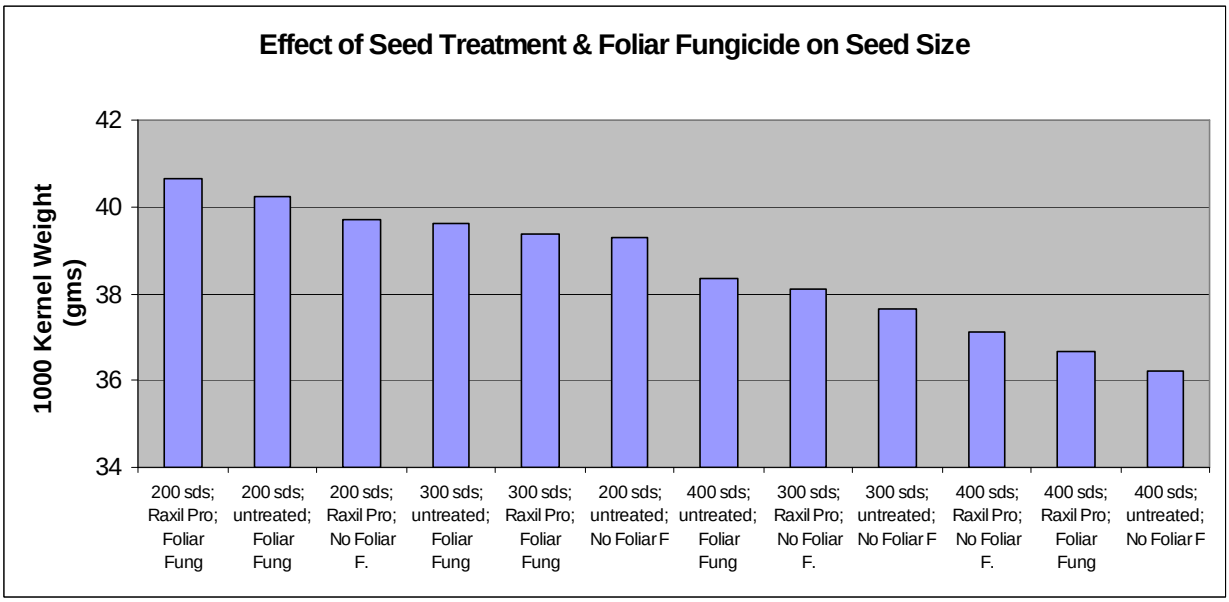
Since there was more tillering at the lower seeding rate, and tiller development lags behind the main stem, the stand is vulnerable to infection and exposed to various pathogens for a longer period of time. Even though overall disease levels were low in this trial, the treatments with lower seeding rates were more susceptible to disease, since they were exposed to a wider window of infection (Graph 4.).

Graph 4.



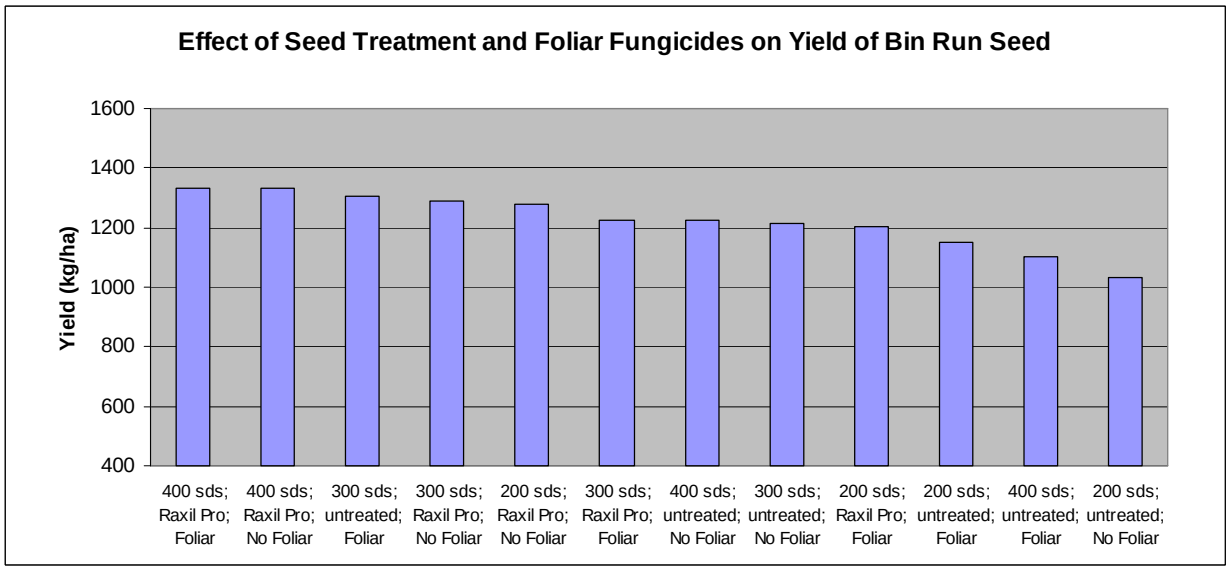
Treatments in this trial had an effect on seed size in 2015 with the low seeding rates producing the larger seed and the higher seeding rates producing the smaller seeds (Graph 5.). At each seeding rate, the smallest seed size came from the no seed treatment / no foliar fungicide treatment. We noted that the foliar fungicide application had more of an overall impact resulting in larger seed size at each seeding rate, with the greatest impact at the low seeding rate and less of an impact at the higher seed rate. The seed treatment had less of an effect on seed size.

Graph 5.



Even though there was low disease pressure in these trials we still observed the best yields coming from the plots with the higher seeding rates with a seed treatment applied, and lowest yield from the low seeding rates with no seed treatment applied (Graph 6.). This data would suggest that there are benefits to increasing seeding rates and using seed treatments on bin run seed that is shown to have relatively low levels of disease.

Graph 6.



Conclusions

Even though overall yields were below average in this trial due to drought conditions, we were able to see some treatment differences. We showed that increasing seeding rates led to more main stems and less tillering. With fewer tillers, the crop developed more evenly creating a very narrow window of infection to harmful pathogens. The downside to this is higher seeding rates can result in a denser crop canopy that promote lodging and retain humidity, which could increase potential for FHB to develop. However, due to the very dry growing conditions, the treatments with higher seeding rates and higher plant densities did not develop an excessively thick crop canopy and therefore, had no negative affect on yield. Increasing seeding rates had a positive effect on the number of heads per metre row and a negative effect on seed size. These two factors may have compensated for each other somewhat resulting in more parity amongst treatments.

Even though there was low disease pressure in these trials we still observed the best yields coming from the plots with the higher seeding rates with a seed treatment applied, and lowest yield from the low seeding rates with no seed treatment applied. This data would suggest that there are benefits to increasing seeding rates and using seed treatments on bin run seed that is shown to have relatively low levels of disease.

Acknowledgements

We thank the Ministry of Agriculture for all our ADOPT projects including plot signage and verbal acknowledgement at field days and on PowerPoint slides during presentations. This will continue at each venue where an extension activity occurs. We also thank Shannon Chant (Saskatchewan Ministry of Agriculture) for her help.

Summary

The objective of this project is to demonstrate the effects of using higher seeding rates, seed treatments, and foliar fungicides to reduce the impacts of seed bourne diseases and FHB when using bin run durum wheat seed with relatively low levels of fusarium.

Cereal leaf diseases and fusarium head blight (FHB) has risen in many parts of Saskatchewan and was a primary cause of yield and grade reductions throughout the province in 2014, with CWAD being affected the most. With limited options for resistant varieties, producers are sourcing seed from bin run seed harvested in 2014, a year with high disease pressure. Even with limited options for resistant varieties, producers can take advantage of best agronomic practices to combat or manage disease. Using a registered seed treatment is an effective way to help insure establishment when planting seed with relatively low levels of diseases like seedling blight/root rot. Using higher seeding rates in cereal crops is known to result in fewer tillers and therefore earlier maturity, less within plant variability and a shorter window of infection for FHB. Higher seeding rates also can result in a denser crop canopy that can retain humidity or potentially lodge, which could increase potential for FHB to develop and cause yield or grade reduction.

Bin run seed harvested in 2014 from our commercial crop was submitted for seed analysis at Seed Solutions Seed Lab showing relatively low levels of disease (Common Root Rot – 3.50%, Fusarium graminearum 1.50 %, and Seedling Blight/Root Rot – Fusarium spp. - 9.00 %). This seed was seeded in four reps with a combination of 3 different seeding rates (200, 300, 400 seeds/m2), 2 seed treatment variables (with Raxil Pro and without a seed treatment) and 2 fungicide treatments (with Caramba and without a registered fungicide for FHB suppression).

Even though overall yields were below average in this trial due to drought conditions, we were able to see some treatment differences. We showed that increasing seeding rates led to more main stems and less tillering. With fewer tillers, the crop developed more evenly creating a very narrow window of infection to harmful pathogens. The downside to this is higher seeding rates can result in a denser crop canopy that promote lodging and retain humidity, which could increase potential for FHB to develop. However, due to the very dry growing conditions, the treatments with higher seeding rates and higher plant densities did not develop an excessively thick crop canopy and therefore, had no negative affect on yield. Increasing seeding rates had a positive effect on the number of heads per metre row and a negative effect on seed size. These two factors may have compensated for each other somewhat resulting in more parity amongst treatments.

With low disease pressure in these trials in 2015, we saw little yield response from the fungicide treatments. We did observed the best yields coming from the plots with the higher seeding rates with a seed treatment applied, and lowest yield from the low seeding rates with no seed treatment applied. This data would suggest that there are benefits to increasing seeding rates and using seed treatments on bin run seed that is shown to have relatively low levels of disease.

This project was promoted during Crop Production Week in Saskatoon in January and will be locally at Cropportunities 2016 on March 3rd in Swift Current (200+ expected participants). This project was promoted on a CKSW radio program called "Walk the Plots" which we broadcast in the summer on a weekly basis. As well this topic was brought to the attention of the group on the Annual Field Day on July 17th (100 participants) as well as a number of smaller individual tours. This topic will also be posted on our website.