Minnesota Wheat Research and Promotion Council
CROP YEAR 2013 RESEARCH REPORTING FORM
Form Due November 15, 2013

1. PROJECT TITLE

Seed Treatment Trial to Evaluate the Relative Effectiveness of Different Active Ingredients Against Latent Root Rots and Crown Rots of Wheat

2. PRINCIPAL INVESTITAGATOR (S)

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11/15/13

5. REPORTING PERIOD
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6. TERMINAL REPORT _____ **PROGRESS REPORT** ___X_____

7. AMOUNT OF GRANT $16,504

8. PUBLICATIONS

None.

9: EXECUTIVE SUMMARY

Research Question:

In 2013 we undertook evaluation of fungicide seed treatments to determine their relative efficacy to protect wheat against latent root and crown rot infections as well as some other common root pathogens. These seed treatments are commonly available to growers but there is a lack of independent scientific data to show which treatments are most effective and under what growing conditions application of seed treatments provide the best return on investment.

Results:

The prolonged snow cover on the ground resulted in later planting in many parts of the state, combined with above average precipitation making field access difficult. Planting began on May 2nd at the more southern locations in the study (Kimball and Fergus Falls) and was completed by May 16th in the Northern locations.

Seed of variety Oxen (susceptible to root and crown rots) were treated with 11 different fungicides (listed in table 1). There was also an untreated batch of seed which had no fungicide applied.

Statistical analysis of stand count data collected at the two leaf stage showed there was no significant interaction between treatment and stand count, suggesting that in the 2013 growing season, stand establishment did not benefit from a seed applied fungicide compared to the untreated control. Visual inspection of crowns and sub-crown internodes of seedlings showed very few lesions indicative of fungal infection at the two leaf stage. No white heads were observed in plots associated with latent infections by root and crown rots.
Statistical analysis of yield from the trial showed that there were no significant differences in yield between treatments or the untreated control at each location.

In addition to stand count, plant height and yield data, plant samples from each plot at each location are undergoing analysis in the lab for isolation of fungi to determine whether there are difference in the incidence of latent infections. This will provide information on the fungal community present at each location and will also shed light on the question whether seed treatments can reduce latent infections

Application/Use:

The testing of these commonly available seed treatments will help growers be able to make more informed decisions about the best use of seed treatments for return on investment. The testing of these fungicides in different locations and different growing seasons will allow us to determine under what conditions seed treatment are likely to produce the most benefit in terms of protecting seedlings to get good stand establishment and which may protect against infection of adult plants later in the season.

Materials and Methods:

A set of fungicide seed treatments (listed in table one) containing a canonical set of active ingredients, were applied to wheat seed cv. Oxen (a variety susceptible to root and crown rots) using a Hegi batch seed treater. For products where no Rhodamine B dye had been incorporated, Rhodamine B at 0.75% was added at a rate of 0.38mL per lb of seed.

Treatments were arranged in a randomized complete block design with four replicates at each of the four trial locations. Plots were 15x 5’ square and were planted at a seeding rate of 32 plants per square foot. Plots were treated with Bronate Advanced and Axial at Feekes 5 to control weeds. The plots were fertilized for a yield goal of 60 bushels per acre.

Stand counts were made at the two leaf stage by counting the number of plants in a three feet section of row in each plot. Two, three feet sections were selected at random in each plot and the number of plants counted. The average of the plant counts were then calculated for each plot. At the same time, five seedlings were selected at random from the plot and assessed for visual symptoms of fungal infection in their crowns and sub-crown internodes.

At Feekes 10, plots were assessed for the presence of white heads not caused by *Fusarium graminearum* (Scab) or by insect feeding damage. These symptoms are indicative of stress caused by latent root and crown rot infections in mature plants.
Crowns and sub crown internodes of plants sampled from plots will be rated for symptoms of root and crown rots before isolation of fungi from the plants parts using selective growth media.

Economic Benefit to a Typical 500 Acre Wheat Enterprise:

Anecdotal evidence suggests that latent root and crown rots can cause up to 10% white heads. This would equate to about a 10% yield loss. Using this use a state average of 57 bushels per acre that would be equal to 2800 bushel or $20,000.

10: RELATED RESEARCH

This research integrates with the research currently being conducted by Dr. Ruth Dill-Macky at the University of Minnesota. Dr. Dill-Macky has conducted a collaborative root rot survey through MN, SD and ND over the last two years showing that some of the pathogens responsible for causing root and crown rots are in fact prevalent throughout Minnesota. In addition her work is looking in the future towards providing methods for screening for genetic resistance to root and crown and rots in the commercially available varieties but also in the breeding lines coming through the breeding program at the University of Minnesota. We hope that these studies will provide growers with the necessary information to have a combined approach to controlling these diseases which will lead to mitigating the yield losses associated with these diseases.

11: RECOMMENDED FUTURE RESEARCH

The data from the 2013 growing season did not show a statistically significant difference between yield, grain parameters or stand establishment. However, the culture work and fungal identification need to be completed before we can draw conclusions about the pathogen situation at each location. .

Fungal isolation and identification work will continue on the 2013 plant samples along with lesion ratings.
If possible we will look at augmenting the field data with some greenhouse experiments.

12: APPENDIX

Table 1: Seed Treatments

Treatment	Active ingredients	g a.i./lb (respectively)
Control		
Charter HL	triticonazole	0.023
Stamina	pyrachlostrobin	0.022
Stamina F3	pyrachlostrobin,triticonazole,metalaxyl	0.022,0.022,0.013
Dyna Shield	metalaxyl	0.063
Dyna Shield (reduced)	metalaxyl half rate	0.01
Raxil MD	tebuconazole, metalaxyl	0.007,0.009
Raxil MD Extra	imazalil, tebuconazole, metalayxl	0.015,0.006,0.009
Tebuconazole	Tebuconazole	0.007
Vibrance Extreme	sedaxane,difenaconazole,mefenoxam	0.010,0.049,0.012
Vibrance	sedaxane	0.011
Systiva	fluxapyroxad	0.022