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

1. PROJECT TITLE

'Determining Baseline Sensitivity of Isolates of Tan Spot from Minnesota to azole and strobilurin-based fungicides'

2. PRINCIPAL INVESTITAGATOR (S)

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4. REPORT DATE
11/15/13

5. REPORTING PERIOD
01/01/2013-11/15/2013

6. TERMINAL REPORT __X_____ **PROGRESS REPORT** _____

7. AMOUNT OF GRANT $8,752

8. PUBLICATIONS

None.

9: EXECUTIVE SUMMARY

Research Question:

Tan spot of wheat, caused by the fungus *Pyrenophora tritici-repentis,* can be a devastating foliar disease of wheat. Crops losses can be near 50%. As a result, fungicides which help control foliar diseases have become the method of choice in combating tan spot. In recent years the trend towards reduced tillage practices in wheat growing states such as Minnesota and North Dakota to slow soil erosion and retain soil moisture, has led to an increased risk of infection in subsequent years due to persistence of crop residue on which the pathogen can survive. The use of foliar fungicides to control tan spot has therefore increased in recent years.

Prolonged fungicide use can exert pressure on pathogens to evolve to be able to grow in the presence of such fungicides, resulting in less effective disease control. There are many well documented cases of this occurring in both cereal diseases such as powdery mildew, snow mold and Septoria leaf blotch, as well as other pathogens such as Cercospora leaf-spot on sugar beets. This can occur after only a few years of use in some cases. Resistance and changes in sensitivity are common in the two classes of chemicals (azoles and strobilurins) to which the active ingredients of commonly used foliar fungicides in Minnesota belong. In particular, strobilurins have been classified at high risk of resistance evolution by the fungicide action committee. Decreased sensitivity requires that either 1) rates have to be increased to maintain the same level of control or 2) having to incorporate different or new chemistries in to best management practice. In both cases will can lead to increased input costs.

Therefore the project aims to establish a baseline sensitivity for tan spot isolates in the state to the active ingredients in the most commonly used fungicides.

Results:

In the 2013 growing season 58 of wheat leaf samples exhibiting tan spot lesions were collected by the cereal disease scouts. The leaves were surface sterilized with dilute bleach solution and individual lesions removed using aseptic technique and placed on acidified PDA media to allow fungal growth but inhibit bacterial growth. Individual fungal cultures were then sub-cultured on to fresh PDA plates.

Cultures are currently being induced to sporulate on V8 media so that single spore isolates can be obtained ready for determination of the sensitivity to the azoles and strobiliurin fungicides. This work should be complete by late December 2012 early January 2013.

Application/Use:

With increased use of fungicides for control of foliar diseases in wheat in Minnesota, it is important to monitor fungal populations in commercial fields as an early warning system for changes in fungicide sensitivity. This will provide data to base fungicide application recommendations to growers.

Materials and Methods:

58 collections of tan spot infected material were made during the 2013 growing season from around the state.

Tan spot was isolated from infected leaf material after surface sterilization with 10% bleach solution. Lesions were then cut from the sterilized leaf pieces using aseptic technique and transferred to PDA media plates. Colonies were then sub-cultured on to new PDA plates. Isolates were then transferred to V8 media to induce sporulation of the fungi.

Individual spores will be collected to for pure cultures. Individual, pure cultures derived from a single spore are required to ensure that each isolate represents single genetic background. This will ensure that testing is conducted on a range of genetically different isolates which are not mixed genetically. These will be taken forward for sensitivity testing.

Pure cultures will then be evaluated for their sensitivity to the active ingredients propiconazole, tebuconazole (azoles), and pyraclostrobin (a strobilurin) by determining growth on water agar amended with differing sequential concentrations of these AIs compared to water agar alone by incubation at 21°C for 6 hrs in the light. EC_{50} values (the concentration of active ingredient at which the growth rate of the fungus is inhibited 50% compared to growth on non-amended media) for each isolate can then be determined.

Economic Benefit to a Typical 500 Acre Wheat Enterprise:

In Europe, where fungicide resistance is prevalent in a number of wheat pathogens, control has become more time consuming, with more applications of fungicide required, and more costly with both the amount and the number of different fungicides being required to maintain good control. We wish to avoid this situation in Minnesota so that the cost of operations do not go up for the farmer. Costs could increase as much as four times the current price for generic products. This kind of change to operating cost has already been observed in resistant weed populations in the state. The benefit to growers will come in the ability to prolong the use of the generic fungicides by timing applications correctly and if and when reduced sensitivity is identified, recommendation can be made for the appropriate mixing of fungicides to maintain control.

10: RELATED RESEARCH None

11: RECOMMENDED FUTURE RESEARCH

Once baseline sensitivity has been established, it is recommended that regular collections of tan spot isolates are collected and that these are the teased for sensitivity to monitor change in the tan spot populations in relation fungicide sensitivity.