Research Questions

This project aims to provide a statewide survey of small grains growing regions of Minnesota (MN) during the growing season in order to provide timely monitoring of disease issues throughout the state and release information to growers on best management practices for the diseases detected. In addition, the project aims to work with U of MN Plant Disease Clinic and the USDA-ARS Cereal Disease Lab in submitting samples for regional/national monitoring as well as race identification for cereal rusts.

Results

Disease distribution maps can be viewed at https://www.ag.ndsu.edu/ndipm

Field surveys began in the last 2 weeks of May. The wheat crop ranged from tillering in the north to the beginning anthesis in the southern survey locations.

The most prevalent and the earliest disease to appear in wheat throughout MN was tan spot. Due to the weather conditions early in the spring, many diseases developed later in the growing season than in previous years. Septoria tritici blotch occurred with high incidences in central MN later in the growing season. Barley yellow dwarf (BYD) incidence was found where aphids established early in central MN and by the end of the growing season, BYD was distributed widely throughout the state. Bacterial leaf streak (BLS) was later in development than in 2014, but was prevalent again in central and west central MN. 2015 also saw an influx of stripe rust which caused a problem in central and northwest MN. Despite what appeared to be drier conditions in some parts of the state, Fusarium head blight (scab) was prevalent in west central MN, where high humidity during heading contributed to higher than forecasted infections. Most growers seemed to combat high disease levels, and therefore potential high vomitoxin levels, by blowing infected grain out of the back of the combine and/or mixing grain from less heavily infected fields with diseased grain.

In barley, field surveys were initiated the last 2 weeks of May. The most prevalent diseases in 2015 on barley were BLS, particularly in central and northwest MN. Central MN saw a high incidence of cereal aphids and this correlated with subsequent high incidence of BYD. Septoria blotch occurred with high incidences in central MN. Fusarium head blight (scab) was only found in far northwest MN. Although spot blotch and netblotch were found in the region they were more often found in North Dakota than MN. Traditionally netblotch has been one of the main diseases on barley in MN.

In oats the most prevalent diseases were oat crown rust and Septoria blotch. The first infections of oat crown rust appeared in mid to late June and rapidly developed in southwestern Minnesota. Many oat growers applied fungicide to control oat crown rust as losses in 2014 were high (as much as 40%) due to this disease.

Application and Use

By providing growers with information on both prevalence and potential risk factors for developing diseases, as well as management options, it is hoped that growers will be able to make informed decisions about pesticide applications in a manner that will minimize potential yield losses in their operation, whilst at the same time minimizing expenditure.

Materials and Methods

The small grains growing regions in MN were divided into three areas as follows: NW Red River Valley; West Central and Southwestern MN; and Central and Southeastern MN.

Three scouts were assigned to these three areas (scouts hired with additional financial support from the Minnesota Soybean Research and Promotion Council and the Midwest Forage Association).

Scouts received training on disease identification and sample handling from the research team prior to scouting fields.

Fields were scouted from early May until mid-August once a week. Fields were selected at random with each scout scouting approximately 20-30 fields per week depending on weather conditions. In addition to the scouting of commercial fields, sentinel plots of varieties of wheat, barley and oats, susceptible to a range of diseases, were planted at on-farm locations around Minnesota. These were also assessed by the scouts throughout the growing season. Fields were assigned an ID number and GPS...
coordinates in order to generate disease distribution maps in conjunction with the North Dakota State University IPM survey.

Fields were assessed for both disease incidence (how many plants were infected by a certain disease) and severity (how badly a plant was infected by a particular disease). These were recorded as percentage incidence and severity.

Weekly data was recorded in Microsoft Excel and disease distribution maps were compiled and placed on the web at https://www.ag.ndsu.edu/ndipm/wheat and https://www.ag.ndsu.edu/ndipm/barley. Postings were also made to MAWG crop disease website and the National and Minnesota Fusarium head blight risk forecasting websites (http://www.wheatscab.psu.edu/).

**Economic Benefit to a Typical 500 Acre Wheat Enterprise**

The benefits to a 500 acre wheat enterprise will vary depending on the season, a variety’s level of disease susceptibility or resistance, disease prevalence, and the cost of individual pesticides. However, it is hoped that the information provided by the survey will prevent unnecessary pesticide applications and thus increase a grower’s return on investment for a given growing season.

**Related Research**

This project is done in collaboration with the North Dakota State University IPM team including: Patrick Beauzay, Janet Knodel, Andrew Friskop, Sam Markell; in order to provide a regional picture of disease distribution and risk forecasting.

This project also feeds into the Upper Great Plains Wheat Pathology Collaboration (UGPWP) recently funded by MWRPC by both providing current information on pathogen and insect distribution and population structures, but also by providing an insight into upcoming disease issues in the state that inform future research aims and objectives of this interdisciplinary plant pathology team.

**Recommended Future Research**

This project will continue for 2016 and 2017 and continue to provide information on disease detection, prevalence and management.