

Minnesota Small Grains Pest Survey

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Research Questions

Spring wheat is a major crop for producers in northwest Minnesota and small grains have had increasing interest from producers across the rest of the state for the past eight years. Wheat, as well as being a valued commodity, is also important in the crop rotation in Minnesota allowing rotation of pesticides, particularly for weed control. Diseases, along with insect pests, have long been detrimental to the quantity and quality of the crop. One of the key elements to successful production centers on the timely and correct identification of these disease and insect problems, followed by implementation of appropriate management strategies. Scouting of fields on a weekly basis allows growers and producers to minimize the impact of pests on yield by alerting them to the presence of pests before they become too severe.

Results

Just over 200 small grains fields were scouted across Minnesota during the 2017 growing season. Areas scouted ranged from Roseau County in the North, to Nicollet and Steele Counties in the south. Scouting started in early June and continued until the crop had reached maturity in late July. Data was collected on severity and incidence of the major cereal diseases in Minnesota as well as some of the important insect pests. Data was submitted each week to the NDSU IPM team who generated distribution maps for the region. Archived distribution data can be found at: <https://www.ag.ndsu.edu/ndipm> for each crop. Postings were also made to the Minnesota Association of Wheat Grower's website <http://mawg.cropdisease.com> as well as the US wheat/Barley Scab Initiative scab prediction website <http://www.wheatscab.psu.edu> for state commentary on Fusarium head blight development.

In general 2017 was a relatively quiet year as far small grains diseases were concerned. This was largely due to lack of moisture in many parts of the state which did not provide the ideal conditions for many of the fungal diseases to develop to concerning levels.

Insects

Grasshoppers, cereal aphids and wheat stem maggot were all recorded as part of the 2017 survey data.

Aphids were found in 43% of fields surveyed June 12th -16th although numbers were far below economic thresholds. This trend continued through the growing season until a marked increase in aphids in early July, particularly in Wilkin county. However, again these populations still did

not reach economic thresholds for spraying, and by this time the crop was headed out and impact on yield would have been minimal.

Grasshoppers appeared in the sweep net sample from mid-June onward but were very low in numbers and not a concern for growers.

Wheat stem maggot numbers were also reportedly low throughout the season. Unusually, in a very localized area around Crookston, wheat stem sawfly, not typically a common problem in Minnesota, did some significant damage to crops. This was probably due to having several successive summers with drier ends to the season. This problem may surface again every few years when the conditions are conducive to increase populations.

Diseases

Diseases which made an appearance in early June were Leaf rust, Tan spot, *Septoria* spot blotch and Barley yellow dwarf. These appeared in 4-6% of fields scouted, and severities were on average less than 10% for leaf rust, tan spot and *Septoria* spot blotch. Powdery mildew was observed in one field in La Sueur county at very low incidence (4%).

As the season progressed conditions became warm and dry in many areas of the state. This resulted in diseases such as stripe rust and leaf rust not having enough available leaf surface moisture for disease development. Low incidence and severity of leaf rust were observed in La Sueur county in late June, but again these were not severe, nor widespread. Again, due to the drier conditions, oat crown rust did not develop until very late in the season. One observation of stem rust on oats was made in Rice county, again with low incidence (4%).

In late June the first observations of Fusarium head blight (FHB) were made in Le Sueur county. Although indications just after heading showed awn infections of FHB in many fields, throughout the state, the drier conditions with less humidity in many areas, combined with spray applications made at the early flowering (Feekes 10.5.1) meant that major outbreaks of FHB were avoided in 2017 and there were not widespread issues with DON levels in grain.

After heading, Bacterial leaf streak (BLS) was again observed in fields although this was towards the end of the scouting period. The warm temperatures contributed to rapid development of this disease in affected areas to the advanced stage of dead patches on leaves. This was more apparent than the early stages of the disease and



led some producers to believe that the disease had had an even more rapid onset than was visible prior to heading.

Overall, the spring wheat crop did very well across the state, leading to the breaking of the state average by 7 bushels to 67 bu/acre. This was in part due to the lack of disease issues in 2017.

Application and Use

This information can be used by growers to make informed decisions about spray application for disease/insect control while balancing out the cost and return on investment for the production of the crop as a whole. This can save money and increases the profit margin on small grains crops.

Materials and Methods

Two scouts operating in the main small grain growing areas of Minnesota scouted approximately 20-30 small grains fields per week during the growing season. Scouts underwent training at the beginning of the season with MJS and PG to learn how to identify and score pest incidence and severity and how to record the data collected.

The MN survey was conducted according to the same protocol followed by the NDSU IPM survey so that the output could be merged and reflect a regional effort. Scouts collected GPS data to aid the construction of distribution maps for each week of data collected for each disease/insect pest.

Fields were scouted by walking out past the headland in each field and walking a “w” pattern and taking observations of 10 plants at each point of the “w”. Fields were selected at random to provide good geographic spread in data collection. Sweep nets were used to monitor the number of grasshoppers per four sweeps in field margins and ditches. Incidence and severity data were collected for Leaf rust, Tan Spot, Septoria spot blotch, spot blotch and FHB. Incidence only data was collected for Barley yellow dwarf, *Wheat spindle streak mosaic virus*, Bacterial leaf streak, Stem rust, Cephalosporium stripe, Stripe rust, Powdery mildew and Loose smut. For FHB, scab index was also calculated taking in to account the severity and incidence data combined. PG collated the weekly scouting data for submission to the NDSU IPM team who then used this data

to construct both weekly distribution maps, as well as end of season maps.

Economic Benefit to a Typical 500 Acre Wheat Enterprise

The cost difference to a 500 acre operation is approximately \$21,000 loss if no fungicide is applied to control disease if disease is present. This takes in to account the cost of making two fungicide applications per season, 2017 wheat prices in MN; three year state yield averages for yields involving no fungicide management and those with fungicide management.

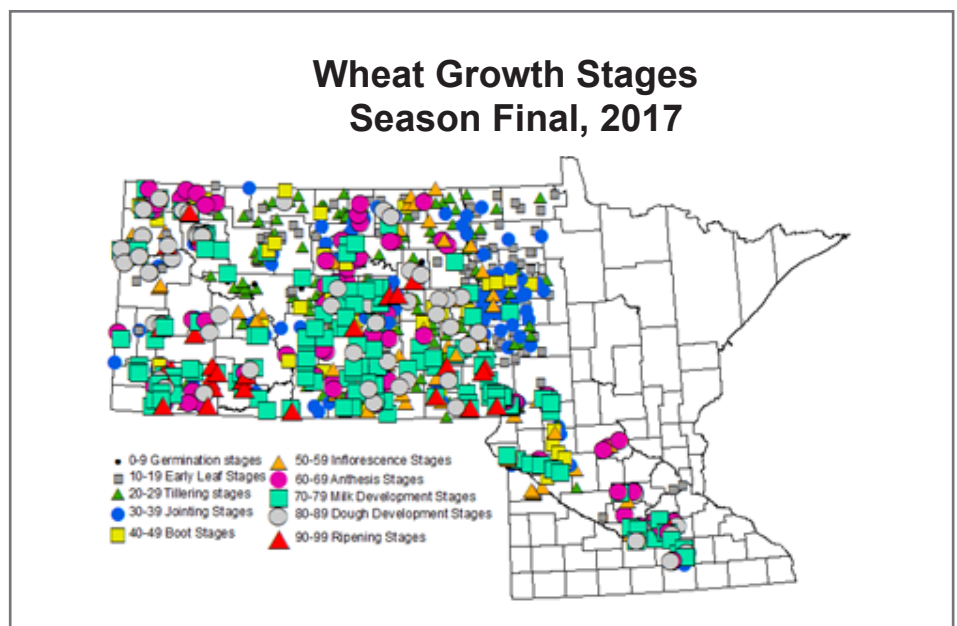
Recommended Future Research

These data not only provide a timely insight and early warning for the pest problems developing over the course of the season, but the archived data can be useful in understanding changes in frequency and severity of diseases when combined with changing climate or other changing farming practices.

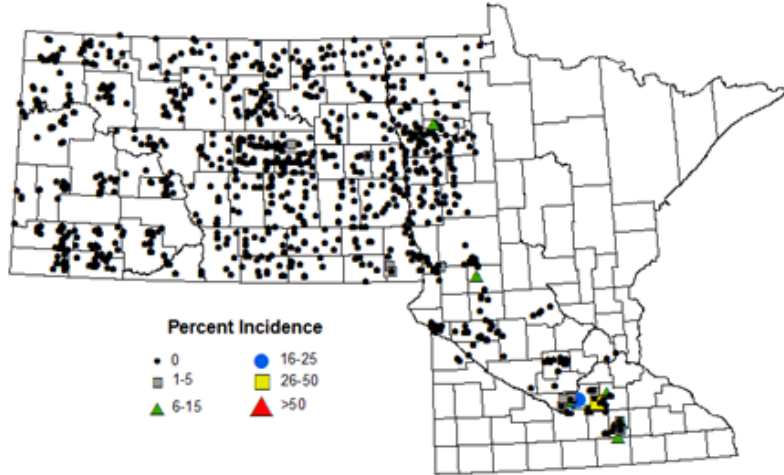
Any future such project should consider other modes of conveying this information to growers. The use of social media to convey results in real time may be of great benefit, especially when considering the younger generation of farmers now learning to farm who are more familiar with these ways of obtaining information.

Appendix

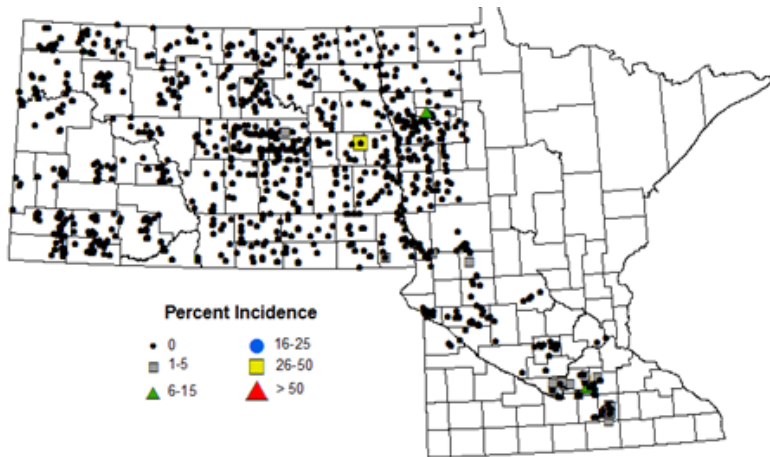
Below are regional maps showing the end of season distributions, incidence and severity for some of the main diseases reported in Minnesota and North Dakota this year.



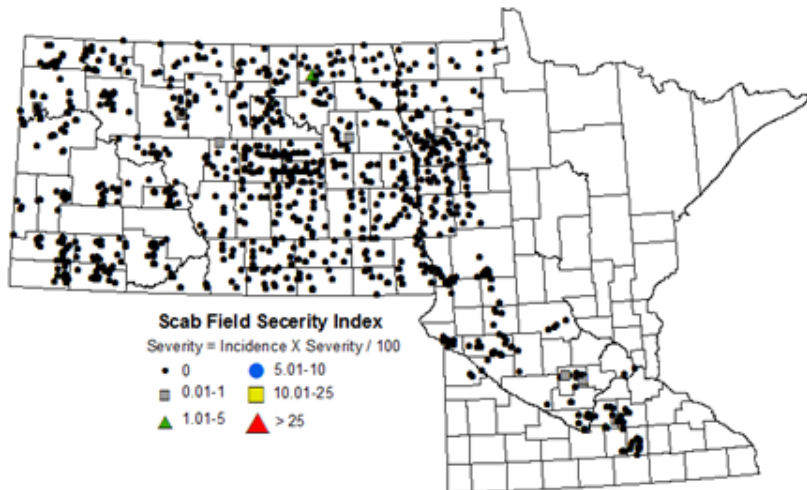
Wheat Leaf Rust Percent Incidence Season Final, 2017



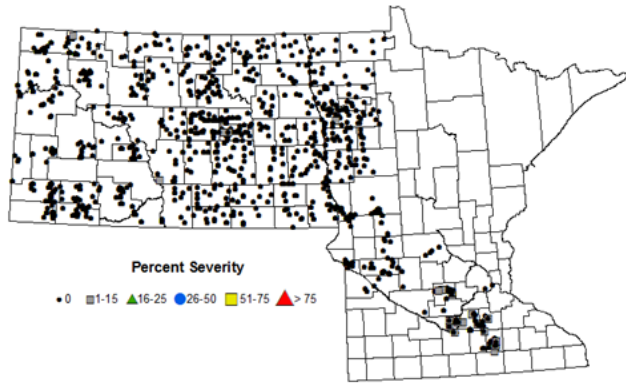
Wheat Leaf Rust Percent Severity Season Final, 2017



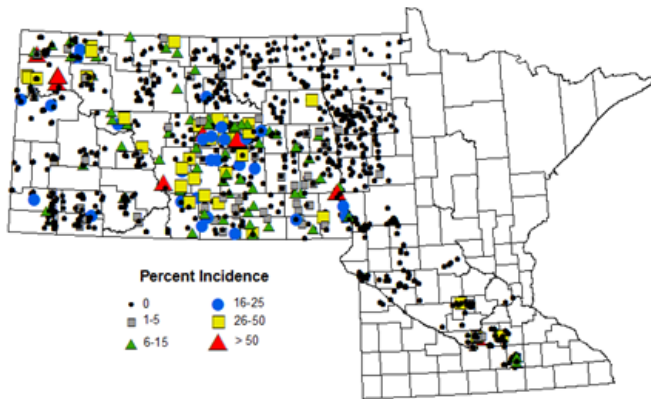
Wheat Scab Field Severity Index Season Final, 2017



Wheat Septoria SSP Severity Season Final, 2017



Tan Spot Percent Incidence Season Final, 2017



Tan Spot Percent Severity Season Final, 2017

