NCERA-184 Wheat Pathology Technical Committee Meeting

NCERA-184 Wheat Pathology
Minutes of the Annual Meeting
Madison, WI
June 11, 2014

Administrative Advisor:
Dr. Kendall Lamkey
Department of Agronomy
Iowa State University

Chair:
Dr. Kiersten Wise
Department of Botany and Plant Pathology
Purdue University

Secretary
Dr. Damon Smith
Department of Plant Pathology
University of Wisconsin-Madison

Members and guests in attendance:

Kiersten Wise (Purdue University), Damon Smith (University of Wisconsin-Madison), Emmanuel Byamukama (South Dakota State University), Ruth Dill-Macky (University of Minnesota), Heather Kelly (University of Tennessee), Kendall Lamkey (Iowa State University), Andrew Friskop (North Dakota State University), Carl Bradley (University of Illinois), Albert Tenuta (Ontario Ministry of Agriculture and Food), Pierce Paul (Ohio State University), Gene Milus (University of Arkansas), Bob Hunger (Oklahoma State University)

Minutes:

9:00 AM Kiersten Wise welcomed the group of 12 wheat scientists to the NCERA 184 Wheat Working Group Meeting

9:10 AM State Reports were given from the 12 participants. Specific reports for each state are available in the attached document. The general consensus was that wheat acreage is down in many states. Wheat disease levels for the 2013/2014 season where described as low to moderate in most states. Fusarium head scab and the performance of the head scab model was a topic of discussion.

10:00 AM Carl Bradley—Timing of foliar fungicide applications for FHB management

Data were presented looking at timing of application of Prosaro (6.5 fl. Oz.) and Caramba (13.5 fl. Oz.) at Feekes 10.5, 10.5.1, and 5 days after 10.5.1.

Winter wheat typically had higher levels of FHB control than spring wheat. Timing of fungicide application alone may not give acceptable control, so resistance should also be incorporated for FHB control.

Additional data were presented from Pierce Paul's meta-analysis. Feekes 10.5.1 timing of application was best timing presented in the data. However, application of fungicide up to 6 days after 50% anthesis was also effective. Control in post-anthesis timings was sometimes even better than anthesis application because anthesis was extended by weather conditions.

Conclusions: Growers should shoot for 10.5.1 for fungicide application; there is some room for error maybe 4-5 days after anthesis and still achieve good efficacy using fungicides.

Pierce Paul—Early season fungicide applications for wheat disease management

Data were presented on fungicide product and timing trials for control of leaf disease (Stagonospora blotch) in the Great Lakes Region. Feekes 5 applications were too early in these trials for control of Stagonospora blotch. Feekes 8 and 10 applications resulted in decent control of Stagonospora blotch over the non-treated check.

Follow-up analysis also showed that the best probability of reducing the level of disease was to spray at Feekes 8 and 10 using a resistant cultivar. Best yield increase over the check treatment was also observed when fungicide was applied at Feekes 8 or 10.

Heather Kelly - Discussion on Barley yellow dwarf management

Insecticide seed treatments are controlling aphids in winter wheat until spring in some cases in Tennessee. Foliar insecticide also seems to control aphids and increase yield over the non-treated check. These treatments might also be resulting in lower Barley yellow dwarf incidence. Research is on going to test these treatments for their utility.

Andrew Friskop—NDSU Extension pest management app

Combines 3 written manuals into an electronic application for smart phones. The project was funded by commodity groups in the state and is free. Also incorporates pictures of disease symptoms. Provides product recommendations for wheat diseases based on the user inputs.

12:00-1:00 PM Lunch on own

1:00pm Ruth Dill-Macky—Bacterial leaf streak and root rot of wheat

Increasingly evident over the past six cropping seasons in Minnesota and the Dakotas. Reasons probably include more wheat being grown, susceptible varieties, increase use of fungicides that may reduce fungal competition.

The disease is caused by *Xanthomonas translucens* pv. *undulosa.* 2011 and 2013 data demonstrate that high levels of disease do result in yield loss.

Survival of the pathogen could be on seed (low transmission rate), soil, and weeds. Warm temperatures promote bacterial leaf streak and spread is promoted by wet conditions and plant injury.

The bacterial population in Minnesota seems to be highly variable genetically, based on multilocus gene sequencing data.

Cooperative experiment data suggest that Bacterial leaf streak is not more severe when Prosaro is used. However, the use of fungicide has probably un-masked the presence of Bacterial leaf streak as a yield limiting disease.

Common root rot, crown rot, and take-all can be found in areas of Minnesota and the Dakotas. Fusarium species seem to be the most common group of pathogens isolated from sampling. *Bipolaris sorokiana* is second. Crown rot (caused by Fusarium species) is likely more common than was expected.

Gene Milus—Race specific adult-plant resistance to stripe rust

Several types of resistance to rusts – all-stage resistance and adult plant resistance.

After 2000 in eastern U.S., new race and strain is the most common and are much better adapted to warmer temperatures. To check races a new set of wheat differentials was developed in 2010.

Research was conducted to identify adult plant resistance varieties and to look at isolate aggressiveness. Some varieties that existed before 2000 did have resistance to the new race and strain while some lost resistance.

Conclusions:

- Most SRWW cultivars have adult plant resistance to stripe rust
- At least 5 races of the stripe rust fungus can be identified in the eastern U.S.
- Races based on adult plant resistance genes, describe resistance in the field better than seedling resistance
- Management
    - Plant varieties with good adult plant resistance
    - Apply fungicide early to fields with overwintering stripe rust
    - Timing of application more important than actual product

2:00 PM Marty Draper—conference call at 2:00 PM
Washington D.C. Updates and Programs coming

Budgets seem to be getting a bit better, with some increases; Could be due to climate change

NIFA Funding – Been through some rough years to align AFRI programs and adjust funding cycles; Now have a plan and better consistency from one program to another; this should help improve planning and preparation; Many of the first CAP grants funded when AFRI Formed are now winding down and will loosen up some budget commitments for future funding.

ERA activity groups – Generate good ideas, but sometimes hard to get funding for those; New areas that might help funding these ideas include the AFRI Foundational CARE program - Can be applied research or extension, but budget cannot exceed $150,000; Food Security RFA also might be a good opportunity

Most significant change in grant opportunities was the development of Crop Protection and Pest Management program – The program is a consolidation of 5 programs - Applied research and development program is the first program; looks sort of like RIPM, but functions a bit differently and contains the old EIPM program in new form

2:30 PM Administrative update and Business meeting

Kendall Lamkey

Climate change is a top priority for USDA – Has developed regional climate HUBS to mine climate data for Agricultural use

Federal funds for USDA have been restored to 2012 levels

**Research impact reporting for multi-state groups is likely key to get more support from USDA

Approve minutes from 2013 meeting

- Elect new secretary - chair to be
  - Andrew Friskop was nominated and accepted to be secretary in 2015 and Chair in 2016
- Discuss dates and location of 2015 meeting

  -Possible meeting locations

  Puerto Rico, South Texas, or South Florida in conjunction with APS Rust Meeting?

  Meet with Western wheat working group?

  Meet with Eastern wheat working group?

  No field tours

3:00 PM Adjourn meeting

The objectives of NCERA 184 are to:

1. Facilitate collaborative research on current and emerging diseases of small grains. Specifically: a) The integrated management of Fusarium head blight b) Fungicide efficacy trials for diseases of small grains c) Epidemiology and risk management d) Screening of uniform regional nurseries for resistance to economically important pathogens e) Studies of the population biology of small grain pathogens f) Develop disease and economic threshold models to improve foliar disease management in wheat g) Surveillance and preparation for stem rust race Ug99 and other diseases of high consequence.

2. Promote the exchange of information, techniques, fungicide efficacy results, disease resistant germplasm and pathogen cultures among small grains researchers in order to coordinate the development of integrated management strategies for important diseases.

The efforts of the committee in 2012 can be seen through a combination of outcomes, outputs, and other activities that integrated our two core objectives. Short term outcomes include: (1) improved understanding of the integrated use of rotation, cultivar resistance, and foliar fungicides for control of Fusarium head blight and deoxynivalenol; (2) new working knowledge on fungicide application methods for optimum efficacy for diseases such as stem rust; (3) an improved awareness and understanding of the research conducted on the potentially threatening disease wheat blast (3) a coordinated effort to continue to improve our knowledge of the efficacy of foliar fungicides for control of foliar diseases - this provides growers the most unbiased piece of information regarding expected control throughout the US; (4) a high level of communication amongst the members of NCERA-184 to provide real-time knowledge of diseases affecting wheat across the production region - in particular, there is a high level of communication for rust and Fusarium head blight as well as electronic methods to disseminate this information; (5) the members of NCERA-184 provide samples to the USDA to improve our knowledge of the race and virulence determinants of the different rust diseases.

Outputs: (1) there are numerous refereed and extension-oriented publications involving members of NCERA-184 (see publications list); (2) Foliar fungicide efficacy table that is updated annually based on observations and data obtained from coordinated and individual trials across the small grain production region; (3) ScabSmart, a web-based tool to provide information about Fusarium head blight in wheat and barley updated annually; (4) the U.S. Wheat & Barley Scab Initiative Fusarium Head Blight Prediction Center, a web-based platform that provides risk maps and commentary regarding the likelihood that Fusarium head blight will occur; (5) a reporting system for rust diseases of small grains, coordinated by the USDA Cereal Disease Laboratory; (6) high use of email listservs amongst members of NCERA-184 to improve real-time communication to improve within-growing season knowledge of small grain diseases.

Activities: (1) Coordination of a national survey through the U.S. Wheat & Barley Scab Initiative to understand producer awareness, attitudes, and management programs for Fusarium Head Blight; (2) annual updates of the foliar fungicide efficacy table based on working knowledge and field research trials, including several coordinated fungicide trials; (3) coordinated field trials for fungicides and biological control agents for the management of Fusarium head blight; (4) coordinated efforts to provide within-growing season knowledge about the risk of Fusarium head blight.

Impacts

1. The NCERA 184 meeting continues to serve as an annual forum for small grain pathologists to exchange information on regional, national, and international diseases. The NCERA 184 committee helps drive collaboration among members in research and outreach activities. The large number of collaborative research and extension publications among NCERA 184 members is evidence that NCERA 184 helps drive this collaboration.
2. Discussions among participants of the NERA-184 meetings have helped in the efficiency and accuracy of applied disease research efforts on small grain crops in participating states through the use of integrated research trials and dissemination of disease-related information to stakeholders.

3. Communication is strong among the group and the means of communication have improved. The use of a wheat disease listserv (wheatdisease@listserv.ksu.edu) has been extremely high as well as the continued use of the cereal rust survey listserv (cereal-rustsurvey@ lists.umn.edu) during the growing season as cereal rusts are reported in each state. This high-level of communication among NCERA 184 members helps improve disease management recommendations in each state.
4. Collaborative field research efforts among NCERA 184 members have shown that the best control of Fusarium head blight (FHB) is achieved through integrated management practices. This information has been used in Extension programs across several states, and growers are adopting these practices to reduce FHB.
5. A multi-state Fusarium head blight disease forecasting system has promoted better stewardship of foliar fungicide applications by providing growers with information that can be used to help make fungicide application decisions based on the threat of disease. This web site was visited over 10,000 times (April _ August) when wheat was actively growing in 30 states. The estimated net value of the disease prediction system to U.S. wheat growers exceeds $47 million.
6. NCERA 184 multi-state projects designed to investigate factors influencing the accumulation of DON in disease-free wheat grain, develop integrated management programs to minimize losses due to FHB/DON, and develop models to predict FHB/DON are ongoing.
7. Small grain disease surveys conducted in many of the NCERA 184 member states provided information on disease occurrence, distribution, and potential effects on yield and quality
8. The information generated from the sampling of rust isolates (and race determination by the USDA-ARS-Cereal Disease Laboratory) are utilized to make informed recommendations to small grain breeders concerning the selection and introgression of effective rust resistance genes into elite germplasm and future varieties.
9. Due to collaborative efforts of NCERA 184 members, new outreach materials are being developed to educate the public about important diseases. These include new educational materials being developed for the Ug99 strain of stem rust, and the development of a ScabSmart web site that contains the best Fusarium head blight management information available.
10. The annually updated Foliar Fungicide Efficacy Table developed by the NCERA 184 Committee members continues to be utilized by Extension personnel, industry personnel, crop consultants, and growers. The development of this table has resulted in more accurate and realistic chemical control recommendations for small grain producers and has facilitated cost-effective disease management decisions in NCERA 184 states.

Combined Annual State Reports

Arkansas State Report – 2014
Gene Milus, June 2014

Wheat crop and diseases

Approximately 440,000 acres of soft red winter wheat were planted in the fall of 2013. The winter was longer and colder than normal. Spring weather fluctuated from near record low temperatures to near record high temperatures and from drought-stressed conditions to flooded portions of fields. The crop flowered 2-3 weeks later than "normal". As of June 9, a few fields in southern Arkansas were harvested, but harvest statewide is on hold due to soggy conditions.

Fungal diseases were at unusually low incidence and severity well into the grain-fill period. Bacterial streak was widespread and severe on some varieties at some locations. Leaf rust, stripe rust, and stem rust were found near physiological maturity in a few areas. Although the risk of scab was forecast to be low throughout the flowering period, low levels of scab were found in many areas before physiological maturity.

Accomplishments

Cultivars and breeding lines were evaluated for resistance to natural infections of bacterial streak and to stripe rust and scab in inoculated plots. Fungicides were evaluated for efficacy against stripe rust. Adult-plant resistance to stripe rust was shown to be common among contemporary varieties of soft red winter wheat, and at least five races of the stripe rust pathogen were characterized based on their adult-plant reactions on 12 cultivars. Two MS students were graduated in 2013.

2013 Delaware State Report for NCERA 184

Nathan M. Kleczewski Ph.D., Extension Plant Pathologist

In 2013, wheat was planted in approximately 85,000 acres of Delaware cropland. Of this, approximately 78,000 acres were harvested. The average yield was 68 bu/A, which was reduced from 2012, when average yields were 74 bu/A.

The impact of wheat diseases on productivity was significant in 2013. Continuous wet weather early in the season favored the development of tan spot, Septoria leaf spot, and powdery mildew in the lower and mid canopy during the growing season. Leaf and stripe rust were present in some fields before heading. Wet weather around flowering resulted in significant and severe levels of Fusarium head blight, with field severity values ranging from 4-80%. DON contamination was also significant, with an average of 6.2 ppm detected at grain elevators. Continual rain resulted in delayed harvest, poor test weights, and dockage at the elevator for many growers. Other diseases detected included BYDV, WSSMV, sooty mold, Cmt, and smut. Dr. Kleczewski participated in monitoring for wheat diseases and distributed disease observations through the Weekly Crop Update and Field Crops Disease Management Blog. Dr. Kleczewski also provided commentary on the FHB prediction center website. A regional talk on Fusarium head blight was

delivered to over 400 growers and agricultural professionals at the Delaware Agriculture Week in Harrington, Delaware in February, 2014.

Indiana 2013 State Report for NCERA-184

Kiersten Wise

2013 in Review

According to the USDA National Agricultural Statistics Service, approximately 440,000 acres of wheat were harvested in Indiana in 2013, with an average production of 73 bushels/acre, which was the highest recorded average since 2005. Wheat diseases were generally at low levels throughout Indiana in 2013. Stagonospora leaf blotch/Septoria leaf blight was observed early, but did not impact yield in most fields. Fusarium head blight (FHB) was observed throughout the state and some fields had high levels of deoxynivalenol present. Leaf rust and stripe rust were observed across Indiana, however all rust diseases arrived too late in the growing season to cause significant yield loss. Several viral diseases of wheat, including wheat streak mosaic virus (WSMV), wheat spindle streak mosaic virus (WSSMV), soil-borne wheat mosaic virus (SBWMV), and barley yellow dwarf virus (BYDV) were confirmed in Indiana.

Projections for 2014

The 2013 winter was unusually cold, which resulted in some winter kill across Indiana. Wheat disease were generally low across the state, with the exception of FHB.

Impact

Research activities in 2013 focused on evaluating integrated management strategies for control of FHB. The results of these research projects indicate that a well-timed fungicide application can significantly reduce the impact of FHB and DON in wheat varieties, and increase yields in most varieties. This information is of primary importance to growers and is presented in extension programs and summarized in extension articles to aid growers in managing wheat diseases, especially FHB. Indiana also contributed periodic commentary to the USWBSI FHB forecasting tool and disseminated information about risk of FHB and other wheat diseases via Extension newsletter articles.

Research is underway to determine the sensitivity of *Fusarium graminearum* to the triazole fungicides metconazole, prothioconazole, and tebuconazole. A baseline sensitivity was established, and screening of recent isolates from across the Midwest is underway. This research will help us determine if shifts in sensitivity are occurring to the fungicides recommended for FHB management.

NCERA-184: Report for Kansas for 2013

William Bockus, Erick De Wolf, and Mark A. Davis

Short-term outcomes and milestones. Quantifying the impact of resistant cultivars, planting date, seed-treatment chemicals, and foliar fungicides on diseases gives wheat producers multiple options when managing pathogens. All of these findings should help to improve management of wheat diseases in Kansas that cause an annual loss of about 35 million bushels. However, overall efforts to control wheat diseases in Kansas (including development of resistant cultivars) have resulted in reducing statewide losses from 17% in the 1970's to about 10% in the last several years, an annual savings of about $190 million at today's grain prices (June 2014; $6.90/bu).

Outputs:

1. Discussions among participants of the NCERA-184 meetings have helped in the efficiency and accuracy of applied disease research efforts on winter wheat in Kansas. The following projects were aided by these meetings: 1. determining the reactions of breeding lines and commercial winter wheat cultivars to various diseases (publications 2, 3, 5, 7, 9, 10, 14, 15); 2. dissemination of disease-reaction data of cultivars to wheat producers (publications 11,12); and 3. the effect of seed-treatment and foliar fungicides on wheat diseases (publications 4, 6, 8, 10). Progress toward identifying resistance to wheat pathogens has helped in the development of new, resistant wheat cultivars.

2. Determining the impact of fungicides on wheat diseases is necessary to develop accurate chemical control recommendations. Extension publications were developed and refined to help producers make more efficient use of fungicides. We are currently developing web-based tools to deliver this information.

3. A multi-state effort to predict epidemics of Fusarium head blight (FHB) continued during the 2009-2013-growing seasons. This prediction effort includes web-based tools, which display daily estimates of disease risk for 30 states. Commentary developed by a disease specialist in each state is displayed along with the risk maps. Commentary is also distributed via an FHB Alert System that sends email and text messages to mobile devices. The prediction tools received over 20,883 visits (122,000 hits) during the 2013-growing season in the U.S. (April – August). The FHB Alert System sent commentary just under 1,000 subscribers in 2013. Users of the FHB prediction models and the FHB Alert System were surveyed annually in 2009-2013. The survey results included input from 1,828 respondents and indicated that 64% of these users were either farmers or farm advisors. More than 70% of the users applied the information directly on their farm, or used it to make recommendations about disease management to others. In 2009-2013, 95% of the users considered the information to be of high or moderate value for their farm operations and businesses. A subset of questions targeting the influence of the information suggests that more than 90% of the users experienced moderate or great improvement in their awareness of the disease risk in their area. The results also showed that the information influenced disease management decisions directly for 35% of the respondents, and motivated another 28% to seek advice from others. The 2013 survey asked growers to estimate the monetary value of the

information provided to their farm or business. This survey indicates that the average monetary value of the information provided by the prediction system was $17,000 per user. Combining this figure with use statistics suggests that annual impact of the FHB prediction model exceeds $170 million.

2013-14 NCERA-184 Kentucky State Report

Prepared By:
Don Hershman
Extension Plant Pathologist
University of Kentucky

Kentucky produces approximately 300,000 to 700,000 acres of soft red winter wheat each year, with the number of acres varying due to crop (corn, soybean, wheat) prices and suitability of fall conditions for wheat planting and early crop development. In 2013, Kentucky planted 700,000 acres of wheat and harvested 610,000. The average yield was 75 bu/A and total production for the state was 45,750,000 bushels. Approximately 80% of Kentucky's wheat acres are treated with a fungicide each year. In the best wheat areas of the state, applications approach 100% percent. The primary target disease is Fusarium head scab, but leaf and stripe rust, leaf blotch complex (*Stagonsopora nodorum* and *Septoria tritici*) and glume blotch are also important target diseases, depending on the year. The wheat disease situation was very quiet during 2013 and losses were minimal, overall. The 2013-2014 season has been characterized by a very cold winter and late spring. Diseases were not extensive during the season, but late season quality issues (especially high DON, even in areas where FHB symptoms were limited) are widespread, but spotty across the state. Harvest numbers are not yet available for inclusion in this report.

Kentucky wheat disease research primarily involves testing new fungicides and timing of treatments to effect the most economical, effective and environmental sustainable fungicide spray decisions. Research projects are developed primarily to test new treatments being evaluated by industry, as well as uniform testing for FHB control where scientists from multiple states implement the same basic protocol.

In 2013, we conducted 2 foliar fungicide efficacy trials aimed at various foliar and head diseases.

In addition, the University of Kentucky wheat breeder, Dr. Dave Van Sanford, has an extensive wheat breeding program targeting variety development featuring resistance to Fusarium head blight/DON.

Louisiana State Report 2014

Trey Price
Assistant Professor – Field Crop Pathology
LSU AgCenter – Macon Ridge Research Station
pprice@agcenter.lsu.edu

Louisiana wheat fared very well this year with excellent growing conditions and yields. Overall, light disease pressure was observed throughout the state. Some seedling disease issues were noted in isolated areas where tillage operations reduced drainage. Barley yellow dwarf was observed in small, isolated spots in fields where aphids were present earlier in the season. Overall, effects of barley yellow dwarf were minimal, but the disease severity within small spots in fields had producers concerned. Bacterial streak was the predominant foliar disease in Louisiana, and was observed statewide in producers' fields and in variety trials. Septoria leaf blotch also was widespread; however, the disease stayed low in the canopy and rarely progressed far enough upward in the canopy to make an impact. In susceptible varieties, stripe rust developed to moderate levels but quickly subsided as temperatures rose. Leaf rust also was noted in susceptible varieties and developed late (after flowering) having negligible effects. Fusarium head blight was observed statewide with light to moderate incidence and severity. In inoculated nurseries, scab was severe. Varieties in trials at several locations in the state were rated for bacterial streak, Septoria leaf blotch, leaf rust, and scab. Currently, the data is being reviewed and will be posted soon at www.lsuagcenter.com.

Michigan State Report – 2014

NCERA 184 report

Martin Nagelkirk, Michigan State University Extension
Martin Chilvers, Michigan State University, Plant Pathologist
June10, 2014

Production:

Ice-sheeting and cold temperatures significantly damaged Michigan's 2014 winter wheat crop. Of the 570,000 acres planted, only some 500,000 acres will be harvested. This represents a 16 percent reduction from last year. Grain yields are expected to be below last year's state average yield 75 bushels.

Approximately a third of Michigan wheat acres is planted to soft white winter wheat and the remaining two thirds is soft red winter wheat.

Crop development:

For the second year in a row, wheat was slow to initiate spring growth and the crop's development lagged due to cool temperatures during April and May. During the first week of June, flowers were first visible in southern Michigan counties. Early flowering is currently being seen in some central areas of the state.

Diseases:

Leaf diseases have been relatively light so far this season. However, low levels of Septoria leaf spot, powdery mildew, Stagonospora leaf blotch, and leaf rust has been reported. So far, the risk of Fusarium head blight is low according to the national prediction model.

MSU field research:

Fungicide efficacy: trials are being conducted by in collaboration with industry to evaluate the performance of selected fungicides on foliar diseases and Fusarium head blight.(Martin Chilvers and Martin Nagelkirk)

USWBSI FHB Management: This trial was initiated in the fall but was lost due to winter damage. A modified trial is being conducted to measure the effects of various fungicide application timings on a single soft white wheat variety (Martin Chilvers and Martin Nagelkirk).

Variety performance: MSU annually evaluate the performance of commercial varieties and experimental lines at multiple locations across the state. These trials provide valuable comparisons of disease susceptibility between varieties and lines. (Eric Olson and wheat breeding team)

Wheat Breeding and genetics: In addition to an emphasis in breeding for improvements in FHB resistance, there is a study of the resistance of stem rust using classical and molecular genetic techniques and a study to evaluate exotic germplasm (Eric Olson and wheat breeding team).

Extension efforts:

Field event: a field event is being planned for June 26, 2014 at the Saginaw Valley Research and Extension Center where topics related to disease management and production practices will be presented.

Educational fact sheets: various informational pieces are made available to growers including "*Management of Fusarium Head Blight*" ; "Susceptibility of soft winter wheat varieties to common diseases"; *"Scab Smart Management"*.

Group presentations: Wheat diseases and management are featured in various grower meetings during the winter months.

Minnesota State Report – 2014

NCERA-184: Diseases of Cereals

Ruth Dill-Macky, Madeleine J. Smith and Jochum J.Wiersma

The 2013 season

Of the 1.23 million acres of wheat planted were in Minnesota in 2013, 1.2 million acres were planted to spring wheat and 30,000 acres to winter wheat. This was a 150,000 and 10,000 acre decrease, in spring and winter wheat, respectively, from the 2012 growing season. The acreage of wheat looks to be similar in Minnesota for the 2014 growing season. The average wheat (all wheat) yield for the state was 56.7 bu/A in 2013, much the same as in 2012 (56.9 bu/A) which was the second highest on record. Winter wheat yields for the state averaged 43 bu/A, which was significantly lower than the 55.0 bu/A in 2012. The number of acres planted to barley in Minnesota increased from 70,000 acres in 2011 to 115,000 acres in 2012, but dropped back somewhat to 90,000 acres in 2013. The average yield of 69 bu/A for barley was 12 bu/A above the 2012 average yield and 18 bu/A above the 2011 average yield. The oat acreage in Minnesota in 2013 was 240,000, which was at least 50,000 acres more than was planted in either 2011 or 2012. The average yield for oats in Minnesota was 57 bu/A, down from 62 bu/A in 2012. There are no longer official (USDA) statistics available for durum wheat planted in Minnesota. The downward trend in the acreages planted to barley and durum wheat likely reflect the

long-term impact of Fusarium Head Blight (FHB) and *Fusarium*-produced mycotoxins, changes in agricultural legislation that resulted in significantly greater competition from other crops, especially RoundUp Ready (RR) soybeans and the economics of agricultural commodities.
Unseasonably cold temperatures and persistent snow cover in Minnesota delayed the start of planting for small grains. Spring rains further limited planting opportunities and ultimately resulted in a highly compressed planting season for small grains in Minnesota in 2013. By the end of the third week in May 71 percent of the spring wheat crop and 68 percent of the barley crop had been planted although emergence for both crops was nearly 50 percentage points behind normal, being only 7 and 6 percent, respectively. Oat progress also lagged behind normal with only 73 percent of the crop planted and 26 percent emerged.

The cool and wet conditions continued into June and diseases were generally light with the exception of tan spot. Tan spot was first noted in early June, being especially prevalent in wheat planted on wheat residues. Extended periods of leaf wetness likely contributed to the widespread prevalence of this disease. Tan spot remained the most prevalent leaf disease in 2013, although fungicides and warmer drier weather, in the second half of June and July, checked disease development.

Barley Yellow Dwarf virus (BYDV) was reported throughout the state but did not reach a high incidence in commercial fields. Leaf rust of wheat was reported in crops in the southern part of the state in mid-June but it appears the levels remained low for the remainder of the season. Stem rust was observed in oats in a localized area in the southern part of the state, though did economic damage to only a few fields. Septoria blotch infections were prevalent, and in some cases severe, in mid-July in early planted wheat. Although there was less rainfall in July than earlier in the season, there was some concern the FHB infections being facilitated by high humidity and dew points that coincided with anthesis. FHB development was however modest in spring wheat as dry conditions after anthesis reduced the risk of FHB development, some winter wheat crops did however have higher levels of FHB.

The 2014 Season
A cool spring and persistent snow cover delayed the start of field work this spring across the state. The low temperatures, and abundant spring precipitation, as both snow and rain, helped to replenish subsoil moisture that was generally well below normal for much of the state following a dry finish to the 2013 growing season. Favorable conditions for planting finally arrived in mid-May, and it appears that almost half of the spring wheat, oat and barley crop was planted in the week of May 19-25 with that the vast majority of the planting being completed by the end of May. With the weather finally warming up at the end of May, crop development moved apace, though due to the late start crops at the end of May were still well behind the five-year average.

Given the crop stage little disease is evident at the time of writing (June 6th), though there are some early reports of tan spot in wheat and in barley either spot blotch or the spot

version of net blotch has been reported - we are still trying to determine which pathogen(s) is present.

Outputs
The reactions of hard red spring wheat, barley and oat varieties to various diseases prevalent in Minnesota were disseminated to small grains producers on the Minnesota Variety Trials Results. This information provides growers with options and aids them in selecting cultivars that are appropriate for their area and risk level for the diseases prevalent in Minnesota.

Activities
Screening of breeding material for Fusarium Head Blight (wheat, barley and oat), leaf rust (wheat), stem rust (wheat), net blotch (barley), bacterial leaf streak (wheat and barley) and loose smut (oat) was conducted in 2013. These data are used by small grains breeders and geneticists to make selections for improved resistance.

Testing of fungicides on wheat and barley for efficacy to Fusarium head blight was conducted as part of a national cooperative effort and recommendations of the best management practices are made available to growers through the US Wheat and Barley Scab Initiative (USWBSI) and MAES websites.

Nebraska State Report – 2014

Stephen Wegulo, University of Nebraska, Plant Pathologist

In 2013, winter wheat acres harvested were 1.13 million, down from 1.3 million in 2012. Total production was 39.55 million bushels, down from 53.30 million bushels in 2012. Yield per acre was 35 bushels, down from 41 bushels in 2012. The predominant disease in 2013 in eastern Nebraska was bacterial streak. Other diseases included barley yellow dwarf virus, wheat soilborne mosaic virus, leaf rust, stripe rust, Septoria tritici blotch, tan spot, powdery mildew, and Fusarium head blight (scab) observed at trace to low levels. In western Nebraska, barley yellow dwarf virus, wheat streak mosaic virus, stripe rust, Septoria tritici blotch, and tan spot were observed at trace to low levels.
Impact statement: Disease management information (fungicide application and timing, cultural practices, and variety resistance) disseminated through various channels saved Nebraska wheat growers an estimated $12 million in 2013.
Current research: epidemiology and integrated management of Fusarium head blight (FHB) of wheat; screening germplasm for resistance to FHB, stem rust, and leaf rust.

2014 North Dakota State Report – NCERA 184

Andrew Friskop, Cereal Extension Plant Pathologist, NDSU

2013 Crop:
Small grain growers experienced profitable gains in 2013 as yields were above both 5-year and 10-year means. Estimated value of gross return per acre was $295 for wheat. Warm temperatures and infrequent moisture events hindered early season foliar disease development. Tan spot continued to be the most commonly detected disease in the state. Rust pressure and scab indices were low across the state. However, pockets of higher

scab indices appeared in acres of late planted durum and hard red spring wheat. Ergot incidence levels as high as 10% were apparent in the SW and NW portions of the state. In some cases, growers had to separate grain to prevent dockage.

2014 Crop:
Winter wheat acres increased largely due to preventative planting acres that occurred during the 2013 growing season. Snow cover was less than optimal and the frost line extended down to seven feet in some locations. However, most of the winter wheat survived and appears to be in good shape. Cold temperatures and frequent moisture events delayed spring planting across the whole state. Tan spot is starting to show up in winter wheat and spring wheat fields. The highest levels of incidence and severity are on no-till wheat on wheat acres.

Impacts of NCERA-184 related activities:

- **Distribution of Updated NCERA Fungicide Efficacy Table for Wheat:** I will be distributing the efficacy table to county agents and growers during the 2014 NDSU Research and Extension Center field day circuit.

- **Provide Commentary for FHB Forecasting Site and FHB Alerts:** I will be providing commentary for the FHB site as the wheat crop progresses towards anthesis.

2013 Annual Oklahoma Report
NCERA-184, Diseases of Small Grains

Personnel: Robert M. Hunger, Professor & Extension Wheat Pathologist
Brian Olson, Senior Agriculturalist
Nathalia Graf Grachet, Graduate Student (MS)

In 2013, Oklahoma produced 105.4 million bu of wheat from 3.4 million acres for an average production of 31 bu/A. This was lower than a typical wheat harvest in Oklahoma, which averaged about 120 million bu/year from 2008-2012. Fall 2012 was extremely dry and mild across Oklahoma, so the crop as a whole was not well established going into the winter and grazing wheat for forage was impacted. Cool and wet weather through March and April helped the wheat in some parts of the state, but drought (especially in western Oklahoma and the panhandle) along with multiple freeze events in late March and early April greatly impacted production. Although heavy leaf and stripe rust were present across southern Texas during the spring, no leaf rust and only slight

stripe rust and powdery mildew were observed in Oklahoma in the early spring. Tan spot and septoria leaf blotch were the more prevalent foliar diseases across Oklahoma, especially in no-till fields in central Oklahoma. Aphids also were reported across much of the state in March, and symptoms of barley yellow dwarf without severe stunting were observed later in the season. Bacterial streak/black chaff was observed in central Oklahoma, and wheat streak mosaic virus and Russian wheat aphid were observed as far down state as Stillwater. Typically the mite-transmitted virus diseases and RWA are seen only in western Oklahoma and the panhandle. Leaf rust and stripe rust did become more prevalent in Oklahoma in May, but the severity of these two foliar diseases was sufficiently late so that there was only a minimal impact on yield. Stem rust also was found in early June, but at a time just before the last "green" in stems senesced.

Current Research Projects

Development of disease resistant wheat germplasm. The reaction to leaf rust and to the *Soilborne wheat mosaic virus* (SBWMV)/*Wheat spindle streak mosaic virus* (WSSMV) complex was determined for over 1,200 breeder lines in greenhouse and field tests including the Northern Regional Performance Nursery, Southern Regional Performance Nursery, and the Regional Germplasm Observation Nursery that are organized and distributed by the USDA-ARS. A subset of more than 500 OSU advanced lines also was tested for reaction to leaf rust, tan spot, septoria, and powdery mildew (greenhouse) and barley yellow dwarf (field). Research by the entire Wheat Improvement Team led by Dr. Brett Carver (Wheat Breeder/Geneticist; Plant & Soil Sciences Department, OkSU) resulted in the release of a two gene Clearfield hard red winter wheat variety (Doublestop CL +) in 2013.

Evaluation of foliar fungicides for control of foliar wheat diseases. A dryland foliar fungicide trial was conducted in 2013. Disease pressure was light in this trial, which resulted in high yields (all treatments >82 bu/acre), and no yield differences between the non-sprayed control and any fungicide treatment.

Testing wheat produced in Oklahoma for presence of Karnal bunt (KB). As required by the USDA-APHIS-PPQ, Oklahoma wheat produced in 2013 was tested for the presence of KB with all samples negative. This testing is required to obtain the phytosanitary certificate so that wheat can move freely into export.

South Dakota State – 2014

Shaukat Ali and Emmanuel Byamukama

2013 in Review

Acreage: 1.3 m acres winter wheat; 1.2 m acres spring wheat.

Generally, the diseases were not a major issue for wheat production in 2013, due to the dry and hot weather conditions in the state. Leaf diseases such as tan spot, Stagonospora leaf blotch, bacterial leaf streak, and leaf rust were observed on lower leaves in most of the surveyed wheat field plots at early-late milk stage. Stripe rust was also observed sparsely in commercial fields; however, this was observed frequently on both spring wheat and winter wheat germplasm planted at SDSU research stations. Stem rust was

also observed at low level in the breeding nursery on cultivar 'Robidoux'. FHB with low incidence and severity was also observed at the university research stations and visited commercial field. Based on a survey conducted on root diseases, take-all and crown rot was observed frequently on winter wheat and spring wheat, respectively. Majority of the crown rot infected root samples produced *Fusarium accuminatum* instead *F. graminearum*, the later is generally considered to be the primary pathogen of crown rot.

Projections for 2014
Severe winter led to some winter kill for winter wheat fields that did not have sufficient snow cover. The 2014 winter season started with cold and wet spring. High moisture may increase the risk for leaf spot diseases and FHB in both winter and spring wheat.

Impact:
Research activities in 2013 were focused on identifying the primary leaf, root, and head diseases and their associated pathogens on both winter wheat and spring wheat in the state. Tan spot was the most common disease observed on both winter wheat and spring wheat. Take-all and common root rot/crown rot was observed on winter wheat and spring wheat, respectively. Bacterial leaf streak was also observed in some of the surveyed wheat field plots. Research on uniform scab fungicide trials and integrated management trials was also conducted. Across twelve sites in the Uniform Scab Fungicide trials from the Mid West, it was shown that a strobilurin fungicide sprayed at Feekes 9 increased DON while a triazole fungicide applied at Feekes 10.5.1 or five days after Feekes 10.5.1 generally resulted in lower DON levels across the sites. The average yield responses to fungicide treatment across the twelve sites showed that it ranged from 5 to 35% of the untreated control. South Dakota contributed commentary to the USWBSI FHB forecasting tool to help the producers with managing fungicide sprays during flowering if the conditions were right for scab to develop

Personnel involved in wheat research and extension:
Emmanuel Byamukama – Extension Plant Pathologist
Shaukat Ali- Small Grains Pathologist
Marie Langham – Virologist
Connie Tande- Diagnostician
Kay Ruden – Research Associate

Tennessee State Report – 2014

Heather Kelly, University of Tennessee, Plant Pathologist

In 2013, 550,000 acres of wheat were planted with 470,000 acres harvested in Tennessee, which was a 200,000 acre increase from the previous year. The wheat fared well through the mild to moderate temperatures of the 2012-2013 winter. The cool, wet spring of 2013 suppressed some diseases but was conducive for stripe rust and powdery mildew, which did effect some yields, but the majority of wheat in Tennessee was unaffected. The cooler temperatures did not promote head scab infection despite the wet weather during the flowering growth stage. Nontreated research plots only exhibited 5 to 10% head scab. Final wheat yields were above average at 65 bu/A in 2013.

Wisconsin State Report – 2014

Damon Smith, Extension Field Crops Pathologist, University of Wisconsin-Madison
Shawn Conley, Extension Soybean and Small Grains Agronomist, University of Wisconsin-Madison

University of Wisconsin-Madison personnel involved in wheat disease extension and research: Damon Smith, Shawn Conley, Carol Groves, Scott Chapman, John Gaska, Adam Roth

In the 2013-2014 growing season, Wisconsin saw a 10% decrease in winter wheat acres harvested compared to the previous year. However, yield averaged 67 bu/a in 2014, up 9% from 2013 harvest. Wheat establishment in the fall of 2013 was a challenge due to extreme drought across much of the WI winter wheat growing region. Wheat germinated late and had poor tiller development prior to winter dormancy. This led to some thin spring stands and weed control problems. Wheat broke dormancy in April and continued to progress one to two weeks behind normal for much of the growing season. Winterkill and severe spring flooding led to thousands of wheat acres to be sprayed out and replanted to either corn or soybean. Furthermore, saturated fields delayed or prohibited many operations to the wheat crop including spring nitrogen, herbicide, and fungicide applications.

Status of Diseases

Statewide incidence and severity of powdery mildew was very low in 2014. Low incidence of barley yellow dwarf virus visual symptoms was observed at all variety trial locations. Stripe rust was nearly non-existent at all research locations. Leaf rust was identified at all research and variety trial locations in late June, however severity was low on flag leaves (<10%). Some incidence of bacterial leaf streak was also identified in early June at all trial locations. Severity on some varieties was moderate while low or non-existent on others. Cephalosporium stripe was also identified in some plots at the Fond du Lac variety trial site. The timing of flowering coincided with weather conditions that were favorable for Fusarium head blight in 2014 at the Fond du Lac and Chilton trial locations. Fusarium head blight incidence and severity was low at the Arlington location.

Research Activities

Research activities focused on evaluation of fungicides for efficacy against winter wheat diseases in Wisconsin. In addition, field trials were implemented to evaluate the performance of the Fusarium head blight prediction tool. Overall, the prediction tool under-predicted FHB across Wisconsin in the 2014 season.

Under the direction of Shawn Conley, a strong focus of the UW wheat program is evaluation of winter wheat cultivars for use in Wisconsin. In 2013, the program evaluated 85 cultivars across four locations in Wisconsin. Those results are published annually and available as UWEX Fact Sheet A3868.

Funding was also received from the Federal Hatch program to begin studies evaluating the impact of stripe rust in the upper Mid-west and to develop an improved understanding of the epidemiology of stripe rust in the Midwest states. The program is currently looking for a graduate student to conduct this research.

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