Minutes NCERA-184 Small Grain Diseases East of the Rocky Mountains
Meeting in conjunction with National IPM Symposium
March 27th Memphis, TN

The NCERA-184 committee organized a special session at the National IPM Symposium focusing on the progress in managing Fusarium head blight in wheat. Topics documented progress in breeding, fungicides technology, the influence of crop residues, disease forecasting, integrated management (using multiple strategies to reduce the risk of severe disease), and management success in North Dakota.

The committee requested that several special guests provide presentations on wheat blast. Wheat blast is a disease causing problems Brazil and other parts of South America. The NCERA-184 committee is interested in helping prepare our country for potential incursion of wheat blast. The first step in this preparation is to raise awareness among the wheat disease specialists in North America. Speakers in this session included Mark Farman, University of Kentucky, and Gary Peterson, USDA-ARS Foreign weed and disease lab. Below are notes from these presentations and discussion.

Mark Farman opened the discussion by reviewing blast problems on rice and perennial rye grass used as turf. Mark has studied in the phylogenetic relationships of the Magnaporthe fungi causing these diseases. He suggests that isolates from turf grass are very similar and likely represent a recent introduction to North America. He also indicates that the isolates from perennial rye are genetically similar to those causing problems in wheat.

The Magnaporthe fungus was isolated from wheat in Kentucky during the 2011 growing season. This sample had symptoms similar to Fusarium head blight (FHB) but incubation of the heads produced sporulation of the Magnaporthe and not Fusarium. Mark detailed his interactions with APHIS and efforts to confirm the identity of the fungus. Current evidence suggests that the KY find was *not an introduction from South America* and most likely was a rye grass isolate that had infected wheat.

Isolates of Magnaporthe that cause wheat blast do not appear to pose much threat to rice because these isolates contain PiCo39, which activates a resistant response in rice. The Magnaporthe on turf grass is normally a problem in July and August. This time frame would put it well after the winter wheat has matured in most states with in the US. To date, Magnaporthe on turf grass has not been reported in the Northern US. This suggests that the spring wheat region is likely at a low risk of disease.

Gary Peterson began his presentation by describing the situation with wheat blast in South America. Brazil, Paraguay, Argentina, and Boliva are all reporting wheat blast. There are considerable differences in the intensity and frequency of epidemics. In South America, blast has causes serious problems with some more than 60% yield loss

observed in some fields. The disease has proven difficult to control with fungicides. Genetic resistance was not well understood at the time of these disease outbreaks.

Gary and cooperators have been looking for resistance in U.S. wheat varieties. To date, more than 300 winter wheat line already screened with about 10% having some resistance to multiple isolates of Magnaporthe.

There are considerable knowledge gaps in epidemiology of wheat blast including potential sources of inoculum and overwintering locations. Current thinking in South America is focused on other grass crops and weeds as potential sources of inoculum. Apparently some other grasses can be hosts of this fungus, but it is unclear how often infection of these grasses occurs in nature. Seed transmission is also possible and fungicide seed treatments are being investigated. They are also considering temperature and wetness requirements for infection.

Discussion of the group concluded with a call for vigilance in monitoring for wheat blast. In some areas of the county Italian rye grass is common weed problem in wheat. Some evidence suggests that this rye grass may also be a host of Magnaporthe. Symptoms may look very similar to FHB, and special care should be taken to confirm the symptoms of head blight are caused by Fusarium.

Erick De Wolf then transitioned the discussion to address the committee's foliar fungicide efficacy table. Erick summarized recent changes and updates. We discussed products to be included and the committee suggested removing Alto from the table. It was unclear how widely Alto was being marketed in the US. Some other products were also withheld for this year because the labeling was uncertain.

Erick De Wolf then led a discussion on seed treatment fungicides. There was some interest in developing a seed treatment efficacy table previously. The group questioned the merit in this type of chart because it would be impossible to predict which disease a given grower's field might contain. It might be possible to focus on a few known seed borne diseases initially. The group thought that data for seed borne Fusarium and common bunt would be reasonable targets for comparing product efficacy.

Erick De Wolf will be the chair of NCERA-184 for the 2013 meeting. Kiersten Wise accepted the nomination to be the secretary for the committee in 2013 and chair in 2014. The meeting location for 2013 is to be determined. Some members expressed a desire to meet with the western small grain disease committee (WERA-097). Erick will inquire about details.

State Report from Arkansas
Gene Milus, May 2012

Wheat crop and diseases

Approximately 540,000 acres of soft red winter wheat were planted in the fall of 2011. Mild temperatures during the winter and early spring caused wheat development to be 2-3 weeks ahead of normal. Stripe rust development was at least 2 months ahead of normal, with the first hot spots being reported in mid-January when wheat was still in the tillering stage. Stripe rust spread at an alarming rate from hot spots during February and March, and many fields were sprayed with a fungicide much earlier than in previous years. The early development of stripe rust was exacerbated by the susceptibility of many cultivars because it was too early for adult-plant resistance to be expressed. April and May were unusually hot and dry, accelerating wheat maturity and making conditions unfavorable for most diseases. Diseases such as leaf rust, leaf blotch, barley yellow dwarf, and bacterial streak were present but generally not severe. Spring freeze damage was found across northeast Arkansas in the earliest-maturing fields. Drought stress was present statewide.

Indiana 2011 State Report for NCERA-184
Wheat Disease Committee
Kiersten Wise

2011 in Review

Harvested wheat acreage in Indiana in 2010 totaled 400,000 acres (USDA, NASS). Wheat averaged a yield of 60 bu/A. Wheat diseases were generally at low levels throughout southern Indiana in 2011. Stagonospora leaf blotch/Septoria leaf blight was observed in southern Indiana early, but did not impact yield in most fields. A prolonged period of rainy and humid weather in early May resulted in outbreaks of Fusarium head blight (FHB) throughout central and northern Indiana. Flowering date impacted severity of this disease, with early-flowering varieties exhibiting low incidence and severity, while some fields with later-flowering varieties experiencing moderate to severe yield loss due to the disease. The impact of DON on grain quality was moderate to severe in areas in northern Indiana. Stripe rust and leaf rust were also observed across the state, at low to moderate severity, depending on the variety. Stem rust was observed in far southern 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 2012

Extremely dry weather in the fall of 2011 impacted wheat tillering for the 2012 crop. Many fields were planted below optimum moisture, and had poor stands and tillering in the spring. Frost events in spring of 2012 resulted in freeze injury across the state. This

compounded with drought stress will limit the acreage harvested as many producers plowed or burned down fields to plant to corn or soybean.

KANSAS

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

Personnel news. Dr. Clare Nelson (bioinformaticist) has retired from the Dept. of Plant Pathology; we are in the process of trying to re-fill that position.

Wheat progress and potential for diseases in 2012. As of June 4, 2012, the wheat in Kansas is mostly mature and harvest is well underway. In general, this growing season has been characterized by a warm fall, winter, and spring. Additionally, dry weather has plagued much of southwest Kansas. The major wheat diseases are expected to be stripe rust, leaf rust, barley yellow dwarf, and wheat streak mosaic. Stripe rust was very severe in many areas and some cultivars that were previously rated as somewhat resistant (e.g. Everest) now show susceptibility.

Disease loss estimates for 2011. Data are from: Appel, J. A., De Wolf, E., Bockus, W. W., and Todd, T. 2011. Preliminary 2011 Kansas Wheat Disease Loss Estimates. Kansas Cooperative Plant Disease Survey Report. (http://www.ksda.gov/includes/document_center/plant_protection/Plant_Disease_Reports/2011KSWheatDiseaseLossEstimates.pdf)

Disease	Loss in 2008	Loss in 2009	Loss in 2010	Loss in 2011	20-yr avg.
Leaf rust	4.72	1.37	1.0	0.01	3.41
Stripe rust	0.01	0.01	10.3	0.05	1.83
Lesion nematodes	-	-	2.0	1.6	1.80
Barley yellow dwarf	0.01	0.44	0.34	2.74	1.19
Septoria complex	0.5	1.0	1.1	0.01	0.98
Wheat streak mosaic	0.02	0.001	0.02	1.7	0.93
Tan spot	0.45	0.26	0.2	0.01	0.89
Fusarium head blight	1.9	0.9	0.3	0.01	0.31
Soilborne mosaic	0.001	0.001	0.1	0.01	0.12
Powdery mildew	0.03	0.02	0.1	0.01	0.10
Take-all	0.001	0.01	0.001	0	0.07
Root and crown rot	0.001	0.001	0.01	0.01	0.06
Strawbreaker	0	0	0	0	0.02
Bunt and loose smut	0.01	0.04	0.03	0.01	0.01
Stem rust	0.001	0.001	0.001	0.01	0.01
Bacterial leaf blight	0.03	0.04	0	0.01	0.01
Total	7.7	4.1	15.6	6.2	11.73*

* Equivalent to about 40 million bushels or $240 million dollars at current cash grain prices ($6.00, June 4, 2012).

Wheat diseases were an important factor influencing wheat production in Kansas in 2011. Moderate winter temperatures favored development of virus diseases and low rainfall inhibited the development of foliar diseases. Viral diseases were of importance in 2011 as barley yellow dwarf virus and wheat streak mosaic had numerous reports. Lesion nematodes were common to Kansas fields and 2011 sampling again verified levels consistent with previous intensive surveys. Barley yellow dwarf was estimated to have caused 2.7% loss, wheat streak mosaic 1.7% loss, and lesion nematodes 1.6% loss. All other diseases including leaf rust and stripe rust accounted for less than 0.2 % combined losses.

NCERA-184, Diseases of Small Grains
Louisiana Report, 6 June 2012
Personnel: Boyd Padgett – Professor
Myra Purvis – Research Associate

2010-11 Crop Season

Two hundred and eight thousand acres of wheat were planted in Louisiana in 2010-11. Grain yields averaged 64.1 bu/A. However, there has been a steady decline over the past two years. Disease incidence and severity was low in most commercial fields.

During 2011-12, weather was favorable at planting. However, hotter than normal temperatures resulted in poor plant development which resulted in reduced yields and quality. Disease pressure was low, and state totals are pending.

Current Research Projects and Impact on Wheat

U.S. Wheat and Barley Scab Initiative - Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast. This project is a part of a nationwide effort to identify varieties/lines for genetic resistance to *Fusarium graminearum*. (Steve Harrison-P.I., Don Groth)

Louisiana Soybean and Feed Grain Research and Promotion Board – Disease Management in Louisiana Wheat. This is a multi-discipline effort to evaluate entries in LSU AgCenter wheat and oat variety tests for disease reactions to naturally-occurring diseases. Develop disease management strategies using genetic resistance and fungicides. Conduct yield loss studies to ascertain the impact of diseases on wheat produced in Louisiana. Information is used to develop recommendation for wheat produced in Louisiana and the Mid-South.

Collaborate with LSU AgCenter entomologists and agronomists in studies designed to develop effective management strategies for Hessian Fly.

Stem Rust Monitoring Effort – Responsible for coordinating efforts in the Mid-South and Southeast U.S. Project coordinator Erick DeWolf

ND State Report - NCERA 184

June 8, 2012

Marcia McMullen, Extension Cereal Pathologist, North Dakota State University

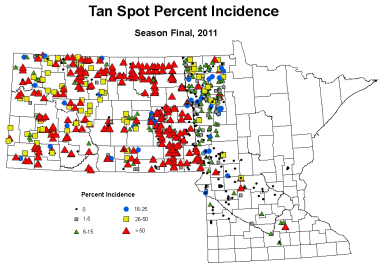
2011 Crop condition: Severe flooding in spring resulted in ~ 6 million prevented plant acres, primarily in northwest and north central parts of state, an area which generally has approximately 1.4 million acres of hard red spring wheat and durum wheat and 300,000 acres of barley. These prevented planted acres resulted in great reductions in production of hard red spring wheat, durum wheat, barley, oats, and field peas. Remainder of crop acreage planted into wet soils, many disease and insect pressures in 2011, lower yields in general, but producers still had good income because of insurance programs.

2012 Crop condition: The fall late summer of 2011 and the fall and winter of 2011-2012 were dry and no flooding or prevented planting occurred in spring of 2012. Areas that were very wet in 2011, however, took some time to dry out before planting in 2012. Wheat and barley crops now are about three weeks ahead of schedule in crop development. Overall, crop condition looks good with minimal disease pressure so far in 2012. Approximately 7.75 million acres of spring, durum and winter wheat were planted and approximately 1 million acres of barley. Diseases noted as of June 8th in wheat include tan spot, barley yellow dwarf, wheat streak mosaic virus, some detections at trace levels of stripe rust, and as of June 8th, no wheat leaf rust has been detected in the state. Sporadic rainstorms are occurring in the state, but generally moisture levels are below normal, and May of 2012 was the warmest on record for the Fargo area.

Some small grain programs:

NDSU IPM Field Scouting Program

The NDSU IPM field pest survey is continuing, with survey of diseases and insects of five major crops in the state – wheat, barley, soybean, sunflower and dry bean in 2012. Generally, about 1000 wheat fields and 150 barley fields are surveyed across the state in the growing season. A poster about the insect survey results for 2011 was presented at the recent International IPM Symposium in Memphis (Primary author Jan Knodel), and a poster about the wheat disease survey results from 2004 through 2010, presented at the NC APS meeting in Omaha, NE in 2011 (primary author Marcia McMullen). The 2011 and 2012 surveys are cooperative efforts among ND and MN Extension. See map of tan spot incidence in 2011.



NDSU Collaboration with US Wheat and Barley Scab Initiative (USWBSI)

NDSU participates in the uniform fungicide trials of the USWBSI at three locations across the state and across three grain classes, spring wheat, durum wheat and barley. We also participate in the Integrated Management Uniform trial of the USWBSI at 4 locations, across spring wheat, barley, durum and winter wheat. These results are reported to the Initiative and summarized in the annual Forum's proceedings and also at meetings in ND and on the web: http://www.ag.ndsu.edu/extplantpath/plantpathology/programs-resources/2008-cereal-foliar-fungicide-seed-treatment-field-trials-results

We also publish an updated comprehensive Field Crop Fungicide Guide each year which includes information about seed treatment and foliar fungicides for small grains registered in the state: link found at: http://www.ag.ndsu.edu/extplantpath/

NDSU has its own Small Grain Disease Forecasting Site, at: www.ag.ndsu.nodak.edu/cropdisease/
Which discusses risk of tan spot, Septoria blotch and leaf rust of wheat, plus provides a face to the FHB forecasting information with their own map of risk, plus Dr. McMullen updates the commentary for the US Wheat Scab Model for ND (www.wheatscab.psu.edu), on a weekly basis or more often during the critical growth stages of wheat.

NCERA-184, Diseases of Small Grains
Oklahoma Report, 06 June 2012

Personnel: Robert M. Hunger, Professor & Extension Wheat Pathologist
Brian Olson, Senior Agriculturalist

2011 season: Oklahoma produced about 70 million bu of wheat from 3.2 million harvested acres for an average production of about 22 bu/A. This was one of the worst wheat harvests in Oklahoma as drought and high temperatures over the entire crop season greatly impacted wheat production. Needless to say, impacts of diseases (especially foliar fungal diseases) were minimal.

2012 season to date: The 2012 season represents a great improvement over 2011. The fall in Oklahoma was dry, but timely rains and a record mild winter allowed wheat to emerge, establish and grow profusely. More than 5 million acres of wheat were planted in the fall, which is typical for Oklahoma. Duster and Endurance were the two most planted varieties, accounting for close to 50% of the acres planted. Few diseases were observed in the state until March 2012 at which time aphid (mostly bird cherry-oat aphid) infestations were widely observed. This led to barley yellow dwarf being commonly observed but of reduce consequence since it was a spring infection. Both stripe rust and leaf rust were observed in the spring with stripe rust probably having the greatest impact because of its wider occurrence. A change in virulence occurred in *Puccinia striiformis* as indicated by the increased virulence on the previously resistant varieties Armour, Pete, Everest and Tam 111. A leaf spotting complex composed of tan spot, septoria, spot blotch, and physiological leaf spotting also was damaging to wheat, especially on acres planted in no-till continuous wheat. Temperature and moisture in the spring of 2012 ranged from cool/wet to hot/dry, which impacted not only the occurrence of foliar diseases but also the wheat. The mild winter, which did not induce dormancy, resulted in tremendous tillering. As a result, hot/dry/windy periods in April and May caused many tillers to abort. However, there was sufficient moisture so that wheat production in Oklahoma in 2012 is expected to be the best crop since 2008 (167 million bushels).

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 1,500 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 600 OSU advanced lines also was tested for reaction to tan spot 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 two hard red winter wheat varieties (Iba and ‘Gallagher) in 2012.

Evaluation of foliar fungicides for control of foliar wheat diseases. A dryland foliar fungicide trial was conducted in 2011. Powdery mildew (PM) and leaf rust (LR) reached moderately high levels (approximately 70% and 76% for PM and LR, respectively) but the PM did not extend up beyond F-2 leaves and LR did not become severe until the medium dough stage so the impact on yield was generally minimal.

Testing wheat produced in Oklahoma for presence of Karnal bunt (KB). As required by the USDA-APHIS-PPQ, Oklahoma wheat produced in 2011 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.

Accomplishments (AR)

Cultivars and breeding lines were evaluated for resistance to stripe rust, stem rust, leaf blotch and leaf rust. Fungicides were evaluated for efficacy against stem rust and Fusarium head blight. The genetic diversity of *Fusarium graminearum* in Arkansas was determined, and the population was found to be more diverse than in other regions. Types I and II resistances to Fusarium head blight were quantified in several cultivars and breeding lines, and these lines were more resistant to nivalenol chemotype isolates than to deoxynivalenol chemotype isolates. A qPCR assay was developed to quantify *F. graminearum* biomass in seeds.

Accomplishments (KS)

Disease phenotypes were determined in the greenhouse for numerous wheat accessions of importance to breeders, geneticists, and extension specialists. Phenotypes were determined for reaction to tan spot, Stagonospora nodorum blotch, Septoria tritici blotch, and Fusarium head blight. 13 field experiments were completed including wheat disease phenotyping nurseries (barley yellow dwarf, Cephalosporiuim stripe, and Fusarium head blight), fungicide efficacy trials (foliar and seed-treatment for control of tan spot/leaf rust, Fusarium head blight, take-all, Fusarium-damaged kernels, barley yellow dwarf, and common bunt), and epidemiological studies.

Coordinated the update of cooperative fungicide efficacy tables for wheat disease management.

Cooperative development and deployment of disease prediction models for Fusarium head blight in 30 states where this disease has been a serious production problem. Included new technologies to communicate disease risk and timely management information to wheat and barley producers throughout the region.

Organized multi-state extension efforts to develop a wheat disease identification book that includes the most common diseases in North America. This is part of the ongoing efforts of the NCERA-184 committee o prepare for potential arrival of Ug99 stem rust in North America.

Impacts (AR)

Information on disease reactions of cultivars, efficacy of fungicides, and disease management practices were disseminated via extension publications and meetings. Invited presentations were given on *What is head scab and how can it be managed?* at the North Alabama Wheat Symposium, Belle Mina, AL; on *What is aggressiveness?* in a panel discussion at the Borlaug Global Rust Initiative Technical Workshop, St. Paul, MN; and on *Epidemiology and management of stripe rust in North America* at the 1st Canadian Wheat Symposium, Winnipeg, Manitoba.

Impact (IN)

Research activities in 2011 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.

Collaborative research with others in the Midwest examined the impact of early fungicide applications on wheat. This work demonstrates that early applications do not always result in increased yield, and that foliar diseases like Stagonospora/Septoria leaf blight are still best managed in Indiana with a fungicide application at the standard FGS 8-9 timing.

Impact (KS)
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 types of experiments were aided by these meetings: 1. determining the reactions of breeding lines and commercial winter wheat cultivars to various diseases; 2. dissemination of disease-reaction data of cultivars to wheat producers; 3. the effect of seed-treatment and foliar fungicides on wheat diseases; and, 4. the effect of cultivar mixtures, tillage practices, crop rotations, and epidemic age on foliar disease development. Progress toward identifying resistance to wheat pathogens has helped in the development of new, resistant wheat cultivars.

Determining the impact of fungicides on wheat diseases is necessary to develop accurate chemical control recommendations.

Users of the FHB prediction models and the FHB Alert System where surveyed annually in 2009-2011. The survey results included input from 1016 respondents between 2009-2011 and indicated that 65% of these users were either farmers or farm advisors. Slightly more than 70% of the users applied the information directly on their farm, or used it to make recommendations about disease management to others. Between 2009-2011, 94% of the users considered the information to be of high or moderate value for their farm operations and businesses. A subset of questions targeting influence of the information suggest that more than 90% of the users experienced a 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 26% to seek advice from others. The estimated net value of the disease prediction system to U.S. wheat growers exceeds $47 million.

The wheat disease identification book developed by the NCERA-184 and WERA-97 committees was well received by growers throughout the country. The publications were customized with logos and contact information (generally the NPDN labs) for use in 26 states and 2 Canadian provinces. Over 18,000 copies of the disease identification book were printed publications and distributed as part of the project. This resource directly supports the ongoing efforts of the committee to improve wheat disease identification skill throughout the US and further strengthen the preparations of the Ug99 stem rust.