

**August 19, 2009**

**TO: Nebraska Wheat Board**

**FROM: Stephen Wegulo, Department of Plant Pathology**

**TOPIC: “Mitigating Winter Wheat Losses Caused by Rust Diseases, Wheat Streak Mosaic, and Tan Spot”**

**Accomplishments:**

Although the project title for the 2008/2009 fiscal year was “Mitigating Winter Wheat Losses Caused by Rust Diseases, Wheat Streak Mosaic, and Tan Spot,” funding from the Wheat Board supported several projects including a *Fusarium* head blight (FHB, scab) cultivar screen at Mead and Paxton, a black chaff cultivar screen at Paxton, and a project in which visual sorting of *Fusarium*-damaged kernels was compared to sorting by a single kernel near-infrared (SKNIR) machine. Due to the emergence of FHB during the last three years and the persistence of black chaff in southwestern Nebraska over the last several years, research efforts funded by the Wheat Board were redirected during the 2008/2009 fiscal year. As a result, work on *Fusarium* head blight and black chaff replaced determination of leaf rust virulence phenotypes.

**FHB.** Based on FHB cultivar screening which started during the 2007/2008 fiscal year and continued during the 2008/2009 fiscal year, it has been determined that the cultivars grown in Nebraska that have moderate to good resistance/tolerance to FHB are Overland, Art, Wahoo, and Millennium. The names of these cultivars have been added a new “Scab Smart” web site developed by North Dakota State University and which lists wheat cultivars by state that have the best available resistance to FHB.

**Black chaff.** The data from the black chaff screen at Paxton have revealed two wheat cultivars (Hawken and Wesley) that appear to be highly susceptible. This screen needs to be repeated at least two more times to generate enough data to enable us to reach solid conclusions. Grain collected from this year’s screen will be tested for presence of the black chaff bacterium. Analysis of all data from this year’s screen is expected to be complete by the end of the fall.

**Triticum mosaic virus.** Wheat samples collected from around the state and tested for viruses revealed a new virus, Triticum mosaic virus (TriMV, discovered in Kansas in 2006 by Dr. Dallas Seifers et al.) which occurs alone or in combination with wheat streak mosaic virus (WSMV). This virus appears (from the samples collected from the field and tested; and tests of preserved samples from Dr. Gary Hein’s WSMV screens over the last several years) to occur in a higher frequency than WSMV. An isolate of TriMV from wheat plants collected in southwestern Nebraska has been completely sequenced by Drs. S. Tatineni and R. French of the USDA and who are affiliated with the UNL Department of Plant Pathology.

**Screening Wheat Lines.** To improve the disease resistance of Nebraska wheat cultivars, our program determines the resistance or susceptibility of the most advanced lines to leaf and stem rusts by screening them as seedlings in the greenhouse and as adults in the field. The lines are screened separately for leaf rust and stem rust in different greenhouse ranges. Seedling resistance of these lines is then verified again as mature plants in the field. Screening of breeder material in this way is vital to improving resistance to stem and leaf rust. Agronomically superior lines will not be moved forward if they are susceptible to stem rust because of the

potentially devastating nature of this disease, but may be moved forward if they are susceptible to leaf rust and are adapted to western Nebraska where the disease is generally not as destructive. In 2008/2009, 460 lines were screened for resistance to leaf rust and 2,174 lines were screened for resistance to stem rust.

**Wheat Disease Surveys.** In May and June 2009, we conducted several wheat disease surveys in south central and southeastern Nebraska and in the Nebraska Panhandle. In general, disease levels were low during the month of May due to dry weather. However, *Fusarium* head blight (FHB), leaf rust, and leaf spots (tan spot and *Septoria tritici* blotch) developed in June due to prolonged wet weather. Rainfall in the Panhandle in June was so much that FHB developed in some fields, but at low levels. South central and eastern Nebraska escaped FHB for the most part because of the dry weather in May. However, some fields in southwestern Nebraska were severely affected by FHB because wheat in this area matured later than wheat in the south central and eastern parts of the state, resulting in a high FHB risk due to co-occurrence of June rains and flowering. A few fields visited during the surveys were severely affected by wheat streak mosaic virus and/or *Triticum* mosaic virus. Other diseases observed at low levels during the surveys were loose smut and stripe rust. Common bunt (stinking smut) was present in at least one sample brought to the PI's office by Steve Knox of the Nebraska Crop Improvement Association.

**Outreach.** An important goal of our program is to disseminate information on wheat diseases to growers, crop consultants, extension personnel, and the public. This information can be used to better manage wheat diseases and hence improve yields and profits. We accomplished this goal by publishing articles and timely disease updates in *Crop Watch*, a University of Nebraska-Lincoln Extension newsletter. We also disseminated information during wheat field days in June 2009.

**Refereed publications.** Several refereed journal papers were published from work that was directly or indirectly funded by the Wheat Board. These publications are listed below:

1. Wegulo, S. N., and F. E. Dowell. 2008. Near-infrared versus visual sorting of *Fusarium*-damaged kernels in winter wheat. *Can. J. Plant Sci.* 88:1087-1089.
2. Wegulo, S. N., Breathnach, J. A., and Baenziger, P. S. 2009. Effect of growth stage on the relationship between tan spot and spot blotch severity and yield in winter wheat. *Crop Prot.* 28:696-702.
3. Sidiqi, J., Read, P. E., Wegulo, S. N., and Baenziger, P. S. 2009. Frequency of resistance to stem rust race TPMK in Afghan wheat cultivars. *Can. J. Plant Pathol.* (in press).
4. Baenziger, P. S., Graybosch, R. A., Nelson, L. A., Klein, R. N., Baltensperger, D. D., Xu, L., Wegulo, S. N., Watkins, J. E., Jin, Y., Kolmer, J., Hatchett, J. H., Chen, M-S., and Bai, G. 2009. Registration of 'Camelot' wheat. *J. Plant Registrations* (in press).
5. Tatineni, S., Ziemis, A., Wegulo, S. N., and French, R. 2009. *Triticum* mosaic virus: A distinct member of the family Potyviridae with an unusually long leader sequence. *Phytopathology* 99:943-950.