Improving Winter Wheat Varieties for Nebraska

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The field season is progressing slowly and we feel that we are about one week to 10 days behind normal growth and development. So far, only the barley lines have begun flowering. The triticale and wheat lines are just beginning to head. Part of this delay is due to Lincoln and Mead being planted late last fall and they are still trying to catch up. Clay Center and North Platte are developing as quickly as Mead and Lincoln. Of our locations, Hemingford, Sidney, North Platte, and Clay Center look very good. Lincoln is probably the worst location due to heavy rains right after planting which hurt emergence and a severe infection with soilborne mosaic virus in many fields. The best wheat areas at Lincoln were those planted last, thus avoiding soilborne mosaic virus (a warm fall disease) and the heavy rains. Mead, despite having the same cycle of plant one day, heavy rains that evening and then wait a week to get back into the field for one day of planting followed by heavy rains again, is better except where the sloping land had washing. Our field operations are current, with the weeds sprayed and the alleyways cut. We hope to spray our fungicides on those experiments where we need to have little or no diseases very soon.

We successfully completed our greenhouse cycle with over 80 crosses made in both barley and triticale, and over 950 crosses made in wheat. Normally we want at least 60 crosses in barley and triticale and about 800 crosses in wheat. The cool spring allowed us to spread our crossing out and to make more crosses. The graduate students were a huge help with the barley crosses and with the wheat crosses over the spring vacation when our student workers were not available.

We prepared and submitted the formal release documents for Camelot (formerly NE01604) and Husker Genetics Brand Settler CL (formerly NH03614 CL). Camelot was co-released with the USDA-ARS and the signed forms have been returned to the University of Nebraska. It will be marketed through Nupride Genetics Network. Settler CL is being co-released with USDA-ARS, the University of Wyoming, and South Dakota State University. As such it takes longer to move through channels and to get all the necessary signatures (e.g. the signed documents have not yet been returned). As part of our improved release procedures, we released both of the lines before the first sale of Foundation Seed (projected to be in fall, 2008). Our goal is to allow certified seed producers to have a full year to watch a line and make the decision of whether or not they want include it in their line-up of cultivars. As part of this effort, we have received approval from the American Organizations of Seed Certifying Agencies (AOSCA) to certify and market both Camelot and Settler CL in other states. This approval facilitates marketing and the co-release process. We have also developed the Plant Variety Protection (PVP) application for both lines and will submit them after we have one more look at the plant types in the field. There is considerable cost associated with the PVP, so there is an incentive to wait to file the application. Note Nupride Genetics Network will pay for the PVP application for Camelot.

Lan completed milling and baking all of our breeding nurseries in March, which is ahead of our normal schedule. One of the interesting aspects of the milling and baking results was that some of our released lines harvested in 2007 did not have their historically good end-use quality. In our current milling and baking assays, we use no oxidation (no oxidizing reagents). The baking industry is moving towards “shorter” bread labels meaning they prefer to have as few ingredients as possible listed on the label. Hence using no oxidizing agents is important during the “first look” at a wheat line. However, when the historically good lines are no longer performing as well as expected, we wondered if there was something in the environment that may have affected their quality. Also, we do not want to throw out a line that may have acceptable quality based upon one bad year, nor keep a poor quality line any longer than needed. Last year, many of our lines were affected by drought (e.g. had good protein contents, but were weaker in their mixing times and

strengths) which coupled with the freeze, drought, and in some cases Fusarium head blight (syn. scab) reduced their baking quality. Lan rebaked the poor quality samples with an oxidizing agent and most had improved quality. In future we will most likely bake all the lines initially with no oxidizing agent (meeting the industry interests) and when we have a poor performing line, rebake the line with an oxidizing agent to see if that can move the line from unacceptable to acceptable end-use quality. If the addition of an oxidizing agent does not or minimally improves baking quality, we will drop the line from further consideration. If the addition of an oxidizing agent does improve baking quality to the acceptable level, we will continue the line for further consideration as a possible cultivar. We want the growers to have the best agronomic lines with acceptable to superior end-use quality.

The annual report on the wheat breeding and end-use quality project was completed and can be found at: http://agronomy.unl.edu/grain/WHTANN0732708.PDF .

On a personal note, after 22 years of continuing to learn wheat breeding, I have decided to take a mini-sabbatical at Murdoch University in Perth, Australia. If everything goes as planned, I will be there from November 1, 2008 to February 28, 2009. The time was chosen to coincide with the times when I am not teaching, the planting should be completed, and before the main greenhouse crossing block begins. We hope to have as little disruption as possible with the small grains breeding program. While there, I hope to learn how to sequence the DNA from a part of the wheat genome (chromosome 3B which contains *Sr2* and *Fhb1*). *Sr2* is a very critical gene for defending wheat against Ug99, the new race of stem rust from Africa. It is also one of the genes that have been used successfully in many older Nebraska wheat cultivars (Scout 66). *Sr2* also causes false black chaff, so we replaced the gene with newer and better stem rust resistance genes. Unfortunately many of the new genes are defeated by Ug99. We are rapidly adding *Sr2* back into our program. *Fhb1* is a major gene preventing Fusarium head blight. It is expected other groups will clone the gene shortly, but it will be interesting to see *Fhb1* in its chromosomal "home". In addition, we have long researched chromosome 3A and its effects on grain yield. The DNA sequences from chromosome 3B will help us identify markers (DNA sequences) for understanding genes on chromosome 3A.

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