

Improving Winter Wheat Varieties for Nebraska

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May 2, 2006

Since our last report, we have spent most of our time making crosses in the greenhouse and handling various personnel changes. In our spring crossing block we made 867 wheat crosses and 72 triticale crosses. The number of wheat crosses was very high and probably resulted from an excellent crossing cycle. As opposed to previous years, we set the crossing block up to begin a little earlier and we began crossing in earnest the first week of March. On a few days, we had over 50 emasculations and pollinations, but in general we did about 40 emasculations and pollinations per day, which is a very easy morning effort for three workers. The weather was excellent during March (bright sunny days generally promote better seed set and better kernel quality than cloudy rainy days). We are in the process of harvesting all of our crosses this and next week and will begin the bulk greenhouse harvest shortly thereafter. We are beginning to effectively incorporate molecular markers in our breeding program, which requires that the male and female parent are genetically identified. Most of our released varieties are F_3 -derived lines that have considerable intravarietal variation (heterogeneity), which makes molecular marker breeding strategies difficult. There are two ways of making sure the genetic identity of the parents is identified: 1. Select a single plant to represent the line (concern is: Does the single line selection truly represent the best attributes of the variety?), or 2. Plant one seed (plant) per pot and make sure that a single head was harvested from each plant that was used as a parent. We are using method 2 to ensure we can use molecular markers for future breeding work. An example of how we are using molecular markers is that in cooperation with Dr. Guihua Bai, USDA-ARS, at Manhattan, KS we have screened our earliest generation materials for the major QTL (quantitative trait locus—similar to a gene) for scab resistance on chromosome 3BS, and all of the lines in the Duplicate nursery for the presence of semidwarfing genes (*Rht1*, *Rht2*, and *Rht8*), disease resistance genes (Stem Rust Resistance: *Sr2*, *Sr24*, and *Sr36* which are effective against the new race from Uganda; leaf rust: *Lr37*; wheat streak mosaic virus: *Wsmv1*; and for the major yield QTL on chromosome 3A identified in Wichita). As we begin to fully incorporate this information we will be better able to design crosses and to provide growers with better information on the varieties that they are growing or thinking of growing in the future. In addition, Dr. Stephen Wegulo is screening over 2000 lines for stem rust resistance. These 2000 lines represent all of the early generation lines (observation nursery), intermediate (duplicate and triplicate nursery), and advanced lines (Nebraska intrastate nursery).

As for personnel changes, Mr. Jerry Bohlmann, who had been with the project for almost three years accepted a position with Monsanto in their soybean improvement program in South Dakota (his home state). We want to thank Jerry for all of his help. On May 1, Mr. Greg G. Dorn joined our project to lead our field efforts. Greg has years of related experience as a farmer and as a technician on Dr. Len Nelson's project. We welcome Greg to the project. We also want to take this opportunity to thank Mr. Mitch Montgomery who did double duty managing the greenhouses and the seed efforts for the period between Jerry's leaving and Greg's coming. We are very fortunate to have dedicated team workers.

The second change is the upcoming retirement of Ms. Mary Shipman. The Plant Breeding and Genetics Panel reviewed the position and the departmental needs and recommended that a Lab Manager be hired. The position is currently being advertised and the position description is: "Responsible for the management/supervision of the Plant Quality Laboratory. Collaborate with breeders and geneticists in the development of crop varieties and germplasm with improved quality. Develop, incorporate, and test strategies designed to improve qualities of relevant crops (e.g. wheat and other small grains, soybeans, corn, sorghum, millet, dry edible beans, etc.). Support Nebraska agriculture by testing samples grown in Nebraska to illustrate the quality of the Nebraska Crop. The

duties include managing full and part-time employees; developing a budget for the laboratory; and seeking grants, contracts, and other sources of funding to support the laboratory in cooperation with the management team. As part of a quality-based team, the outcomes of research will be communicated via peer reviewed journal articles, oral presentations, and as seed of new varieties and germplasm.” There are two advantages to the wheat project in this position description. The first is that the lab manager will have to be or become knowledgeable in wheat quality and will have sufficient resources to hire full and part time help to do many wheat quality tests. Hence the overall understanding of wheat quality will reside in more people, thus making the project less vulnerable to personnel changes. The second advantage is that by expanding the quality lab role, it is expected that the costs can be shared among many projects, thus allowing for important equipment, but rarely used in wheat to be purchased (expands our access to different assays for wheat) and for efficient use of student labor.

On a final note, I have been asked and agreed to be part of the “expert panel” to review the International Center for Agricultural Research in Dry Areas (ICARDA), one of the major international centers for agricultural research. The main region that ICARDA works in is North Africa, the Middle East, and Central Asia. It also has a program in Latin and South America. As such, it works in the areas where wheat was domesticated. The research at ICARDA is directly relevant to our dryland research and much of their germplasm, especially from Turkey and Central Asia, should be valuable to our program. The review panel visited Syria in late April and I will have to make a return trip in June to finalize the report. I may have to briefly visit Uzbekistan and Turkey during the June trip. While the April visit came at an excellent time, the June visit will conflict with fieldwork. It is hoped that the connections, information, and germplasm that I will get from ICARDA will make this visit very beneficial to the program. Syria, despite what we read in the newspaper, was a very safe and nice country to visit.



Drs. S. Rajaram and S. Baenziger looking at *in situ* conservation of wild barley at ICARDA in Aleppo, Syria.