

Improving Winter Wheat Varieties for Nebraska

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The fall greenhouse has been harvested and the much of the seed has been “turned around” to try to get a second generation in one year. We do this for research studies or when we are impatient. In this year’s second cycle we are advancing our scab resistant crosses and a single seed descend population that will be used to study agronomic performance in our adapted wheat lines (in this case Harry x Wesley). This cross is very interesting because Harry carries a grain yield enhancing quantitative trait loci (QTL, synonymous with a “gene”) from Wichita that we have been working on for the past 15 years, while Wesley does not contain the QTL. Hence it may be possible to add the QTL to Wesley and select lines that are better than Wesley, a popular variety in Nebraska. In any event, it will be interesting to see if we can add the rainfed performance of Harry to the irrigated performance of Wesley. Both lines are attractive semi-dwarf lines. We also received a number of scab resistant lines derived from Wesley from collaboration with Dr. Guihua Bai, USDA-ARS at Manhattan, KS. Interestingly, despite three crosses to Wesley, many of the derivatives have retained the spring growth habit of the scab resistant parent. This was not entirely unexpected but the frequency of spring growth habit is higher than we expected. One Nebraska winter will eliminate the spring growth habit derivatives.

All breeding programs try to balance their resources with their most efficient use to improve new varieties. We have incorporated a limited marker assisted selection (MAS) program to try to select useful traits that are hard to select for phenotypically. Marker assisted selection uses DNA polymorphisms to track useful genes (for example the QTL for grain yield mentioned above in the Harry X Wesley population). Because we have a grant, we are using MAS to select for scab resistance and to study the genes affecting plant height. We are also screening a number of lines for stem rust and wheat streak mosaic virus resistance. This work is done in cooperation with Dr. Guihua Bai and Ismail Dweikat (of UNL). We also sent a mapping population to Australian for contract marker genotyping. If this contract is successful, it may change how we do part of our research. It is hoped they will add 200 to 300 DNA markers to 184 inbred lines for about \$8000 which is considerably less than our costs and would be (\$0.15 to 0.21 data point). In cooperation with a friend in England we are creating a number of doubled haploids for a limited number of crosses. Doubled haploidy is the quickest way to develop a new variety (inbred line), however, it is a very costly technology for the public breeding programs.

In March we will begin our main crossing block. In this crossing effort, we will emphasize increasing agronomic performance (yield and standability), disease resistance (e.g. resistance to the new stem rust race), and end-use quality, and expanding our white wheat germplasm,. Of the two experimental lines we submitted to the Wheat Quality Council, NE01643 was marginally acceptable (the lowest quality wheat we intend to release) and NE02584 was one of the best lines for end use quality. Our lines are being evaluated by the Seed Quality Laboratory and we are very pleased with their analyses. Compared to the other lab evaluating lines in the Wheat Quality Council, their scores were a little higher than the mean, but were in the middle of the scores. This result means that the lab is scoring very near the “average” of the labs, hence are not biased too high or too low. Our goal is to have our lines being evaluated near the average so that we are not basing our selections on overly optimistic or extremely harsh scoring results.

The variety distribution results were released and Jagalene was the most popular variety with its being grown on over 30% of Nebraska. No variety since Arapahoe has had this market

share. Pronghorn was the second most popular wheat variety indicating the continued need for tall wheat cultivars. Wesley was third most popular and was statistically tied with Alliance and Millennium. We expect Infinity CL and Husker Genetics Brand Overland will become popular lines. A white wheat line identified by Dr. Graybosch as having excellent sprouting tolerance, NW03681, has better end-use quality than NE01643, but would not be considered as being an excellent quality wheat. It can be used as a parent for its sprouting tolerance and agronomic performance and may have potential for release as a cultivar depending upon additional end-use quality tests.

The R&D fees for wheat and triticale releases was approximately \$50,000 for 2006, of which the program received about \$28,000 after costs and the shares going to collaborative projects were deducted.

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