

# Final report 2009

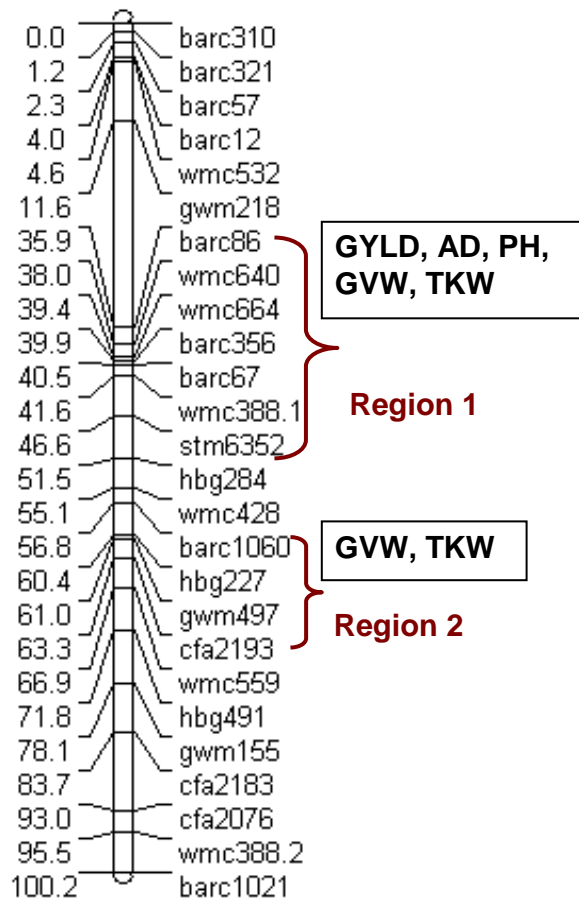
**Submitted to:** Nebraska Wheat Board, Lincoln, Nebraska

**Project Title:** Integrating Molecular Markers into Winter Wheat Breeding for Nebraska

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*Specific objectives:* The objectives are to: 1) more fully integrate molecular marker technology into our applied breeding program so as to increase wheat productivity, and 2) continue research on improving breeding efficiency.

Project 1. Mr. has **Neway Mengistu** has identified and mapped quantitative trait loci (QTLs) for eight agronomic traits (anthesis date (AD), plant height (PH), grain yield (GYLD), grain volume weight (GVW), 1000-kernel weight (TKWT), kernels per spike (KPS), kernels per square meter (KPSM), and spikes per square meter (SPSM) on chromosome 3A in individual environments and combined across environments.



**Figure1.** Position of QTLs detected on 3A chromosome

QTLs were detected for anthesis date, plant height, grain yield, grain volume weight, and 1000-kernel weight (Fig. 1). A grain yield QTL detected in the combined analysis explained 17% of the phenotypic variance and the substitution of CNN allele for a WI allele decreased grain yield by 118 kg ha<sup>-1</sup>. This grain yield QTL is believed to be the major grain yield QTL detected in CNN(RICL3A) population as it mapped to a similar position. In addition to grain yield, grain volume weight and 1000-kernel weight QTLs were detected in the combined analysis that explained 38% and 14% of the phenotypic variance, respectively.

The first year results of this study indicated the possibility of detecting most of the major chromosome 3A QTLs reported in the previous CNN(RICL3A) studies using a different background. The WI 3A alleles in a previous CNN(RICL3A) study showed an increase in grain yield and yield components traits and, as expected, the CNN 3A alleles in this WI(RICL3A) study had a decreased effect on grain yield and yield components traits.

## **Project 2.** Estimating the genetic diversity in Turkish and Nebraska cultivars

Ms. Anyamanee Auvuchanon (who is supported by a scholarship from the government of Thailand) is studying the relationship between U.S. and Turkish wheat lines. In her study, she is evaluating 23 U.S. Great Plains wheat and 22 Turkish wheat lines. In 1874, Turkey red winter wheat was brought to the Great Plains and became the most widely grown wheat in the United States. Since then the Turkish and U.S. breeding programs have interacted, but often used different germplasm. This study suggests that modern Great Plains wheat cultivars diverged from Turkish wheat cultivars by breeding for adaptation since only historic Great Plains wheat cultivars had a close relationship with Turkish wheat cultivars using the various clustering programs to determine similarity. For Great Plains wheat improvement, it may be possible to use those Turkish wheat cultivars that have agronomic merit and are most closely related to the Great Plains wheat cultivars as parents to add new alleles without adding so much genetic diversity as to make it hard to find the useful alleles.