

Hard Winter Wheat Quality Laboratory (HWWQL), Manhattan, Kansas



MISSION

Contribute to global food security by defining, evaluating, and screening the intrinsic end-use quality of hard winter wheat progenies grown in the United States (US) to enhance germplasm and cultivar development for commercial food production in the wheat milling and baking industries and the export trade. Since 1937, the HWWQL has had sole

responsibility for this mission within the USDA for the US Great Plains growing region.

Address global climate change by reducing energy used to produce food through: 1) selecting cultivars with improved milling efficiency, 2) developing testing methods to assist in the purchasing of grain to match demands for high-efficiency milling and baking operations, and 3) reducing food loss due to flour shipments that do not meet specifications upon delivery at factories.

In collaboration with regional US wheat breeding programs, improve food quality by identifying specific genes and glutenin alleles associated with superior hard winter wheat quality and end-use functionality.

Provide essential leadership to hard winter wheat projects of national importance, such as the Wheat Quality Council (WQC) evaluations, the U.S. Wheat Associates' (USWA) annual Crop Survey, and Regional Performance Nursery (RPN) tests for improvement of U.S. wheat quality.

CURRENT OBJECTIVES

- Determine the biochemical and macro-molecular interactions between protein and starch responsible for hard winter wheat end-use quality.
- Identify specific genes and glutenin alleles associated with superior hard winter wheat quality and end-use functionality, in cooperation with wheat breeders and geneticists.
- Define, evaluate, and screen the intrinsic end-use quality of hard winter wheat progenies in the Great Plains growing region to enhance germplasm and cultivar development.

BACKGROUND

Wheat is one of the oldest and most widely used food crops in the world, and it supplies approximately 20 percent of the food calories for the world's population. Wheat is the leading export crop and the fourth leading field crop in the United States. In 2010, U.S. farmers grew 2.2 billion bushels of wheat (all classes) on 53.6 million acres of land, with a market value over \$12.5 billion at harvest. It is the primary cereal grain used in U.S. grain products; approximately three-quarters of all U.S. grain products are made from wheat flour. Hard winter wheat represents 40 percent of total U.S. production, and over 90 percent of the U.S. production of hard winter wheat is in the Great Plains. Located in Manhattan, Kansas, the USDA-ARS Hard Winter Wheat Quality Laboratory not only serves the largest hard winter wheat-producing state, but also the entire Great Plains growing region covering 24 million planted hard winter wheat acres in 2010. The HWWQL conducts genetic studies of wheat quality through long established coordinated research with 13 state and land-grant universities in the U.S. Great Plains, and is one of the few laboratories in the world that that develops methods for testing the quality of hard winter wheat.

The HWWQL critically evaluates the quality of nearly all the wheat cultivars marketed from Canada to Mexico. It also publishes new methods and research in the area of milling and flour quality. This research is transferred through publication in peer-reviewed journals, participation in regional and national scientific and technical meetings, workshops and research meetings held in Manhattan, Kansas, Kansas City, Missouri, and through online support during the year.

CURRENT STAFF AND RESOURCES

Current base funding supports research and testing activities of two scientists, seven full-time support staff, and three part-time Kansas State University milling student helpers. In 2011-12, the flour milling facilities were relocated to a newly renovated 5000 sq. ft. building, offering upgraded and improved HVAC systems and dust/air handling capabilities. A new 900 sq. ft. freezer was appended to the building to replace 10 units more than 35 years old scattered throughout Center facilities. A new Brabender Quadrumat Sr. mill was purchased in 2011 to replace a Quad. Sr. mill purchased in 1995 (the Quad. Sr. experimental mill is the workhorse mill of the HWWQL). The HWWQL also purchased a new "tandem" Buhler laboratory mill (one of two in existence in the world; the only one in the US), to replace an existing 60-year old single Buhler mill, for use in regional projects such as the annual WQC evaluations and USWA Crop Survey.

The HWWQL evaluates 2500-3000 individual samples per year for milling and baking quality, generating more than 40 test data values per sample. This large amount of data is delivered to the breeder (customer) via a unique relational database developed by the HWWQL and Dr. Scott Haley, Colorado State University wheat breeder.

LABORATORY IMPACTS

Over 95 percent of the commercial hard winter wheat cultivars released for commercial production pass through the HWWQL prior to their release. In the 2010-2011 crop year, the HWWQL supported the development of hard winter wheat cultivars with a market value of \$6.6 B (USDA Ag Statistics). Using USDA economic multiplier effects, this single, most recent crop year resulted in \$24.6 B in economic output to the US economy as a whole. These improved cultivars reduce consumer's food costs and improve the efficiency and competitiveness of the US hard winter wheat industry.

CONTACT

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[Click here to go to the webpage for the project associated with this laboratory.](#)