PROJECT NO: BJKW33

TITLE: Assurance and Improvement of the Milling, Baking, and End-Use Quality of Idaho Wheat

PERSONNEL: Katherine O'Brien, Manager, U of I Wheat Quality Lab, Aberdeen
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JUSTIFICATION: Characterization of end-use quality traits of varieties and advanced breeding lines is valuable to wheat breeding programs, researchers evaluating environmental effects and production practices on wheat, wheat growers and end-use industries. The mission of the University of Idaho wheat quality lab is to provide end-use quality information for wheat developed in the University breeding programs to ensure there are satisfactory characteristics for both producers and end-users. High flour yield, favorable protein content, protein quality, and flour functionality as well as good bakery performance are attributes of wheat cultivars with good end-use quality. Screening experimental lines for various quality traits gives breeders the information needed to select wheat that has value for both growers and end-users. Early screening allows wheat breeders to cull out lines that have marginal use for end-users. Resources are not wasted advancing poor quality lines, and the lines retained have a higher potential for release. End-use quality of wheat may be affected by both production practices and environmental factors. Wheat researchers in both University breeding and extension programs benefit from receiving end-use quality data obtained from multiple locations for evaluating environmental affects and diverse production practices on both released varieties and experimental lines.

The quality lab compiles data on samples submitted and provides it to interested parties, including University and other wheat researchers, industry personnel, and growers. This data may be used to select those varieties that provide the best yield and end-use quality for particular growing environments. Acceptable or high end-use quality wheat may give Idaho producers market advantages that may improve the profitability of their operations.

HYPOTHESIS & OBJECTIVES: Genetics, environmental conditions, and management practices all influence the end-use functionality of wheat. With this in mind, the mission of the University of Idaho wheat quality lab is to pursue the following objectives.

1. Support the U of I wheat breeding programs by providing accurate quality analyses of potential, new, and established varieties in a timely manner.
2. Support U of I extension personnel by evaluating the quality of advanced lines and established varieties grown in diverse environments and with variable management

inputs. Provide quality analyses for other wheat researchers to help ensure that all wheats available to Idaho growers are of marketable quality.

3. Evaluate, develop, and implement new procedures for measuring wheat quality.
4. Promote the importance of high and specific quality characteristics desired by the flour industry to increase the market share and volume of Idaho wheats.

PROCEDURES: University of Idaho wheat breeders and cereal extension agronomists submit wheat samples grown in multiple locations across the grain producing areas throughout Idaho. Private wheat breeding companies also submit samples for analysis as time and resources allow. Lab services are offered to private breeding programs and special projects on a fee basis.

Protocols used are American Association of Cereal Chemists International approved methods or modifications of those methods. Flour yield is an important component of wheat quality, higher yields increase profit margins of millers and higher break flour yields usually indicate higher quality flour. Grain hardness and size may also be evaluated using the single kernel characterization hardness tester. Whole grain protein may be determined on some samples with the Perten 9100 whole grain analyzer. A minimum of 180 grams is needed for this test. Meal is prepared on a UDY hammermill. Flour is obtained by milling on either the Quadromat Senior or Jr. mill. Flour is sifted using Great Western Sieve Shakers. Flour protein, moisture, hardness, and ash values are obtained using a Perten 8611 NIR analyzer. 10% of samples are verified with bench top methods for protein, moisture and ash. Confirmation of protein values is obtained using an N-Cube combustion nitrogen analyzer. NIR moisture and flour ash are confirmed with moisture and ash oven methods. National Mfg. computerized mixographs are used for obtaining rheological data and dough absorption. Sprout damage was a significant issues for the Fall 2014 harvest. We will be modifying the bread bake protocol for a few bakes to examine bake data with FN data. This will be done by rebaking some groups without the addition of malt. This will not become common practice but more of a curiousity for this year.

Generation	End-use quality test	Amount of seed needed
F_4	Whole meal protein, hardness, SDS Sedimentaion	>40 grams
F_5	Whole meal protein, hardness, SDS Sedimentation, Jr. mill or Sr. Mill(bake test-cookies for soft wheats, bread for hard wheats)	>40 grams for ground meal testing >80 grams for Jr. Milling 450 grams for Sr. Milling
F_6	Hardness, Sr. Mill for flour yield, noodle color, sugar snap cookie or white pan bread bake analysis, Solvent Retention Capacity test (SRC)	450 grams
F_7 and up	Hardness, Sr. Mill for flour yield, noodle color, sugar snap cookie or white pan bread bake analysis, SRC	450 grams
F_{11} and up	Hardness, Sr. Mill for flour yield, noodle color, sugar snap	450 grams PNW wheat quality council

	cookie or white pan bread bake analysis, SRC. Submit to PNW wheat quality council	samples are milled on USDA Miag mill in Pullman and distributed to collaborators

To accomplish goal three to evaluate, develop, and implement new procedures for measuring wheat quality, the quality lab participates in regional methods collaboratives, AACCI methods collaboratives and the PNW wheat quality council. March 12, 2015 the lab will host a wheat quality workshop.

The FY2016 budget proposal includes salaries for two appointment employees and one part-time irregular help employee. Bonnie Grover retired in May and we have replaced her with part-time help. The budget also includes a small increase for travel and operating expenses.

DURATION: One year of a continuing project.

COOPERATION:

Jianli Chen, U of I Wheat Breeder, Aberdeen
Juliet Marshall, U of I Extension Crop Management Specialist, Aberdeen
Arash Rashed, U of I Entomologist, Aberdeen
Kurtis Schroeder, U of I Extension Crop Management Specialist, Aberdeen
Yueguang Wang, U of I Assistant Wheat Breeder, Moscow
Doug Finkelnburg, U of I Extension Educator, Nez Perce County
Jean-Bruno Beaufume, Wheat Breeder-Limagrain Cereal Seeds LLC, Waitsburg, WA

ANTICIPATED BENEFITS/EXPECTED OUTCOMES/INFORMATION TRANSFER:
With end-use functionality information, University of Idaho wheat research programs are better able to select improved quality cultivars, identify optimal production practices, and determine how environmental conditions may affect a cultivar's acceptability to end-users. Idaho wheat producers may use this information to select those wheat varieties that have the best agronomic characteristics for their growing environment and provide a quality product to meet the needs of our diverse wheat grain and flour consumers.

Wheat end-use quality information will be communicated via journal articles, UI publications, presentations, and cereal schools.

LITERATURE REVIEW: Wheat is a complex biochemical entity that varies in composition and properties from year to year, location to location and from one cultivar to another (Hoseney 1994). "Good quality wheat" depends on the desired end-use. Hard wheat products such as bread require higher protein and water absorption levels than soft wheat typically used for pastry products. Wheat cultivars have been developed for Idaho with diverse end-use properties for distinct markets (Souza et al., 2004). End-use quality can be determined through milling and baking tests as well as more definitive tests such as the solvent retention capacity test (Guttieri et

al., 2001). End-use quality testing of wheat cultivars enables growers in Idaho to choose wheat cultivars suitable for their environment that are marketable for end-users in the flour industry.

Literature Cited:

Guttieri, M.J., D. Bowen, D. Gannon, K. O'Brien, and E. Souza. 2001. Solvent retention capacities of irrigated soft white spring wheat flours. Crop Sci. 41:1054–1061.

Hoseney, C.R. 1994. Cereal Science and Technology. 2nd. Ed. American Association of Cereal Chemists, Inc: St. Paul, Minnesota.

Souza, E.J., Martin, J.M., Guttieri, M.J., O'Brien, K.M., Habernicht, D.K., Lanning, S.P., McLean, R., Carlson, G.R., & Talbert, L.E. 2004. Influence of genotype, environment, and nitrogen management on spring wheat quality. Crop Sci. 44:425-432.

IDAHO WHEAT COMMISSION - BUDGET FORM

Allocated by	Idaho Wheat Commission	during FY 2014	$	119,448
Allocated by	Idaho Wheat Commission	during FY 2015	$	130,136

REQUESTED FY 2016 SUPPORT:

	Salary	Temporary Help	Fringe	Travel	OE	Grad Fees	TOTALS
Idaho Wheat Commission	$ 50,196	$ 18,800	$ 36,618	$ 2,800	$ 10,000	$ -	$ 118,414

OTHER RESOURCES (not considered cost sharing or match):

TOTAL OTHER RESOURCES	$	120,671

TOTAL PROJECT ESTIMATE FOR FY 2016:	$ 118,414 *(Requested)*	$ 120,671 *(Other)*	$ 239,085 *(Total)*

BREAKDOWN FOR MULTIPLE SUB-BUDGETS:

	(PI name)	*(PI name)*	*(PI name)*	*(PI name)*
Salary	$ -	$ -	$ -	$ -
Temporary Help	$ -	$ -	$ -	$ -
Fringe Benefits	$ -	$ -	$ -	$ -
Travel	$ -	$ -	$ -	$ -
Operating Expenses	$ -	$ -	$ -	$ -
Graduate Student Fees	$ -	$ -	$ -	$ -
TOTALS	$ -	$ -	$ -	$ -

Total Sub-budgets	$ -

10.24.2014 - Version