Grant Code: AP6313

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

Personnel: Sarah M. Windes, Manager, U of I Wheat Quality Lab, Aberdeen
Lyona Anderson, Lab Technician
Ericka Ziebarth, Lab Technician

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Justification/Rationale:
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 determine market suitability of new releases. Characterization of end-use quality traits of varieties and advanced lines is valuable to wheat programs, researchers evaluating environmental effects and production practices on quality, growers and end-use industries. High flour yield, favorable protein content, protein quality, and flour functionality as well as good bakery performance are attributes of wheat cultivars with favorable 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 end use desirability. This increases efficiency of utilizing resources by not wasting efforts advancing poor quality lines. End-use quality may be affected by both production practices and environmental factors. Wheat researchers in both breeding and extension 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 gives Idaho producers market advantages that may improve the profitability of their operations.

Objectives:
Genetics, environmental conditions, and management practices all influence the end-use functionality of wheat. Considering this, 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.

Methods/Plan of Work:
To accomplish goals one and two, University of Idaho wheat breeders and cereal extension agronomists submit wheat samples grown in multiple locations across the grain producing areas throughout Idaho. The U of I lab also processes samples submitted from the Limagrain/U of I wheat breeding partnership. Private wheat breeding companies may 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 accepted modifications of those methods. Whole grain meal prepared on a UDY hammermill is analyzed for protein content and grain hardness and may be used to estimate gluten quality using the SDS sedimentation test. Flour is obtained by milling on either the Brabender Quadromat Senior or Jr. mill. Flour is sifted using Great Western Sieve Shakers. Whole grain meal protein, flour protein, moisture, hardness, and ash values are obtained using a Bruker Tango NIR analyzer. National Mfg. computerized mixographs are used for obtaining rheological data and dough absorption.

Generation	End-use quality test	Amount of seed needed
F_4	Whole meal protein, hardness, SDS Sedimentation	>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 flour yield, noodle color, sugar snap cookie or white pan bread 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 analysis, SRC	450 grams
F_{11} and up	Hardness, Sr. Mill for flour yield, noodle color, sugar snap cookie or white pan bread analysis, SRC. May be submitted to PNWWQC	450 grams PNW WQC samples are milled on USDA Miag mill in Pullman and distributed to collaborators

To accomplish objective three, the quality lab participates in regional methods collaboratives, AACCI methods collaboratives and the PNW Wheat Quality Council (PNWWQC).

Objective four is accomplished by providing information on end-use quality to researchers for inclusion in presentations, publications and popular press articles. Participation in the PNW Wheat Quality Council and regional collaborative projects also helps promote development and release of quality cultivars for our producer's markets.

The FY2024 budget proposal includes salaries for two full-time classified employees and one part-time employee, as well as funds for travel and operating expenses.

Duration: One year of a continuing project.

Cooperation/Complementation:

Jianli Chen, U of I Wheat Breeder, Aberdeen
Juliet Marshall, U of I Extension Crop Management Specialist, Aberdeen
Kurtis Schroeder, U of I Extension Crop Management Specialist, Moscow
Yueguang Wang, U of I Assistant Wheat Breeder, Moscow
Dylan Larkin, Wheat Breeder-Limagrain Cereal Seeds LLC, Walla Walla, WA
Jared Spackman, U of I Extension Barley Agronomist, Aberdeen, ID
Xi Liang, U of I Extension Cropping Systems Agronomist, Aberdeen, ID
Earl Creech, Utah State University Professor and Extension Agronomy Specialist, Logan, UT

Anticipated Benefits/Expected Outcomes/Information Transfer:
We provide essential end-use quality information to our partners in variety development and management. Wheat varieties for growers need to have excellent agronomic characteristics for the economic benefit of the grower, good milling characteristics of value to the millers and desirable end-use properties that are preferred by the baking industry and others using wheat flour products. Data for varieties both in selection of what to plant and management practices of those varieties are helpful to growers to maximize their knowledge and ability to grow a healthy and marketable wheat crop. The cost benefit to growers is identifying lines that are desirable for end-users subsequently improving marketability of varieties.

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

Literature Review: None.

References:
Marshall, J.M., Yimer, B., Shelman, T., Jones, L., Hatch, J., Moll, M., and Windes, S.M. 2022. 2021 Small Grains Report, Southcentral and Southeast Idaho Cereals Research and Extension Program. University of Idaho, Idaho Agricultural Experiment Station Bulletin. CIS BUL 205. 159 pp

Marshall, J.M., Yimer, B., Shelman, T., Jones, L., Baldwin, S., Hogge, J., Hatch, J., Moll, M., and Windes, S.M. 2021. 2020 Small Grains Report, Southcentral and Southeast Idaho Cereals Research and Extension Program. Idaho Agricultural Experiment Station. UI Research Bulletin 204. 150 pp. University of Idaho, Idaho Agricultural Experiment Station Bulletin. CIS BUL 204. 163 pp.

Marshall, J.M., Yimer, B., Shelman, T., Jones, L., Arcibal, S., Hogge, J., Moll, M., Jackson, C., and O'Brien, K. 2020. 2019 Small Grains Report, Southcentral and Southeast Idaho Cereals

Research and Extension Program. Idaho Agricultural Experiment Station. UI Research Bulletin 202.150pp.
https://www.uidaho.edu/-/media/UIdaho-Responsive/Files/Extension/topic/cereals/scse/2019/small-grains-report_2019.pdf

FY2024

COMMODITY COMMISSION BUDGET

Principal Investigator: Sarah M. Windes

Allocated by	**Idaho Wheat Commission** *(Commission/Organization)*	**during FY2022**	**$ 138,548**
Allocated by	**Idaho Wheat Commission** *(Commission/Organization)*	**during FY2023**	**$ 156,556**

REQUESTED SUPPORT: Budget Categories	*Awarded for FY2023*	*Requested for FY2024*
(10) Salary *(staff, post-docs, e* NOTE: *Faculty salary/fringe not allowed*	$ 85,509	$ 88,024
(12) Temporary Help/IH	$ 20,000	$ 20,000
(11) Fringe Benefits	$ 43,047	$ 38,710
(20) Travel	$ 2,000	$ 4,000
(30) Other Expenses	$ 6,000	$ 5,400
(40) Capital Outlay >$5k	$ -	$ -
(45) Capital Outlay <$5k	$ -	$ -
(70) Graduate Student Tuition/Fees	$ -	$ -
TOTALS	$ 156,556	$ 156,134
TOTAL BUDGET REQUESTED FOR FY2024:		$ 156,134

BREAKDOWN FOR MULTIPLE INDEXES:

Budget Categories	*(Insert Lead PI name)*	*(Insert Co-PI Name)*	*(Insert Co-PI Name)*	*(Insert Co-PI Name)*
(10) Salary *(staff, post-docs, e*	$ -	$ -	$ -	$ -
(12) Temporary Help	$ -	$ -	$ -	$ -
(11) Fringe Benefits	$ -	$ -	$ -	$ -
(20) Travel	$ -	$ -	$ -	$ -
(30) Other Expenses	$ -	$ -	$ -	$ -
(40) Capital Outlay >$5k	$ -	$ -	$ -	$ -
(45) Capital Outlay <$5k	$ -	$ -	$ -	$ -
(70) Graduate Student Tuition/Fees	$ -	$ -	$ -	$ -
TOTALS	$ -	$ -	$ -	$ -
			Total Sub-budgets	$ -

Budget Justification

$	88,024	2 full time employees with an hourly rate of $20.92 and $21.40 @ 2080 hrs/yr, these two employees combined have a salary of $88,024. Tasks include prepping samples, milling, baking, SEDs, mixographs, SRCs, and general lab
$	20,000	1 IH worker @ $12/hr and approximately 1666 hrs/yr. Tasks include washing lab equipment, assisting in milling, baking, running samples on NIR, and general lab upkeep.
$	38,710	Staff @ 42%
$	4,000	2 employees are expected to attend the PNW Wheat Quality Council Meeting. One additional trip for collaboration and learning experience is also anticipated.
$	5,400	Reagents for SEDs, SRCs, and baking will be purchased. Equipment repair for the UDY hammermill, the Bruker Tango NIR, the Brabender Quadromat Mill, the mixographs, proof box and oven will be covered. Additional needs of centrifuge tubes, glassware, weigh boats, and miscellaneous small lab purchases will be required.
$	-	

Annual Report

FY2023 Grant Code: AP6313

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Cooperators:

Dr. Jianli Chen, U of I Wheat Breeder, Aberdeen jchen@uidaho.edu
Dr. Jared Spackman, U of I Extension Barley Agronomist jspackman@uidaho.edu
Dr. Juliet Marshall, U of I Extension Crop Management Specialist, Aberdeen jmarshall@uidaho.edu
Dylan Larkin, Wheat Breeder-Limagrain Cereal Seeds LLC, Walla Walla, WA dylan.larkin@limagrain.com
Dr. Xi Liang, Aberdeen, Cropping Systems Agronomy xliang@uidaho.edu
Dr. Kurtis Schroeder, U of I Extension Crop Management Specialist, Aberdeen kschroeder@uidaho.edu
Dr. Yueguang Wang, Assistant Breeder, U of I, Moscow ywang@uidaho.edu
Dr. Alecia M. Kiszonas, Cultivar Development Manager, USDA-ARS Western Wheat & Pulse Quality Lab, alecia.kiszonas@email.wsu.edu
Dr. Earl Creech, Utah State University Professor and Extension Agronomy Specialist, earl.creech@usu.edu

Abstract:
We will continue to provide essential end-use quality information to our partners in variety development and management. Wheat varieties for growers need to have excellent agronomic characteristics for the economic benefit of the grower, good milling characteristics of value to the millers and desirable end-use properties that are preferred by the baking industry and others using wheat flour products. Both end-use quality and agronomic performance data are critical selection criteria for growers to maximize their knowledge and ability to grow and market a healthy wheat crop. The cost benefit to growers is identifying lines that are desirable for end-users subsequently improving marketability of varieties.

Objectives:
We continue the path of providing end-use quality information to the breeding programs and extension projects for the University of Idaho. We have a new collaboration with Dr. Earl Creech from Utah State University to run wheat samples from a fertility trial. This collaboration should extend into the next two years. Our focus has not changed for the new fiscal year.

Results and Accomplishments:
We are analyzing wheat samples from the fall 2022 harvest. We have worked through entries from Dr. Chen, Dr. Spackman, Dr. Marshall, Dr. Liang, and the North Idaho Limagrain Partnership. These include small samples for protein and hardness and samples submitted for milling and baking tests. We are currently working on large hard wheat samples for bread baking for Dr. Chen's spring wheat selections and we have completed analysis of a number of groups of other advanced selections. Additionally, we are currently working on samples for Dr. Earl Creech from Utah for a wheat fertility trial as well as samples for Dr. Spackman for a similar trial. For the North Idaho/Limagrain partnership, we have completed milling and baking tests for all their samples.

In November of 2021 the lab acquired a new NIR, the Bruker Tango, with funding from IWC. The Tango has been used exclusively for the harvest year of 2022 for all samples. New parameter readings from the Tango include fat, fiber, and starch in addition to the traditional protein, ash content, and moisture. We continue to collaborate with other projects in running samples of wheat and other grains.

Next Steps:

- Continue providing data for use by U of I wheat breeders and extension personnel.
- Collaborate with other wheat quality labs to ensure best practices in evaluating wheat end-use quality.
- Collaborate with other wheat quality labs and industry personnel in evaluating potential variety releases and experimental lines for end use desirability.
- Collaborate with outside researchers to improve lab management and maintain standards of wheat end use quality testing.

Projections:
We will seek funding to continue working on ongoing objectives and cooperating with PNW wheat quality labs.

We will request funding for lab operating and personnel salaries as usual. We have anticipated and calculated an increase in salary for university employees. This was calculated at a 2% increase of the previous years annual salaries for the two technicians within the lab.

Publications/Variety Releases:

Marshall, J.M., Yimer, B., Shelman, T., Jones, L., Hatch, J., Moll, M., and Windes, S.M. 2022. 2021 Small Grains Report, Southcentral and Southeast Idaho Cereals Research and Extension Program. University of Idaho, Idaho Agricultural Experiment Station Bulletin. CIS BUL 205. 159 pp

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https://www.uidaho.edu/-/media/UIdaho-Responsive/Files/Extension/topic/cereals/scse/2019/small-grains-report_2019.pdf