

# Research Proposal for the Oklahoma Wheat Research Foundation and Oklahoma Wheat Commission 05/03/22

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## TITLE: *Small Grains Variety Testing*

**PRINCIPAL INVESTIGATORS:** Amanda de Oliveira Silva, Small Grains Extension Specialist, Plant and Soil Sciences, OSU, Stillwater

### COOPERATORS:

- Meriem Aoun, Small Grains Extension Plant Pathologist, Department of Entomology and Plant Pathology, OSU, Stillwater
- Brett Carver, Wheat Breeder, Department of Plant and Soil Sciences, OSU, Stillwater
- Various farmer-cooperators throughout the state of Oklahoma

**FUNDING HISTORY:** The Oklahoma wheat variety trials have been supported by the Oklahoma Wheat Research Foundation and the Oklahoma Wheat Commission for many years. The variety trials were supported at \$45,101 in 2021-2022, and we are requesting a similar amount in 2022-2023. Even though state funding for technical support has continued to decrease and labor and travel costs have continued to increase, we are not requesting an increased funding amount at this time. As the OWC moves towards a more quality based marketing strategy, we would like to continue supporting this effort by providing information on grain protein concentration simultaneously with grain harvest results. For that, we would like to request additional funding to update our current GrainGage combine system to a H2 GrainGage system with SCiO NIR equipment to be able to measure grain protein concentration at the same time of grain harvesting in the field. Typically, we haul all grain samples to the lab and rely on temporary student workers to measure grain protein. Results are made available to producers as soon as possible, but due to the manual labor procedure to measure protein in the lab and the huge amount of samples analyzed from the variety trials, it can take up to 30 days, depending on the number of samples to have complete results available to producers. This new GrainGage system with NIR would help us to stay efficient and allow us to release grain yield, test weight, and protein concentration on the same day encouraging stakeholders to take one of the end-use quality aspects into consideration when selecting a variety.

**ABSTRACT:** An ever-changing list of wheat varieties available to Oklahoma wheat producers necessitates evaluation and comparison of hard red and hard white winter wheat varieties currently being sold. To address this need, *this project is designed to evaluate yield potential and quality characteristics of approximately 25 commercially released wheat cultivars and 2-4 candidate cultivars at approximately 10 locations throughout Oklahoma.* In addition, we will evaluate 40 – 50 cultivars and experimental lines at five regional test sites to ensure that our statewide tests are filled with the best-adapted cultivars. Data to be collected include grain yield under dual-purpose and grain-only production systems, forage yield, resistance to disease, response to intensive management, adaptability to no-till production systems, high- temperature sensitivity to germination, plant height, first hollow stem date, shattering, lodging, and heading date. Data will be collected and

distributed through Extension publications, oral presentations, and web-based communication outlets.

**OBJECTIVES:** The primary objective of this research is to provide farmers, Extension personnel, seedsmen, and consultants the necessary information to make well-informed decisions as to what variety will work best at a particular location. To achieve this primary objective, we propose the following sub-objectives:

1. Evaluate 40 – 50 cultivars and experimental lines at five regional test sites, including two intensive management trials and a late-planted short season wheat variety, to select varieties for entry into county-level trials the following year.
2. Compare and contrast the grain yield, test weight, and grain protein concentration of approximately 25 commercially released varieties and 2 to 4 candidate cultivars at approximately 10 locations throughout Oklahoma.
3. Evaluate disease incidence and severity at any of the locations where disease pressure is high enough to differentiate among varieties.
4. Determine fall forage production and first hollow stem dates at 2 locations.
5. Evaluate and compare variety responses to intensive management practices at Apache, Chickasha, Lahoma, and Morris locations.
6. Evaluate other variety characteristics such as grain protein concentration, high-temperature germination sensitivity, shattering, lodging, plant height, and heading date at select locations.
7. Provide approximately 30 demonstration strip seed sets (15-18 varieties each) for county Extension personnel.
8. Disseminate information through print and web-based media outlets.

## **PROCEDURES:**

### **Hierarchy of trials**

1. **Regional trials:** The OSU Regional Wheat Variety Performance Tests consist of the fall forage yield test and four regional grain yield test sites. The entry fee charged all companies (including OGI) is \$1000 per eligible variety per year and covers all five regional test sites. Entries to individual sites will be accepted, but the entry fee will not be prorated. Experimental lines from the OSU Wheat Breeding Program, OSU-developed varieties without licensing agreements, and other varieties of historical or regional importance may be entered free of charge at the discretion of the OSU Small Grains Extension Program. Trial sites are subject to change, but general locations are as follows:
  - Forage trial – Stillwater, OK
  - Southcentral – Chickasha, OK
  - Southwest – Altus, OK

- Northcentral – Lahoma, OK
  - Panhandle – Hooker, OK
2. **County trials:** The top ten yielding commercially released varieties at each regional grain yield trial will be included in OSU county-level replicated variety trials within the associated region for one production season following the regional trial. Additional years of testing, additional varieties, and experimental lines will be included at the discretion of the OSU Small Grains Extension Specialist. There is no entry fee for county-level trials, but seed (20 lbs per region or 60 lbs for all regions) must be supplied according to the same deadlines and guidelines as the regional trials.
  3. **Non-replicated demonstration sites:** Top-performing varieties statewide may be invited to be included in approximately 30 non-replicated demonstration sites. These tests are planted by OSU Area Agronomists and County Extension Educators in conjunction with farmer cooperators and are not generally harvested for yield. If invited, 300 lbs. of seed are required for these tests, and special arrangements will be made for shipment of seed.

#### **Eligibility**

Hard winter wheat varieties that are offered for sale as a certified class of seed in the state of Oklahoma and promising experimental lines will be eligible, space providing. Acceptance into the variety testing program does not constitute endorsement or recommendation by Oklahoma State University.

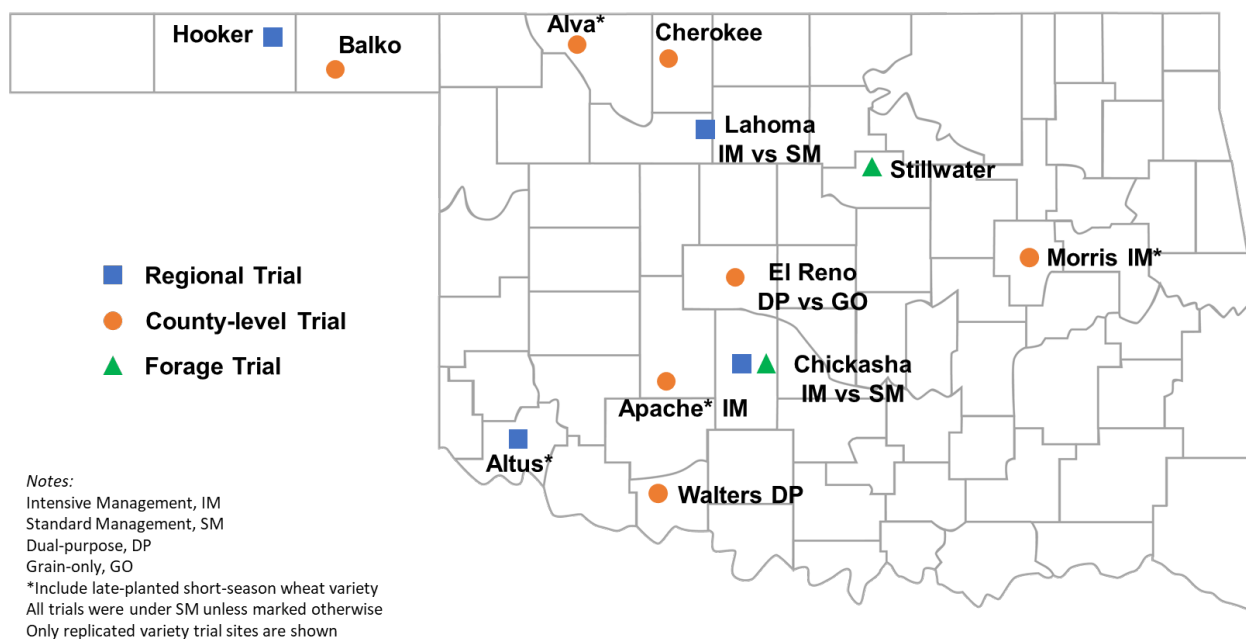
**Planting procedures and sites:** Locations are selected to represent as wide of an array of environments as possible and to reflect the distribution of harvested wheat acres within the state. Dual-purpose trials will be planted with the anticipation that they will be a graze plus grain production system. These locations will be sown at a 120 lb/ac seeding rate as opposed to the 60 lb/ac rate used in grain-only trials. Intensive management trials will be planted on a seeds per acre basis (1.2 million seeds/acre), receive two fungicide applications, and an additional 50 lbs of N at greenup stage.

**TIMELINES:** Management of the variety trials is a year-round enterprise. Plots will be planted in September and October, and data will be collected throughout the growing season. Forage measurements will be collected, published, and distributed by April 2023.

Near real-time posting of variety trial data to the OSU Small Grains Website has been extremely well received, and this practice will continue in 2023. We anticipate posting yield data for variety trial locations within four days of harvest. Grain protein concentration data will be posted as the it becomes available. Printed materials will be available within a few weeks after completion of harvest.

Data for high-temperature sensitivity to germination is obtained from seed saved from the Stillwater demonstration strip; therefore these data are not completed in the first year but will be published soon thereafter. Annual renewal of this project is proposed.

**Locations (blue dot indicates a regional trial location)**



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|--------------------------------|-----------------------------------|---------------------------------|
| 1. Altus                       | 7. Chickasha Intensive Management | 12. Lahoma Intensive Management |
| 2. Alva                        | 8. El Reno grain-only             | 13. Morris Intensive Management |
| 3. Apache Intensive Management | 9. El Reno dual-purpose           | 14. Stillwater                  |
| 4. Balko                       | 10. Hooker                        | 15. Walters dual-purpose        |
| 5. Cherokee                    | 11. Lahoma                        |                                 |
| 6. Chickasha                   |                                   |                                 |

**JUSTIFICATION:** Data from the Oklahoma wheat variety trials are extremely important to producers and are the most requested data by producers. Through a cooperative agreement with High Plains Journal, these data are distributed to approximately 8,000 subscribers in the state of Oklahoma. The Oklahoma Wheat Commission and Oklahoma Wheat Research Foundation are recognized as the primary granting agencies on the cover of these publications.

Published survey data indicated that variety trials are the most influential decision-making tool used by producers in deciding which varieties to plant. These data represent an unbiased source of information to help growers make better-informed decisions and are generally the only source of variety data for the dual-purpose production system. In addition, one of the variety trial locations are used by the OSU wheat breeding program to evaluate elite germplasm that may be nearing release. The evaluation of multiple varieties under intensive management trials, fungicide, tillage, and dual-purpose systems provide data that are publishable in refereed scientific publications and can provide a long-term perspective on the impact of genetics, management, and environment on wheat yield and protein in Oklahoma.

**REPORT OF ACCOMPLISHMENTS:** We collected data at 2010 wheat field days on the impact of the OSU small grains variety testing program. Field day attendees represented over 1.7 million acres and placed an average value of \$21.46 per acre on the information they received. This equated to a \$37 million in perceived value by producers from a \$30,000 investment in the small grains variety testing program by the OWC and OWRF. This and other impact statistics were published in two tri-fold leaflets: L-342 *Impact of the OSU Wheat Variety Testing Program* and L-343 *Impact of the OSU Small Grains Extension Program*.

Wheat variety trial results including grain yield and protein concentration were posted on the small grains extension website ([www.wheat.okstate.edu](http://www.wheat.okstate.edu)) within a few days of harvest, which allowed producers in each region to access data much more quickly than in previous years. The information on the small grains extension site was accessed over 20,000 times in 2017 or about one page view every 25 minutes. Additionally in 2021, the World of Wheat Blog reached about 16,500 people, the small grains extension program Facebook posts reached over 23,482 people, and Twitter impressions reached approximately 84,522 people.

The print version of the small grains variety performance tests was published in mid-July and distributed to over 8,000 High Plains Journal subscribers in Oklahoma. The Oklahoma Wheat Research Foundation and Oklahoma Wheat Commission were both recognized on the cover of this publication, which helped Oklahoma wheat farmers see the value of their checkoff investment.

**BUDGET:** Services and supplies reflect the purchase price of materials as well as repair and maintenance on equipment. This includes but is not limited to the purchase of bags for sample collection (Ziploc, paper, and cloth), materials for variety signs (posts, metal signs, and vinyl), flags, stakes, and pesticides. Travel is a significant budget item and is reflective of the geographic dispersal of our test site locations. Publication costs will be used for printing the small grains variety testing results book at the end of the 2022-2023 growing season. Wages are for student labor and provide agronomy students with hands on experience in wheat production that will be used once they graduate.

Wages	14,000
Services, supplies, & equipment	11,500
Publication costs	3,500
Travel	18,000
<hr/> Total	<hr/> \$47,000

**RELATION TO OTHER RESEARCH:** The funding provided by the OWRF and OWC for this program is used as a base to secure nationally competitive grants. Also, the support of undergraduate labor in this project provides learning opportunities and support for tomorrow's consultants and scientists. Having well-trained individuals in industry positions is becoming more and more important and student training funded by this project will help ensure qualified individuals are available.