**UNITED STATES DEPARTMENT OF AGRICULTURE**

**AGRICULTURAL RESEARCH SERVICE**

**In cooperation with**

**STATE AGRICULTURAL EXPERIMENT STATIONS**

**Report on Hard Red Spring Wheat Varieties Grown in Cooperative Plot and**

**Nursery Experiments in the Spring Wheat Region in 2024**

Nursery Coordinator:

Andrew Read

USDA-ARS

Research Geneticist

Report prepared by: S. Blecha and A. Read

This is a joint progress report of cooperative investigations underway in the State Agricultural Experiment Stations and the Agricultural Research Service of the U.S. Department of Agriculture. It contains preliminary data which have not been sufficiently confirmed to justify general release, and interpretations may be modified after additional experimentation. Confirmed results will be published through established channels. This report is primarily a tool for use by cooperators and their official staffs, and for those persons having direct and special interest in the development of agricultural research programs.

This report includes data furnished by the State Agricultural Experiment Stations as well as by the Agricultural Research Service of the U.S. Department of Agriculture. This report is not intended for publication and should not be referred to in literature citations, nor quoted in publicity or advertising. Accuracy of information within this report is not guaranteed by the U.S. Government.

Use of the data may be granted for certain purposes upon written request to the agency or agencies involved.

USDA is an equal opportunity provider and employer.

Agricultural Research Service

U.S. Department of Agriculture

Midwest Area

St. Paul, Minnesota

March 27, 2025

**2024 HARD RED SPRING WHEAT UNIFORM REGIONAL NURSERY REPORT**

**CONTENTS PAGE**

Cooperating Agencies, Stations and Personnel 2

Policy for Protected or Patented Genes 3

Previous HRSWURN Entries Released as New Cultivars 4

2024 Spring Wheat Production Statistics 5

2024 Environmental Notes by Stations 6-7

Description and Summary of 2024 HRSWURN 8

Figure 1. Geographic Locations of 2024 HRSWURN 9

Table 1. List of Entries in the 2024 HRSWURN 10

Table 2. Nursery Locations and Comparative Plot Management Data 11

Tables 3-15. Nursery Data by Individual Location 12-24

Table 16. Summary of Trait Means Across Locations 25

Table 17. Yield Rankings by Location 26

Table 18. Seedling Leaf Rust Reactions, St. Paul, MN 27

Table 19. Seedling and Field Stem Rust Reactions, St. Paul, MN 28-29

Table 20. Fusarium Head Blight (Scab) Reactions, St. Paul, MN 30

Table 21. Fusarium Head Blight (Scab) Reactions, Crookston, MN 31

Table 22. Fusarium Head Blight (Scab) Reactions, North Dakota Locations 32

Table 23. Molecular Marker Data for Agronomic Trait/Disease Resistance Genes 33-35

Table 24. Seedling and Field Stem Rust Reactions in St. Paul and Kenya 36-39

**COOPERATING AGENCIES, STATIONS, AND PERSONNEL FOR THE 2024 HRSWURN**

USDA-AGRICULTURAL RESEARCH SERVICE

National Program Leader O. Crasta

Midwest Area Director R. James

Nursery Coordinator, Plant Science Research Unit, St. Paul, MN A. Read

 S. Blecha

Quality Investigations, Cereal Crops Research Unit, Fargo, ND L. Dykes

Molecular Marker Analysis, Cereal Crops Research Unit, Fargo, ND J. Fiedler

Disease Evaluations

Cereal Disease Laboratory, St. Paul, MN Y. Jin

 P. Olivera

 S. Gale

 J. Kolmer

 M. Rouse

MINNESOTA AGRICULTURAL EXPERIMENT STATION

St. Paul, University of Minnesota J. Anderson

 S. Reynolds

Fergus Falls, Experiment Station J. Wiersma

Crookston, Northwestern Experiment Station M. Leiseth

NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

Fargo, North Dakota State University A. Green

 J. Underdahl

Hettinger Research Extension Center J. Rickertsen

Langdon Research Extension Center B. Hanson

 L. Henry

Williston Research Extension Center G. Pradhan

 J. Jacobs

Carrington Research Extension Center M. Ostlie

 K. Simons

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

Brookings, South Dakota State University K. Glover

MONTANA AGRICULTURAL EXPERIMENT STATION

Bozeman, Montana State University J. Cook

 H.-Y. Heo

Please note change in personnel: Matt Rouse is still with the USDA but in a new unit. Pablo Olivera has filled Rouse’s position. Jim Kolmer retired in 2024. Bryan Hanson retired in February 2025 after being at the Langdon Research Extension Center for 41 years. Lawrence Henry has filled Hanson’s position.

**Entering Lines with Protected or Patented Genes into the Hard Red Spring Wheat Uniform Regional Nursery**

Transgenic wheat lines may be considered for the nursery program ONLY if they have been granted permanent non-regulated status. Non-regulated status is granted only after the originator files a formal petition to de-regulate a line with APHIS. However, ultimately the decision whether to include or exclude such germplasm will reside with individual location cooperators.

**HRSWURN ENTRIES RELEASED AS NEW CULTIVARS**

When the spring wheat breeders release a new variety tested in the HRSWRN, the released variety name, experimental name, PI number, brief description, and years entered in the HRSWURN or URSN will be included below, if available.

**Enhance-SD** (SD4905) Released in 2025 by South Dakota State University and South Dakota Agricultural Experiment Station. It has high yield potential, above average test weight and protein content, and moderate resistance to bacterial leaf streak and Fusarium head blight. Enhance-SD is better suited for northern areas of spring wheat production in South Dakota. **HRSWURN 2021-2022**

**U.S. SPRING WHEAT PRODUCTION, 2024**

***SPRING WHEAT (OTHER THAN DURUM)*: Growers produced an estimated 542 million bushels of spring wheat. This production estimate is 7.4 percent higher than year 2023 production. Yield averaged 52.5 bushels per acre, an increase of 6.5 bushels per acre from year 2023. Acres harvested totaled 10.3 million acres, which is approximately 5.4 percent lower than the acreage harvested in 2023.**

**Spring Wheat Production Statistics, 2022-2024\***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | Acres Harvested (x1000) |   | Production (x1000 Bushels) |   | Yield (Bushels/Acre) |
|   | 2022 | 2023 | 2024 |   | 2022 | 2023 | 2024 |   | 2022 | 2023 | 2024 |
| Minnesota | 1,210 | 1,260 | 1,180 |   | 73,810 | 78,120 | 80,830 |   | 61 | 62 | 68.5 |
| Montana | 2,440 | 2,630 | 2,340 |   | 61,000 | 78,900 | 60,840 |   | 25 | 30 | 26 |
| North Dakota | 5,260 | 5,490 | 5,250 |   | 263,000 | 266,265 | 309,750 |   | 50 | 48.5 | 59 |
| South Dakota | 710 | 650 | 635 |   | 34,080 | 27,950 | 31,115 |   | 48 | 43 | 49 |
| USA | 10,450 | 10,915 | 10,330 |   | 482,670 | 502,245 | 542,320 |   | 46.2 | 46 | 52.5 |

\* Source: National Agricultural Statistics Service: (https://quickstats.nass.usda.gov) as of 12-27-24.

**2024 ENVIRONMENTAL NOTES BY STATIONS**

Environmental notes are reported here and can be found in each location table. This information provided valuable context to explain high or low yields.

**Minnesota**

St Paul - Plentiful growing season moisture. Low test weights are due to scab and rainfall after harvest ripeness. Bacterial leaf streak, powdery mildew, and tan spot affected some entries.

Crookston- Plentiful growing season moisture. Low test weights are due to scab and rainfall after harvest ripeness. Bacterial leaf streak and tan spot affected some entries.

Fergus Falls- Early season hail damage; field abandoned.

**South Dakota**

Brookings- Very nice trial in 2024, however high levels of naturally occurring FHB and BLS were prominent. FHB Index values are from inoculated mist-irrigated screening nursery.

Groton- Trial was generally good. Disease pressure was minimal. Around July 28th a severe thunderstorm pass through the area with heavy rain and a few hours of sustained winds > 60 mph. Meaningful lodging scores were able to be collected.

Selby- Pretty good trial - no substantial disease pressure.

**North Dakota**

Langdon- Excellent growing conditions with plentiful growing season rainfall. Low to moderate disease levels.

Casselton- This location was seeded very early, and moisture was adequate to excessive throughout much of vegetative growth. Stripe rust was found at high levels beginning shortly after head emergence, and Fusarium head blight pressure was very high as well. Leaf and stem rust was present on susceptible varieties, and bacterial leaf streak pressure was present on leaves which survived rust infection. Yield was high but protein was slightly lower than desired. The location was harvested after a devastating early-harvest rain, resulting in severe pre-harvest sprouting throughout the trial.

Carrington- Previous crop was soybean/field pea. FHB was present in the field.

Forman- This location was seeded on-time and had very high moisture levels throughout the season, which contributed to very high pressure from Fusarium head blight. Stripe rust was present at low levels, leaf rust had high severity on susceptible and later maturing varieties, and bacterial leaf streak was also present. Field variability was present but data were analyzed with spatial models and variability was resolved adequately.

Berthold- Seasonal conditions were fairly typical for this location, but with adequate moisture throughout most of the season. Seeding date was timely for adequate development, but many commercial fields were seeded earlier than our trial. Disease pressure was almost nonexistent.

Hettinger- Previous Crop was barley. Very dry conditions after 1st week of July, fair amount of stripe rust on susceptible varieties. Precipitation by month: April (1.14 in), May (1.9 in), June (2.57 in), July (0.7), and August (1.42 in)

**Montana**

Bozeman- Yields were compromised by a moderate hailstorm that occurred when the lines were maturing

**2024 NURSERY DESCRIPTION AND SUMMARY**

The Hard Red Spring Wheat Uniform Regional Nursery (HRSWURN) was planted for the 94th year in 2024. The nursery contained 31 entries submitted by five different scientific or industry breeding programs, and six check varieties (Table 1). Trials were conducted as randomized complete blocks with three replicates except where noted. The HRSWURN was planted at 14 locations in 4 different states in the USA (MN, ND, SD, MT). Thirteen locations provided data included in this report, except Fergus Falls, MN due to an early season hail damage (Figure 1, Table 2). Bozeman yield data was not included in across location means due to severe hail damage. Data summaries for each of the reporting locations are presented in individual tables. Lodging was scored as 0-9, with 0 being no lodged plants while 9 being fully lodged, unless otherwise noted. Overall means across locations for a set of core traits are summarized in Table 16, and yield rankings for individual locations are found in Table 17. Entries were also evaluated for various diseases at different locations; these can be found in individual location data summaries. Leaf rust and stem rust resistance were evaluated in St. Paul, MN. These results are presented in Tables 18-19. Entries were evaluated for Fusarium head blight at St. Paul and Crookston, MN, and several locations in ND; these results are provided in Tables 20, 21 and 22, respectively. Molecular marker genotyping for select agronomic, quality and disease resistance traits was also performed; this information is presented in Table 23. The highest average yielding location was Casselton, ND, with 80.6 Bu/Ac, while the lowest yielding location was Brookings, SD, with 39.6 Bu/Ac.

A digital copy of the 2024 HRSWURN and older annual reports can be found on the GrainGenes website: https://wheat.pw.usda.gov/GG3/

Field results from the African stem rust nursery planted in Njoro, Kenya are included in Table 24. Seedling resistance to foreign races, including Ug99, were screened for in the USDA-ARS Cereal Disease Lab (CDL) in St. Paul, Minnesota (Table 24). The timeline of field planting in the United States is about six months ahead of field planting in Africa. Due to this offset of the field season, the entire HRSWURN is screened a year later in triplicate per entry after this report is published (2023 HRSWURN results received this year in 2024). To overcome this challenge, wheat breeders send at least 50 entries of their elite breeding material with the intention to capture some of the future URN entries in single rows. Thus, the African stem rust data is incomplete for the 2024 entries but is complete for the 2023 entries. The 2024 HRSWURN entries will be grown, and results will be received in 2025. A more complete copy of the previous year’s URN entries in the African stem rust nursery can be found on GrainGenes.

Wheat stem rust was found in 13 states throughout the US in 2024. There was moderate incidence and severity of wheat stem rust, a few isolated areas had high severity. The dominant and only wheat stem rust race was QFCSC. Wheat leaf rust was found in 20 states across the US in 2024. It spanned from south to north Plains, being severe in Texas and North Dakota. For the Midwest, leaf rust disease was higher in 2024 than the past three years. This information is provided by the CDL, updated status of rust surveys in the US can be accessed at their website:

https://www.ars.usda.gov/midwest-area/stpaul/cereal-disease-lab/docs/cereal-rust-bulletins/cereal-rust-bulletins/

**Figure 1. Hard Red Spring Wheat Uniform Regional Performance Nursery Locations, 2024**

