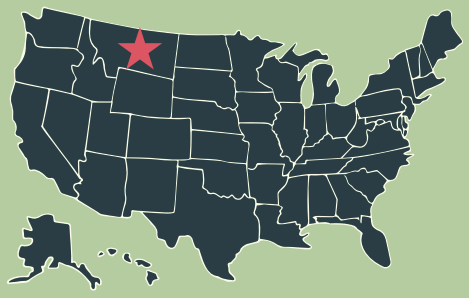
ORGANIC FARMING RESEARCH FOUNDATION

Farmer-Led Trials: The Quest for Hardy White Winter Wheat



2024

Farmer-Researcher:
Bob Quinn
Quinn Institute
Big Sandy, MT

IN A NUTSHELL

The Quinn Institute is working on the selection of a new population of high performing hard white winter wheat suitable for organic farmers in the Northern Great Plains, and the assessment of wheat selections for their milling and baking quality.

When Grist Milling and Bakery in Missoula, Montana expressed interest in a hard white variety for whole grain bread that was less dark, and possibly more appealing to customers, Quinn selected white kernels out of 15 hard red wheat lines, and grew them out for further evaluation. The Montana State Grain Lab tested for protein and test weight while Grist Milling and Bakery tested for milling and baking quality, aroma, texture and taste.

The results from this research allowed Quinn to identify six promising lines for further evaluation in 2025.

Map of the state of Montana, with a marker in the approximate location of the farm.

One of the lines newly emerged in May, surrounded by Bob Quinn (right, Director) and Josh Poole (left, Research Coordinator).

ABOUT THE TRIAL

The grain was grown for this project on Quinn Institute test fields (formerly Quinn Farm & Ranch – 100% certified organic since 1991), located 12 miles southeast of Big Sandy, MT. All wheat was seeded with a plot seeder, weeded by roto-tiller, hoe or by hand, harvested with a small plot combine, then cleaned. All field data collection was

15 lines of wheat in the trial area at the Quinn Institute after heading out in early July of 2024.

The original heirloom lines of grain were selected from landraces collected in Turkey and preserved in the USDA Small Grains Collection in Aberdeen, Idaho. Heirloom land races were chosen to avoid the digestive troubles that nearly 20% of the US population experiences with modern wheat.

undertaken by Quinn Institute personnel, bake tests were undertaken by Grist, and the Montana State Grain Lab performed grading and protein testing.

WHAT WAS THE ON FARM TRIAL ABOUT?

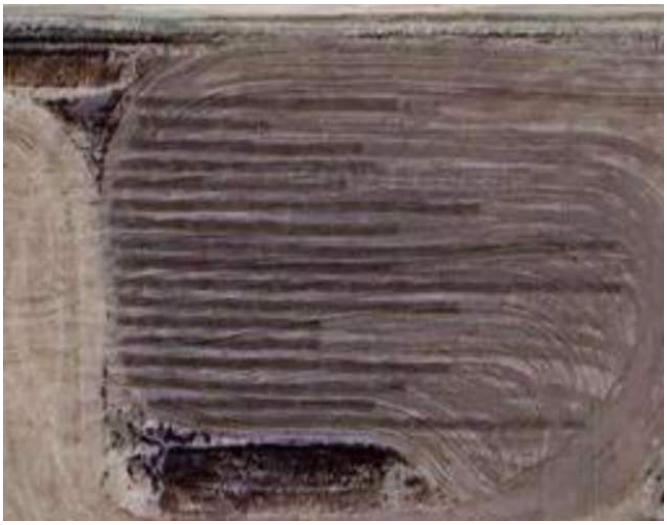
The project focused on selecting a new population of hard white winter wheat best suited for organic farmers in the northern Great Plains. This is wheat that is intended to produce the highest quality of whole grain bread for whole grain bakers with the highest possible nutrition, flavor and aroma for the final customers while avoiding sensitivity challenges experienced by many with modern wheat.

The Quinn Farm and Ranch began their integrated wheat breeding project in 2014 with 100 samples of hard red winter wheat. This study, which was supported through the OFRF Farmer Led Trial program, implemented quality testing on 15 promising lines of the hard white winter wheat.

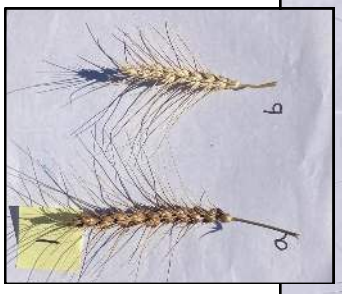
HOW WAS THE TRIAL DONE?

The trial was conducted on an organically managed parcel of sandy loam soil. The previous (2023) crop was a green manure cover crop of peas worked into the soil in mid-June. Wheat lines were planted in the fall of 2023 to plots averaging 120’ long by 6’ wide. Plots were harvested at maturity on 8/13/24. Each of the 15 wheat lines were measured for yield, % lodging, purity, color of the heads, color of the kernels (white, red, amber), bake quality, and taste.

- Percent lodging was collected by direct observation and visual estimate two weeks before harvest. Some lodging was due to a minor sawfly infection.
- Purity was measured by direct observation and visual estimate two weeks before harvest.
- Yield was calculated after weighing harvested grain and dividing by plot size.
- Color of the kernels was visually assayed by Montana State University's winter wheat breeder after harvest.
- Milling and baking quality and taste were measured by project lead and Grist bakery in Missoula after baking a loaf made from wheat of each line.
- Grain lab tests include an analysis of protein, test weight, and color.
- Bake test analysis looked at the loaf volume, texture, aroma, and flavor of each line.



Darker lines show the fifteen winter wheat lines. The variable length is due to varying amounts of available seed.



Above: Two unique heads from line number 1.

At right: Seven unique heads from line number 7.

Farm map identifying the project area as the bright red polygon in the upper right quadrant. Green polygons surrounded by red outline in the center represent future boundaries of the Quinn Institute.

Cover crop tilled in

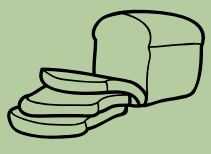
JUNE 2023

Wheat planted

FALL 2023

Plots harvested

AUGUST 2024



Samples taken & tests conducted

AUGUST 2024

A few of the lines of wheat just before harvest in August.

"These heritage wheat lines will aim to support both the farmer, by being a more reliable winter wheat crop, and the consumer by delivering health giving nourishment."

- Bob Quinn, farmer-researcher

FINDINGS

All of the wheat lines had acceptable yield for organic production in the Northern Great Plains, yet a handful yielded exceptionally well and only three lines had significant lodging issues (1,13,15).

Action for wheat lines that had purity and color issues will be determined after the head rows are grown out in Arizona during winter of 2024/2025 and evaluated. Of the six lines that made a great bread loaf, two yielded exceptionally well (6,19) and one of which was the best tasting (19).

Line 19 also had a yellow-ish hue, which could be an indicator of increased nutrition. A sample of this grain has been sent to a lab for nutritional evaluation.

The next steps for this research project will be to verify the 2024 performance of each line with evaluations made on the 2025 crop. Quinn expects to have other bakeries assist in the evaluation process and hopes to also conduct bake tests with different mixtures of the lines. They will continue increasing supply of the lines and testing until the expected release of the grain for production in 2027, consisting of a mixture of the top 3 to 6 lines.

Table 1. Yield and quality test results for each of the 15 hard white winter wheat lines included in the trial. Highlighted rows denote the six lines that will advance in the breeding project.

Line	Estimated Yield (bu/acre)	Protein (%)	Bake and Taste Test Pass
1	46.2	13.7	yes
3	62.4	12.6	no
6	64.5	12.9	yes
7	49.2	13.4	no
8	47.4	13.3	no
9	38.0	13.0	no
11	48.5	12.6	yes
12	54.6	14.1	no
13	44.1	14.0	no
15	46.7	15.2	yes
19	73.6	13.1	yes
20	52.5	13.3	no
21	47.3	13.8	no
26	35.6	13.0	no
29	48.9	12.6	yes

TAKE HOME MESSAGES

The preliminary results indicate that a potential high yielding, high nutrition wheat line (19) with excellent baking quality could be within reach. This will need to be verified on a larger acreage and across different seasons, but is nonetheless a promising sign. At the finish of the selection process, the most optimal lines will be blended together to form a unique population best suited to organic systems on the northern Great Plains and having the best nutritional and baking results.

To learn more about USDA germplasm resources, visit the USDA Germplasm Resources Information Network https://npgsweb.ars-grin.gov/gringlobal/search

To learn more about the Quinn Institute visit https://quinninstitute.org/ or review this article about their work: https://www.prweb.com/releases/agricultures-new-frontier-the-quinn-institute-unveiled-302134818.html

ACKNOWLEDGEMENTS

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