

ANNUAL REPORT

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Title: Barley Yield and Protein Response to Nitrogen and Sulfur Rates and Application Timing

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Accomplishments

The objectives of this study were:

- 1) Assess the effect of variety and the rate of nitrogen (N) and sulfur (S) application on plant nutrient utilization, grain yield and protein, and soil responses for three barley varieties
- 2) Identify the critical concentration ranges of N and S for developing correlated tissue test guidelines for malt, feed, and food barley under Idaho growing conditions
- 3) Develop a correlation-calibration response curve to establish the relationship between plant tissue N and S content with active canopy sensors for Idaho growing conditions

We successfully established field plots at the Aberdeen and Kimberly Research and Extension Centers during the 2021 growing season. We formed a collaborative relationship with Paul Stukenholtz who agreed to perform the soil, tissue, and water sample analyses associated with this project (value of \$215,000). We also received an additional grant for \$4,950 from the American Malting Barley Association to run select samples for malt quality at Montana State University's malt quality testing lab.

We hired Jacob Bevan as a research technician in July 2021. He had recently completed his MS at the University of Idaho in Jianli Chen's wheat breeding program. Because of his research background and experience with wheat, he was able to rapidly adjust to barley research and hit the ground running. He is an essential member of the Barley Agronomy research program and is doing an excellent job of keeping the project samples organized and processed in a timely manner.

We hired two undergraduate interns (one from the University of Idaho, one from Brigham Young University – Idaho) to help with this project during the summer of 2021. They were able to use this project to gain research experience and share their experience with their peers.

We had originally extended a Ph.D. assistantship to a student last spring, but due to Covid-19 and familial constraints, she was unable to join the program. In her place, Olanrewaju Adeyemi was hired in January 2022 as a MS graduate assistant.

To meet our objectives, we applied eight N fertilizer treatments (0, 40, 80, 120, 160 lb N ac⁻¹ as urea at planting; 40/20, 40/40, or 40/80 lb N ac⁻¹ split applied as urea at planting/jointing) by three S fertilizer treatments (0, 15, 30 lb S ac⁻¹ as potassium sulfate applied at planting). All 24 of these treatments were applied to Claymore (feed), Julie (food), and M179 (malt) barley for a total of 72 treatments and 576 plots.

Soil samples were collected by replication at 1 foot increments down to 3 feet at pre-plant and analyzed for complete nutrient analysis. Additional soil samples were collected from each plot at 1 foot increments down to 2 feet at jointing, flowering, and post-harvest for a total of 3,460 soil samples. These soil samples were

Projections: 1) We have identified two new potential sites for the 2022 growing season that have low ($<50 \text{ lb N ac}^{-1}$) residual soil N. We will use the current data plus the next one or possibly