

Fertilizer Trials

Increasing nitrogen rates in barley (Lacombe)

This trial was conducted with the agronomic support of Dan Orchard Ag Services Ltd.

Closest Town: Bentley, Alberta

Soil type: Orthic Dark Gray Chernozem on medium textured sediments

Seeding Date: May 11, 2022

Harvest Date: September 1, 2022

Row Spacing: 25.5 cm (10")

Variety(s): Sirish

Reps: Four

Previous Crop: Canola

Tillage: Fall deep tillage, spring harrow

Herbicides: **Pre:** Avadex®

In-Crop: Puma® & Pixxaro™

Seed Treatment: Vibrance® Quattro & Awaken® ST

Foliar Insecticides: None

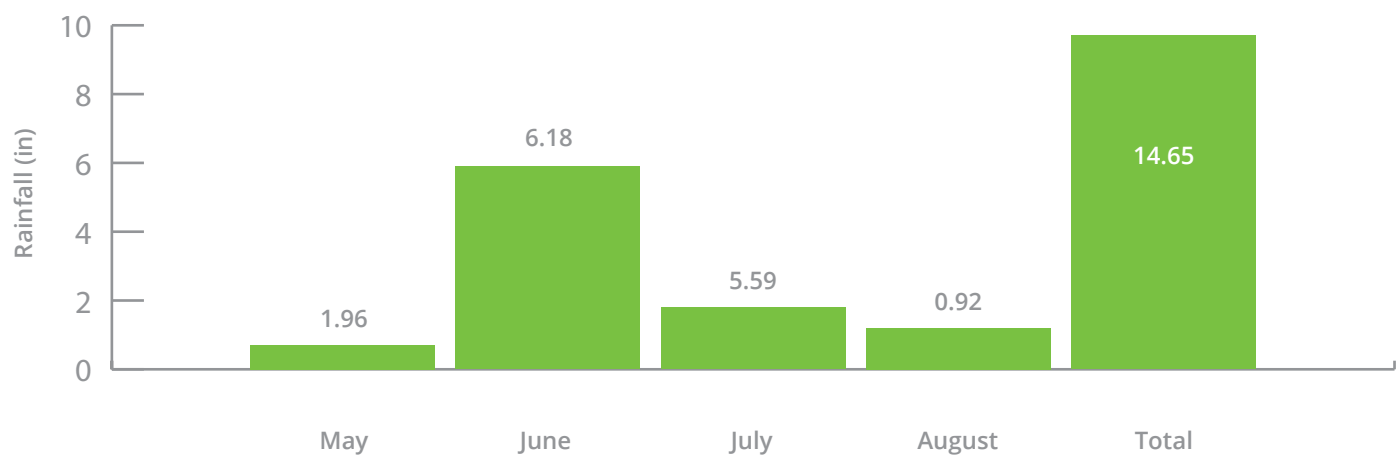
Foliar Fungicides: Quilt®

Fertilizer: (Nitrogen varied between treatments)-40P-26K-0S lbs nutrient/ac

Irrigation: None

Rainfall:

Rainfall (in) at trial location from May through August, 2022



Introduction

Partnering with Lenz Farms in Bentley, Alberta, this trial compared increasing nitrogen rates on the barley variety, Sirish. The trial was seeded using a hoe style Case IH seeder with 10" row spacings and Dutch low-draft 4" paired row openers. A base level nitrogen fertility rate of 65 lbs was determined using soil testing and yield goals in relation to farm and field history. Additional treatments of increasing nitrogen were determined by adding an additional 20 lbs of nitrogen ac^{-1} and 40 lbs of nitrogen ac^{-1} . Other macro nutrients were assessed and applied to mitigate potential deficiencies in all treatments. Treatments were replicated and randomized.

Treatments

Trial design goal:

To determine the yield and grain quality impacts of increasing nitrogen rates on barley.

Treatment 1: 65 lbs of nitrogen ac^{-1}

Treatment 2: 85 lbs of nitrogen ac^{-1}

Treatment 3: 105 lbs of nitrogen ac^{-1}

Results

In-crop assessment results

Plant stand counts were collected 21 days after seeding. Significant differences in plant stands were seen between treatments (Table 1). The highest nitrogen rate treatment saw a decrease in plant stand from 35.3 plants ft⁻² to 31.3 plants ft⁻² as compared to the lowest nitrogen rate treatment. It is possible that seed bed utilization as well as fertilizer toxicity impacted germination and establishment. The middle nitrogen rate (85 lbs N ac⁻¹) was not significantly different than the high or low nitrogen rate treatments.

Yield results

Treatments had a significant effect on yield. However, not in the anticipated direction. The yield of the highest nitrogen rate treatment (139.9 bu ac⁻¹) was significantly lower than the lowest nitrogen rate treatment (149.9 bu ac⁻¹). The middle nitrogen rate treatment (143.3 bu ac⁻¹) was not significantly different than the highest and lowest nitrogen rate treatments. The differences between treatments may have been caused by the increased lodging rates seen within the higher nitrogen rate treatments (Figure 1). However, this cannot be confirmed.

Table 1: Yield, and quality results comparing increasing nitrogen rates of 65lbs nitrogen ac⁻¹, 85 lbs nitrogen ac⁻¹, and 105 lbs nitrogen ac⁻¹ on the barley variety Sirish in Bentley, Alberta, 2022.

Applied Nitrogen Rate (lbs/ac of N)	Plant stand count at 21 days after seeding (plants/ft ²)	Yield at 13.5% seed moisture content (bu ac ⁻¹)	Protein (%)	Thins (%)	Greens	Test Weight (bu/ac)	Plump (%)
65 lbs N/ac	35.3 a	149.9 a	10.8 a	1.0 a	0.03 a	62.4 a	94.0 a
85 lbs N/ac	33.8 ab	143.3 ab	11.6 b	1.6 b	0.13 ab	62.8 a	90.7 b
105 lbs N/ac	31.3 b	139.9 b	12.0 b	1.6 b	0.23 b	62.8 a	91.0 b
<i>p</i> -value	0.0312	0.021	0.0016	0.0098	0.0029	0.0844	0.003
CV%	7.04%	4.19%	5.34%	27.54%	77.22%	0.60%	1.92%

Values with the same letter are not significantly different. Significant difference if $p \leq 0.05$.



Figure 1: Images of increasing nitrogen rate trial (65 lbs nitrogen ac^{-1} , 85 lbs nitrogen ac^{-1} , and 105 lbs nitrogen ac^{-1}) on Sirish barley comparing lodging visuals. Image taken August 6, 2022.

Grain quality results

Treatments had a significant effect on grain quality. Grain protein, thins, and plump were significantly lower in the lowest nitrogen rate treatment as compared to the two higher nitrogen rate treatments. Greens were lowest in the low nitrogen rate treatment.

Economics

Table 2: Economic comparison of increasing nitrogen rates (65 lbs N ac⁻¹, 85 lbs N ac⁻¹ and 105 lbs N ac⁻¹) row spacing on the barley variety Sirish in Bentley, Alberta, 2022.

Applied Nitrogen Rate (lbs ac ⁻¹ of N)	Nitrogen cost ac ⁻¹ (\$) *	Yield ac ⁻¹	Profit**	Profit difference compared to lowest nitrogen rate (\$ ac ⁻¹)
65 lbs N/ac	\$ 83.20	149.9	\$ 1,190.95	-
85 lbs N/ac	\$ 108.80	143.3	\$ 1,109.25	-\$ 81.70
105 lbs N/ac	\$ 134.40	139.9	\$ 1,054.75	-\$ 136.20

* Assuming \$1300/tonne urea (\$1.28/lb N)

** Assuming \$8.50/bu elevator price

Summary

Increased nitrogen rates provided lower yield and lower profitability per acre. The lower yields may have been impacted by higher occurrence of lodging in the higher nitrogen rate treatments. Nitrogen rates significantly impacted protein, thins, greens, and plump kernels. This trial demonstrates the value of understanding relationships and synergistic effects of multiple agronomic management practices. Increasing nitrogen may have less of a negative effect or may provide a positive effect on yield if additional agronomic inputs such as plant growth regulators are implemented as well. This would depend on the response of Sirish to plant growth regulators in conditions similar to this trial.