SASKATCHEWAN ON-FARM RESEARCH TRIALS 2024

Acknowledgments

SaskOilseeds, Sask Wheat, SaskBarley and Saskatchewan Pulse Growers

wish to acknowledge and thank the grower cooperators and agronomists around the province for their time and efforts in conducting this year's on farm trials. Without your participation, these trials and the valuable data gained from them would not be possible.

A special thanks to

Kayla Slind and **Jessica Enns**
from the Western Applied Research Corporation (WARC).

Kayla Slind was Project Lead for each program, consisting of the organization, management, statistical interpretation and reporting for each trial.

Jessica Enns conducted the statistical analysis of the data and reporting revisions.

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Overview

This book is a compilation of results from the trial work completed on-farm by farmers and agronomists in Saskatchewan who participated in the barley, canola, pulse and wheat trials this year. This resource is a way to enhance communication and knowledge sharing amongst farmers conducting on-farm trials. Our goal is that it will allow farmers to review the comprehensive data, analyze the trends and make informed decisions that directly impact their farms.

SaskBarley, SaskOilseeds, Saskatchewan Pulse Growers, and Sask Wheat are working together to generate results that address challenges including increasing yield, quality and profits for farm businesses. This collaborative approach will ensure trial work is diverse and representative of the various crops grown across the province.

Stats 101

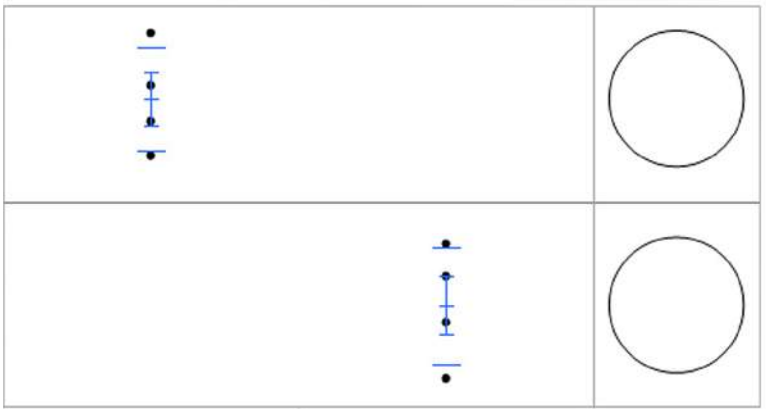
The p-value is a measure used to determine the statistical significance of results. It is a probability value derived from statistical analysis. A p-value less than 0.05 suggests that the results are statistically significant, while a p-value greater than 0.05 indicates that the results are not significant.

When the p-value is below 0.05, it means that we can be 95% confident that the yield difference observed is due to the treatment applied. On the other hand, if the p-value exceeds 0.05, it suggests that the yield difference is not significant, and we can be 95% confident that the treatment had no effect on yield.

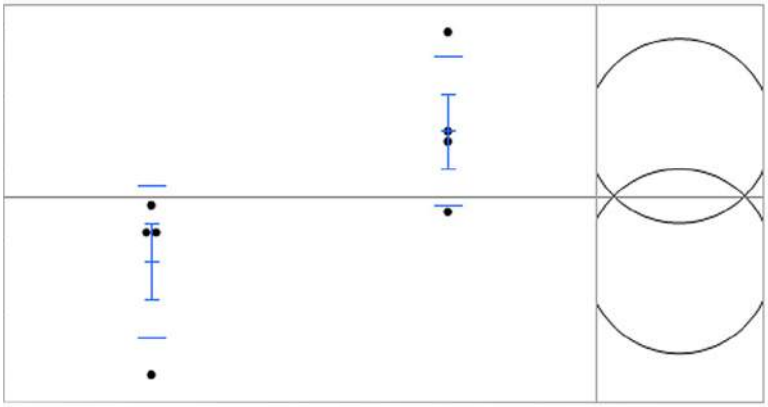
Yield variability is common across different strips within an on-farm trial due to natural differences in the field. Therefore, when analyzing the yield data from each trial strip at the end of the season, the key question is whether the observed yield differences are due to inherent field variability or if they are the result of the treatment or management practice being tested. If the results are statistically significant, we can confidently attribute the yield difference to the treatment or management practice. If the results are not significant, any yield variation is likely due to field variability rather than the effect of the treatment or management practice.

Letter labels are often used in the results of statistical tests, to indicate whether groups are significantly different from each other. If A and AB share the same letter, it means there is no significant difference between those two treatments. However, A and B have different letters, which means there's a statistically significant difference in their yields. Examples: If two groups share the same letter (e.g., A and AB), it suggests that their difference is not statistically significant—they are similar. If groups have different letters (e.g., A and B), it indicates that the difference between those groups is statistically significant.

Significant:
Data points are spread out and circles do not overlap.



Insignificant:
Data points and therefore, circles are very close or overlap. Stating that some data was the same between treatments, resulting in insignificance.



Economics:
For the purposes of this book, even when insignificant, economics were still run based on average yields. It is important to note though, that if yield was insignificant, the untreated check or low rate would be classified the most economical. Lastly, for the seeding rate trials, economics were conducted based on the average yields for each seeding rate, to fully encompass the input cost that producer would have fronted, regardless of plant densities that were achieved in the field.

Barley

the BarleyBin Field Lab

by SaskBarley DEVELOPMENT COMMISSION

Overview

SaskBarley launched the BarleyBin Field Lab in 2023 to provide an opportunity to participate in high-quality on-farm research. SaskBarley views the BarleyBin Field Lab as an integration of our research and communication core functions.

SaskBarley's goals for the BarleyBin Field Lab are to generate farm-scale research results that complement small plot trials, gather farmer input on research questions facing Saskatchewan barley farmers, and encourage best practices for on-farm trials. Results from field scale trials will be distributed through our media platforms to share with other farmers, agronomists and researchers.

In 2023, SaskBarley's BarleyBin Field Lab consisted of one protocol with two sites, in 2024 it has expanded to three protocols with seven sites. SaskBarley will continue the BarleyBin Field Lab beyond 2025, collaborating with producers and agronomists to adapt research for use on the farm.

Protocol: Seeding Rates

Protocol: Nitrogen Fertility Rates

Protocol: Plant Growth Regulator

the BarleyBin Field Lab
Brought to you by SaskBarley

Barley Seeding Rate Trial

The recommended seeding rate for malt barley is 300 live seeds/m², which corresponds to a plant density in the range of approximately 20-22 plants/ft². Researchers found that 300 live seeds/m² optimized agronomics including yield and lodging, as well as malt characteristics including protein and plump kernels.

Objective

To optimize barley seeding rates based on target plant density to balance seed costs, yield, crop competitiveness and stand management.

Treatments

Seeding rates varied by site and year, but generally targeted three plant populations:

1)	Low Rate: Target 21 plants/ft²
2)	Standard Fixed Rate: Target 25 plants/ft²
3)	High Rate: Target 29 plants/ft²
4)	Standard Variable Rate (VR): Target 21-24 plants/ft² based on field position (Optional)

Terminology

Treatments: actual seeding rates applied by the producer at time of seeding

Density Groups: grouped according to plant counts conducted in the field

For each treatment, seeding rates were adjusted to account for seed weight (TKW) and germination, as well as expected mortality. The treatments were replicated a minimum of four times, for a total of a minimum 12 plots. Apart from seeding rates, all plots were managed the same agronomically.

Data collected

- Seed test
- Spring soil test
- In-season plant density, at the 2-4 leaf stage, by landscape position within plots, if applicable
- Height and lodging at the soft dough to late dough stage
- Field history and management practices
- Yield by plots
- General in-season observations such as weed competition, disease susceptibility, standability, and maturity
- Weather data

The following footnotes will be referred to for the combined and individual site reports for this protocol:

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data.

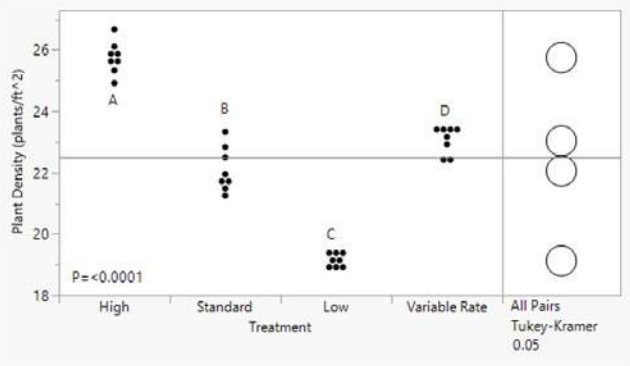
[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate and location considered random and seeding rate and density groupings were considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$. Locations were combined when treatment by location interaction was not significant, indicating that the trends were relatively the same among sites. A linear regression was also used to assess and provide visual representation of the effects of plant density on the response variables.

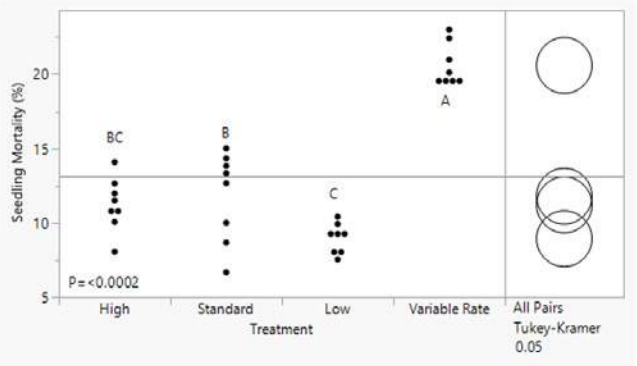
[3]SE was not recorded as the sample sizes are unequal and therefore standard error was different for each sample size.

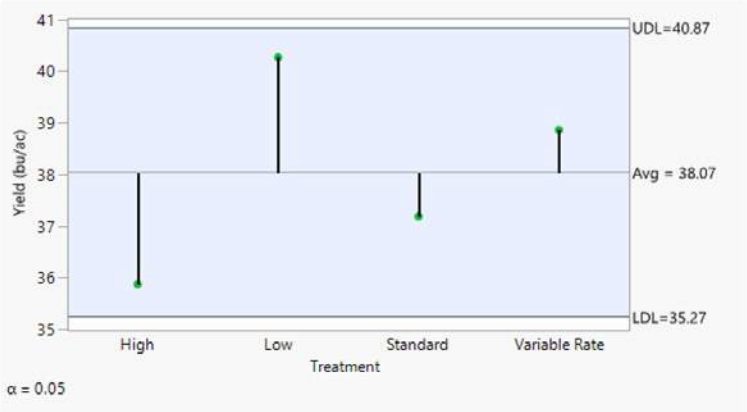
2023 Combined Results (2 sites)

Data from 2023 was combined to assess the overall impact of seeding rates on barley. As seeding rates increased, both plant density ($p<0.0001$) and seedling mortality ($p<0.0002$) also increased. The variable seeding rate resulted in the highest seedling mortality, but it still produced the second-highest plant density and yield among the treatments. While not statistically significant, the low seeding rate yielded the best results, making it the most cost-effective option (data not shown).

Treatment	Plant Density (plants/ft²)	Seedling Mortality (%)	Yield (bu/ac)	Height (cm)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)
Low – 21 plants/ft²	19.1 D	8.9 C	40.3	75.3	59.1 A	13.1 B	208.5 A	2.8
Standard – 25 plants/ft²	22.1 C	11.8 B	37.2	75.2	56.7 B	14.3 A	194.5 AB	4.1
High – 29 plants/ft²	25.8 A	11.2 BC	35.9	73.5	57.1 AB	14.0 AB	190.7 B	3.9
Variable Rate – 29 plants/ft²	23.0 B	20.6 A	38.9	75.4	58.1 AB	13.6 AB	196.9 AB	3.5
SE[1]	0.177	0.67	1.7	1.36	0.8	0.343	5.13	1.7
p-value[2]	**<0.0001**	**<0.0002**	0.0876	0.4498	**0.0384**	**0.0194**	**0.0117**	0.0952







2024 Combined Results (5 sites)

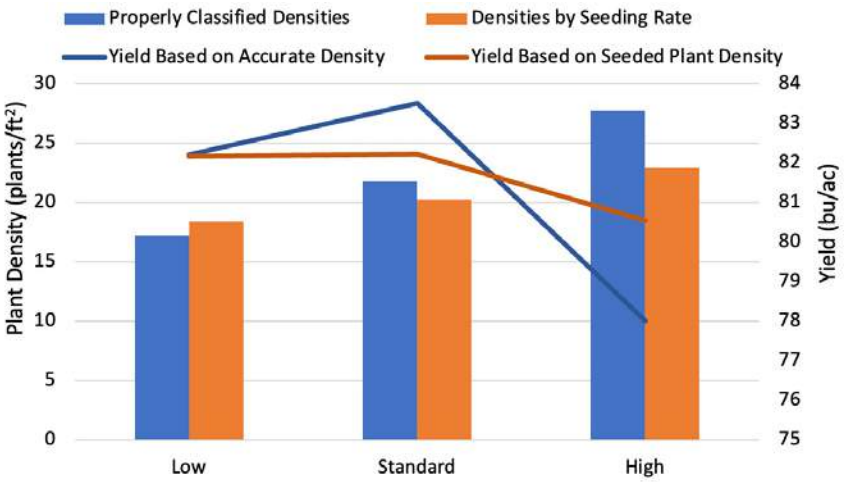
Data from all 2024 sites were pooled to evaluate the effects of seeding rates on plant density, seedling mortality, yield, and grain quality. There are two options for reviewing the data. 1) seeding rates or 2) density groups, meaning that regardless of the seeding rate, data was grouped together based off plants/ft^2 counted in the field. When simply looking at seeding rates, a significant trend was seen between seeding rates and plant density (p=0.001), and seeding rates and seedling mortality (p=0.017). Although not statistically significant, the "low" and "standard" seeding rates produced the highest yields, suggesting that the "low" seeding rate may be the most cost-effective option (data not shown). Test weight was the only grain quality parameter to show a significant difference, with the "standard" seeding rate yielding the highest test weight, followed by "low" and "high," indicating that lower seeding rates tended to produce heavier seeds.

Treatment	Plant Density (plants/ft^2)	Seedling Mortality (%)	Yield (bu/ac)	Heights (cm)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Low – 21 plants/ft^2	18.4 B	15.2 B	82.2	94.5	42.6	59.8 AB	12.7	233.4	4.2	99.6
Standard – 25 plants/ft^2	20.3 B	19.7 AB	82.2	92.4	43.5	60.5 A	12.5	235.2	4.1	99.6
High – 29 plants/ft^2	22.9 A	21.9 A	80.5	91.9	41.6	58.7 B	12.6	231.2	4.7	99.6
SE[1]	0.77	2.42	1.29	1.8	0.83	0.651	0.143	2.32	0.581	0.148
p-value[2]	**0.001**	**0.017**	0.5398	0.3308	0.0797	**0.0312**	0.1784	0.2366	0.5477	1

In comparison, when looking at the data based on density groups, besides plant density (p<0.0001), no significant trends were found. While not significant, yield trends indicate that when proper plant stands were achieved that "standard" would have the greatest return (not shown).

Density Group	Plant Density (plants/ft^2)	Yield (bu/ac)	Heights (cm)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Low	17.2 C	82.2	92	42.8	59.7	12.6	234.3	4.2	99.5
Standard	21.8 B	83.5	93	42.5	59.8	12.6	232.8	4.29	99.6
High	27.7 A	78	none	41.7	58.7	12.7	230.6	4.79	99.8
SE[1]	1.1	3.3	1.8	1.7	1.3	0.27	3.9	1.2	0.26
p-value[2]	**<0.0001**	0.4034	0.9275	0.8045	0.6195	0.8108	0.6998	0.8828	0.5256

The graph provided indicates the importance of calibrating your seeder and calculating the seeding rate correctly in order to hit the target seeding rate. The plant density and yield shown in orange indicate that the "low" seeding rate was the highest yielding. However, when the true target densities are met, the yield increased by 1 bu/ac and there was a $2.00 profit compared to the "low" seeding rate.



2023 and 2024 Combined

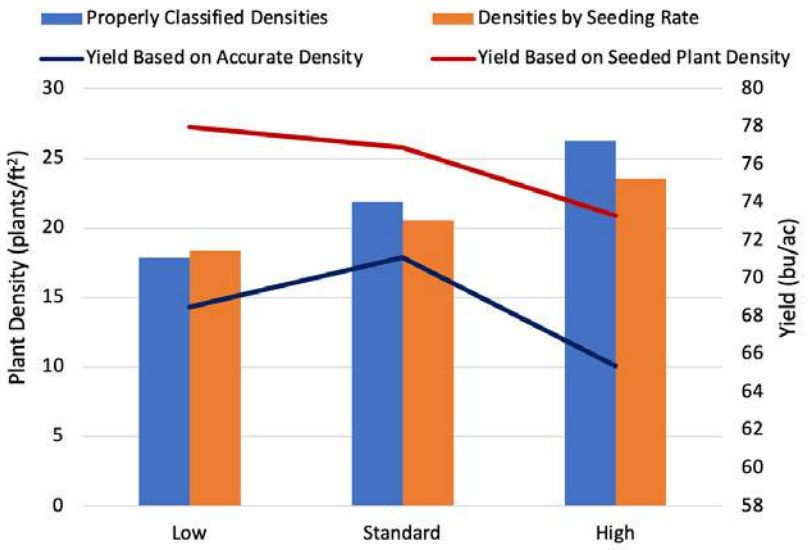
When combining seven site years of data from 2023 and 2024, there are two options when reviewing the data. 1) seeding rates or 2) density groups, meaning that regardless of the seeding rate, data was grouped together based off plants/ft^2 counted in the field. When looking simply at seeding rates, significant trends on plant density ($p<0.0001$), seedling mortality ($p=0.0285$) and plumps ($p=0.0409$) were seen. As seeding rates increased, both plant density and seedling mortality rose. The low seeding rate appears to be the most economical treatment (not shown), as it resulted in insignificantly higher yields. Seedling mortality was also analyzed according to row spacing, resulting in no significance effects (not shown).

Treatment	Plant Density (plants/ft^2)	Seedling Mortality (%)	Yield (bu/ac)	Test Weight (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)
Trt 1 – Low – 21 plants/ft^2	18.3 C	14.6 B	78.0	59.8	12.9	228.3 A	3.3
Trt 2 – Standard – 25 plants/ft^2	20.5 B	18.4 AB	76.9	59.5	13.1	225.1 AB	5.1
Trt 3 – High – 29 plants/ft^2	23.5 A	19.7 A	73.3	58.5	13.0	221.2 B	4.0
SE[1]	2.27	7.18	2.7	0.666	0.192	2.87	1.169
p-value[2]	**<0.0001**	**0.0285**	0.068	0.106	0.6254	**0.0409**	0.3217

In comparison, density groups had a significant effect on plant density ($p<0.0001$) and plumps ($p=0.0273$). While not significant, yield shows that when proper plant stands were achieved that "standard" would have the greatest return with an average yield increase of 2.6 bu/ac, resulting in a $9/ac gain (not shown).

Density Group[3]	Plant Density (plants/ft^2)	Heights (cm)	Yield (bu/ac)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)
Low	17.9 C	84.3	68.5	59.6	12.8	228.6	3.4
Standard	21.9 B	83.8	71.1	59.2	13.2	223.6	4.1
High	26.2 A	81.3	65.4	58.5	13.2	217.2	4.1
p-value[2]	**<0.0001**	0.2924	0.3715	0.5723	0.1951	**0.0273**	0.3515

The graph, shown on the right, shows that when a producer was able to hit their target densities, that the standard seeding rate is the best yielding. Therefore, conducting plant counts is essential for determining plant density, which in turn allows for the assessment of seedling mortality. This information enables producers to make more informed agronomic decisions for their farms. If actual plant densities differ from expectations, producers can take several steps to address the issue, such as checking thousand kernel weight (TKW), germination rates, and drill calibrations.



the BarleyBin Field Lab
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Barley Seeding Rate
(Luseland)

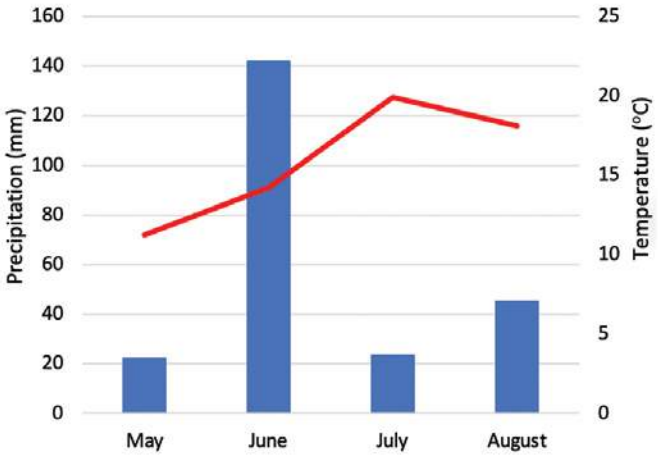
Objective: Optimizing barley seeding rates based on target plant density to balance seed costs, yield, crop competitiveness and stand management.

Trt No.	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Low	21	101
2	Standard	25	117
3	High	29	138

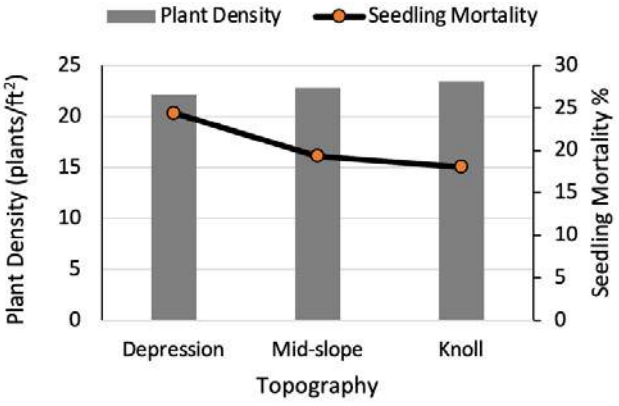
General Trial Information:

Variety	AAC Synergy (Malt)
Thousand Kernel Weight	49.1 g
Germination	99%
Seed Treatment	N/A
Previous Crop	Canola
Soil Organic Matter	3.1 %
Residual Nitrate-N (0-6")	19 lb/ac
Soil Texture	Medium
Seeding Date	May 19
Seeding Equipment	X35
Seeding Depth	1½"
Seeding Speed	3.2 - 5.7 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	55-28-0-0
Crop Protection	May 17: Glyphosate June 13: Axial Extreme + Buctril M July 17: Tilmor

Weather obtained from local station from May 19th

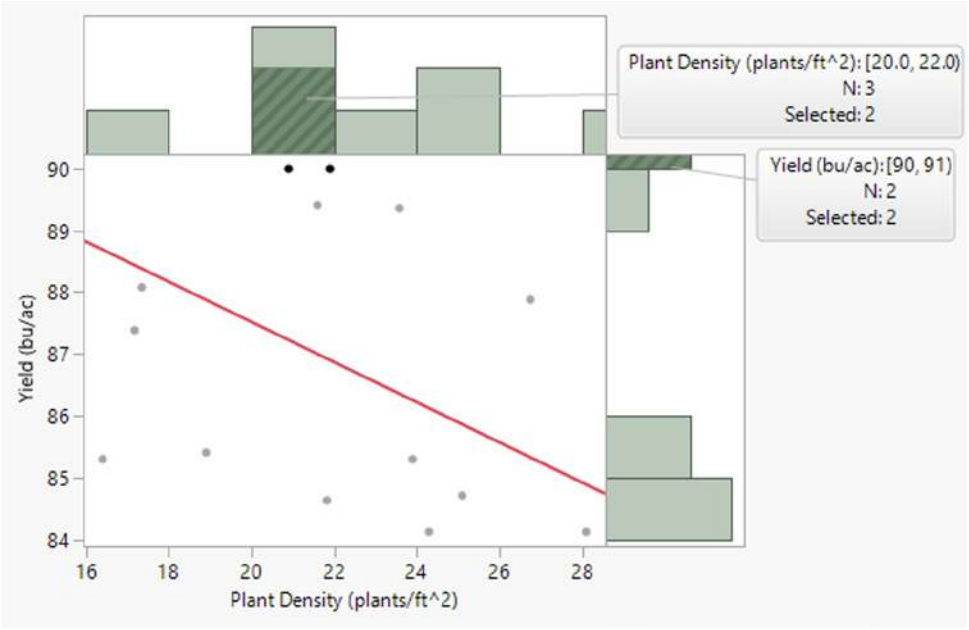


Landscape	Plant Density (plants/ft²)	Seedling Mortality (%)
Knoll	23.4	18.0
Mid-Slope	22.8	19.3
Depression	22.1	24.4
SE[1]	2.08	12.3
p-value[2]	0.8303	0.862



As seeding density increased, plant densities also rose across different landscape positions. Depressions experienced a higher percentage of seedling mortality compared to knolls or mid-slopes, potentially due to precipitation levels.

Treatment	Plant Density (plants/ft²)	Seedling Mortality (%)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Trt 1 – Low – 21 plants/ft²	20.7 B	6.9	86.9 AB	36.7 B	58.5 B	12.6	215.0	8.2	99
Trt 2 – Standard – 25 plants/ft²	20.9 B	13.5	90.4 A	41.5 A	62.1 A	11.4	230.7	4.8	100
Trt 3 – High – 29 plants/ft²	26.1 A	9.4	84.3 B	39.1 AB	59.7 AB	11.9	217.7	6.8	100
SE[1]	1.42	5.7	1.41	1.37	0.833	0.0856	7.68	1.17	0.258
p-value[2]	**0.0207**	0.5689	**0.0144**	**0.0381**	**0.0204**	0.415	0.1726	0.0745	0.3989



Treatment	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – Low – 21 plants/ft²	101	23.72	6.73	30.45	86.9	6.45	560.51	530.06	0.00
Trt 2 – Standard – 25 plants/ft²	117	27.48	7.79	35.27	90.4	6.45	583.08	547.81	17.75
Trt 3 – High – 29 plants/ft²	138	32.41	9.19	41.60	84.3	6.45	543.74	502.13	-27.92

[x]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed price $29.12/ac)
[y]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed treatment/inoculants $8.26/ac)
[z]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (target price $6.45/bu)

As seeding rates increased, plant densities also rose (p=0.0207). A significant difference in yield was observed across seeding rates (p=0.0144), with the standard seeding rate yielding 6 bu/ac more than the high rate. However, the expected relationship between target seeding rates and actual plant densities was not consistent; only one plot each at the low and high seeding rates matched the anticipated plant density counts. Therefore, it's crucial to consider both seeding rates and plant densities to fully understand the results. Overall, the standard seeding rate produced the highest yields and was the most economical choice.

To review footnote references please refer to overall trial summary on page 10.

The trial was conducted with the agronomic support of

MNP AgINTELLECT

the BarleyBin Field Lab
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Barley Seeding Rate
(Major)

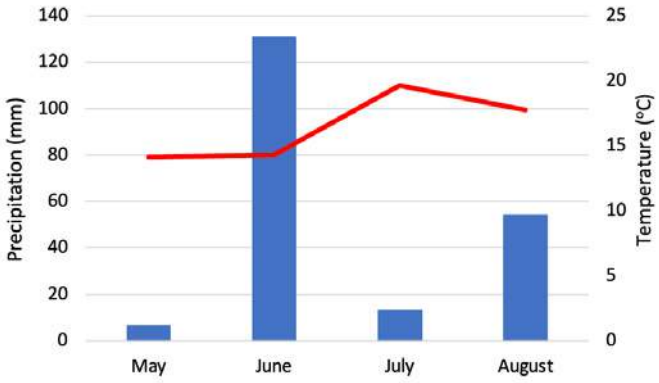
Objective: Optimizing barley seeding rates based on target plant density to balance seed costs, yield, crop competitiveness and stand management.

Trt No.	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Low	21	102
2	Standard	25	118
3	High	29	139

General Trial Information:

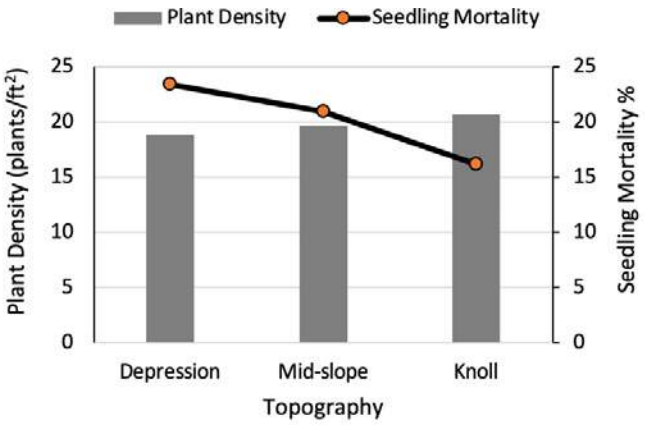
Variety	AAC Synergy (Malt)
Thousand Kernel Weight	49.7 g
Germination	99%
Seed Treatment	Vitaflo
Previous Crop	Durum
Soil Organic Matter	4.6%
Residual Nitrate-N (0-6")	20 lb/ac
Soil Texture	Medium
Seeding Date	June 2
Seeding Equipment	Seed Hawk 70ft
Seeding Depth	1½"
Seeding Speed	3.5-4.7 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	28-41-23-0
Crop Protection	May 21: Glyphosate + 2,4D Ester 700 + Engenia June 19: Axial Extreme + PP2525

Weather obtained from local station from May 26th

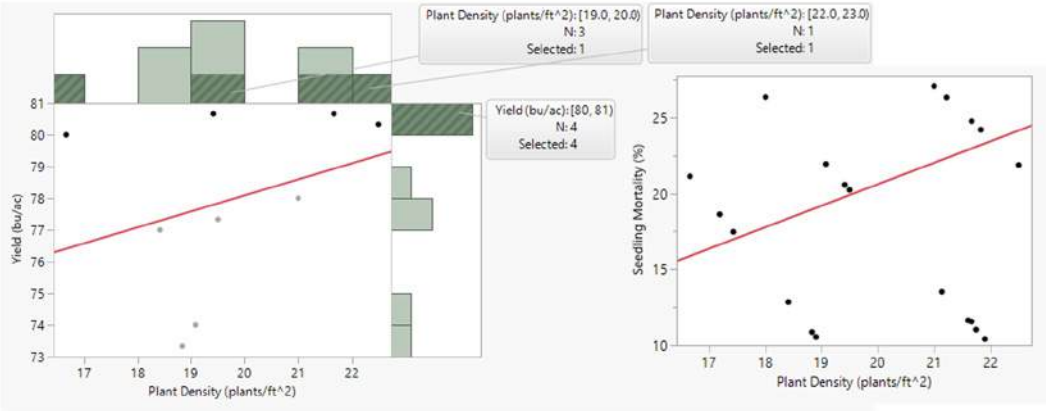


Landscape	Plant Density (plants/ft²)	Seedling Mortality (%)
Knoll	20.6 A	16.2
Mid-Slope	19.6 A	20.9
Depression	18.8 A	23.4
SE[1]	1.1	3.7
p-value[2]	0.2774	0.1686

No significant differences were observed between landscape positions. There was a slight increase in plant densities and seedling mortality from depressions to mid-slopes to knolls. This may be attributed to the heavy rainfall in June, which caused flooding in the depression areas.



Treatment	Plant Density (plants/ft²)	Seedling Mortality (%)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Trt 1 – Low – 21 plants/ft²	18.0 B	14.9 B	76.8	42.7	54.8	11.9	233.8	4.3	100.0
Trt 2 – Standard – 24 plants/ft²	19.3 B	20.9 AB	77.3	46.1	57.0	11.9	240.0	3.3	99.6
Trt 3 – High – 29 plants/ft²	21.7 A	24.6 B	79.7	44.6	56.3	12.0	236.2	4.0	99.6
SE[1]	0.6557	2.87	2.32	2.12	1.29	0.197	5.58	1.2	0.38
p-value[2]	**0.0035**	**0.041**	0.4666	0.3306	0.2884	0.8389	0.5591	0.8379	0.6297



Treatment	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – Low – 21 plants/ft²	102	23.95	6.79	30.75	76.8	6.45	495.36	464.61	0.00
Trt 2 – Standard – 24 plants/ft²	118	27.71	7.86	35.57	77.3	6.45	498.59	463.01	-1.60
Trt 3 – High – 29 plants/ft²	139	32.64	9.26	41.90	79.7	6.45	514.07	472.16	7.55

[x]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed price $29.12/ac)
[y]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed treatment/inoculants $8.26/ac)
[z]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (target price $6.45/bu)

Plant density (p=0.0035) and seedling mortality (p=0.041) increased with higher seeding rates. However, high mortality rates led to actual plant densities being lower than the targeted seeding rates. As a result, high seeding rates did not correspond to high plant densities, complicating the ability to accurately assess the effects of seeding rates. While yields tended to rise with increasing seeding rates, this increase was not significant (p=0.4666). Yields of 80-81 bu/ac were most consistent when plant densities ranged from 19 to 23 plants/ft². Although the high seeding rate showed potential for higher yields, it is not considered reliable or economical due to the associated mortality.

To review footnote references please refer to overall trial summary on page 10.

The trial was conducted with the agronomic support of

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Brought to you by SaskBarley

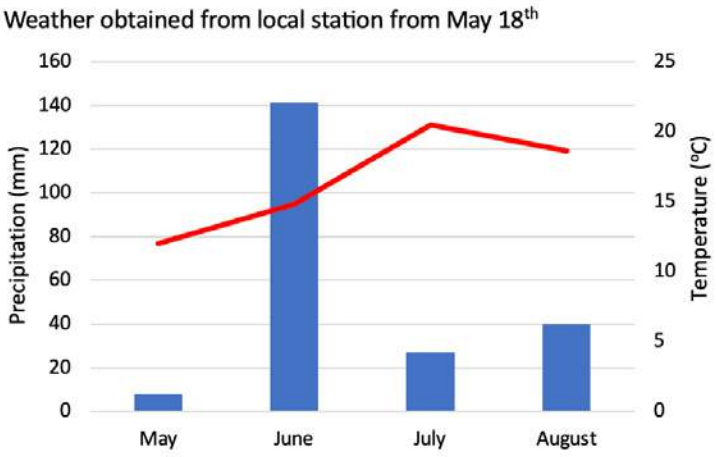
Barley Seeding Rate
(Rosetown)

Objective: Optimizing barley seeding rates based on target plant density to balance seed costs, yield, crop competitiveness and stand management.

Trt No.	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Low	21	86
2	Standard	25	100
3	High	29	118

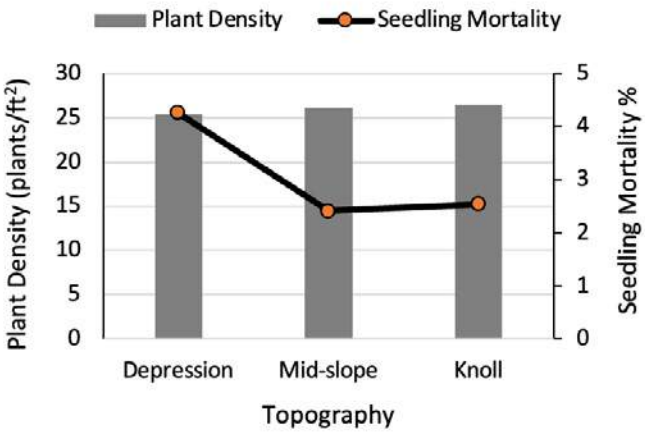
General Trial Information:

Variety	CDC Fraser (Malt)
Thousand Kernel Weight	41.6 g
Germination	98%
Seed Treatment	Raxil Pro Shield
Previous Crop	Canary Seed
Soil Organic Matter	4.5%
Residual Nitrate-N (0-6")	9 lb/ac
Seeding Date	May 30
Seeding Equipment	Seedhawk
Seeding Depth	1.5"
Seeding Speed	3.5 - 4.7 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	40-34-1-0
Crop Protection	May 29: Glyphosate + AIM June 21: Pinoxaden + Ondeck + MCPA



Landscape	Plant Density (plants/ft²)	Seedling Mortality (%)
Knoll	26.5 A	2.5
Mid-Slope	26.1 A	2.4
Depression	25.4 A	4.3
SE[1]	2.22	2.75
p-value[2]	0.8875	0.7578

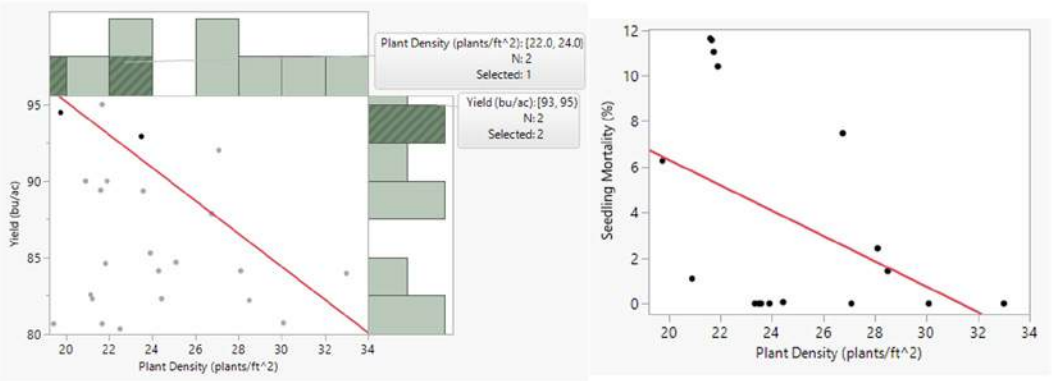
There were no significant interactions observed between plant density and seedling mortality, irrespective of landscape position.



Plant Density (plants/ft²)	Yield (bu/ac)
SE[1]	6.67
p-value[2]	**0.0038**

When examining plant density and yield, yields decreased with higher plant densities, regardless of seeding rates.

Treatment	Plant Density (plants/ft²)	Seedling Mortality (%)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Trt 1 – Low – 21 plants/ft²	22.3 A	2.1	92.3	45.3	64.1	12.5	243.9	1.5	99.6
Trt 2 – Standard – 25 plants/ft²	26.3 A	3.0	89.2	45.1	64.6	12.4	242.1	1.7	100
Trt 3 – High – 29 plants/ft²	29.4 A	3.9	84.7	43.3	61.0	12.8	236.8	2.6	100
SE[1]	2.72	4.03	4	2.16	2.3	0.546	4.9	0.648	0.192
p-value[2]	0.1006	0.9101	0.2417	0.6392	0.3114	0.7974	0.382	0.5029	0.4219



Treatment	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – Low – 21 plants/ft²	86	20.20	5.73	25.92	92.3	6.45	595.34	569.41	0.00
Trt 2 – Standard – 25 plants/ft²	100	23.48	6.66	30.15	89.2	6.45	575.34	545.19	-24.22
Trt 3 – High – 29 plants/ft²	118	27.71	7.86	35.57	84.7	6.45	546.32	510.74	-58.67

[x]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed price $29.12/ac)
[y]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed treatment/inoculants $8.26/ac)
[z]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (target price $6.45/bu)

No significant trends were observed with varying seeding rates. Overall, the data indicates that as plant densities increased, yields decreased, and seedling mortality (%) rose with higher seeding rates. However, not all plots achieved high plant densities, making it challenging to obtain accurate results. The most consistent yield of 93-95 bu/ac was recorded at a plant density of 22-24 plants/ft². Due to the higher yield and lower costs of seed and seed treatments, the low seeding rate of 21 seeds/ft² yielded the highest return.

To review footnote references please refer to overall trial summary on page 10.

The trial was conducted with the agronomic support of

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Barley Seeding Rate
(Wilkie 1)

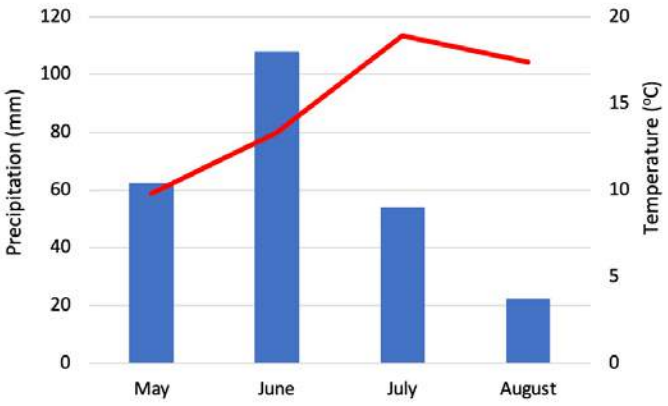
Objective: Optimizing barley seeding rates based on target plant density to balance seed costs, yield, crop competitiveness and stand management.

Trt No.	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Low	20	100
2	Standard	25	125
3	High	30	150

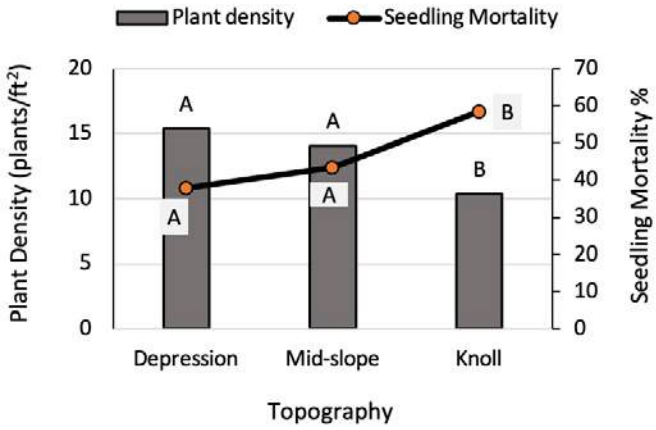
General Trial Information:

Variety	CDC Copeland (Malt)
Thousand Kernel Weight	47.6 g
Germination	92%
Seed Treatment	Vitaflow 280
Previous Crop	Canola
Soil Organic Matter	5.7 %
Residual Nitrate-N (0-6")	12 lb/ac
Soil Texture	Medium
Seeding Date	May 13
Seeding Equipment	50ft Morris. 12" with 3" paired row
Seeding Depth	1 ½"
Seeding Speed	4.5 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	68 – 34 – 0 – 10
Crop Protection	May 12: Glyphosate + Pre-Pass Flex, June 14: Axial Extreme + MCPA Ester, August 24: Swathed

Temperature from Environment Canada (Scott CDA)



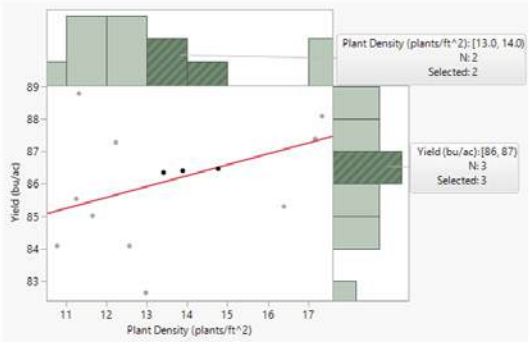
Landscape	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	15.4 A	37.7 A
Mid-slope	14.1 A	43.3 A
Knoll	10.4 B	58.4 B
SE[1]	1.64	4.3
p-value[2]	**0.0002**	**0.0001**

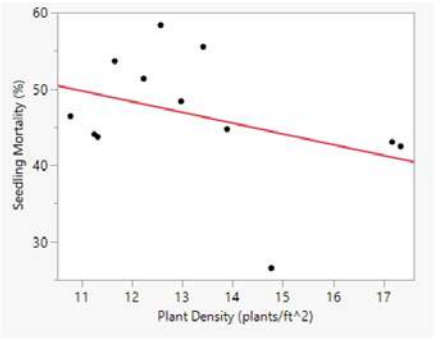


The plant densities achieved across different landscapes were significant (p=0.0002), likely due to the high topographical variability in the field. This variability also contributed to significant seedling mortality (p=0.0001) based on position. Depressions exhibited the highest plant density and lowest mortality, which can be attributed to early spring precipitation. In contrast, knolls had the lowest plant density and highest mortality, likely due to runoff associated with the elevated topography, while mid-slopes displayed intermediate densities.

Treatment	Plant Density (plants/ft²)	Seedling Mortality (%)	Establishment (%)	Yield (bu/ac)	Height (cm)	Lodging (1=erect, 9=flat)
Trt 1 – Low – 20 plants/ft²	12.0	40.2	59.8	86.2	93.2	1
Trt 2 – Standard – 25 plants/ft²	12.7	49.5	50.5	85.3	90.7	1
Trt 3 – High – 30 plants/ft²	15.1	49.8	50.2	86.5	91.0	1
SE[1]	1.26	5.26	5.26	1.28	2.32	0
p-value[2]	0.0879	0.1760	0.176	0.6622	0.5148	0.1

Treatment	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Trt 1 – Low – 20 plants/ft²	43.2	58.9	12.4	233.8	4.8	99.5
Trt 2 – Standard – 25 plants/ft²	42.5	57.5	12.4	231.5	6.0	99.8
Trt 3 – High – 30 plants/ft²	41.1	57.9	12.2	232.1	4.9	99.5
SE[1]	1.045	0.896	0.147	2.013	0.826	0.513
p-value[2]	0.1818	0.3096	0.22	0.5317	0.3275	0.8563





Treatment	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – Low – 20 plants/ft²	100	23.48	6.66	30.15	86.2	6.45	555.99	525.84	0.00
Trt 2 – Standard – 25 plants/ft²	125	29.35	8.33	37.68	85.3	6.45	550.19	512.50	-13.34
Trt 3 – High – 30 plants/ft²	150	35.23	9.99	45.22	86.5	6.45	557.93	512.71	-13.14

[x]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed price $29.12/ac)
[y]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed treatment/inoculants $8.26/ac)
[z]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (target price $6.45/bu)

Overall, no significant effects were observed between seeding rates. Notably, across all treatments—including the high seeding rate of 30 seeds/ft²—only 15.1 plants/ft² or fewer were achieved, making it challenging to draw definitive conclusions. Consequently, all data should be categorized under the low seeding rate. Interestingly, the trends between landscape positions and seeding density was significant, with the field's highly variable topography resulting in higher plant densities in depressions and lower densities on knolls. While yields increased with plant density, it raises the question of whether yields would have continued to rise with higher plant densities. Given the higher costs associated with seed and seed treatments yielding similar results, the low seeding rate provided the greatest return.

To review footnote references please refer to overall trial summary on page 10.

The trial was conducted with the agronomic support of

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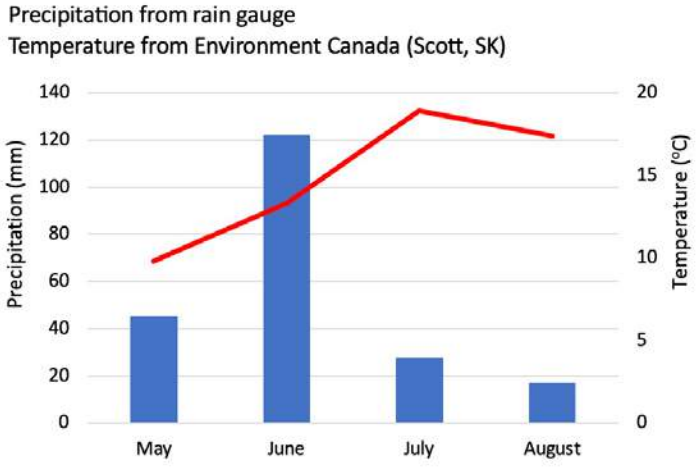
Barley Seeding Rate
(Wilkie 2)

Objective: Optimizing barley seeding rates based on target plant density to balance seed costs, yield, crop competitiveness and stand management.

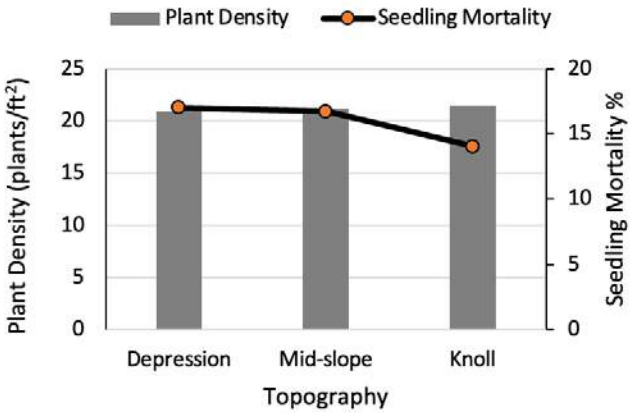
Trt No.	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Low	21	102
2	Standard	24	118
3	High	29	139

General Trial Information:

Variety	Claymore (Feed)
Thousand Kernel Weight	49.7 g
Germination	99%
Seed Treatment	Lixar Pro
Previous Crop	Lentil
Soil Organic Matter	5.2 %
Residual Nitrate-N (0-6")	27 lb/ac
Soil Texture	Medium
Seeding Date	May 12
Seeding Depth	¾ - 1"
Seeding Speed	4.5 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	74-30-0-12
Crop Protection	May 11: Glyphosate + Pilot June 11: Foxxy RCK + Hellcat July 10: Tornado Pro

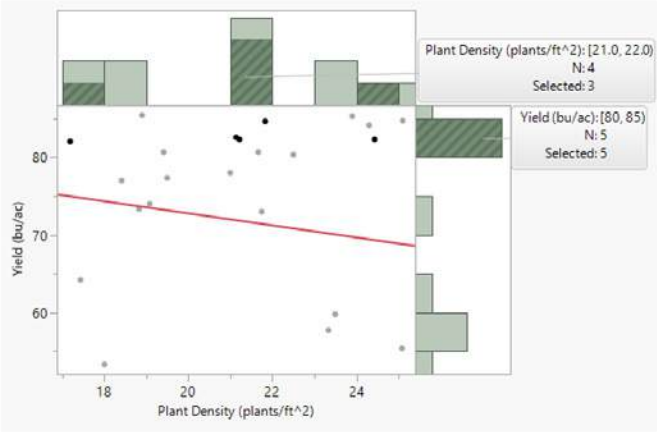


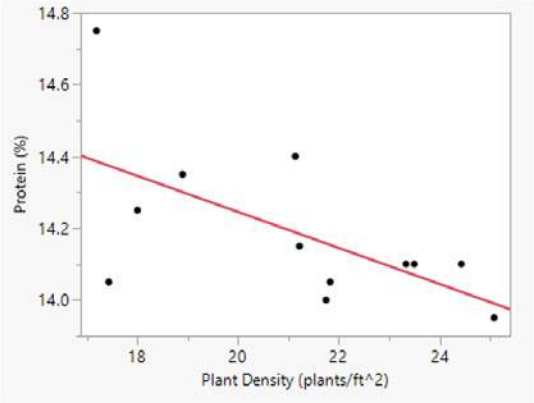
Landscape	Plant Density (plants/ft²)	Seedling Mortality (%)
Knoll	21.4	14.0
Mid-Slope	21.2	16.7
Depression	20.9	17.0
SE[1]	1.53	4.79
p-value[2]	0.9383	0.7872



The site featured variable topography, characterized by a continuous downward slope. This may explain why plant density and seedling mortality were similar across landscape positions, resulting in no significant differences.

Treatment	Plant Density (plants/ft²)	Seedling Mortality (%)	Yield (bu/ac)	Height (cm)	Lodging (1=erect, 9=flat)	TKW (g/1000)	TW (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Trt 1 – Low – 21 plants/ft²	19.2	11.7	72.3	95.7	2	44.2 A	62.1 B	14.3	239.1	2.6	99
Trt 2 – Standard – 24 plants/ft²	21.3	12.7	72.8	94.1	2	43.0 AB	61.8 AB	14.1	233.9	4.1	99
Trt 3 – High – 29 plants/ft²	22.9	20.5	70.5	92.7	2	40.3 B	58.9 B	14.1	233.0	5.0	99
SE[1]	1.74	3.13	4.5	1.49	0	1.29	1.73	0.121	3.29	1.09	0
p-value[2]	0.1679	0.3396	0.8699	0.2006	0.1	**0.0442**	**0.0312**	0.1801	0.2026	0.1428	0.1





Treatment	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – Low – 20 plants/ft²	102	23.95	6.79	30.75	72.3	5.30	383.19	352.44	0.00
Trt 2 – Standard – 24 plants/ft²	118	27.71	7.86	35.57	72.8	5.30	385.84	350.27	-2.17
Trt 3 – High – 29 plants/ft²	139	32.64	9.26	41.90	70.5	5.30	373.65	331.75	-20.69

[x]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed price $29.12/ac)
[y]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 22 plants per square foot, 45 g TKW, 85% germ; seed treatment/inoculants $8.26/ac)
[z]2024 Malt Barley, 2024 Crop Planning Guide, Government of Saskatchewan (target price $5.30/bu)

Overall, seeding rates significantly effected thousand kernel weight (p=0.0442) and test weight (p=0.0312). Given the costs involved, the low rate of 21 seeds/ft² proved to be the most economical option. It's important to note that the high seeding rates did not result in correspondingly high plant densities, which should be considered when evaluating the impact of seeding rates on yield. The most consistent yields of 80-85 bu/ac were achieved with 21-22 plants/ft², while increases in seeding rates were associated with decreases in both thousand kernel weight and test weight.

To review footnote references please refer to overall trial summary on page 10.

Thank you to Nutrien for the use of their weigh wagon

The trial was conducted with the agronomic support of Western Applied Research Corporation WARC Research from our farm to yours

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Brought to you by SaskBarley

Barley Fertility Rate Trial

Increasing applied fertilizer rates can increase barley yield and quality. Prairie soils are often deficient in nitrogen (N) and phosphorus (P). Some soils are also deficient in potassium (K), sulphur (S), and possibly one or more micronutrients. However, depending on the growing environment, genetics, and other management practices within the production system, increasing fertilizer rates may result in differing economic returns for each farm. Higher nitrogen fertilizer rates may also lead to increased crop lodging or decreased malting quality.

Objective

To quantify the agronomic and economic impact of increasing fertility rates on your farm under typical management.

Treatments

1)	Normal Rate: Soil-test recommended rate based on yield goal
2)	Reduced Rate: 10% to 25% lower than normal rate
3)	Enhanced Rate: 10% to 25% higher than normal rate
4)	Variable Rate: Soil-test recommended rate based on yield goal for separate management zones (Optional)

The treatments were replicated three times, and randomized within the field. Apart from fertility, all treatments were managed the same agronomically. All fertilizer apart from the nutrients being manipulated in the treatments were consistent across all treatments and were applied at a rate that was not limiting to yield potential. All fertilizer was applied by the same methods for each treatment (i.e. same equipment, source, timing, and placement). To evaluate the influence of variable topography on plant populations, sections of plots were further identified by landscape position (knoll, mid-slope, and depression), and data was collected separately within these subplots.

Data collected

- Seed test
- Spring soil test
- In-season plant density, at the 2-4 leaf stage, by landscape position within plots, if applicable
- Height and lodging at the soft dough to late dough stage
- Field history and management practices
- Yield by plots
- General in-season observations such as weed competition, disease susceptibility, standability, and maturity
- Weather data

The following footnotes will be referred to for the individual site reports for this protocol:

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data.

[2]Linear regression was used to assess the effects of plant density on the relationship between seeding rate and the response variables. A linear mixed effects model was used with treatments as a fixed effect and replication and location as a random effect. Analysis of variance (ANOVA) was used to indicate significance at $p<0.05$, however, p-values of 0.05-0.1 may also be acknowledged.
$p<0.05$ = likely that the difference was due to the treatment
$p<0.1$ = possible that the difference was due to the treatment
$p>0.1$ = not likely that the difference was due to the treatment

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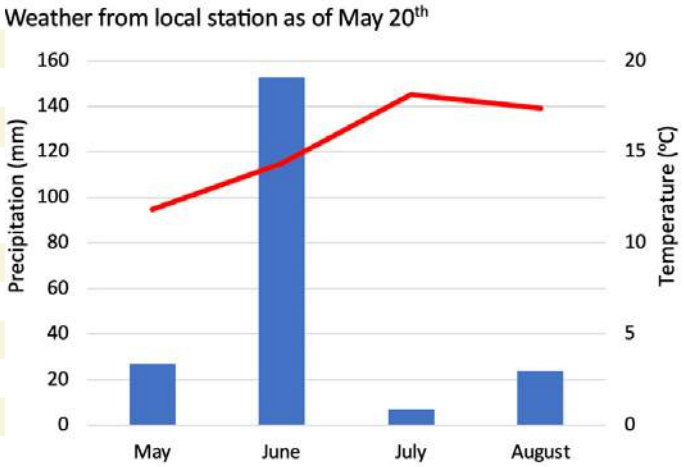
Barley Nitrogen Rate
(Plenty)

Objective: To quantify the agronomic and economic impact of increasing fertility Nitrogen rates on your farm under typical management.

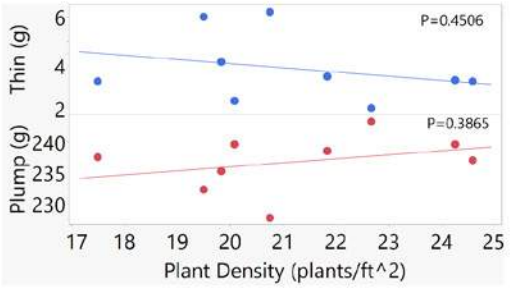
Trt No.	Nitrogen Rate	Actual N fertilizer (lb/ac)
1	Normal Rate: soil test recommended	48
2	Enhanced Rate: 10%-25% higher than normal rate	54
3	Reduced Rate: 10%-25% lower than normal rate	42

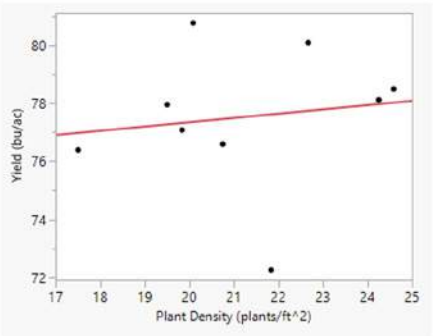
General Trial Information:

Variety	AAC Connect
Thousand Kernel Weight	43.7 g
Germination	99%
Seed Treatment	Vibrance Quattro
Previous Crop	Flax
Soil Organic Matter	4.5%
Spring Residual Nitrate-N **0-6”** **6-24”**	 24 lb/ac 30 lb/ac
Soil Texture	Fine
Seeding Date	June 10
Seeding Equipment	Seed Hawk
Seeding Depth	1 ½”
Seeding Speed	3.2-5.3 mph
Row Spacing	12”
Total Applied P-K-S (lbs/ac P-K-S)	36-21-0
Crop Protection	May 27: Glyphosate + AIM80 + 878 June 26: Barricade + Axial

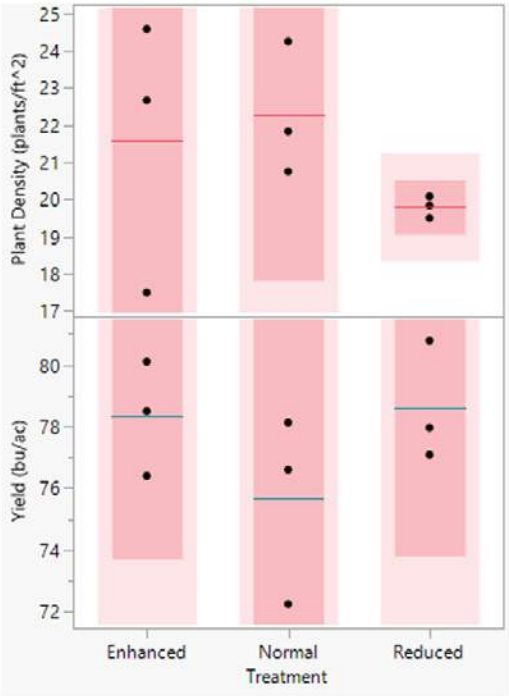


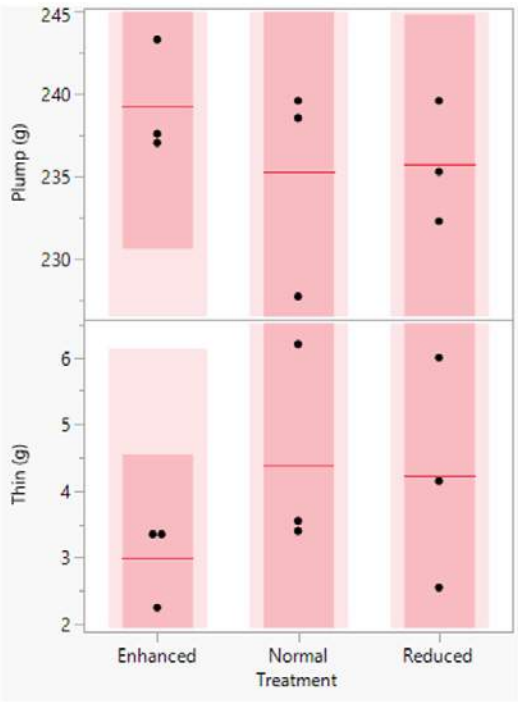
When examining plant densities, no significant effects on yield or grain quality were observed, regardless of nitrogen rates. Overall trends showed a slight increase in plump grains with higher plant densities, while thin grains decreased. Additionally, there was a non-significant increase in yield as plant densities rose.





Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Trt 1 – Normal N Rate	22.3	75.7	46.0	61.0	12.3	235.3	4.4	100
Trt 2 – Enhanced N Rate	21.6	78.3	47.6	61.2	12.3	239.3	3.0	100
Trt 3 – Reduced N Rate	19.8	78.6	46.5	61.3	12.3	235.7	4.2	100
SE[1]	3	5.37	1.165	0.681	0.09	3.723	1.03	0
p-value[2]	0.404	0.0557	0.4381	0.8938	0.4934	0.5415	0.4016	0.1





Varying nitrogen rates had minimal impact on thousand kernel weights, test weights, protein levels, and germination rates. Although the relationship between yield and nitrogen rates approached significance, variability prevented it from being conclusive. The reduced nitrogen treatment yielded the highest return (not shown). The lack of a nitrogen response may be attributed to higher residual nitrogen levels found in spring soil samples, along with the narrow range of application rates (+/- 6 lb N/ac).

To review footnote references please refer to overall trial summary on page 25.

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Plant Growth Regulator Trial

The use of plant growth regulators (PGRs) in high yielding and high moisture areas can provide benefit by reducing lodging risk in cereals. Barley varieties have been shown to vary in their response to treatment with PGR trinexapac-ethyl (Moddus), and the response can also vary with growing conditions. PGR application can also impact barley yield and quality.

Objective

To quantify the agronomic and economic impact of PGR (Moddus) application on barley compared to an untreated check across various management, soil, and weather conditions.

Treatments

1)	Untreated Check: No Moddus application
2)	Moddus single application at BBCH growth stage 30-32, applied according to label directions
3)	Moddus split application, with first application at BBCH growth stage 21-24 and second application at BBCH, 37-39, applied according to label directions

The treatments were replicated three times, and randomized within the field. Apart from PGR application, all treatments were managed the same agronomically including applied fertilizer, seeding date, variety, seed treatment, and pesticide applications.

Data collected

- Seed test
- Spring soil test
- In-season plant density, at the 2-4 leaf stage
- Height and lodging at the soft dough to late dough stage
- Field history and management practices
- Yield by plots
- General in-season observations such as weed competition, disease susceptibility, standability, and maturity
- Weather data

The following footnotes will be referred to for the individual site reports for this protocol:

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data.

[2]Analysis of variance (ANOVA) was used to indicate significance at $p<0.05$, however, p-values of 0.05-0.1 may also be acknowledged.
$p<0.05$ = likely that the difference was due to the treatment
$p<0.1$ = possible that the difference was due to the treatment
$p>0.1$ = not likely that the difference was due to the treatment

the BarleyBin Field Lab
Brought to you by SaskBarley

Barley Plant Growth Regulator (PGR)
(Humboldt)

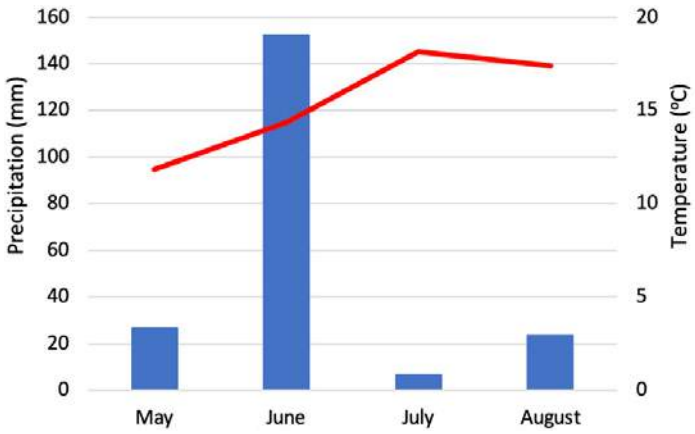
Objective: to quantify the agronomic and economic impact of PGR (Moddus) application on barley compared to an untreated check across various management, soil, and weather conditions.

Trt No.	Description
1	Untreated Check
2	PGR ½ Rate applied 2 times
3	PGR Full Rate

General Trial Information:

Variety	Cerveza - Malt
Thousand Kernel Weight	53.9g
Germination	95%
Seed Treatment	Vibrance Quattro
Previous Crop	Canola
Soil Organic Matter	4.5%
Residual Nitrate-N (0-6")	14 lb/ac
Seeding Date	May 15
Seeding Equipment	Bourgault 3335 PLDS, dual shank with mid row banders
Seeding Depth	¾"
Seeding Speed	4.7 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	85-43-11-11 + 1.1 Zn
Crop Protection	May 20: Glyphosate + 2,4-D Ester June 14: Infinity FX + Axial BIA July 13: Sphaerex

Weather from local station as of May 20th



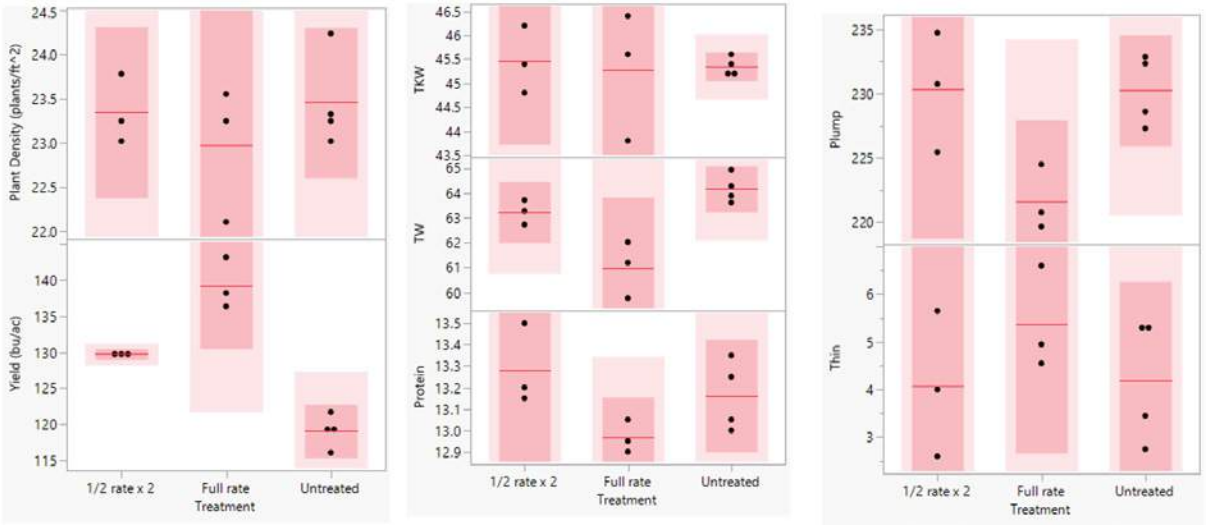
Moddus Application Information

Rate		
	Full Rate	0.42 L/ac
	½ Rate	0.21 L/ac
Date		
	June 18	Half Rate (1st app)
	June 26	Full Rate
	July 4	Half Rate (2nd app)
Speed		11 mph
Water Volume		12 gal/acre
Sprayer		Agrifac Endurance 2100gal 160 ft.

Harvestability Comments from the Producer:

"The full rate applied once was by far the winner in every respect, yield, harvestability, broken off stems, less green in the sample. The half rate had approximately 10% lodged with the odd broken stem, not the head but the whole stem was laying behind the header. What wasn't lodged seemed more mature than the full rate. Check was a mess - 40% lodged, lots of green growing through, extremely hard to combine. What wasn't lodged seemed to be the most mature with the heads kinked right over."

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Plumps (g/250g)	Thins (g/250g)	Germ (%)
Trt 1 – Untreated Check	23.5	119.1	45.4	64.1	13.2	230.4	4.2	99.5
Trt 2 – PGR ½ Rate x 2	23.3	129.8	45.5	63.3	13.3	230.2	4.1	98.3
Trt 3 – PGR Full Rate	23.0	139.3	45.3	61.0	13.0	221.5	5.4	97.3
SE[1]	0.458	1.4	0.668	0.454	0.089	2.5	1.04	0.99
p-value[2]	0.5322	**<0.0001**	0.9564	**0.0011**	0.0890	**0.0175**	0.429	0.1295



Treatment Description	PGR ($/ac)[x]	Machinery Operating[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
Trt 1 – Check	0	0	0	119.1	6.45	768.18	768.18	0.00
Trt 2 – PGR ½ Rate x 2	17.17	18.48	35.65	129.8	6.45	836.90	801.25	33.07
Trt 3 – PGR Full Rate	17.17	9.24	26.41	139.3	6.45	898.21	871.80	103.62

[x]2024 Local Retail, October 30, 2024 (PGR cost $17.17/ac)
[y]2024-25 Farm Machinery Custom and Rental Rate Guide, Government of Saskatchewan (avg sprayer custom rate: $9.24/ac)
[z]2024 Malting Barley, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $6.45/bu)

The application of plant growth regulators (PGRs) led to a significant yield increase ($p<0.0001$). The full rate achieved the highest yield at 139.3 bu/ac, representing a 20.2 bu/ac increase over the untreated check. However, while yields increased, PGRs also resulted in lower test weights ($p=0.0011$) and fewer plump grains ($p=0.0175$). The full rate provided the highest returns, benefiting from both the increased yield and the fact that only one application was needed.

To review footnote references please refer to overall trial summary on page 29.

This trial was conducted with the agronomic support of SWATMAPS

Canola

TOP NOTCH FARMING RESEARCH TRIALS

by SASK OILSEEDS

Overview

In the program's second year, SaskOilseeds' Top Notch Farming trials have reached new heights and expanded significantly! Building on the success of its first year, this groundbreaking program has maintained its focus on field-scale research, delivering valuable insights and solutions directly to canola farmers. By investing levy dollars into research that has immediate, practical applications at the farm level, SaskOilseeds reaffirms its commitment to enhancing producer prosperity. The excitement and growth in 2024 are a testament to the program's impactful contributions to the farming community!

The program started in 2023 with one protocol and 10 sites and has grown to 4 protocols and 23 sites in 2024. We continue to actively seek input from farmers and agronomists to shape future projects, and cultivate a collaborative network between SaskOilseeds, farmers, agronomists and research specialists.

Protocol: Foliar-Applied Nitrogen-Fixing Biological Products for Canola

Protocol: Split N or Top-Up N

Protocol: Enhanced Efficiency Nitrogen Fertilizer

Protocol: Seeding Rate

TOP NOTCH FARMING RESEARCH TRIALS

Foliar-Applied Nitrogen-Fixing Biological Products For Canola

Canola generally requires a large supply of nitrogen (N) to support high yields and quality, provided naturally from the soil and with applied fertilizer. New, commercially available biological products may facilitate biological N fixation in non-legume crops, potentially reducing their N fertility requirements. However, there is little publicly available data regarding the performance of N-fixing biological products on canola.

Objective

To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan. Producers will determine the value of utilizing the product of their choice under the typical management practices and environmental conditions of their operation.

Treatments

1)	Untreated check
2)	Foliar N- Fixing Biological Product 1
3)	Product 2 (Optional)

Foliar N-fixing bacteria products were applied according to the label, with consideration given to handling, storage, crop stage, application timing, application conditions, water volume and tank mixing. Trials were set up in randomized strips with four replications, for a total of 8 or 12 plots. All plots were managed the same agronomically, besides foliar product, including seeding rate, date, variety, seeding depth, seed treatment, fertility and pesticide application.

Data Collection

- Spring soil samples were collected at each trial site prior to seeding and fertilizer application to assess residual soil nutrient levels at 0-6" and 6-24" depths.
- Plant density was conducted at the 2-4 leaf stage.
- The following management and agronomic data were recorded precisely:
  - Fertilizer products, rates, placement, timing
  - Equipment type, opener, and row spacing
  - Wheat variety and seeding rate
  - Crop protection: seed treatment, pesticide applications
  - Previous crop and residue accumulation
  - General notes on weed, insect, disease infestations, and notable weather events
- Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale
- Grain samples were collected from each plot separately for grain quality analysis.
- Fall soil samples were collected for treated plots and untreated plots, to determine if there was any additional residual N.

The follow footnotes will be referred to for the 2024 combined and 2024 individual site reports for this protocol

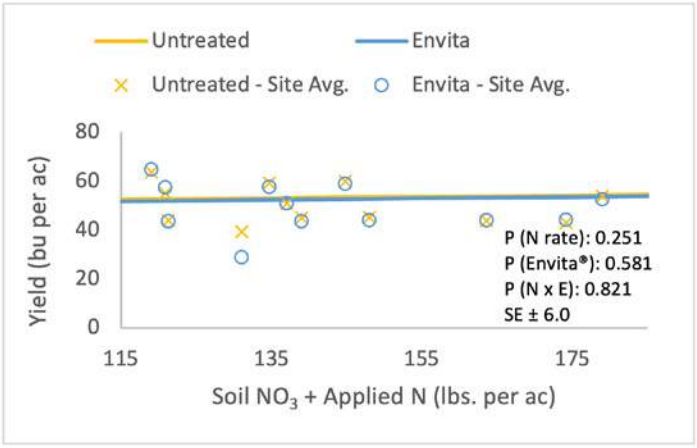
[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

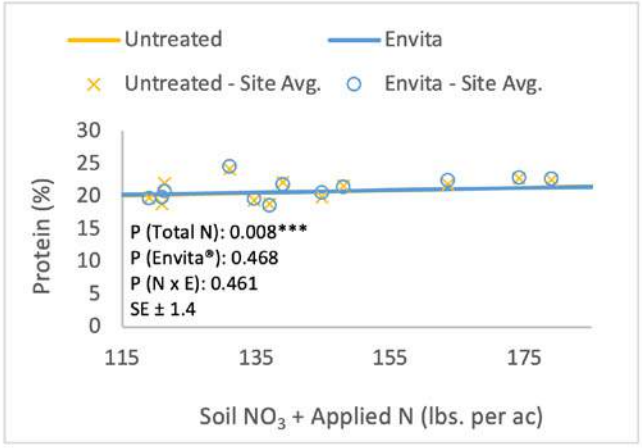
[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate and location considered a random effect and product considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$.

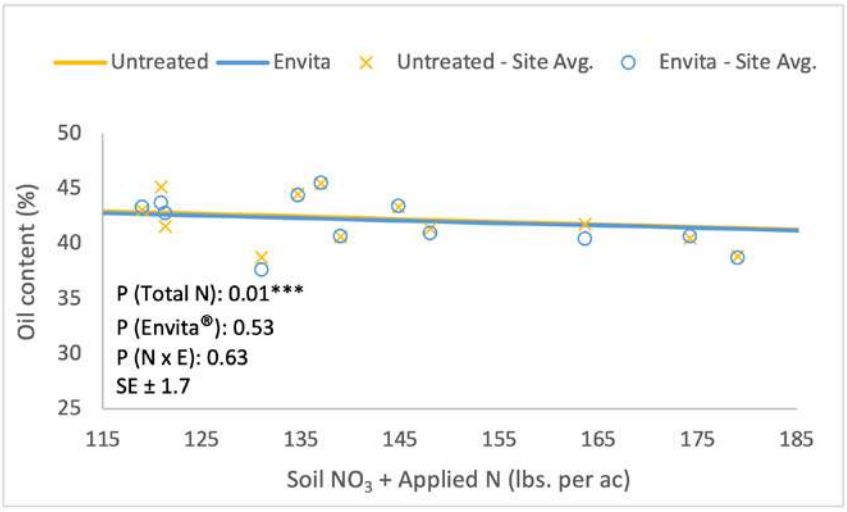
[3]SE was not record as the sample sizes are unequal and therefore standard error was different for each sample size

2023 Combined Results (9 sites)

Data from all sites was combined to assess the overall effect of Envita® application and whether the effect differed with nitrogen (N) availability. The amount of applied N was added to the soil residual NO3- to estimate N supply for different sites and treatments. Overall, we were unable to detect a difference in yield in response to Envita® application or N rate under the conditions experienced across the trials this growing season. Protein increased significantly and oil content decreased significantly with N supply, but did not differ significantly with Envita® application.







The following footnotes will be referred to for the 2023 combined report only:

[1]Yields were adjusted to 10% seed moisture content

[2]SE is the standard error which is in the same unit as the measurement and indicates the level of variability or uncertainty in the data.

[3]The p-value indicates the statistical significance, or likelihood that the measured difference was a result of the treatment:
p < 0.01 = Very likely; Very high probability that the difference was due to the treatment (***)
p < 0.05 = Likely; Good probability that the difference was due to the treatment (**)
p < 0.1 = Possibly; Moderate probability that the difference was due to the treatment (*)
p > 0.1 = Not likely; Probability too low to confirm if the difference was due to the treatment (not significant)
** Where P < 0.05, treatment differences are shown in summary figures.

[4]p-value (N rate) indicates the likelihood of a difference resulting from N rate treatments only;
p-value (Envita®) indicates the likelihood of a difference resulting from Envita® application only; p-value (N x E) indicates the likelihood of N rate treatments having different responses to Envita® application

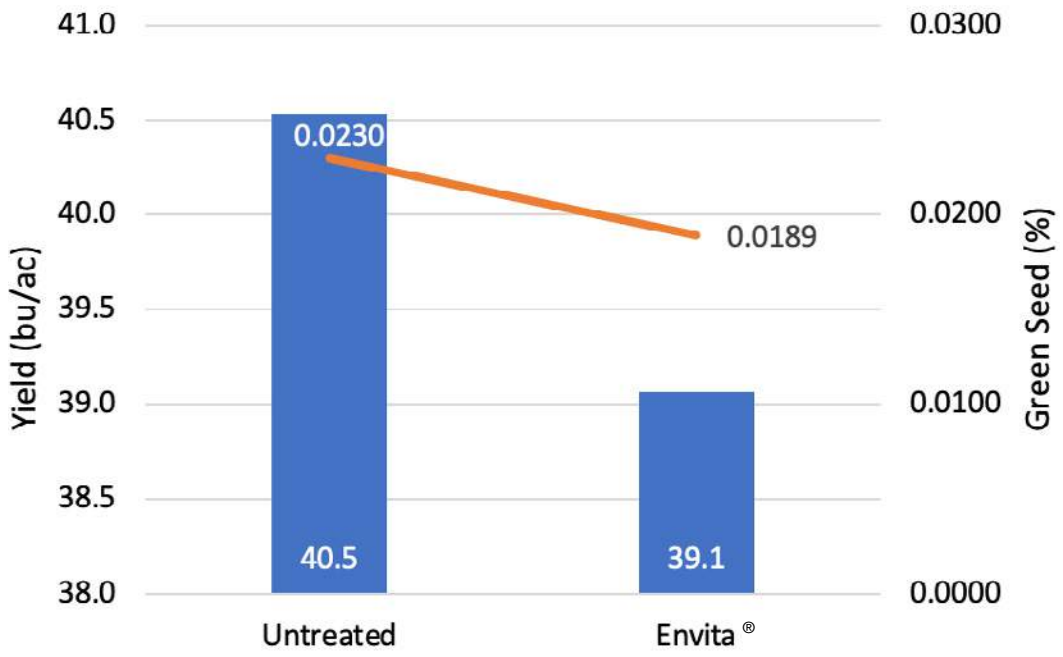
Thank you to Syngenta for donating product in 2023

syngenta

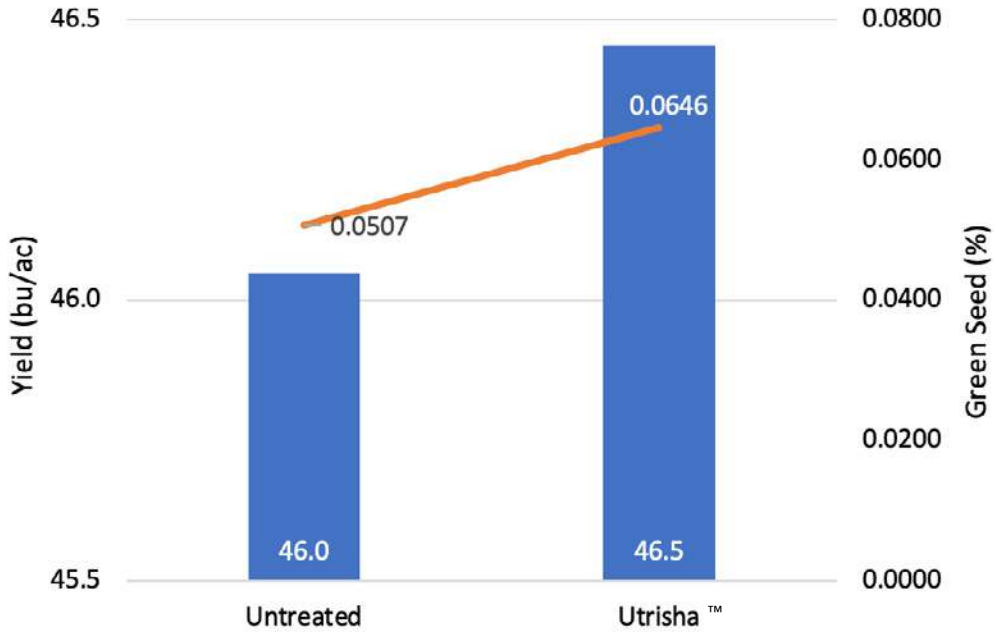
2024 Combined Results (8 sites)

A total of 8 locations- 2 used Envita®, 5 used Utrisha™, and 1 used both products. As a result, the combined data includes 3 sites with Envita® and 6 sites with Utrisha®. Overall, there were no detectable differences in plant densities, yield, or grain quality with the application of foliar-applied N-fixing bacteria products. Since no significant yield differences were observed between treatments, the most economical option is the control.

Product[3]	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
Untreated	40.5	24.5	4.1	65.0	47.6	0.0230
Envita®	39.1	24.5	4.0	64.9	47.4	0.0189
p-value[2]	0.4728	0.9175	0.682	0.5337	0.5186	0.773



Product[3]	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
Untreated	46.0	24.0	4.2	63.9	47.0	0.0507
Utrisha™	46.5	24.2	4.2	64.1	46.8	0.0646
p-value[2]	0.745	0.343	0.6045	0.5556	0.7223	0.5286



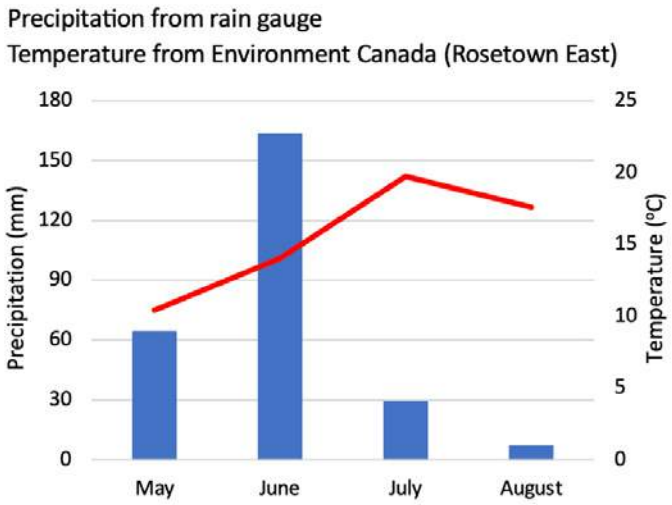
TOP NOTCH FARMING RESEARCH TRIALS

Foliar – Applied Nitrogen – Fixing Biological Products in Canola (Biggar)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Envita®)

General Trial Information	
Variety	L345PC
TSW	5.6 g
Seed Treatment	Helix Vibrance®
Previous Crop	Lentils
Seeding Date	May 22
Seeding Rate	4.3 lb/ac
Seeding Equipment	Vaderstad®
Seeding Depth	1 ¼”
Seeding Speed	5 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	103 – 39 – 0 – 20
Crop Protection	May 18: Emphasis® + Glyphosate June 20 – Liberty® + Arrow All In® September 6 – Glyphosate



Foliar N-Fixing Biological Product Application:

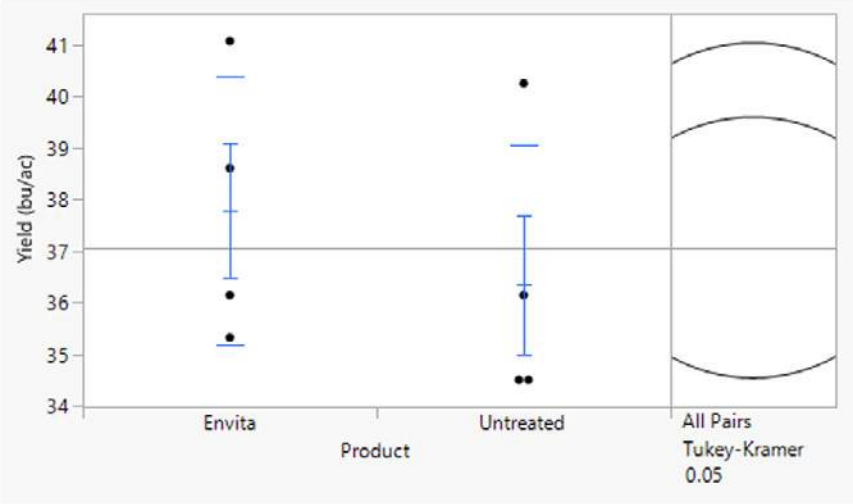
Product	Envita®
Date/Time	June 20 @ 11:00 a.m.
Crop Stage	4 leaf
Tank Mix	Liberty® + Arrow All In®
Water Volume	10 gal/ac
Sprayer	Case 135’
Speed	14 mph
Nozzles	Teejet 08
Weather Conditions	17°C, 8 km wind

Soil Properties

Spring Residual Nitrate- N	
- 0-6”	52 lb/ac
- 6-24”	114 lb/ac
Fall Residual Nitrate- N	N/A
Soil Organic Matter	6.2%
Soil Texture	Fine

Results

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Untreated Check	6.4	36.3	22.0	3.8	64.1	48.1	0.0
Envita®	6.4	37.8	22.2	3.4	63.9	48.0	0.0
SE[1]	0.09456	1.3281	0.23447	0.2961	0.0661	0.28495	0.01976
p-value[2]	0.6357	0.4731	0.5453	0.3672	0.0541	0.8123	0.6704



At this location, no differences in yield or grain quality were observed with the application of Envita® foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

This trial was conducted with the agronomic support of

Hoppe Agronomy

TOP NOTCH FARMING RESEARCH TRIALS

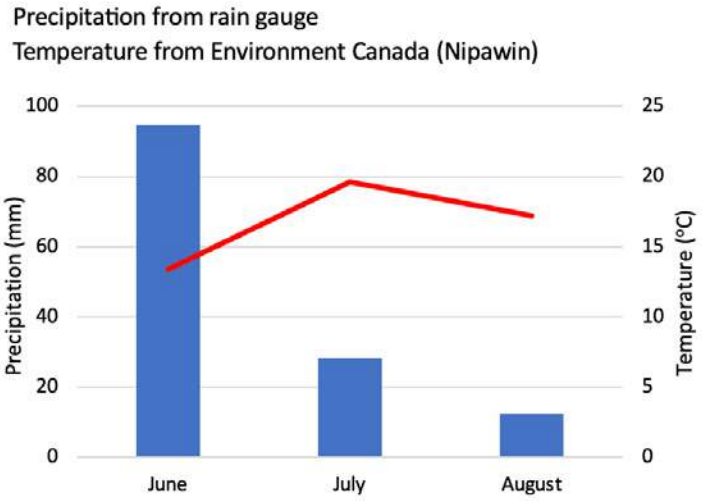
Foliar – Applied Nitrogen – Fixing Biological Products in Canola
(Carrot River)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Utrisha™)

General Trial Information

Variety	L233P
TSW	4.4 g
Seed Treatment	Buteo® + Helix Vibrance®
Previous Crop	Barley
Seeding Date	May 29
Seeding Rate	4.6 lb/ac
Seeding Equipment	45 Series Seed Hawk®
Seeding Depth	¾”
Seeding Speed	4 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	16 – 27 – 16 – 0
Crop Protection	May 25: Conquer® + Glyphosate June 27 – Glufosinate July 13 – Proline Gold®



Foliar N-Fixing Biological Product Application:

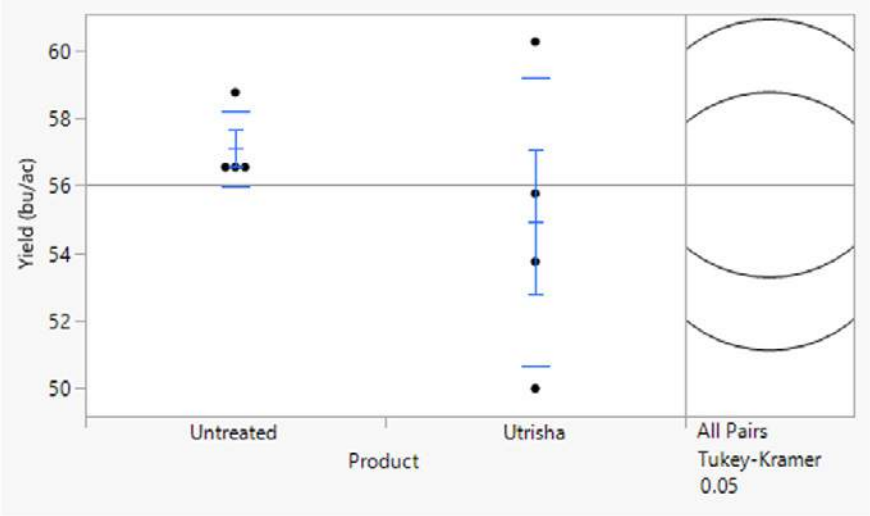
Product	Utrisha™
Date/Time	July 8 @ 3:00 p.m.
Crop Stage	5-10% bloom
Tank Mix	N/A
Water Volume	10 gal/ac
Sprayer	John Deere 412R
Speed	14 mph
Nozzles	03 & 04 flat fan
Weather Conditions	Nice warm afternoon

Soil Properties

Spring Residual Nitrate- N	
- 0-6”	21 lb/ac
- 6-24”	30 lb/ac
Spring Residual Nitrate- N	
1. Untreated Check:	
- 0-6”	37 lb/ac
- 6-24”	27 lb/ac
2. Foliar N-Fixing Biological Product:	
- 0-6”	14 lb/ac
- 6-24”	6 lb/ac
Soil Organic Matter	7.6 %

Results

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Untreated Check	7.7 A	57.1	24.8	4.7	62.8	48.4	0.2
Utrisha™	7.1 B	54.9	24.4	4.5	62.8	48.4	0.3
SE[1]	0.13066	1.559	0.13607	0.28247	0.275	0.32771	0.0395
p-value[2]	**0.0262**	0.366	0.0758	0.691	0.9558	0.9587	0.2283



At this location, no differences in yield or grain quality were observed with the application of Envita® foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

This trial was conducted with the agronomic support of

Ag Grow Consulting Ltd.

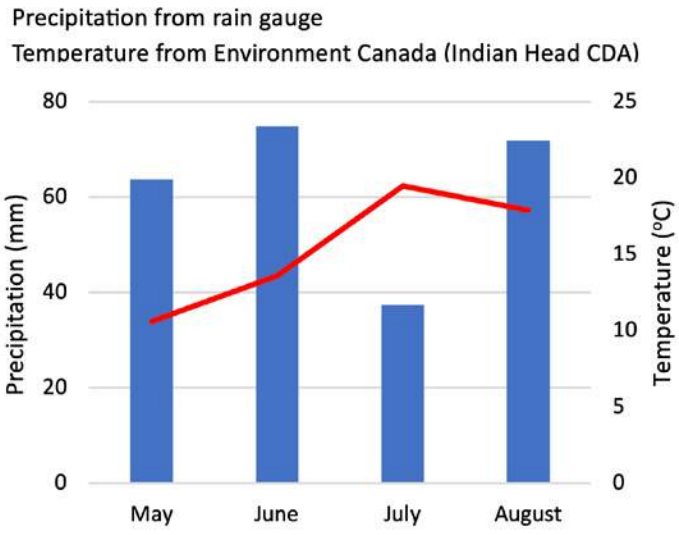
TOP NOTCH FARMING RESEARCH TRIALS

Foliar – Applied Nitrogen – Fixing Biological Products in Canola (Indian Head)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product 1 (Envita®)
3	Foliar N-Fixing Biological Product 2 (Utrisha™)

General Trial Information	
Variety	LL Canola
TSW	4.9 g
Seed Treatment	Buteo Start®, Helix Vibrance®, Lumiposa®
Previous Crop	Canary Seed
Seeding Date	May 17
Seeding Rate	4.7 lb/ac
Seeding Equipment	2021 SeedMaster 40' CT with UltraPro II onboard tank
Seeding Depth	7/8”
Seeding Speed	4.4 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	130 – 45 – 0 – 15
Crop Protection	June 22 – Liberty® + Centurion® + Amigo® July 11 – Proline Gold®



Foliar N-Fixing Biological Product Application:

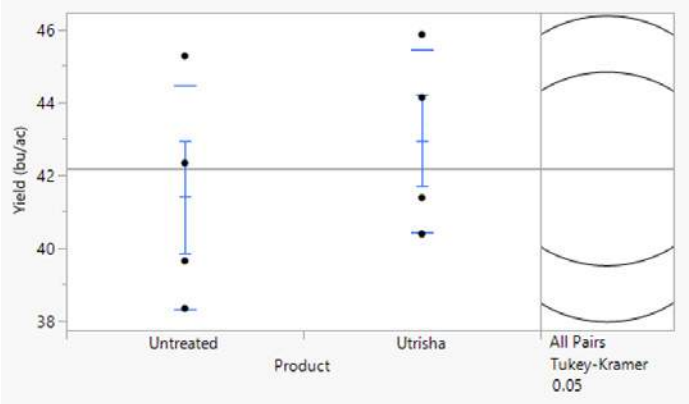
Product	Envita®	Utrisha™
Date/Time	July 5 @ 12:00 – 2:00 p.m.	
Crop Stage	Bolted, bud formation, 2 days pre-flower	
Tank Mix	N/A	
Water Volume	20 US gal/ac	
Sprayer	2008 Case SPX 3320	
Speed	8.5 mph	
Nozzles	Lechler IDK 120-04 air induction nozzles	
Weather Conditions	23°C, 13 km wind, 60% RH	

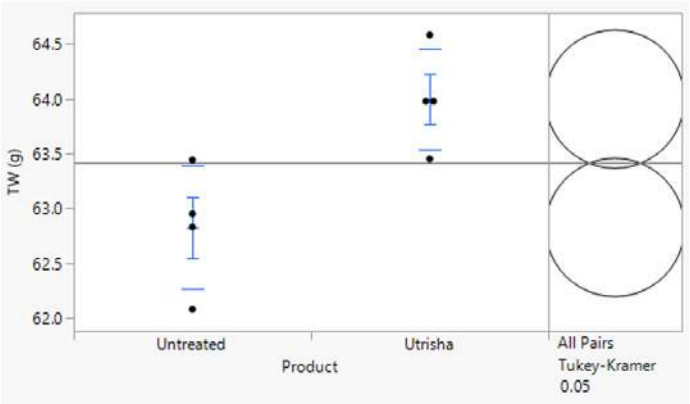
Soil Properties

Spring Residual Nitrate- N	
- 0-6”	2 lb/ac
- 6-24”	30 lb/ac
Fall Residual Nitrate- N	N/A
Soil Organic Matter	5.0%
Soil Texture	Fine

Results

Treatment	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Untreated Check	48.4	24.8	3.7	66.1	47.2	0.0
Envita®	47.8	24.6	3.6	65.9	47.1	0.0
Utrisha™	48.0	24.9	3.7	65.9	47.0	0.0
SE[1]	1.0539	0.14325	0.05457	0.19164	0.2501	0
p-value[2]	0.9056	0.2929	0.3793	0.7109	0.7457	0.1





At this location, no differences in yield or grain quality were observed with the application of either foliar-applied N-fixing bacteria products. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

This trial was conducted with the agronomic support of

IHARF
INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

TOP NOTCH FARMING RESEARCH TRIALS

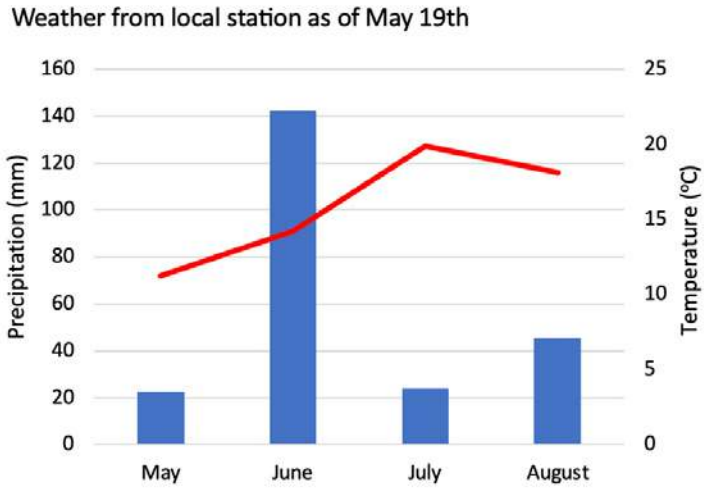
Foliar – Applied Nitrogen – Fixing Biological Products in Canola (Luseland)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Utrisha™)

General Trial Information

Variety	L340PC
TSW	4.4 g
Seed Treatment	Helix Vibrance®
Previous Crop	Barley
Seeding Date	May 30
Seeding Rate	3.5-5 lb/ac
Seeding Equipment	Vaderstad®
Seeding Depth	¾”
Seeding Speed	4.5-6.5 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	108 – 32 – 1 – 18
Crop Protection	May 27 – Revenge® and MPower® July 4 – Liberty® + Independence®



Foliar N-Fixing Biological Product Application:

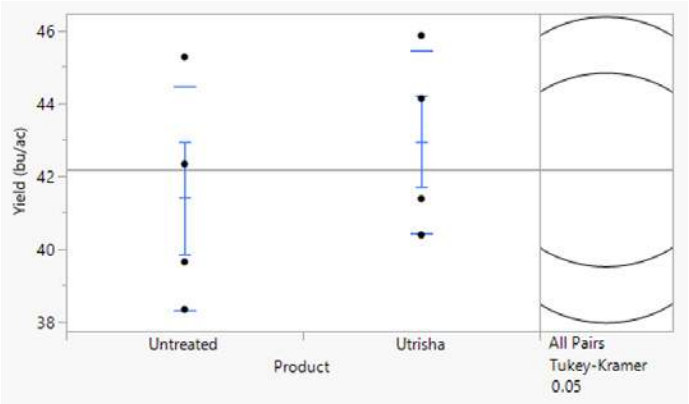
Product	Utrisha™
Date/Time	July 5
Crop Stage	Bolting
Tank Mix	N/A
Water Volume	10 gal/ac
Sprayer	Case 4440
Speed	13.6 mph
Nozzles	10 gal/ac
Weather Conditions	Dry

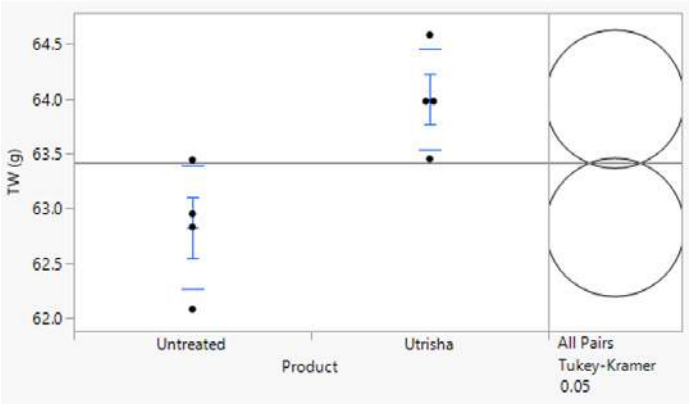
Soil Properties

Spring Residual Nitrate- N	
- 0-6”	5 lb/ac
Fall Residual Nitrate- N	
- 0-6”	22 lb/ac
- 6-18”	10 lb/ac
Soil Organic Matter	4.6%

Results

Treatment	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Untreated Check	41.4	23.6	4.2	62.8 B	46.8	0.00
Utrisha™	42.9	24.4	4.3	64.0 A	46.7	0.00
SE[1]	1.402	0.62339	0.13973	0.25741	0.34652	0
p-value[2]	0.4661	0.3657	0.6033	**0.0183**	0.8261	0.1





At this location, test weight had a 1.2 g/0.5L increase from the application of Utrisha™ versus the untreated check. Otherwise, no differences in yield or remaining grain quality were observed with the application of Utrisha™ foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

TOP NOTCH FARMING RESEARCH TRIALS

Foliar – Applied Nitrogen – Fixing Biological Products in Canola (Shaunavon)

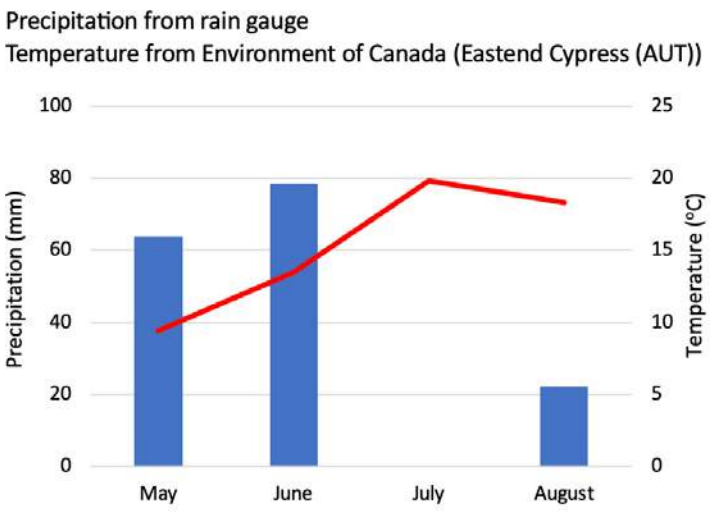
Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Envita®)

General Trial Information

Variety	L340PC
TSW	4.7 g
Seed Treatment	Helix Fortenza Advance®
Previous Crop	Barley
Seeding Date	May 30
Seeding Rate	5 lb/ac
Seeding Equipment	Bourgault Paralink™
Seeding Depth	½”
Seeding Speed	5.3 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	9 – 24 – 0 – 11 – 0.029B
Crop Protection	May 23 – Glyphosate + AIM® June 18 – Liberty® + Yuma® July 5 – Coragen® MaX



Foliar N-Fixing Biological Product Application:

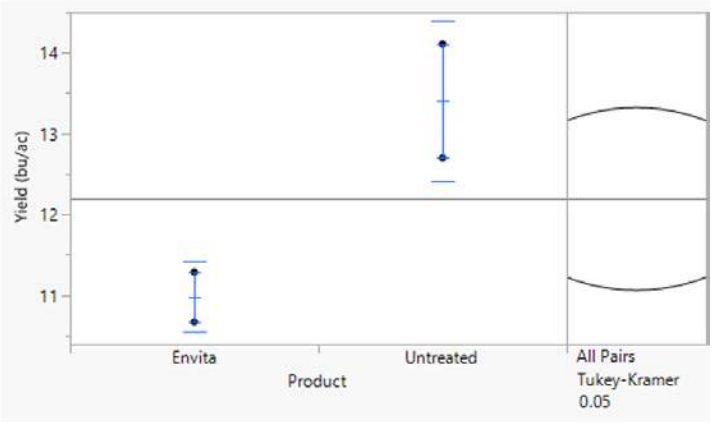
Product	Envita®
Date/Time	June 21
Crop Stage	4 leaf
Tank Mix	N/A
Water Volume	10 gal/ac
Sprayer	616r John Deere
Speed	12 mph
Nozzles	5-gal low drift

Soil Properties

Spring Residual Nitrate- N - 0-6”	85 lb/ac
Fall Residual Nitrate- N	23.6 lb/ac
Soil Organic Matter	4.6

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)
Untreated Check	2.7	13.4
Envita®	2.5	11.0
SE[1]	0.20579	0.5445
p-value[2]	0.6838	0.0878



At this location, no differences in yield were observed with the application of Envita® foliar-applied N-fixing bacteria. Post harvest samples were not located at this location. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

TOP NOTCH FARMING RESEARCH TRIALS

Foliar – Applied Nitrogen – Fixing Biological Products in Canola (Plenty)

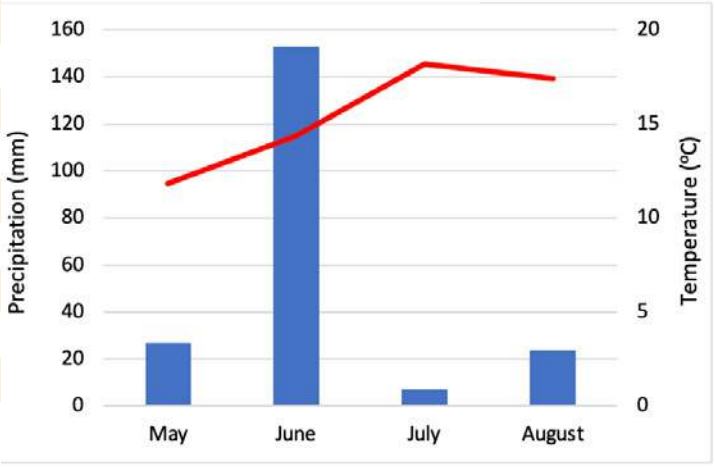
Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Utrisha™)

General Trial Information

Variety	L340PC
TSW	4.4 g
Seed Treatment	Helix Vibrance®
Previous Crop	Wheat
Seeding Date	May 18
Seeding Rate	4.23 lb/ac
Seeding Equipment	Bourgault 3335
Seeding Depth	¾”
Seeding Speed	4.5 – 6.5 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	68 – 38 – 1 – 0
Crop Protection	May 16 – Glyphosate June 20 – Liberty® + Centurion® August 15 – Glyphosate

Weather from local station as of May 20th



Foliar N-Fixing Biological Product Application:

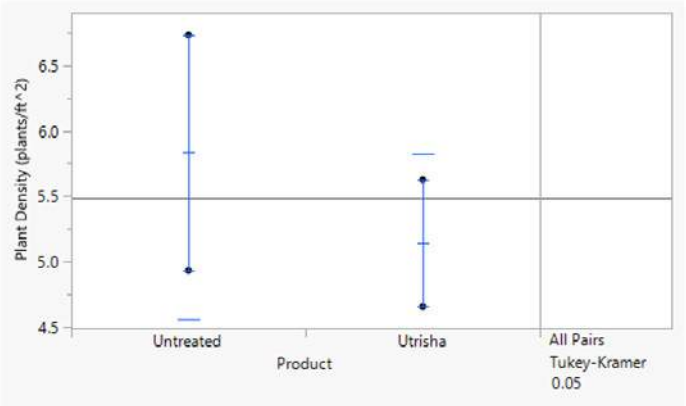
Product	Utrisha™
Date/Time	June 20 @ evening
Crop Stage	Prior to bolting
Tank Mix	Liberty® + Centurion®
Water Volume	10 gal/ac
Sprayer	John Deere 616R
Speed	13.6 mph
Nozzles	3D pulsating JD
Weather Conditions	Warm & sunny

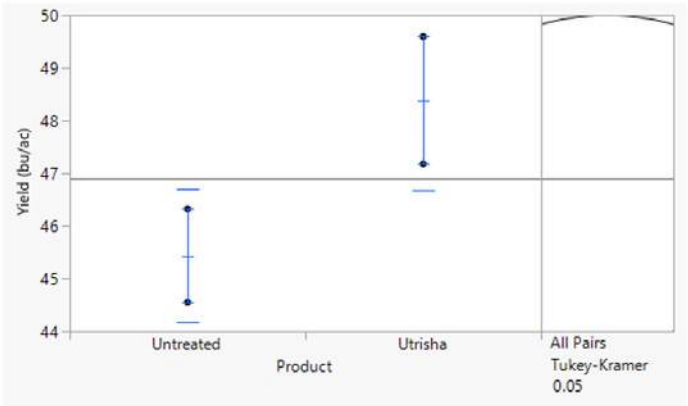
Soil Properties

Spring Residual Nitrate- N	
- 0-6”	47 lb/ac
- 6-24”	72 lb/ac
Fall Residual Nitrate- N	
- 0-6”	79 lb/ac
- 6-18”	24 lb/ac
Soil Organic Matter	4.3%

Results

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Untreated Check	5.8	45.4	21.6	3.4	65.7	41.7	0.0
Utrisha™	5.1	48.4	22.3	3.9	65.6	40.7	0.0
SE[1]	0.72502	1.0601	0.29262	0.2	0.52823	0.73845	0.01768
p-value[2]	0.5681	0.1881	0.2568	0.2407	0.9433	0.4491	0.4226





At this location, no differences in yield or grain quality were observed with the application of Envita® foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

TOP NOTCH FARMING RESEARCH TRIALS

Foliar – Applied Nitrogen – Fixing Biological Products in Canola (St. Walburg)

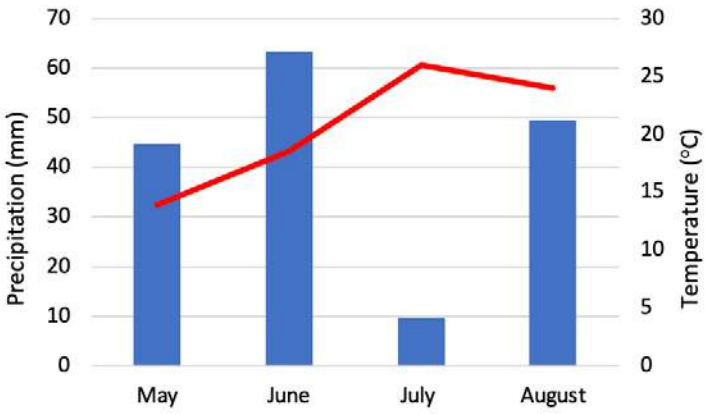
Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Utrisha™)

General Trial Information

Variety	PV661
TSW	Standard
Seed Treatment	Prosper®
Previous Crop	Wheat
Seeding Date	May 28
Seeding Rate	5 lb/ac
Seeding Equipment	Bourgault 3310
Seeding Depth	½ - ¾”
Seeding Speed	5 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	100 – 25 – 10 – 25
Crop Protection	May 26 – Glyphosate + AIM® EC June 26 – Liberty® + Centurion®

Weather from local station



Foliar N-Fixing Biological Product Application:

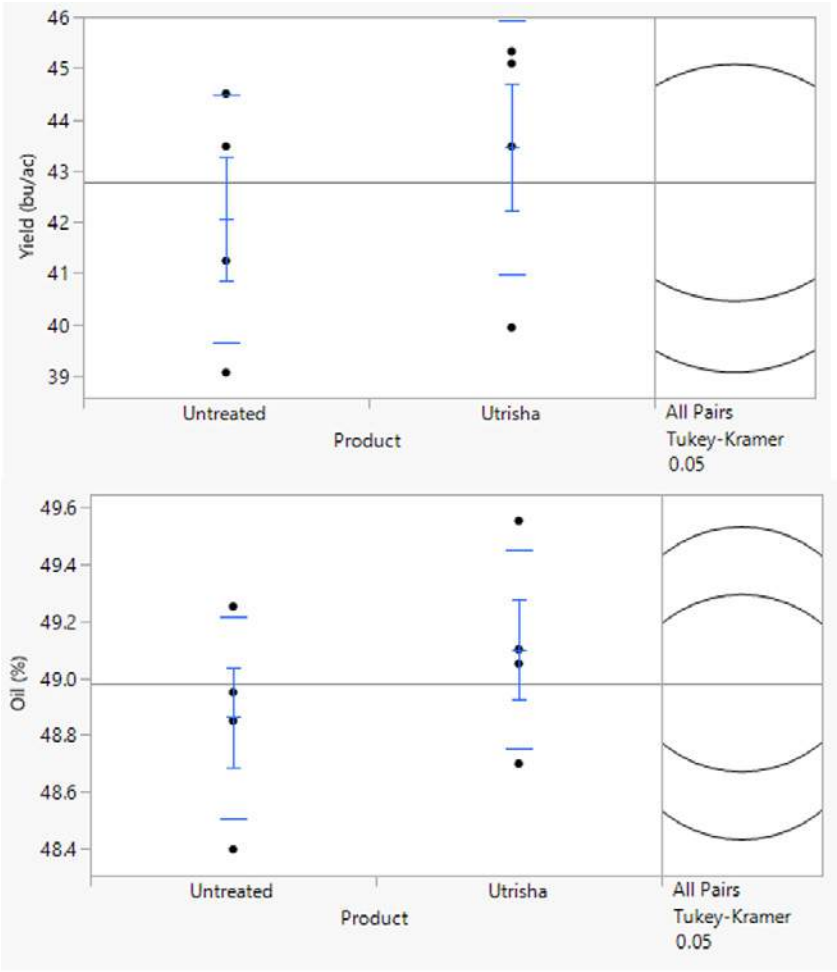
Product	Utrisha®
Date/Time	July 5
Crop Stage	4-5 leaf
Tank Mix	N/A
Water Volume	10 gal/ac
Sprayer	Rogator® 1184
Speed	10 mph
Nozzles	11025 TeeJet®
Weather Conditions	20°C, 24km wind

Soil Properties

Spring Residual Nitrate- N	
- 0-6”	45 lb/ac
- 6-24”	18 lb/ac
Fall Residual Nitrate- N	
1. Untreated Check:	
- 0-6”	13 lb/ac
- 6-24”	9 lb/ac
2. Foliar N-Fixing Biological Product	
- 0-6”	19 lb/ac
- 6-24”	12 lb/ac
Soil Organic Matter	5.9%
Soil Texture	Medium

Results

	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
Untreated Check	12.1	43.5	24.0	4.6	64.3	49.1	0.013
Utrisha®	12.1	42.1	23.9	4.4	64.4	48.9	0.038
SE[1]	0.16793	1.2277	0.139	0.09878	0.08162	0.17522	0.01909
p-value[2]	0.809	0.4542	0.5882	0.2191	0.1803	0.3749	0.3903



At this location, no differences in yield or grain quality were observed with the application of Utrisha™ foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

TOP NOTCH FARMING RESEARCH TRIALS

Foliar – Applied Nitrogen – Fixing Biological Products in Canola (Wakaw)

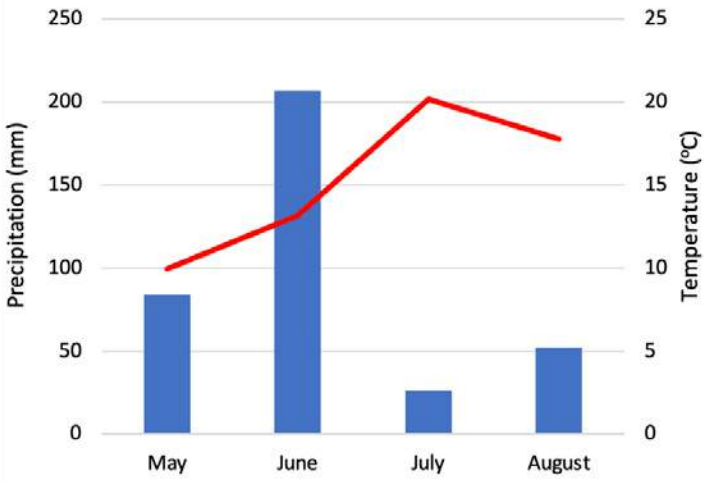
Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan.

Treatment #	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Envita®)

General Trial Information

Variety	PV681
TSW	6.4 g
Seed Treatment	Prosper Evergol® + Buteo®
Previous Crop	Wheat
Seeding Date	May 15
Seeding Rate	6.4 lb/ac
Seeding Equipment	Bourgault 5710
Seeding Depth	¾”
Seeding Speed	3.8 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	62 – 56 – 0 – 21
Crop Protection	May 14 – Glyphosate + Octagon® June 15 – Liberty® + Centurion® June 26 – Liberty® + Centurion® July 8 – Miravis Bold®

Weather from a local station



Foliar N-Fixing Biological Product Application:

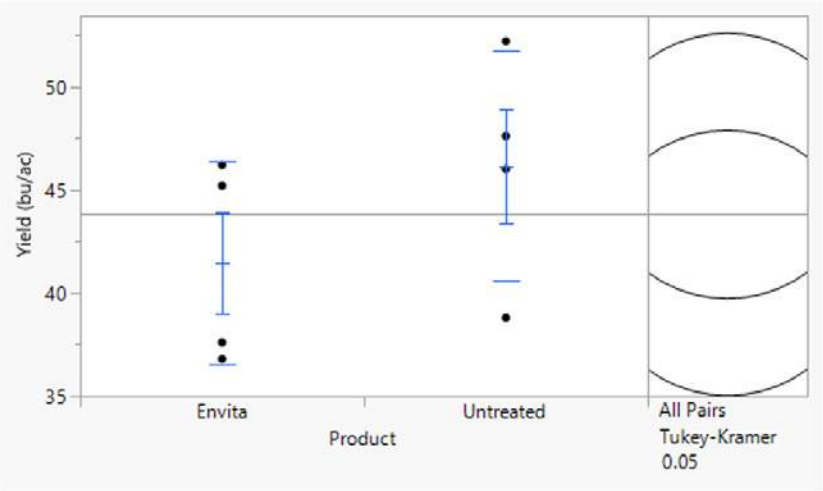
Product	Envita®
Date/Time	July 8 @ noon
Crop Stage	25-30% Bloom
Tank Mix	Miravis Bold®
Water Volume	10 gal/ac
Sprayer	Patriot® 3185
Speed	10 mph
Nozzles	Green Leaf Turbo Drop 02
Weather Conditions	21°C, minimal wind

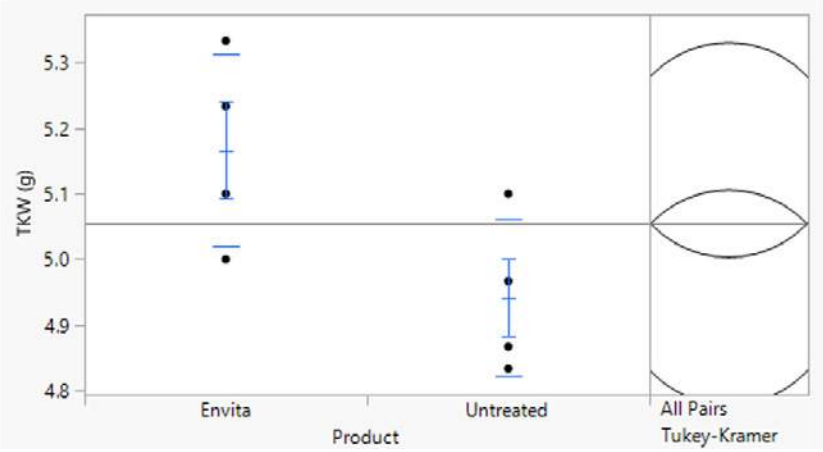
Soil Properties

Spring Residual Nitrate- N	
- 0-6”	90 lb/ac
- 6-24”	228 lb/ac
Fall Residual Nitrate- N	
- 0-6”	11 lb/ac
- 6-24”	33 lb/ac
Soil Organic Matter	5.4%
Soil Texture	Medium

Results

	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
Untreated Check	9.1	46.2	25.8	4.9	65.0	47.4	0.04
Envita®	9.1	41.5	25.9	5.2	65.2	47.2	0.04
SE[1]	0.3878	2.6285	0.14031	0.06693	0.06843	0.22471	0.02394
p-value[2]	0.913	0.253	0.7185	0.055	0.1163	0.5286	0.1





At this location, no differences in yield or grain quality were observed with the application of Envita® foliar-applied N-fixing bacteria. Envita® almost resulted in a significant higher TKW compared to the untreated check. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 35.

This trial was conducted with the agronomic support of

Sara Olexsyn

TOP NOTCH FARMING RESEARCH TRIALS

Split or Top-Up Nitrogen Trial

Nitrogen (N) plays a critical role in canola production in Saskatchewan. Producers are tasked with increasing yield, quality and economic return while using applied nutrients efficiently, considering factors such as cost and environmental impact. Two related management practices have emerged to potentially increase efficiency and reduce the economic risk of N fertilizer application, ***split N application and top-dressing N.*** *Split application is primarily a risk management approach, where only part of the total N required based on the yield goal, is applied at or before seeding, and the remainder applied in-crop if conditions are conducive to achieving the yield goal. Top-dressing entails applying 100% of the recommended N at seeding and supplementing with additional N in-season if growing conditions are conducive to further improving the yield or quality of the crop. These methods could potentially help crops utilize N more effectively, boost productivity, reduce costs, and minimize environmental impact from N losses.*

Objective

To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on canola yield, quality and economic return under various soil and weather conditions in Saskatchewan.

Treatments

Option A: Split N		Option B: Split N + Top dress	
1)	100% N at seeding	1)	100% N at seeding
2)	70% N at seeding + 30% in-crop	2)	70% N at seeding + 30% in-crop
		3)	100% N at seeding + additional in-crop

Trials were set up in randomized strips with four replications, for a total of 8 (option A) or 12 plots (option B). All plots were managed the same agronomically, besides N fertility, including seeding date, variety, seeding depth, seed treatment, and pesticide application.

Data Collection

- Spring soil samples were collected at each trial site prior to seeding and fertilizer application to assess residual soil nutrient levels at 0-6" and 6-24" depths.
- Plant density was conducted at the 2-4 leaf stage.
- The following management and agronomic data were recorded precisely:
  - Fertilizer products, rates, placement, timing
  - Equipment type, opener, and row spacing
  - Canola variety, TSW and seeding rate
  - Crop protection: seed treatment, pesticide applications
  - Previous crop and residue accumulation
  - General notes on weed, insect, disease infestations, and notable weather events
- Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale
- Grain samples were collected from each plot separately for grain quality analysis.

The follow footnotes will be referred to for the combined and individual site reports for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

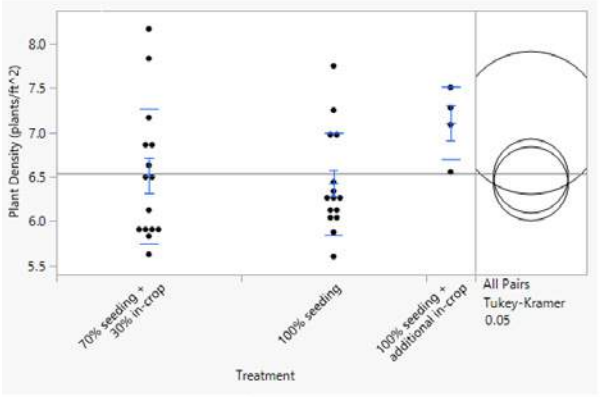
[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate considered a random effect and location and fertilizer treatment considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$.

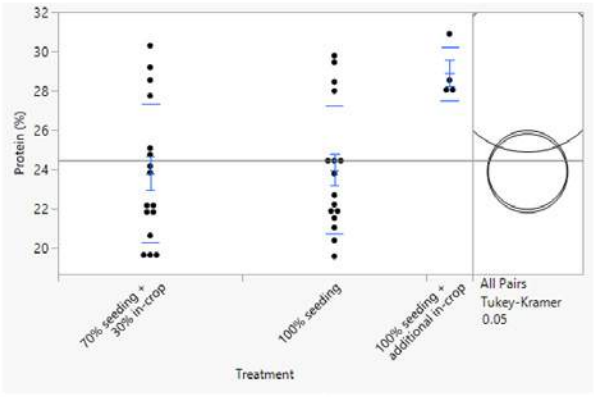
[3]SE was not record as the sample sizes are unequal and therefore standard error was different for each sample size

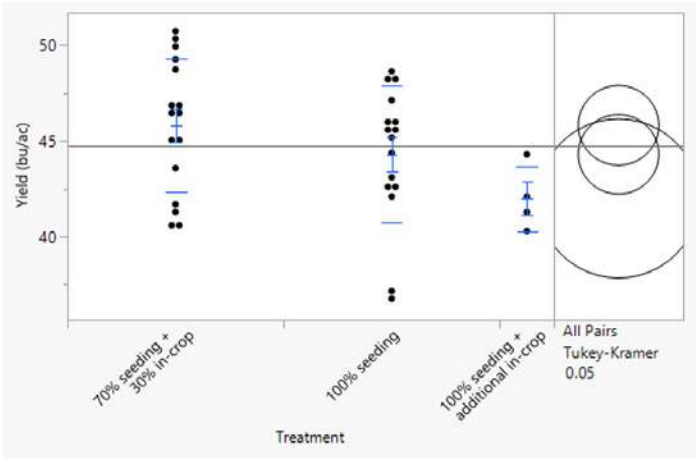
2024 Combined Results (4 sites)

When data from all four sites were combined, significant trends were observed between fertilizer treatments and protein (p=0.0238), as well as between fertilizer treatments and moisture content (p=0.0107). The protein level was significantly higher with the additional in-crop application, suggesting that extra nitrogen increased protein content. Moisture content was also significantly higher with the in-crop application, likely due to delayed maturity. Plant densities, yield, test weight, oil content, and green seed were similar across treatments. Although not statistically significant, the 70% N at seeding + 30% in-crop treatment averaged the highest yield and provided the greatest net return.

Treatment[3]	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)	Moisture (%)
100% N at seeding	6.8	44.3	24.0 B	5.8	65.4	47.3	0.01	8.0 B
70% N at seeding + 30% in-crop	6.9	45.8	23.8 B	5.7	65.5	47.3	0.01	7.8 B
100% N at seeding + additional in-crop	7.3	42.0	28.9 A	5.6	64.7	45.0	0.00	12.8 A
p-value[2]	0.1904	0.1245	**0.0238**	0.9915	0.1799	0.5129	0.7729	**0.0107**







TOP NOTCH FARMING RESEARCH TRIALS

Split N or Top-Up N Trial
(Birch Hills)

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on canola yield, quality and economic return under various soil and weather conditions in Saskatchewan.

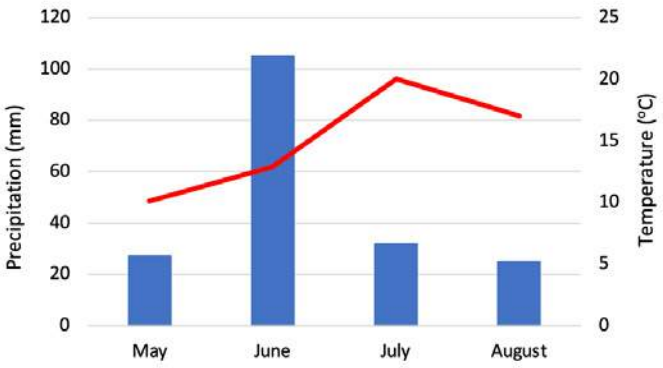
Treatment

Trt #	Description
1	100% N at seeding
2	70% N at seeding + 30% in-crop

General Trial Information

Variety	InVigor® L358HPC
Thousand Kernel Weight	4.9 g
Seed Treatment	Buteo Start®
Previous Crop	Wheat
Soil Organic Matter	4.7%
Residual Nitrate- N **- 0-6”** **- 6-12”**	 10 lb/ac 42 lb/ac
Soil Texture	Medium
Seeding Date	May 29
Seeding Rate	4.2 lb/ac
Seeding Equipment	JD P680 drill with C850 tank
Seeding Depth	½”
Seeding Speed	5.5 mph
Row Spacing	12”
Crop Protection	May 27: Glyphosate June 20: Liberty® + Clethodim July 3: Liberty® + Clethodim July 17: Lance® AG

Precipitation from rain gauge
Temperature from Environment Canada (Prince Albert A)



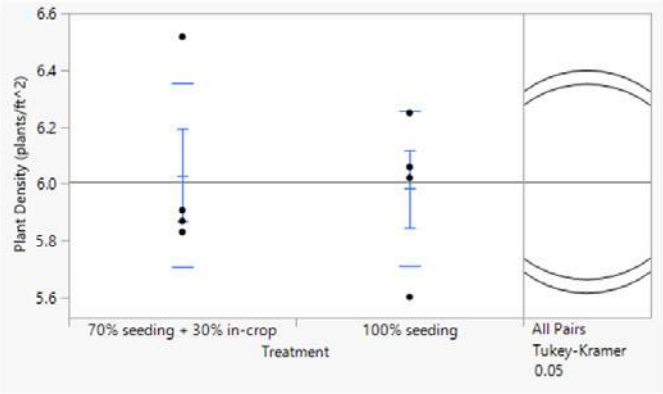
Nitrogen Application

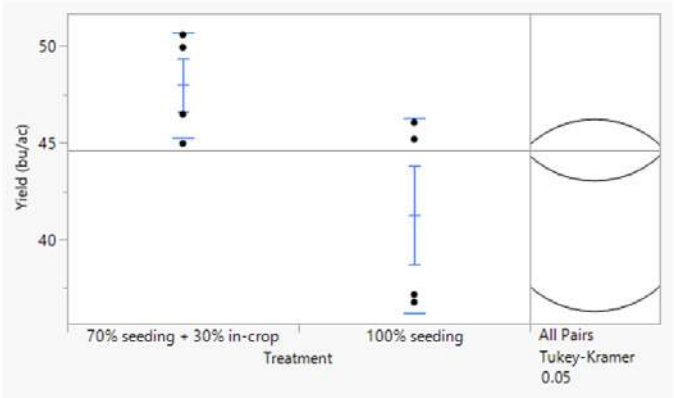
Seeding		In-Crop	
Product	46-0-0	Product	28-0-0 (UAN/Anvil®)
Date	May 29	Date	July 5
Time	Seeding	Crop Stage	5 leaf
Placement	Sideband	Water Volume	0 gal/ac
Form	Granular	Application Rate	8.8 gal/ac
		Speed	12 mph
		Sprayer	JD 4920
		Nozzles	Stream Jet

Nitrogen Application:	Seeding						In Crop		Total Actual (lbs/ac)			
Treatments:	46-0-0 (lb/ac)	Actual N (46-0)	13-33-0-15S (lb/ac)	Actual N (13-33)	Actual P (13-33)	Actual S (13-33)	UAN (gal/ac)	Actual N	N	P	K	S
100% seeding	170	78.2	80	10	26	12	0	0	89	42	0	0
70% seeding + 30% in-crop	112	52	80	10	26	12	8.8	26	88	42	0	0

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
100% N at seeding	6.0	41.2	20.7	4.3	65.1	50.9	0.0
70% N at seeding + 30% in-crop	6.0	48.0	19.9	4.4	65.3	51.4	0.0
SE[1]	0.15019	2.0315	0.38669	0.05336	0.27537	0.5664	0
p-value[2]	0.83	0.0569	0.1821	0.2333	0.7591	0.5272	NA





Economics

Treatment	N at seeding (lb/ac)	N at seeding ($/ac)[x]	In-Crop N (gal/ac)	In-Crop N ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	170	54.0	0	0.00	53.98	41.2	16.06	662.4	608.39	0.00
70% N at seeding + 30% in crop	112	35.6	8.8	17.98	53.54	48.0	16.06	770.9	717.34	108.95

[x]46-0-0-0 price, Local Retailer, July 8, 2024 ($700/MT)
[y]28-0-0 price, Local Retailer, July 8, 2024 ($425 MT)
[z]2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Overall, no significant responses were observed at this location. Plant densities and grain quality were similar between the two treatments. While yield approached statistical significance (p = 0.0569), it did not reach significance due to variability. The 70% N at seeding + 30% in-crop treatment showed an average increase of 6.8 bu/ac, making it the most economical option.

To review footnote references please refer to overall trial summary on page 54.

This trial was conducted with the agronomic support of

TOMTENE SEED FARM J.V

TOP NOTCH FARMING RESEARCH TRIALS

Split N or Top-Up N Trial
(Craik)

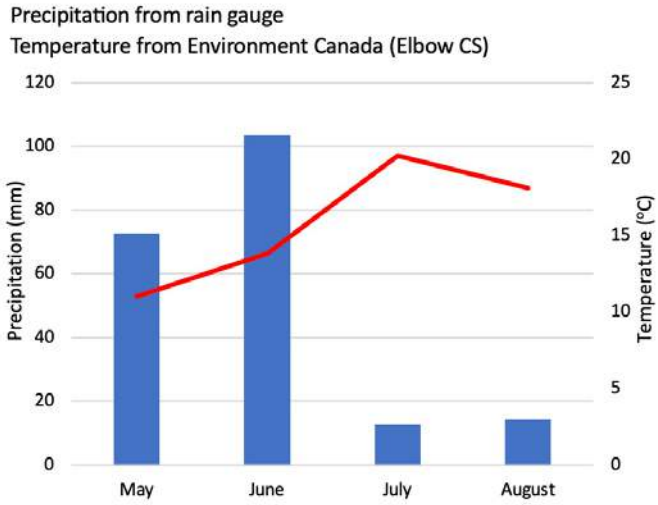
Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on canola yield, quality and economic return under various soil and weather conditions in Saskatchewan.

Treatment

Trt #	Description
1	100% N at seeding
2	70% N at seeding & 30% in-crop

General Trial Information

Variety	InVigor® L233
Thousand Kernel Weight	4.2 g
Seed Treatment	Lumiderm® + Helix Vibrance®
Previous Crop	Lentils
Soil Organic Matter	2.3%
Residual Nitrate- N **- 0-6”** **- 6-12”**	 40 lb/ac 138 lb/ac
Seeding Date	May 5
Seeding Rate	4 lb/ac
Seeding Equipment	Bourgault 3320 XTC
Seeding Depth	¾ - 1”
Seeding Speed	4.2 mph
Row Spacing	12”
Crop Protection	May 3 – Glyphosate May 28 – Liberty® June 9 – Liberty® July 4 – Quash® SC



Nitrogen Application

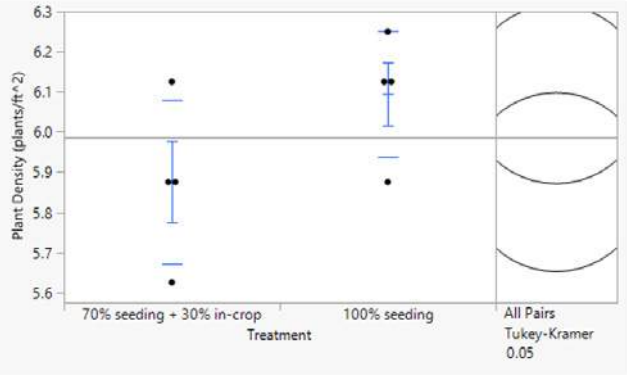
Seeding	
Product	Urea + ESN (50:50 blend)
Date	May 5
Time	Seeding
Placement	Mid-row
Form	Granular

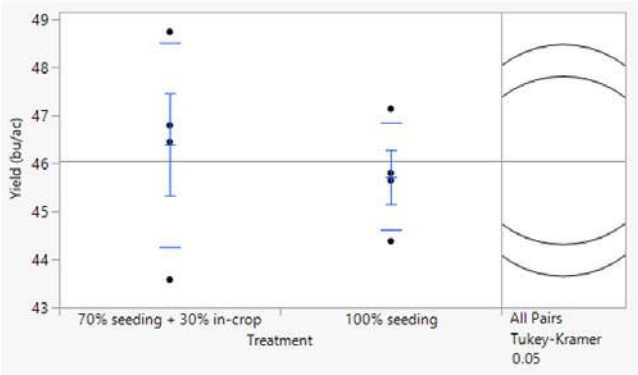
In-Crop	
Product	28-0-0 (UAN)
Date	June 12
Crop Stage	3-5 leaf
Water Volume	10 gal/ac
Application Rate	7 gal/ac
Speed	13 mph
Sprayer	Case 4430
Nozzles	SJ3-VR Streamjet

Nitrogen Application:	Fall		At Seeding							In Crop		Total Actual (lbs/ac)			
Treatments	46-0-0 (lb/ac)	Actual N	44-0-0 (lb/ac)	46-0-0 (lb/ac)	Actual N	MAP + MST (9-43-0-16S) (lb/ac)	Actual N (MAP + MST)	Actual P (MAP + MST)	Actual S (MAP + MST)	UAN (gal/ac)	Actual N	N	P	K	S
100% seeding	100	46	65	65	58.5	80	7	34	13	13	0	89	42	0	0
70% seeding + 30% in-crop	100	46	45	45	40.5	80	7	34	13	13	26	88	42	0	0

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
100% N at seeding	6.1	45.7	24.3	9.3	65.6	42.7	0.0
70% N at seeding + 30% in-crop	5.9	46.4	24.4	9.2	65.6	42.8	0.0
SE[1]	0.09111	0.85105	0.22115	0.0756	0.13492	0.36214	0.0135
p-value[2]	0.1405	0.6035	0.6485	0.3858	0.99	0.9627	0.537





Economics

Treatment	N at seeding (lb/ac)	N at seeding ($/ac)[x]	In-Crop N (gal/ac)	In-Crop N ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	130	46.9	0	0.00	46.88	45.7	16.06	733.9	687.06	0.00
70% N at seeding + 30% in crop	90	32.5	7.0	14.30	46.76	46.4	16.06	745.2	698.43	11.36

[x]44-0-0 & 46-0-0-0 price, Local Retailer, July 8, 2024 ($795/MT)
[y]28-0-0 price, Local Retailer, July 8, 2024 ($425 MT)
[z]2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

At this site, no significant differences were observed in plant density, yield, or grain quality due to the fertilizer treatments. Although not statistically significant, the combination of 70% N at seeding and 30% in-crop resulted in a 0.7 bu/ac increase, making it the most cost-effective option.

To review footnote references please refer to overall trial summary on page 54.

This trial was conducted with the agronomic support of

BRODERSON FARMS

TOP NOTCH FARMING RESEARCH TRIALS

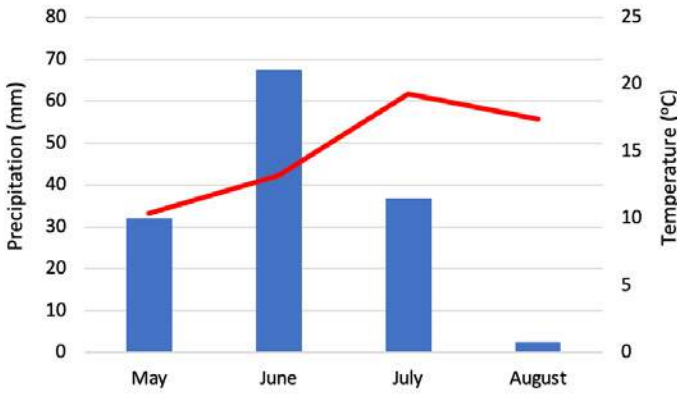
Split N or Top-Up N Trial
(Cut Knife)

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on canola yield, quality and economic return under various soil and weather conditions in Saskatchewan.

Treatment #	Description
1	100% N at seeding
2	70% N at seeding + 30% in-crop
3	100% N at seeding + additional in-crop

General Trial Information

Variety	L340PC
Thousand Kernel Weight	4.3 g
Germination	95%
Seed Treatment	Buteo®
Previous Crop	Spring Wheat
Soil Organic Matter	5.9%
Residual Nitrate-N	
- **0-6”**	31 lb/ac
- **6-12”**	69 lb/ac
Seeding Date	May 18
Seeding Rate	4.5 lbs/ac
Seeding Equipment	Bourgault
Seeding Depth	¾”
Seeding Speed	4.5 mph
Row Spacing	12”
Crop Protection	May 16: Glyphosate June 21: Liberty® September 2: Glyphosate



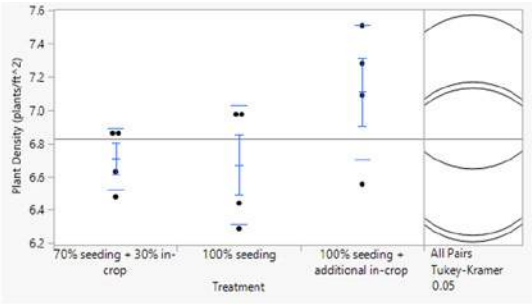
Nitrogen Application

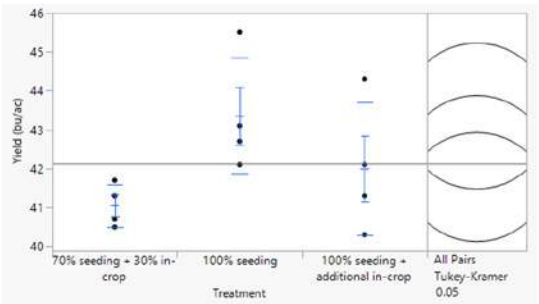
Seeding		In-Crop	
Product	28-0-0	Product	28-0-0
Date	May 18	Date	June 22
Placement	Sideband	Crop Stage	4-5 leaf
Water Volume	0 gal/ac	Water Volume	0 gal/ac
Application Rate	14 or 24 gal/ac	Application Rate	10 gal/ac
Form	Liquid	Speed	10 mph
		Sprayer	Case 4440
		Nozzles	stream

Nitrogen Application:	Fall Applied			At Seeding					In Crop		Total Actual			
	21-0-0-25 (lb/ac)	Actual N	Actual S	UAN (gal/ac)	Actual N	11-52 (lb/ac)	Actual N (11-52)	Actual P (11-52)	Actual UAN	Total N	N	P	K	S
100% seeding	115	25	29	24	72	80	9	42	0	0	106	42	0	29
70% seeding + 30% in-crop	115	25	29	14	42	80	9	42	10	30	106	42	0	29
100% seeding + add. in- crop	115	25	29	24	72	80	9	42	10	30	136	42	0	29

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
100% N at seeding	6.7	43.3	28.9	5.5	64.4	44.9	0.0
70% N at seeding + 30% in-crop	6.7	41.0	29.0	5.3	64.5	44.6	0.0
100% N at seeding + additional in-crop	7.1	42.0	28.9	5.6	64.7	45.0	0.0
SE[1]	0.16526	0.67359	0.55148	0.10096	0.15703	0.51275	0
p-value[2]	0.2011	0.0891	0.9965	0.1445	0.4101	0.8128	NA





Economics

	N at seeding (gal/ac)	N at seeding ($/ac)[y]	In-Crop N (gal/ac)	In-Crop N ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	24	49.04	0	0	49.04	43.3	16.06	695.4	646.36	0.00
70% N at seeding + 30% in-crop	14	28.61	10	20.4	49.04	41.0	16.06	658.5	609.42	-36.94
100% N at seeding + additional in-crop	24	49.04	10	20.4	69.48	42.0	16.06	674.5	605.04	-41.31

[x]46y28-0-0 price, Local Retailer, July 8, 2024 ($425 MT)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

There were no significant differences between treatments. Plant density and grain quality were similar across all treatments. Although not statistically significant, the 100% nitrogen (N) at seeding produced the highest average yield, with increases of 1.4 and 2.3 bu/ac compared to 100% N at seeding + additional in-crop and 70% N at seeding + 30% in-crop, respectively. Considering both fertilizer costs and yield, 100% N at seeding provided the greatest return.

To review footnote references please refer to overall trial summary on page 54.

This trial was conducted with the agronomic support of

Western Applied Research Corporation WARC Research from our farm to yours

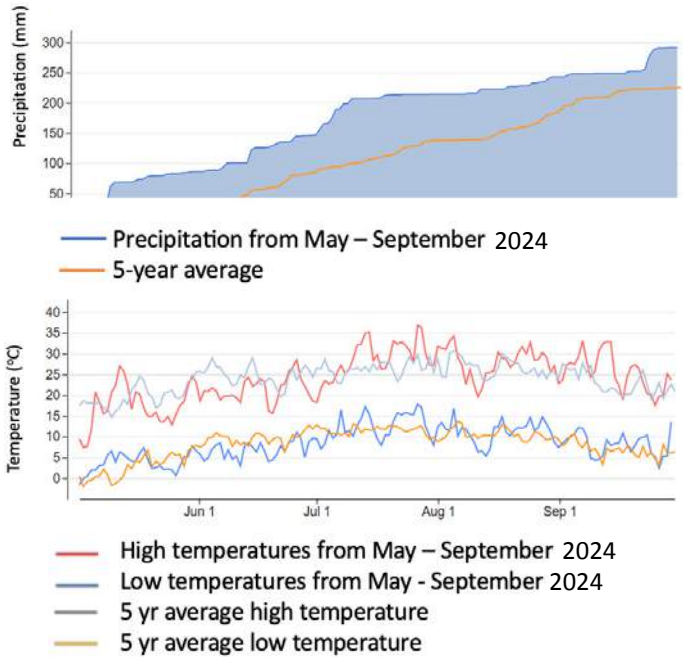
TOP NOTCH FARMING RESEARCH TRIALS

Split N or Top-Up N Trial
(Marquis)

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on canola yield, quality and economic return under various soil and weather conditions in Saskatchewan.

Trt #	Description
1	100% N at seeding
2	70% N at seeding & 30% in-crop

Weather from local station



General Trial Information

Variety	InVigor® L358HPC
Thousand Kernel Weight	4.8 g
Seed Treatment	Helix Vibrance® + Lumiderm®
Previous Crop	Peas
Soil Organic Matter	3.7%
Residual Nitrate- N **- 0-6”** **- 6-12”**	 18 lb/ac 6 lb/ac
Seeding Date	May 13
Seeding Rate	4.7 lb/ac
Seeding Equipment	Bourgault 5710 hoe drill
Seeding Depth	¾”
Seeding Speed	4.8 mph
Row Spacing	10”
Crop Protection	May 10 – Certitude® + Glyphosate June 15 – Liberty® + Centurion® July 8 – Cotegra®

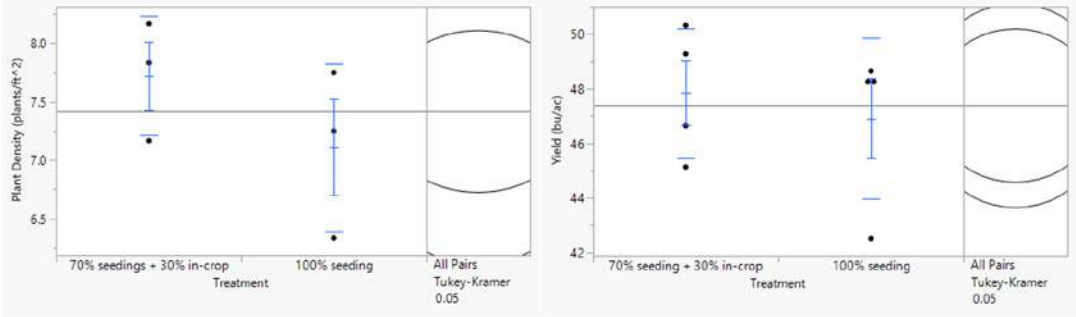
Nitrogen Application

Seeding		In-Crop	
Product	46-0-0	Product	28-0-0 (UAN)
Date	May 13	Date	June 25
Time	Seeding	Crop Stage	5-6 leaf
Placement	Midrow banded	Water Volume	92.5 US gal/ac
Form	Granular	Speed	9.5 mph
		Sprayer	Patriot® (Case IH) 4420
		Nozzles	SJ3-08 TeeJet® Streamer

Nitrogen Application:	At Seeding						In Crop		Total Actual (lbs/ac)			
Treatments:	46-0-0 (lb/ac)	Actual N (46-0)	13-33-0-15S (lb/ac)	Actual N (13-33-0-15S)	Actual P (13-33-0-15S)	Actual S (13-33-0-15S)	UAN (gal/ac)	Total N	N	P	K	S
100% seeding	114	52	100	13	33	15	0	0	65	42	0	0
70% seeding + 30% in-crop	84	39	100	13	33	15	9.9	30	81	42	0	0

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
100% N at seeding	7.1	46.9	22.0	4.1	66.4	50.9	0.0
70% N at seeding + 30% in-crop	7.7	47.8	22.0	4.0	66.7	50.6	0.0
SE[1]	0.3595	1.339	0.18085	0.13137	0.1134	0.2381	0.0084
p-value[2]	0.2957	0.6419	0.8515	0.7004	0.0685	0.4655	0.3559



Economics

Treatment	N at seeding (lb/ac)	N at seeding ($/ac)[x]	In-Crop N (gal/ac)	In-Crop N ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	114	36.2	0	0.00	36.20	46.9	16.06	753.4	717.19	0.00
70% N at seeding + 30% in crop	84	26.7	9.9	20.23	46.90	47.8	16.06	768.3	721.38	4.18

[x]46-0-0-0 price, Local Retailer, July 8, 2024 ($700/MT)
[y]28-0-0 price, Local Retailer, July 8, 2024 ($425 MT)
[z]2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

At this location, no significant trends were seen between treatments. While not significant, on average, 70% N at seeding +30% in-crop resulted in higher yields, therefore, making it more economical. It should also be noted that N is not balanced, with 70% N at seeding + 30% in-crop having 16 lb/ac more Nitrogen than 100% N at seeding.

To review footnote references please refer to overall trial summary on page 54.

This trial was conducted with the agronomic support of Cargill

TOP NOTCH
FARMING
RESEARCH TRIALS
Brought to you by SaskOilseeds

Enhanced Efficiency Nitrogen Fertilizer Trial

Nitrogen (N) is one of the most important nutrients for canola production in Saskatchewan. Producers have been challenged with maximizing nitrogen use efficiency while increasing yield and quality due to high fertilizer prices and government/societal pressure to minimize greenhouse gas emissions. As part of a nitrogen management plan producers have included the use of enhanced efficiency nitrogen fertilizer (EENF) products including urease inhibitors, nitrification inhibitors and controlled release nitrogen or combination products. These products have the potential to reduce nutrient loss and increase N fertilizer efficiency. Producers are interested in using an EENF to sustain or increase yield and quality on their farm but are unsure of the best practices for their growing conditions and operation and whether it is economical.

Objective

To examine different ratios or proportions of treated and untreated N fertilizer using an EENF product of choice, compared to 100% untreated N fertilizer, on canola establishment, yield, and quality under various management, soil, and weather conditions in Saskatchewan.

Treatments

1)	100% untreated N fertilizer
2)	25% treated with EENF product + 75% untreated N fertilizer
3)	50% treated + 50% untreated

Trials were set up in randomized strips with four replications, for a total of 12 plots. All plots were managed the same agronomically, besides N fertility, including seeding date, variety, seeding depth, seed treatment, and pesticide application.

Data Collection

- Spring soil samples were collected at each trial site prior to seeding and fertilizer application to assess residual soil nutrient levels at 0-6" and 6-24" depths.
- Plant density was conducted at the 2-4 leaf stage.
- The following management and agronomic data were recorded precisely:
  - Fertilizer products, rates, placement, timing
  - Equipment type, opener, and row spacing
  - Canola variety, TSW and seeding rate
  - Crop protection: seed treatment, pesticide applications
  - Previous crop and residue accumulation
  - General notes on weed, insect, disease infestations, and notable weather events
- Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale
- Grain samples were collected from each plot separately for grain quality analysis.

The follow footnotes will be referred to for the combined and individual site reports for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

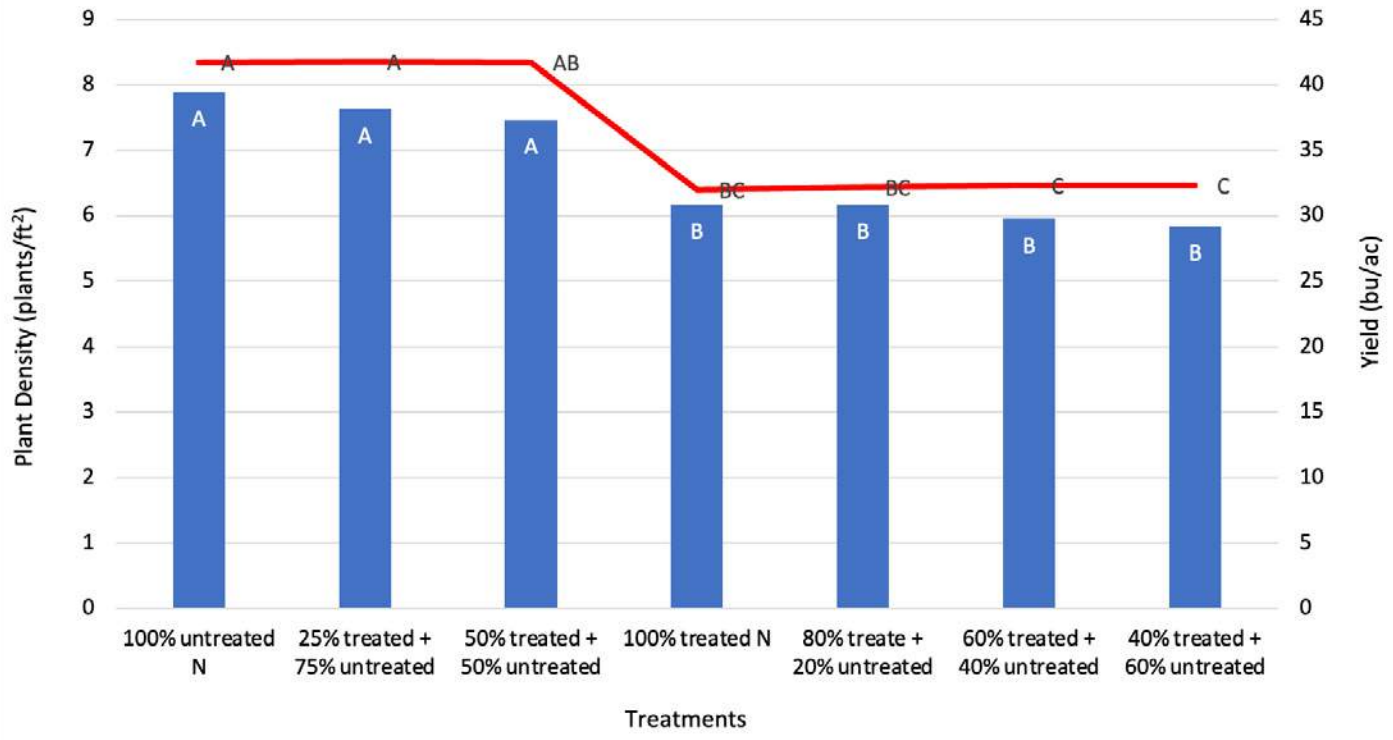
[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate nested in location and considered a random effect and fertilizer treatment considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$.

[3]SE was not recorded as the sample sizes are unequal and therefore standard error was different for each sample size

2024 Combined Results (3 sites)

When all three sites were combined, there were significant trends. These trends may be more attributed to location then treatments, such that two locations conducted the same three treatments, whereas the third location chose different treatments. Economically, due to the increase in costs for the treated fertilizer, the 100% untreated nitrogen resulted in the highest net profit (not shown). Overall, TKW, TW, protein, oil and green seed were consistent across sites and treatments, with 0.03% being the highest green seed seen, well below requirements for No. 1 grade.

Treatment[3]	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Protein (%)	Oil (%)	Green Seed (%)
100% untreated N	7.9 A	41.7 A	4.2	66.0 A	22.5	48.8	0.00 B
25% treated + 75% untreated	7.6 A	41.8 A	4.1	66.0 A	22.0	49.1	0.00 B
50% treated + 50% untreated	7.5 AB	41.7 A	4.3	66.0 A	22.6	48.2	0.00 B
100% treated N	6.2 BC	32.0 B	5.2	63.2 B	23.5	47.4	0.03 A
80% treated + 20% untreated	6.2 BC	32.2 B	5.1	64.2 B	23.6	47.3	0.00 B
60% treated + 40% untreated	5.9 C	32.3 B	5.3	62.9 B	23.7	48.0	0.00 B
40% treated + 60% untreated	5.8 C	32.3 B	5.1	63.0 B	23.7	47.1	0.00 B
p-value[2]	**0.0043**	**0.0022**	**0.0002**	**<.0001**	0.4712	0.515	**<.0001**



TOP NOTCH FARMING RESEARCH TRIALS

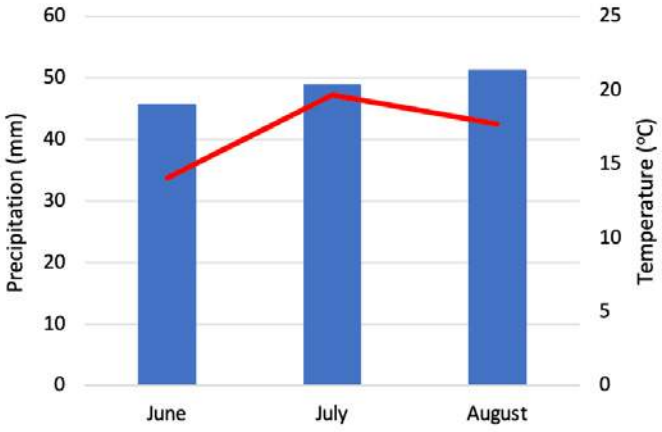
Canola Enhanced Efficiency Nitrogen Fertilizer (EENF)
(Lone Rock)

Objective: To examine different ratios or proportions of treated and untreated N fertilizer using an EENF product of choice, compared to 100% untreated N fertilizer, on canola establishment, yield, and quality under various management, soil, and weather conditions in Saskatchewan.

Treatment #	Description
1	100% untreated N fertilizer
2	25% treated with EENF product: 75% untreated N fertilizer
3	50% treated with EENF product: 50% untreated N fertilizer

General Trial Information	
Variety	P515G
Thousand Kernel Weight	5.3 g
Germination	95%
Seed Treatment	Lumiscend®, Lumiderm®
Previous Crop	Wheat
Soil Organic Matter	4.4%
Residual Nitrate-N - **0-6”** - **6-20”**	 32 lb/ac 26 lb/ac
Soil Texture	Fine
Seeding Date	May 26
Seeding Rate	5 lb
Seeding Equipment	Bourgault, knife opener
Seeding Depth	½”
Seeding Speed	4 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	126-37-0-28
Crop Protection	May 22: Transorb® + Prospect® June 23: Transorb®

Weather from local station



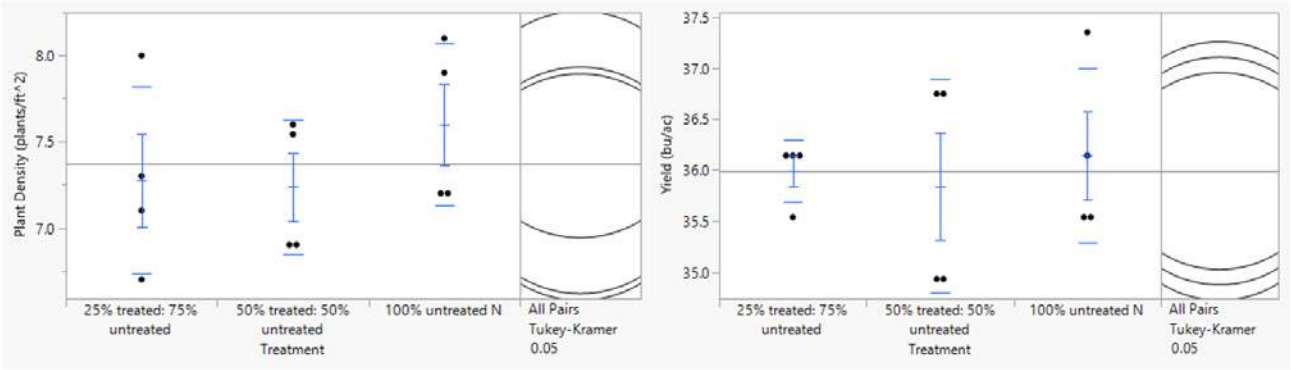
Economics

Treatment	Untreated N Rate (lb/ac)	Untreated N Cost ($/ac)[x]	Treated N Rate (lb/ac)	Treated N Cost ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – 100% untreated N fertilizer	126.0	40.01	0	0.00	40.01	36.1	16.06	580.5	540.48	0.00
Trt 2 – 25% treated + 75% untreated	31.5	10.00	94.50	38.15	48.15	36.0	16.06	578.1	529.91	-10.56
Trt 3 – 50% treated + 50% untreated	62.5	19.84	62.50	25.23	45.08	35.8	16.06	575.6	530.57	-9.91

[x]Untreated N price, Local Retailer, July 8, 2024 ($700/MT)
[y]Treated N price, Local Retailer, July 8, 2024 ($890/MT)
[z]2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Trt 1 – 100% untreated N fertilizer	7.6	36.1	22.9	4.0	65.4	46.4	0.0
Trt 2 – 25% treated + 75% untreated	7.3	36.0	22.5	4.0	65.3	47.0	0.0
Trt 3 – 50% treated + 50% untreated	7.2	35.8	23.8	4.1	65.5	45.1	0.0
SE[1]	0.2357	0.39846	0.46628	0.0791	0.08586	0.6669	0
p-value[2]	0.5417	0.8567	0.19	0.6955	0.4314	0.1708	NA



Overall, no significant differences were observed between treated and untreated fertilizers. The 100% untreated nitrogen (N) treatment showed a slight increase in yield, ranging from 0.1 to 0.3 bushels per acre (bu/ac), compared to the other treatments. Given the lower cost of untreated N, this option would be the most economical. Additionally, grain quality analysis revealed no substantial variation across the different treatments.

To review footnote references please refer to overall trial summary on page 64.

This trial was conducted with the agronomic support of SWATMAPS

TOP NOTCH FARMING RESEARCH TRIALS

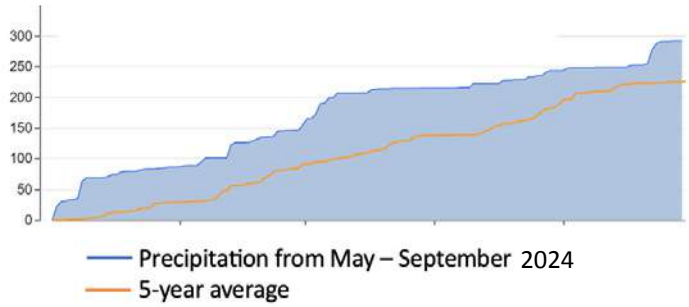
Canola Enhanced Efficiency Nitrogen Fertilizer (EENF)
(Marquis)

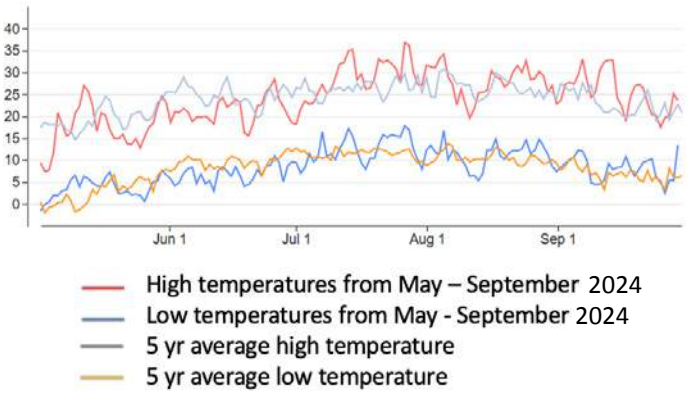
Objective: To examine different ratios or proportions of treated and untreated N fertilizer using an EENF product of choice, compared to 100% untreated N fertilizer, on canola establishment, yield, and quality under various management, soil, and weather conditions in Saskatchewan.

Treatment #	Description
1	100% untreated N fertilizer
2	25% treated with EENF product: 75% untreated N fertilizer
3	50% treated with EENF product: 50% untreated N fertilizer

General Trial Information	
Variety	InVigor® L358HPC
Thousand Kernel Weight	4.8 g
Seed Treatment	Helix Vibrance® & Lumiderm®
Previous Crop	Peas
Soil Organic Matter	3.9%
Residual Nitrate-N - **0-6”** - **6-20”**	 15 lb/ac 17 lb/ac
Seeding Date	May 13
Seeding Rate	4.7 lb/ac
Seeding Equipment	Bourgault 5710 47’
Seeding Depth	¾”
Seeding Speed	4.8 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	114-33-0-15
Crop Protection	May 10: Certitude® + Glyphosate June 15: Liberty® + Centurion® July 8: Cotegra®

Weather from local station





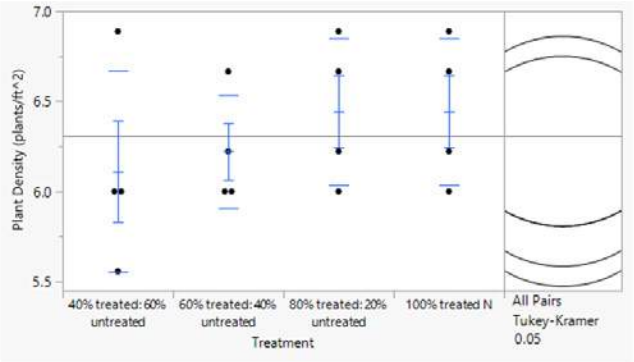
Economics

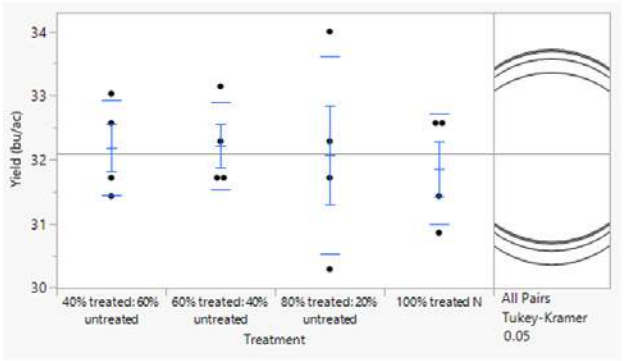
Treatment	Untreated N Rate (lb/ac)	Untreated N Cost ($/ac)[x]	Treated N Rate (lb/ac)	Treated N Cost ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – 100% untreated N fertilizer	114	36.20	0	0.00	36.20	46.3	16.06	744.0	707.78	0.00
Trt 2 – 25% treated + 75% untreated	85.5	27.15	28.5	11.51	38.65	46.6	16.06	748.0	709.34	1.56
Trt 3 – 50% treated + 50% untreated	57	18.10	57	23.01	41.11	46.6	16.06	748.0	706.89	-0.90

[x]Untreated N price, Local Retailer, July 8, 2024 ($700/MT)
[y]Treated N price, Local Retailer, July 8, 2024 ($890/MT)
[z]2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Trt 1 – 100% untreated N fertilizer	8.1	46.3	21.5	4.7	66.5	50.5	0.0
Trt 2 – 25% treated + 75% untreated	7.9	46.6	21.1	4.6	66.6	50.6	0.0
Trt 3 – 50% treated + 50% untreated	7.6	46.6	20.9	5.1	66.6	50.5	0.0
SE[1]	0.33	0.951	0.237	0.4542	0.0919	0.2792	0
p-value[2]	0.584	0.9812	0.1848	0.2822	0.7414	0.9734	NA





Overall, no significant trends were observed at this location. Plant densities, yield, and grain quality were comparable across treatments. Given the lack of significant differences in yield averages, and considering the lower fertilizer costs, 25% treated + 75% untreated emerged as the most economical option.

To review footnote references please refer to overall trial summary on page 64.

This trial was conducted with the agronomic support of

Cargill™

TOP NOTCH FARMING RESEARCH TRIALS

Enhanced Efficiency Nitrogen Fertilizer (EENF)
(Wynyard)

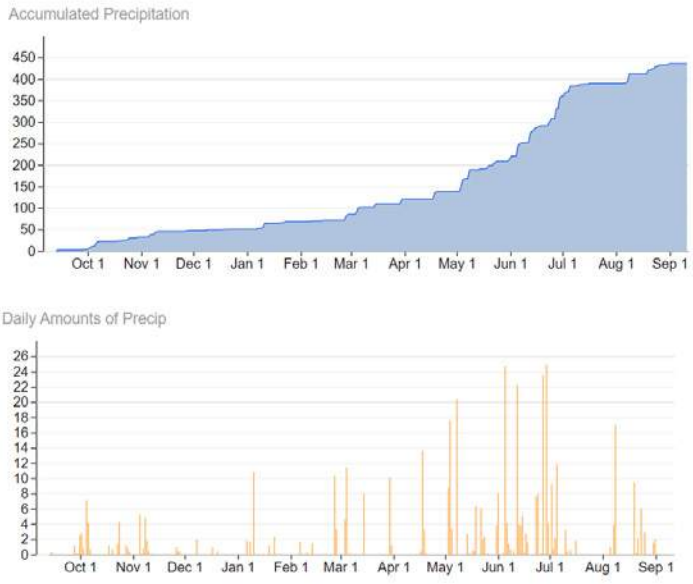
Objective: To examine different ratios or proportions of treated and untreated N fertilizer using an EENF product of choice, compared to 100% untreated N fertilizer, on canola establishment, yield, and quality under various management, soil, and weather conditions in Saskatchewan.

Treatment #	Description
1	100% treated N fertilizer
2	80% treated with EENF product + 20% untreated N fertilizer
3	60% treated with EENF product + 40% untreated N fertilizer
4	40% treated with EENF product + 60% untreated N fertilizer

General Trial Information

Variety	V25-3T
Thousand Kernel Weight	5.32 g
Seed Treatment	Prosper Evergol®/Buteo®
Previous Crop	Wheat
Soil Organic Matter	5.9%
Residual Nitrate-N - **0-6”** - **6-20”**	 6 lb/ac 15 lb/ac
Soil Texture	Medium
Seeding Date	May 14
Seeding Rate	4.1 lb/ac
Seeding Equipment	Seed Master
Seeding Depth	¾”
Seeding Speed	3.5-4.9 mph
Row Spacing	13.5”
Total Applied Fertilizer (lbs/ac N-P-K-S)	110-50-0-23
Crop Protection	May 10: Prospect® + Glyphosate June 3: Glyphosate July 10: Proline Gold® August 24: Swathed

Weather from local station



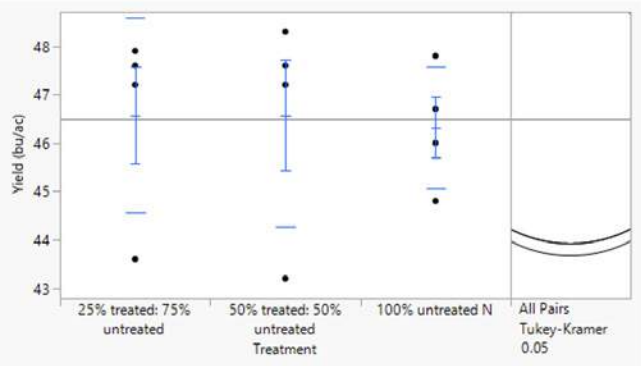
Economics

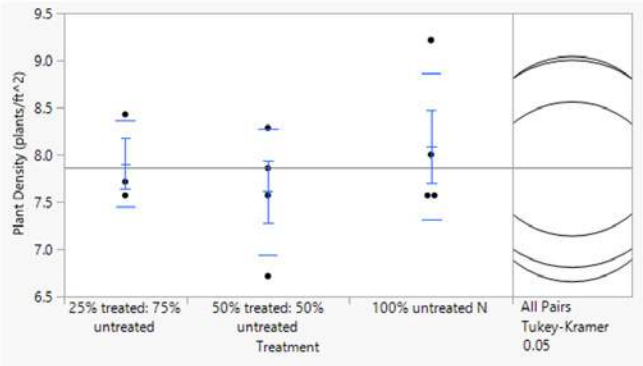
Treatment	Untreated N Rate (lb/ac)	Untreated N Cost ($/ac)[x]	Treated N Rate (lb/ac)	Treated N Cost ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – 100% treatedN	0	0.00	110	44.41	44.41	31.9	16.06	511.6	467.22	0.00
Trt 2 – 80% treated + 20% untreated	22	6.99	88	35.53	42.51	32.1	16.06	515.1	472.56	5.34
Trt 3 – 60% treated + 40% untreated	44	13.97	66	26.64	40.61	32.2	16.06	517.4	476.75	9.53
Trt 4 – 40% treated + 60% untreated	*66*	*20.96*	*44*	*17.76*	*38.72*	*32.2*	*16.06*	*516.9*	*478.18*	*10.96*

[x]Untreated N price, Local Retailer, July 8, 2024 ($700/MT)
[y]Treated N price, Local Retailer, July 8, 2024 ($890/MT)
[z]2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results

Treatment	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Trt 1 – 100% treated N	6.4	31.9	23.2	5.6	62.8	47.0	0.0
Trt 2 – 80% treated + 20% untreated	6.4	32.1	23.3	5.5	63.8	46.9	0.0
Trt 3 – 60% treated + 40% untreated	6.2	32.2	23.4	5.7	62.6	47.6	0.0
Trt 4 – 40% treated + 60% untreated	6.1	32.2	23.4	5.5	62.6	46.7	0.0
SE[1]	0.32381	0.50637	0.5385	0.2809	1.13	0.5232	0.0072
p-value[2]	0.5144	0.957	0.9066	0.7993	0.2315	0.1487	0.12





Overall, no significant trends were seen at this site. Plant densities were all relatively similarly throughout treatments. There was an a 0.3 bu/ac increase between treatments, therefore, based on averages, 40% treated: 60% untreated resulted in the greatest economics, due to the lesser cost of the treated fertilizer.

To review footnote references please refer to overall trial summary on page 64.

This trial was conducted with the agronomic support of

Cargill

TOP NOTCH FARMING RESEARCH TRIALS

Canola Seeding Rate and Survivability

Canola farmers are challenged with the rising cost of inputs, with seed cost comprising one of the most significant expenses. Recommendations have been updated over the years to use the seed size (thousand seed weight, TSW) of canola seed lots to adjust seeding rates with the aim of achieving the optimal plant density for maximized productivity. Seeding rate tools have been developed to help with this calculation. The calculation includes an adjustment for estimated survivability, which is the proportion of seeds that emerge and develop to maturity. It is recommended to factor 60% survivability of canola seed; however, producer experience and previous research have shown this value can range widely. Survivability can depend on many factors including soil and weather conditions, equipment, and management practices which vary by field and farm. Thus, uncertainty remains in the estimation of survivability in consideration of these factors, and so we may be missing the mark when calculating optimal seeding rates to achieve agronomic and economic goals.

Objective

To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Treatments

1) 6-7 seeds per sq. ft
2) 8-9 seeds per sq. ft
3) 10-11 seeds per sq. ft

Terminology

Treatments: actual seeding rates applied by the producer at time of seeding

Density Groups: grouped according to plant counts conducted in the field

Seeding rates were calculated using the TSW of the canola seed lot for each trial individually, accounting for a 100% survivability. Trials were set up in randomized strips with four replications, for a total of 12 plots. All plots were managed the same agronomically, besides seeding rate, including seeding date, variety, seeding depth, seed treatment, fertility and pesticide application.

Data Collection

- Spring soil samples were collected at each trial site prior to seeding and fertilizer application to assess residual soil nutrient levels at 0-6″ and 6-24″ depths.
- Plant density was conducted at 2 weeks after seeding, 2-4 leaf stage and post harvest.
- The following management and agronomic data were recorded precisely:
  - Fertilizer products, rates, placement, timing
  - Equipment type, opener, and row spacing
  - Canola variety, TSW and seeding rate
  - Crop protection: seed treatment, pesticide applications
  - Previous crop and residue accumulation
  - General notes on weed, insect, disease infestations, and notable weather events
- Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale
- Grain samples were collected from each plot separately for grain quality analysis.

The follow footnotes will be referred to for the combined and individual site reports for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

[2]The data was analyzed using an ANOVA Mixed Model in JMP, where locations were grouped based on their response to seeding densities. Replication was nested in location and treated as a random effect. The treatments were classified as a fixed effect. Means were separated using Tukey's at significance level of 0.05. Distribution was tested for normality, to meet assumptions of ANOVA, transformations were used. Variance was tested for equality. Means were separated using Tukey's at significance level of 0.05 and significant trends at 0.01 will also be discussed.

[3]SE was not record as the sample sizes are unequal and therefore standard error was different for each sample size

[4]In order to analysis the combined data, there needed to be a grouping among seeding rates as all of the locations slightly modified the rates to fit their farm. Therefore, the very low seeding rate is seeding rates 4 pl/ft^2 and under, low is 5 - 7 pl/ft^2, medium is 8-9 pl/ft^2, high is 10-12 pl/ft^2, very high is 13 pl/ft^2 or greater.

2024 Combined Data (8 sites)

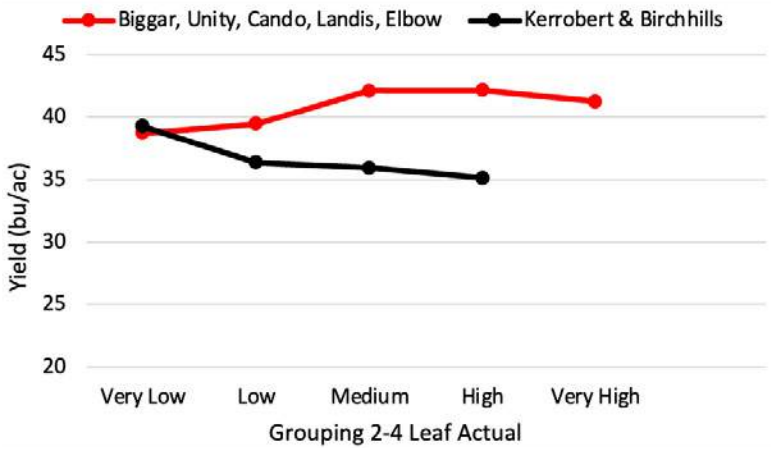
Eight locations across Saskatchewan participated in a canola seeding rate and survivability study. Due to varying seeding rates and variability, density groups at the 2-4 leaf stage were used for the combined analysis. Group 1 included the locations of Biggar, Unity, Cando, Landis, and Elbow, which were grouped together because yield increased with higher seeding rates. Notably, the highest yields were achieved at medium-high (8-12 plants/ft^2) densities. In contrast, Group 2, consisting of Birch Hills and Kerrobert, showed a significant linear regression (p=0.02) where yield decreased with increased seeding rates. The lowest plant densities yielded the highest at these two locations. Both groups exhibited significant effects at the 2-4 leaf stage and with stubble density, as both plant and stubble density increased across the groupings. Group 2 showed no significant differences in grain quality, while Group 1 demonstrated significant trends in thousand kernel weight (TKW) and oil content.

Group 1 consisting of Biggar, Unity, Cando, Landis and Elbow.

Density Group[3,4]	2 – 4 Leaf Plant Density (plants/ft^2)	Stubble Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Very Low	4.2 E	5.0 D	38.7	24.9	4.1 ABC	64.5	46.9 AB	0.006
Low	6.3 D	5.5 D	39.5	24.5	4.2 AB	64.2	46.1 A	0.008
Medium	8.1 C	7.7 C	42.1	24.6	4.3 A	64.4	45.7 AB	0.002
High	10.7 B	9.4 B	42.2	24.6	3.9 BC	64.9	43.9 B	0.012
Very High	13.2 A	11.5 A	41.3	24.6	3.6 C	65.1	43.7 AB	0.002
p-value[2]	**<0.0001**	**<0.0001**	0.0908	0.9853	**0.0025**	0.3335	**0.0295**	0.8701

Group 2 consisting of Birch Hills and Kerrobert

Density Group[3,4]	2 – 4 Leaf Plant Density (plants/ft^2)	Stubble Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Very Low	3.8 C	4.1 C	39.3	21.9	4.1	65.1	49.7	0.00
Low	5.7 B	6.2 B	36.4	22.6	4.3	65.0	49.1	0.00
Medium	8.5 A	8.0 A	35.9	24.2	4.4	64.7	48.2	0.00
High	9.7 A	9.6 AB	35.1	23.7	4.2	65.2	48.3	0.00
p-value[2]	**<0.0001**	**0.0021**	0.8654	0.1763	0.1189	0.1642	0.4963	1



Shows the generalized trends of yield in response to increased plant densities. Group 1 yield increased as plant densities increased while Group 2 yield decreased as plant densities increased.

TOP NOTCH FARMING RESEARCH TRIALS

Canola Seeding Rate and Survivability

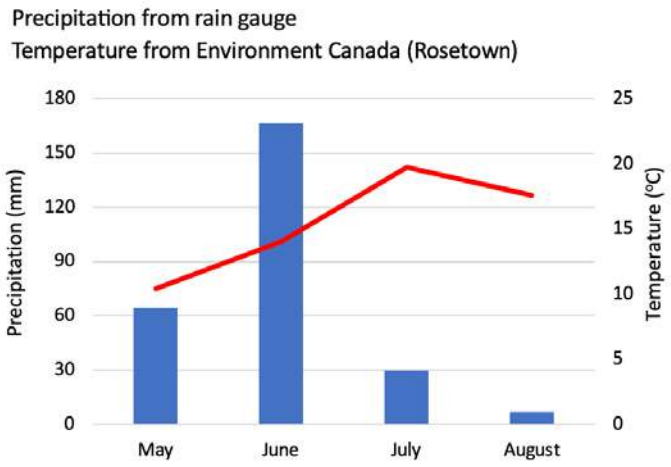
(Biggar)

Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	6 seeds/ft^2	3.2
2	8 seeds/ft^2	4.3
3	10 seeds/ft^2	5.4

General Trial Information:

Variety	345LP
TSW	5.6 g
Seed Treatment	Helix Vibrance®
Previous Crop	Lentils
Soil Organic Matter	6.0%
Residual Nitrate-N (0-6")	52 lb/ac
Soil Texture	Medium
Seeding Date	May 22
Soil Temperature	13°C
Seeding Equipment	Vaderstad®
Seeding Depth	1 ¼"
Seeding Speed	5 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	103 – 39 – 0 – 20
Crop Protection	May 18 – Glyphosate + Emphasis® June 20 – Liberty® + Arrow All In® September 6 – Glyphosate



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 1 (6 seeds/ft^2) resulted in the greatest return.

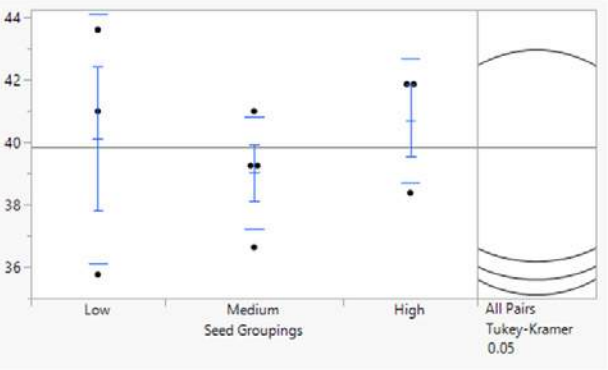
Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	3.2	54.43	5.76	60.19	40.1	16.06	644.36	584.17	0.00
2	4.3	73.14	7.74	80.88	39.0	16.06	626.85	545.97	-38.20
3	5.4	91.85	9.72	101.57	40.7	16.06	653.69	552.12	-32.05

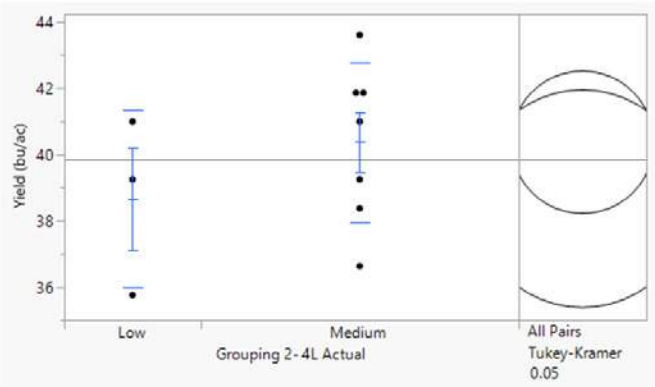
x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results:

Treatment	2 Weeks after Seeding (WAS)		2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 6 seeds/ft² (Low)	5.8 C	6.3	6.2 C	1.8 B	6.9 B	0.0
Trt 2 – 8 seeds/ft² (Medium)	7.2 B	10.0	7.5 B	5.8 AB	7.9 AB	4.7
Trt 3 – 10 seeds/ft² (High)	8.8 A	11.8	8.6 A	13.7 A	9.1 A	8.7
SE[1]	0.33919	3.5361	0.24219	2.16	0.34805	2.5704
p-value[3]	**0.0004**	0.5315	**0.0001**	**0.0095**	**0.0037**	0.0923

The target seeding rates resulted in significant differences in plant densities at 2 weeks after seeding, 2-4 leaf stage and post harvest, along with seedling mortality at the 2-4 leaf stage. However, plant densities and stubble counts were lower than the targeted rate. Since plant densities were lower, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield.





The data presented below is based on actual plant densities collected from the field at the 2-4 leaf stage. Densities counts at the 2-4 leaf stage and post harvest were significantly different. Otherwise, these were the only factors that had statically significant differences. However, there are general trends that can be discussed. In general, yield tended to peak at the medium (8-9 plants/ft²). Grain quality was similar between density groups.

Density Group[3,4]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Low	6.2 B	6.6 B	38.7	23.6	5.0	64.5	48.1	0.0
Medium	8.1 A	8.6 A	40.4	23.2	5.0	64.4	48.4	0.0
p-value[2]	**0.0016**	**0.0003**	0.3468	0.5325	0.9241	0.3354	0.5547	0.1000

To review footnote references please refer to overall trial summary on page 72.

This trial was conducted with the agronomic support of

Hoppe Agronomy

TOP NOTCH FARMING RESEARCH TRIALS

Canola Seeding Rate and Survivability

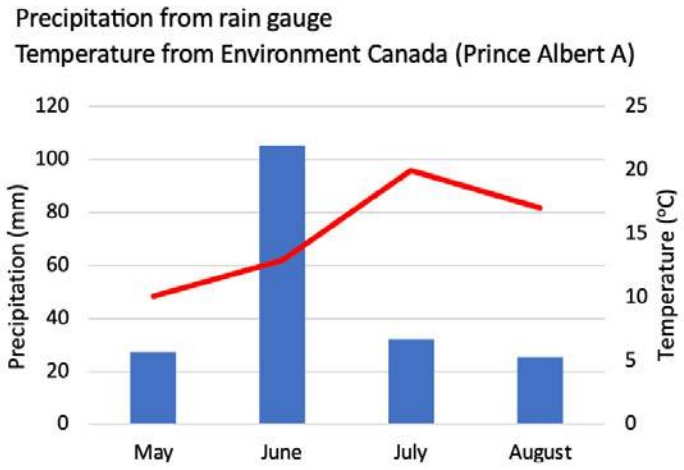
(Birch Hills)

Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	6 seeds/ft^2	3.0
2	8 seeds/ft^2	4.0
3	11 seeds/ft^2	5.0

General Trial Information:

Variety	L358HPC
TSW	4.9 g
Seed Treatment	Buteo Start®
Previous Crop	Wheat
Soil Organic Matter	4.9%
Residual Nitrate-N (0-6")	11 lb/ac
Soil Texture	Medium
Seeding Date	May 29
Soil Temperature	13°C
Seeding Equipment	JD P680 drill with C850 tank
Seeding Depth	½"
Seeding Speed	5.5 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	89 – 26 – 0 – 12
Crop Protection	May 27 – Glyphosate June 20 – Liberty® + Clethodim July 3 – Liberty® + Clethodim July 17 – Lance® AG



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 1 (6 seeds/ft^2) resulted in the greatest return.

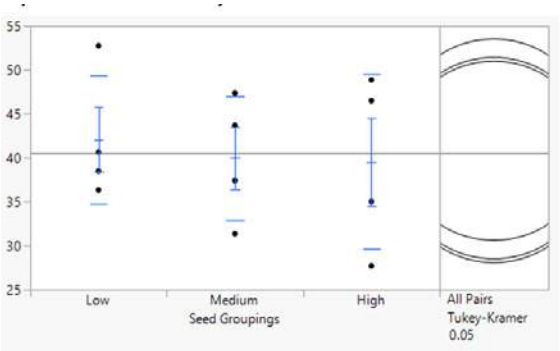
Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	3.0	51.03	5.40	56.43	42.1	16.06	675.39	618.96	0.00
2	4.0	68.04	7.20	75.24	39.9	16.06	640.79	565.55	-53.40
3	5.0	85.05	9.00	94.05	39.5	16.06	634.37	540.32	-78.64

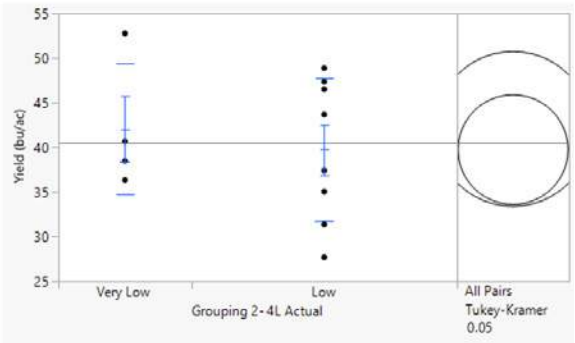
x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results:

Treatment	2 Weeks after Seeding (WAS)		2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 6 seeds/ft² (Low)	4.8 B	20.3 B	3.8 C	37.1 B	3.7 C	38.5 B
Trt 2 – 8 seeds/ft² (Medium)	5.6 B	29.7 AB	4.8 B	39.4 AB	4.9 B	39.1 B
Trt 3 – 11 seeds/ft² (High)	7.3 A	34.1 A	6.1 A	44.5 A	6.0 A	45.5 A
SE[1]	0.21415	3.421	0.117	1.545	0.104	1.28
P-value[3]	**<0.0001**	**0.0455**	**<.0001**	**0.0204**	**<.0001**	**0.0098**

The target seeding rates resulted in significant differences in plant densities at 2 weeks after seeding, 2 – 4 leaf stage and post harvest, along with seedling mortality at all three timings. However, plant densities and stubble counts were much lower than the targeted rate. Since plant densities were much lower, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield.





The data presented below is based on actual plant densities collected from the field at the 2 – 4 leaf stage. Density counts at the 2-4 leaf stage and post harvest were significantly different. Overall, those were the only factors that had statically significant differences. However, there are general trends that can be discussed. In general, yield was highest at the very low grouping (</= 4 plants/ft2) and decreased at the low plant density. Grain quality was similar between density groups.

Density Group[3]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Very Low	3.8 B	3.7 B	42.1	19.9	4.2	64.5	51.3	0.0
Low	5.5 A	5.4 A	39.7	19.9	4.4	64.5	51.2	0.0
p-value[2]	**0.001**	**0.0004**	0.6369	0.9312	0.0549	0.9117	0.7935	0.1

To review footnote references please refer to overall trial summary on page 72.

TOP NOTCH FARMING RESEARCH TRIALS

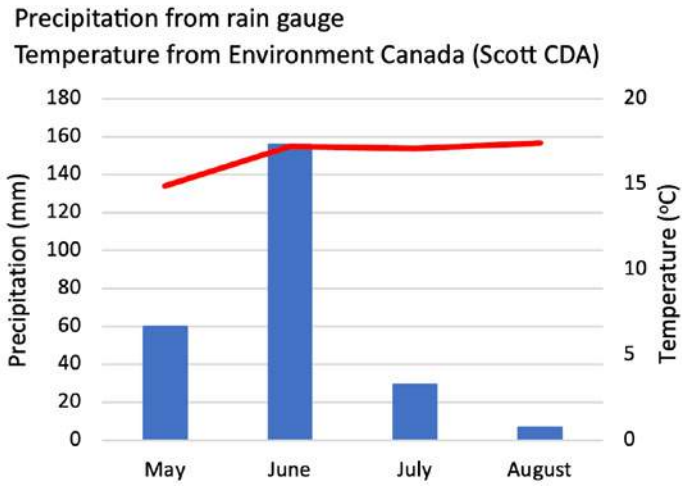
Canola Seeding Rate and Survivability
(Cando)

Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	7 seeds/ft^2	3.3
2	9 seeds/ft^2	4.2
3	11 seeds/ft^2	5.2

General Trial Information:

Variety	InVigor 340
TSW	4.9 g
Seed Treatment	Helix Vibrance® + Buteo®
Previous Crop	Wheat
Soil Organic Matter	5.0%
Residual Nitrate-N (0-6")	12 lb/ac
Soil Texture	Medium
Seeding Date	May 13
Soil Temperature	10°C
Seeding Equipment	Vaderstad®
Seeding Depth	1"
Seeding Speed	4.5 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	99 – 45 – 15 – 33
Crop Protection	May 11 – Glyphosate + Conquer® June 18 – Liberty® + Centurion® September 1 - Glyphosate



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 2 (9 seeds/ft^2) resulted in the greatest return.

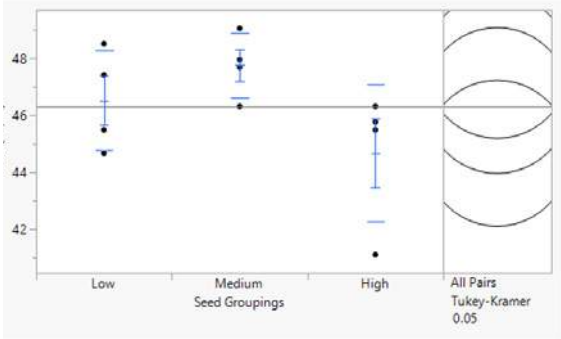
Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	3.3	56.13	5.94	62.07	46.5	16.06	746.79	684.72	0.00
2	4.2	71.44	7.56	79.00	47.7	16.06	766.70	687.70	2.99
3	5.2	88.45	9.36	97.81	45.8	16.06	736.27	638.46	-46.26

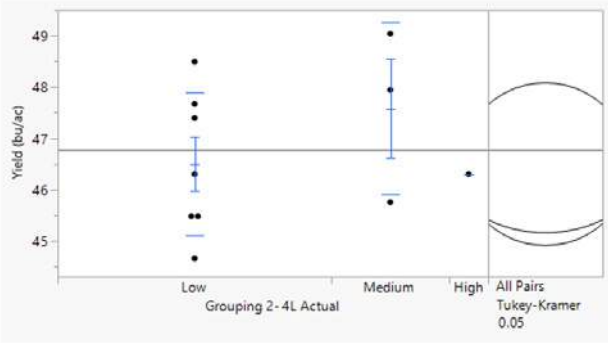
x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results:

Treatment	2 Weeks after Seeding (WAS)		2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 7 seeds/ft² (Low)	6.4 B	9.7	6.3 B	10.5	6.1 C	13.0 C
Trt 2 – 9 seeds/ft² (Medium)	7.3 B	18.7	7.2 AB	20.0	7.3 B	19.3 B
Trt 3 – 11 seeds/ft² (High)	9.3 A	15.0	8.4 A	24.1	8.0 A	27.6 A
SE[1]	0.45622	4.98	0.4527	5.168	0.08476	1.0063
p-value[3]	**0.0031**	0.4412	**0.0244**	0.2054	**<0.0001**	**<0.0001**

The target seeding rates resulted in significant differences in plant densities at 2 weeks after seeding, 2-4 leaf stage and post harvest, along with seedling mortality at post harvest. However, plant densities and stubble counts were lower than the targeted rate. Since plant densities were lower, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield.





The data presented below is based on actual plant densities collected from the field at the 2-4 leaf stage. Density counts at the 2-4 leaf stage and post harvest were significantly different. Overall, those were the only factors that had statically significant differences. However, there are general trends that can be discussed. In general, yield was highest at the low grouping (5-7 plants/ft²) and decreased at the low plant density. Grain quality was similar between density groups.

Density Group[3]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Low	6.6 C	6.6 B	47.6	25.1	4.2	64.1	45.9	0.01
Medium	7.8 B	7.7 A	46.5	25.7	4.3	64.2	45.4	0.0
High	10.0 A	7.9 AB	46.3	25.9	4.2	64.6	45.8	0.0
p-value[2]	**0.0024**	**0.0497**	0.7400	0.4378	0.9521	0.1513	0.7530	0.7477

To review footnote references please refer to overall trial summary on page 72.

This trial was conducted with the agronomic support of

Hoppe Agronomy

TOP NOTCH FARMING RESEARCH TRIALS

Canola Seeding Rate and Survivability

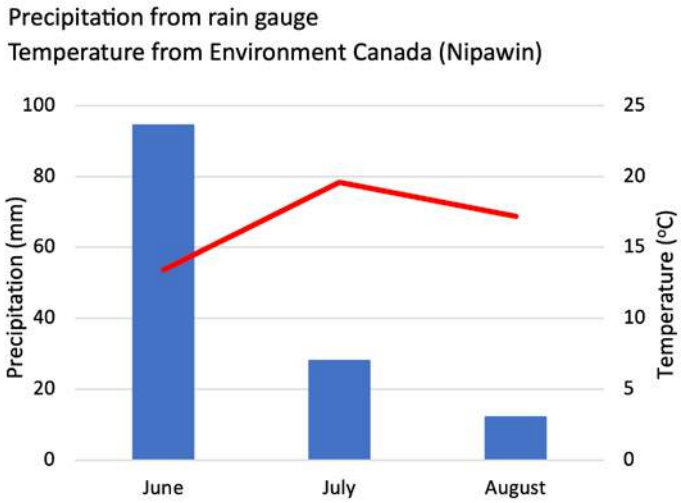
(Carrot River)

Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	10 seeds/ft^2	4.1
2	13 seeds/ft^2	5.5
3	17 seeds/ft^2	6.9

General Trial Information:

Variety	L340PC
TSW	4.3 g
Seed Treatment	Buteo® + Helix Vibrance®
Previous Crop	Barley
Soil Organic Matter	11 lb/ac
Residual Nitrate-N (0-6")	3.9 %
Soil Texture	Medium
Seeding Date	May 29
Soil Temperature	12.4°C
Seeding Equipment	45 Series SeedHawk®
Seeding Depth	¼"
Seeding Speed	4.5 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	16 – 27 – 16 – 0
Crop Protection	May 27: Conquer® + Glyphosate June 27 – Glufosinate July 14 – Proline Gold®



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 1 (10 seeds/ft^2) resulted in the greatest return.

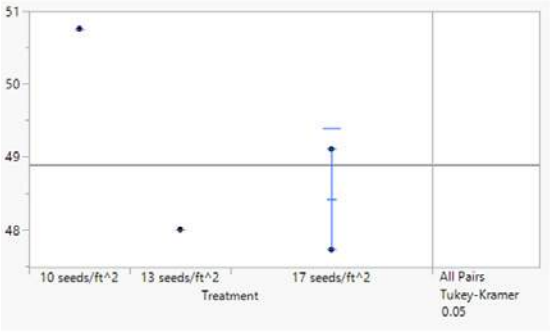
Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	4.1	69.74	7.38	77.12	48.0	16.06	770.88	693.76	0.00
2	5.5	93.56	9.90	103.46	48.4	16.06	777.53	674.07	-19.69
3	6.9	117.37	12.42	129.79	50.8	16.06	815.19	685.40	-8.36

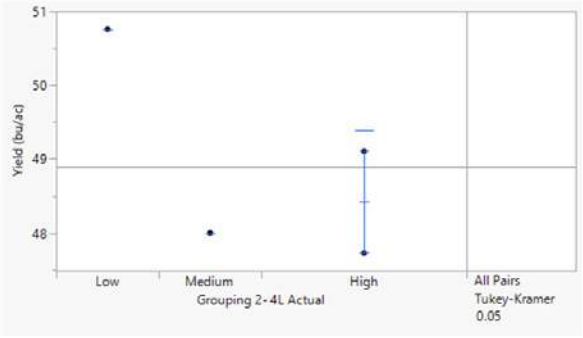
x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results:

Treatment	2 Weeks after Seeding (WAS)		2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 10 seeds/ft²	7.8	21.2 B	7.5 B	24.0 B	6.8 B	31.6
Trt 2 – 13 seeds/ft²	9.3	30.0 AB	9.5 A	28.8 AB	8.8 A	33.5
Trt 3 – 17 seeds/ft²	8.9	46.7 A	9.8 A	41.2 A	9.4 A	43.9
SE[1]	0.55228	4.734	0.42145	3.428	0.4599	3.9952
p-value[3]	0.1884	**0.0104**	**0.0105**	**0.0153**	**0.008**	0.1293

The target seeding rates resulted in significant differences in plant densities at 2-4 leaf stage and post harvest, along with seedling mortality at 2 weeks after seeding and 2-4 leaf stage. However, plant densities and stubble counts were much lower than the targeted rate. Since plant densities were much lower, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield.





The data presented below is based on actual plant densities collected from the field at the 2-4 leaf stage. Density counts at the 2-4 leaf stage and post harvest were significantly different, along with test weights. Overall, those were the only factors that had statically significant differences. However, there are general trends that can be discussed. In general, yield was highest at the low grouping (5-7 plants/ft²) and decreased at the medium and high plant density. The remaining grain quality was similar between density groups.

Density Group[3]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Low	6.9 C	5.9 C	50.8	23.8	5.6	65.1 A	48.1	0.4
Medium	8.5 B	8.1 B	48.0	23.8	5.8	64.2 B	48.5	0.4
High	10.2 A	9.6 A	48.4	23.5	5.6	64.0 B	48.4	0.3
p-value[2]	**0.0001**	**<0.0001**	0.4307	0.8553	0.1487	**0.0162**	0.9189	0.6369

To review footnote references please refer to overall trial summary on page 72.

This trial was conducted with the agronomic support of

Ag Grow Consulting Ltd.

TOP NOTCH FARMING RESEARCH TRIALS

Canola Seeding Rate and Survivability
(Elbow)

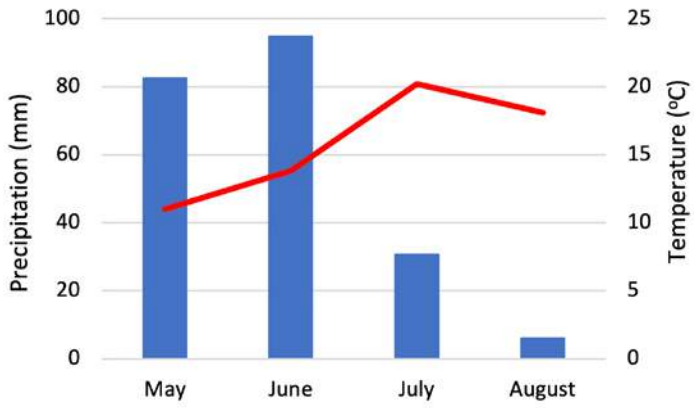
Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	8 seeds/ft^2	4.6
2	10 seeds/ft^2	5.9
3	12 seeds/ft^2	7.2

General Trial Information:

Variety	Proven 680 LL
TSW	6.2 g
Seed Treatment	Lumiderm®
Previous Crop	Wheat
Soil Organic Matter	2.3%
Residual Nitrate-N (0-6")	15 lb/ac
Seeding Date	May 10
Soil Temperature	10°C
Seeding Equipment	Bourgault Paralink™
Seeding Depth	¾"
Seeding Speed	3 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	140 – 40 – 0 – 0
Crop Protection	May: Glyphosate + Carfentrazone June: Glufosinate + Clethodim

Weather from Environmental Canada (Elbow CS)



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 1 (8 seeds/ft^2) resulted in the greatest return.

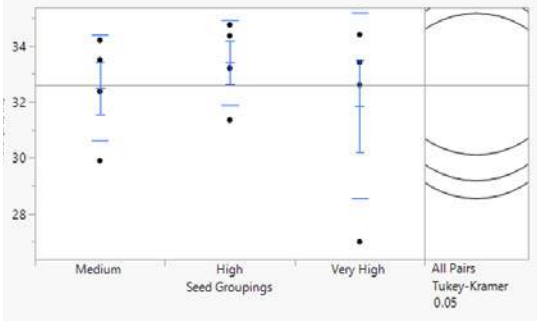
Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	4.6	78.25	8.28	86.53	32.5	16.06	521.95	435.42	0.00
2	5.9	100.53	10.64	111.17	33.4	16.06	536.40	425.24	-10.19
3	7.2	122.98	13.01	136.00	33.5	16.06	538.01	402.01	-33.41

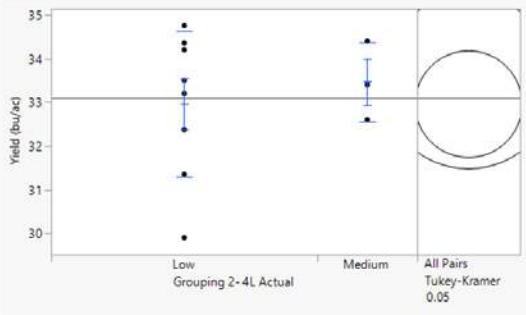
x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results:

Treatment	2 Weeks after Seeding (WAS)		2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 8 seeds/ft²	6.2 C	22.9 C	6.6 C	17.9 B	4.1 B	48.3
Trt 2 – 10 seeds/ft²	6.8 B	31.7 B	7.1 B	29.1 A	5.2 B	48.4
Trt 3 – 12 seeds/ft²	7.4 A	38.3 A	8.5 A	28.8 A	6.6 A	44.7
SE[1]	0.12738	1.2572	0.17729	1.748	0.2687	3.1545
p-value[3]	**0.0002**	**<.0001**	**<.0001**	**0.0038**	**0.0003**	0.6984

The target seeding rates resulted in significant differences in plant densities at 2 weeks after seeding, 2-4 leaf stage and post harvest, along with seedling mortality, except post harvest. However, plant densities and stubble counts were much lower than the targeted rate. Since plant densities were much lower, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield.

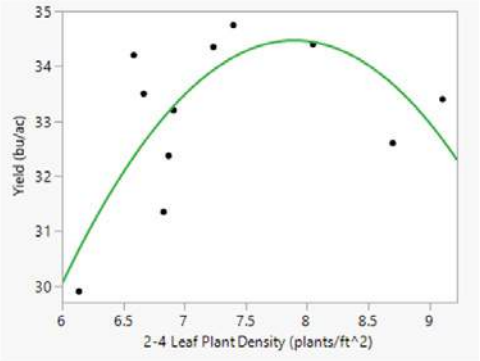




The data presented below is based on actual plant densities collected from the field at the 2-4 leaf stage. Density counts at the 2-4 leaf stage and post harvest were significantly different. Overall, those were the only factors that had statically significant differences. However, there are general trends that can be discussed. In general, yield was highest at the medium grouping (8-9 plants/ft²) and decreased at the low plant density. Grain quality was similar between density groups, but oil and greenseed were slightly higher at the low-density grouping compared to medium.

Density Group[3]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Low	6.8 B	4.6 B	32.9	25.3	4.2	66.2	43.6	0.038
Medium	8.5 A	6.6 A	33.5	25.6	4.2	66.3	42.7	0.025
p-value[2]	**<0.0001**	**0.0008**	0.4495	0.557	0.7467	0.4454	0.0588	0.6673

As shown in the graph on the right, a quadratic response was observed when plant density was measured at the 2-4 leaf stage in relation to yield. This indicates that the highest yields occurred at 8 plants/ft², with a decline in yield as density increased beyond this point.



To review footnote references please refer to overall trial summary on page 72.

TOP NOTCH FARMING RESEARCH TRIALS

Canola Seeding Rate and Survivability

(Kerrobert)

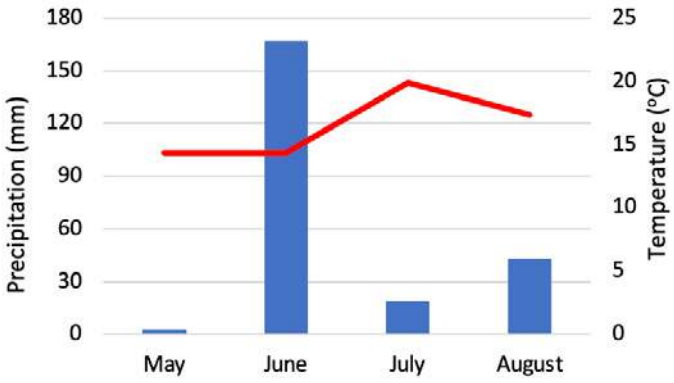
Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	7 seeds/ft^2	2.9
2	9 seeds/ft^2	3.8
3	11 seeds/ft^2	4.5

General Trial Information:

Variety	L340PC
TSW	4.2 g
Seed Treatment	Helix Vibrance® + Buteo®
Previous Crop	Wheat
Soil Organic Matter	4.0%
Residual Nitrate-N (0-6")	34 lb/ac
Soil Texture	Medium
Seeding Date	May 24
Soil Temperature	10°C+
Seeding Equipment	SeedHawk®
Seeding Depth	¾"
Seeding Speed	4.5-6.1 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	104 – 35 – 0 – 21 (VR Average)
Crop Protection	May 14 – Glyphosate + Certitude® June 21 – Liberty®

Weather from local station as of May 26th



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 2 (9 seeds/ft^2) resulted in the greatest return.

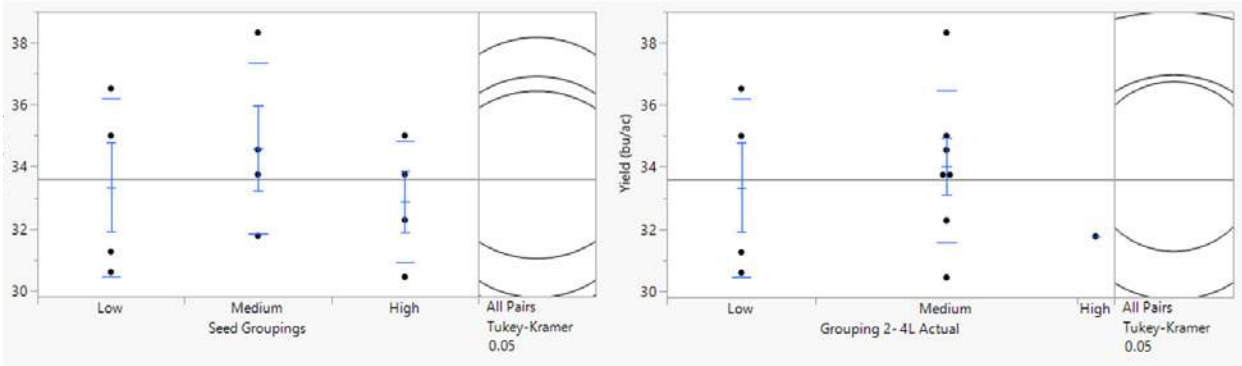
Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	2.9	49.33	5.22	54.55	33.3	16.06	535.44	480.89	0.00
2	3.8	64.64	6.84	71.48	34.6	16.06	555.64	484.17	3.27
3	4.5	76.55	8.10	84.65	32.9	16.06	527.76	443.12	-37.77

x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results:

Treatment	2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 7 seeds/ft² (Low)	6.0 B	14.3 AB	7.5	0.0
Trt 2 – 9 seeds/ft² (Medium)	9.0 A	2.8 B	8.7	12.2
Trt 3 – 11 seeds/ft² (High)	8.5 A	22.7 A	9.5	14.1
SE[1]	0.29011	3.135	0.719	5.08
p-value[3]	**0.0001**	**0.0038**	0.2036	0.1778

The target seeding rates resulted in significant differences in plant densities and seedling mortality at the 2-4 leaf stage. However, plant densities and stubble counts were slightly lower than the targeted rate. Since plant densities were lower, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield.



The data presented below is based on actual plant densities collected from the field at the 2-4 leaf stage. Density counts at the 2-4 leaf stage and post harvest were significantly different. Overall, those were the only factors that had statically significant differences. However, there are general trends that can be discussed. In general, yield was highest at the high grouping (10-12 plants/ft²) and decreased at the low then medium plant density. Protein was slightly higher at the high-density group compared to low and medium. Seed size and green seed were similar amongst groups. Oil was highest for the low group.

Density Group[3]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Low	6.0 B	7.55	33.3	25.4	4.2	64.7	46.4	0.0
Medium	8.6 A	8.7	31.8	25.6	4.4	64.5	45.9	0.0
High	9.8 A	11	34.0	26.2	4.1	64.8	45.1	0.0
p-value[2]	**<0.0001**	0.0999	0.7068	0.4446	0.5707	0.6853	0.1591	0.1000

To review footnote references please refer to overall trial summary on page 72.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

TOP NOTCH FARMING RESEARCH TRIALS

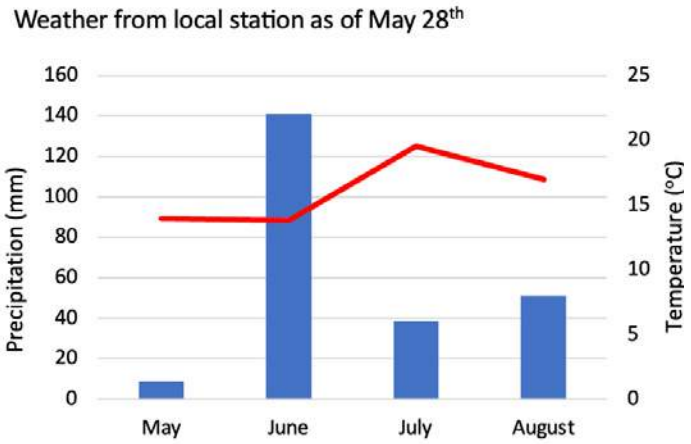
Canola Seeding Rate and Survivability (Landis)

Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	7 seeds/ft²	2.8
2	9 seeds/ft²	3.6
3	10 seeds/ft²	4.4

General Trial Information:

Variety	L340PC
TSW	4.4 g
Seed Treatment	Buteo®
Previous Crop	Peas
Soil Organic Matter	4.4%
Residual Nitrate-N (0-6")	30 lb/ac
Seeding Date	May 14
Soil Temperature	10+°C
Seeding Equipment	Bourgault 3710
Seeding Depth	¾"
Seeding Speed	4.5-6.1 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	94 – 34 – 0 – 18
Crop Protection	May 11 – Glyphosate + Command® June 11 – Liberty® + Centurion®



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 1 (7 seeds/ft²) resulted in the greatest return.

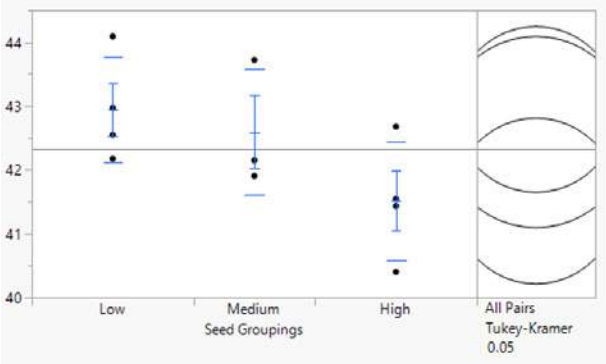
Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	2.8	47.63	5.04	52.67	42.9	16.06	689.62	636.95	0.00
2	3.6	61.24	6.48	67.72	42.6	16.06	684.16	616.44	-20.51
3	4.4	74.84	7.92	82.76	41.5	16.06	666.49	583.73	-53.22

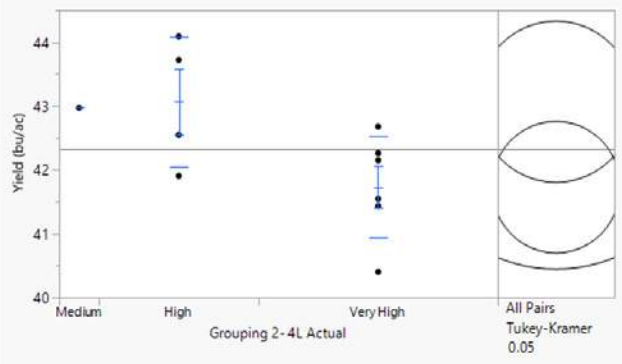
x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

Results:

Treatment	2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 7 seeds/ft² (Low)	10.6 B	0.0	10.0	0.0
Trt 2 – 9 seeds/ft² (Medium)	12.1 AB	0.0	10.5	0.0
Trt 3 – 10 seeds/ft² (High)	13.5 A	0.0	11.8	0.0
SE[1]	0.5954	0	0.77567	0
p-value[2]	**0.0263**	0.99	0.262	0.1

The target seeding rates resulted in significant differences in plant densities (p=0.0263). However, plant densities and stubble counts were much higher than the targeted rate. Since plant densities were much higher, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield. Plant counts 2 weeks after seeding were not conducted at this location.





The data presented below is based on actual plant densities collected from the field and they are significantly (p=.0027) different. Overall, this was the only factor that had a statically significant difference. However, there are general trends that can be discussed. In general, yield tended to peak at the high (10- 12 plants/ft²) and decreased at the very high plant density. The very high plant densities also tended to have the lowest seed size.

Density Group[3]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Green Seed (%)
Medium	9.0 B	9.2	43.0	23.8	3.9	65.6	0.000
High	11.0 B	10.0	43.1	24.2	3.7	65.4	0.013
Very High	13.3 A	11.6	41.7	24.3	3.4	65.8	0.000
p-value[2]	**0.0027**	0.3642	0.1063	0.6216	0.4055	0.3468	0.7532

To review footnote references please refer to overall trial summary on page 72.

TOP NOTCH FARMING RESEARCH TRIALS

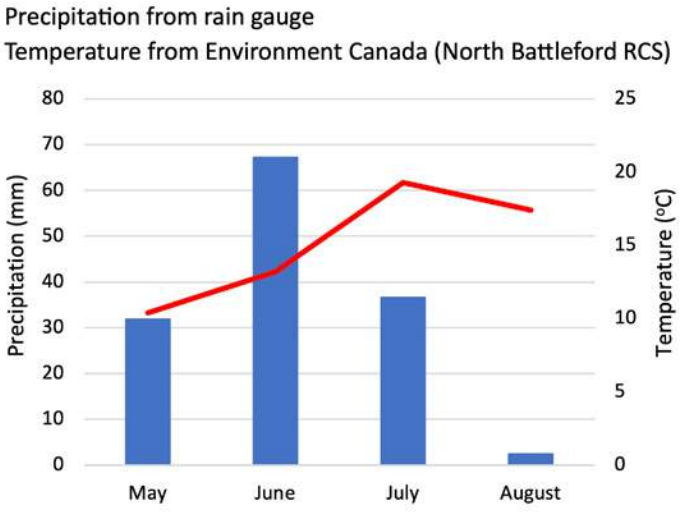
Canola Seeding Rate and Survivability
(Unity)

Objective: To determine the range of canola survivability rates on commercial farms and the optimal seeding rate to achieve adequate plant densities and maximize yield under various management, soil and weather conditions in Saskatchewan.

Trt #	Target Density	Actual Seeding Rate (lb/ac)
1	6 seeds/ft^2	2.8
2	8 seeds/ft^2	3.8
3	10 seeds/ft^2	4.7

General Trial Information:

Variety	L340PC
TSW	4.9 g
Seed Treatment	Buteo® + Vibrance Maxx®
Previous Crop	Wheat
Soil Organic Matter	4.5%
Residual Nitrate-N (0-6")	42 lb/ac
Soil Texture	Medium
Seeding Date	May 22
Soil Temperature	7°C
Seeding Equipment	Bourgault 3320
Seeding Depth	¾"
Seeding Speed	4.2 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	110 – 35 – 0 – 30
Crop Protection	May 25: Glyphosate June 11: Liberty® + Emphasis®



Economics:

For the economic analysis, the yield data was collected based on the seeding target rates (yields below). This data was used to help producers get an accurate reference on profitability. However, since there were slight differences in actual plant densities recorded in the field, the following yield and quality data is based on true plant densities rather than the target seeding rates. Therefore, treatment 1 (6 seeds/ft^2) resulted in the greatest return.

Trt No.	Seeding Rate (lbs/ac)	Seed ($/lb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	2.8	47.63	5.04	52.67	40.4	16.06	648.50	595.83	0.00
2	3.8	64.64	6.84	71.48	41.5	16.06	666.81	595.33	-0.50
3	4.7	79.95	8.46	88.41	42.0	16.06	673.88	585.47	-10.36

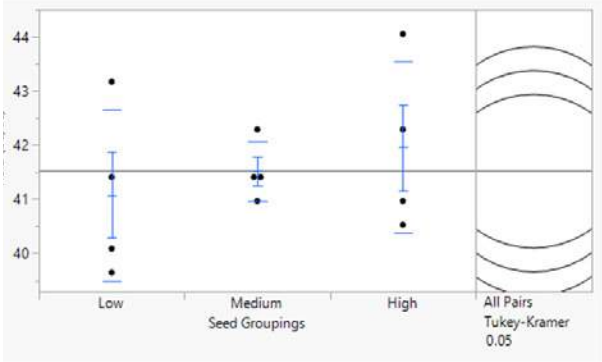
x2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed price $85.05/ac)
y2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 5lb/ac; seed treatment/inoculants $9.00/ac)
z2024 Canola, 2024 Crop Planning Guide, Government of Saskatchewan (target price $16.06/bu)

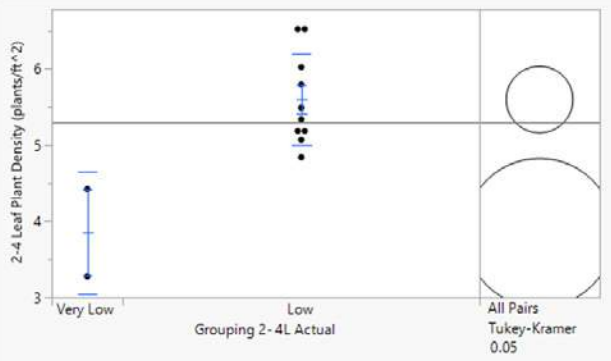
Results:

When focusing solely on seeding rate treatments, only plant densities were analyzed due to variability in data regarding yield and grain quality. Notable trends were observed in plant density and seedling mortality two weeks after seeding. A significant trend was nearly observed in plant density at the 2-4 leaf stage, while post-harvest counts revealed significant seedling mortality.

	2 Weeks after Seeding (WAS)		2 – 4 Leaf Stage		Post Harvest	
	Plant Density (plants/ft²)	Seedling mortality (%)	Plant Density (plants/ft²)	Seedling mortality (%)	Stubble Density (plants/ft²)	Seedling mortality (%)
Trt 1 – 6 seeds/ft² (Low)	4.4 B	26.2 B	4.4	26.2	3.9	35.2 B
Trt 2 – 8 seeds/ft² (Medium)	4.3 B	46.4 A	5.7	28.2	4.1	48.7 AB
Trt 3 – 10 seeds/ft² (High)	5.9 A	41.4 AB	5.7	42.6	4.9	50.7 A
SE[1]	0.33768	4.8398	0.3473	4.87	0.31359	3.83
p-value[3]	**0.023**	**0.0386**	0.0598	0.0933	0.1004	**0.045**

The target seeding rates resulted in significant differences in plant densities and seedling mortality at 2 weeks after seeding, along with seedling mortality post harvest. However, plant densities and stubble counts were much lower than the targeted rate. Since plant densities were much lower, the plant density groupings differed from the original seeding rate target. The below yield graphs demonstrate this difference between the target seeding rate and the actual plant densities on yield.





The data presented below is based on actual plant densities collected from the field and they are significantly (p=.0046) different. Test weight was also significantly (p=0.0004) different, where the low-density group had a great kg/hl than the very low. Overall, those were the only factors that had statically significant differences. However, there are general trends that can be discussed. Yield was the same between density groups. Stubble density was higher with the very low grouping compared to low. The remaining grain qualities were similar between density groups.

Density Group[3]	2 – 4 Leaf Plant Density (plants/ft²)	Stubble Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Oil (%)	Green Seed (%)
Very Low	5.6 A	4.5	41.4	23.5	4.1	62.1 A	47.1	0.0
Low	3.8 B	4.1	41.4	23.9	4.1	62.9 B	47.6	0.0
p-value[2]	**0.0046**	0.6521	0.9744	0.4247	0.8296	**0.0004**	0.2509	0.1000

To review footnote references please refer to overall trial summary on page 72.

This trial was conducted with the agronomic support of

Pulses

Pulse Replicated On-Farm Independent Trials

by Saskatchewan Pulse Growers

Overview

First established in 2017, Pulse Replicated On-Farm Independent Trials (PROFIT) are SPG's field scale, producer-driven, on-farm research trials. SPG works directly with producers and agronomists to develop scientifically sound trial protocols and implement the trials on-farm where agronomists are directly involved in the monitoring, management, and data collection of the producer's trial. Trial results are made available on SPG's website, and a copy is provided to the producer to inform future decisions on their farm.

In 2023, there were 20 field-scale trials established. In 2024, the program initiated 21 trial sites: 17 lentil seeding rate trials, 3 pea fungicide trials and 1 chickpea plant population trial. For 2025, the PROFIT program will continue and SPG will work with producers and industry to identify and shape future projects and protocols looking at integrated pest management, fertility, or other agronomic practices on pulse crops.

Protocol: Lentil Seeding Rate

Protocol: Pea Fungicide

Protocol: Chickpea Plant Population

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate Trial

A typical seeding practice for small lentils involves a flat rate of 40 lbs/ac (0.67 bu/ac), while large lentils are commonly seeded at a rate of 90-95 lbs/ac (1.5–1.6 bu/ac). While these conventional seeding rates have successfully produced high-yielding lentil crops, a more precise approach can be applied. This will ensure producers are targeting an optimal plant stand and can adjust seeding rate according to seed size (thousand kernel weight, TKW) and seedling survivability. Ranges in seed size between varieties in a specific lentil market class can lead to differences in plant stand if seeded at a single rate across all varieties. A target lentil population of 12 plants/ft² is generally recommended; however, small-plot research has indicated that targeting populations higher than 12 plants/ft² may reduce weed biomass, increase yields, and maximize return.

Objective

To evaluate seeding rate of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Treatments

Standard (12 plants/ft²)
High (18 plants/ft²)
Very High (24 plants/ft²)

Trials were set up in randomized strips with 3-4 replicates for a total of 8-12 plots. All plots were managed the same agronomically, besides the targeted seeding rates using TKW and germination, including seeding date, variety, seeding depth, seed treatment and inoculant, and pesticides.

Data Collection

- Seed and soil test
- Seeding information
- Field history and management practices
- In-season plant density
- Weighed yield and harvest sample
- General in-season observations
- Weather data

Terminology

Treatments: actual seeding rates applied by the producer at time of seeding

Density Groups: grouped according to plant counts conducted in the field

The follow footnotes will be referred to for the combined and individual site reports for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

[2]SE was not record as the sample sizes are unequal and therefore standard error was different for each sample size

[3]Data was analysed with an ANOVA Mixed Model in JMP. The data was analyzed to meet the assumptions of ANOVA of normal distribution and equal variance. Test for normality using Shapiro Wilks and equal variance using Levene's. Data was transformed to meet the assumptions of ANOVA. A Tukey's HSD test was conducted to separate means. * A linear regression was used to determine the effect of plant density on yield. All treatment effects and differences between means were considered significant at $p \leq 0.05$; however, p-values of 0.05-0.1 may also be acknowledged. $P<0.05$ = likely that the difference was due to the treatment. $P<0.1$ = possible that the difference was due to the treatment. $P>0.1$ = not likely that the difference was due to the treatment

[4]The data was analyzed using an ANOVA Mixed Model in JMP, with replication nested in location both as a random effect. The treatment and density group were classified as a fixed effect. Means were separated using Tukey's at significance level of 0.05

[5]The data was analyzed using an ANOVA Mixed Model in JMP, where locations were grouped based on their response to seeding densities and plant densities. Replication was nested in location and treated as a random effect. The treatments were classified as a fixed effect. Means were separated using Tukey's HSD at significance level of 0.05 Distribution was tested for normality, to meet assumptions of ANOVA, transformations were used. Variance was tested for equality. Means were separated using Tukey's at significance level of 0.05

[6]The data from 2023 and 2024 was grouped based on their similar trends from the individual year analysis. Replication was nested in location, there was 33 site years. Data was tested for normality and equal variance. Data was transformed to meet assumptions and then back transformed for display of results. Replication and location were random effects and treatment/density group was fixed effects. Means were separated using Tukey's at significance level of 0.05

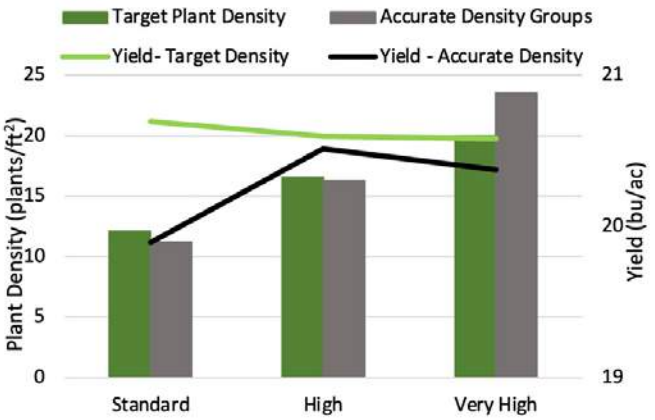
2023 Combined Results (12 sites)

When evaluating treatments the standard seeding rate showed a yield gain, but when considering plant densities groups that were observed in the field, a positive response to the higher seeding rate was seen over the standard. From an economic standpoint (not shown), using the yields from the treatments, the standard seeding rate resulted in the highest return, whereas, when classified by density group, the high seeding rate resulted in the highest return. Eight sites used twelve-inch row spacing, while nine operated with ten-inch spacing. Seedling mortality was not significantly different between the two row spacings. Yield was not analyzed due to being more dependent on location and precipitation versus row spacing.

Treatments[2]	Plant Density (plants/ft²)	Seedling Mortality (%)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Protein (%)
Standard	12.1 C	13.9 B	21.2	41.7	24.1
High	16.6 B	19.1 B	20.0	41.8	24.2
Very High	20 A	24.9 A	19.8	41.8	23.9
p-value[4]	**<0.0001**	**<0.0001**	0.4337	0.9936	0.5565

Density Group[2]	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Protein (%)
Standard	11.2 C	19.9	41.0 B	24.3
High	16.3 B	20.5	41.9 AB	23.9
Very High	23.6 A	20.4	42.6 A	24.0
p-value[4]	**<0.0001**	0.868	**0.0378**	0.3302

Row Spacing (inches)[2]	Seedling Mortality (%)
Twelve	22.9
Ten	16.17
p-value[4]	0.1017



As seen below, data analysis initially revealed a clear division between the North/Central/West and South/Eastern locations, largely due to differences in precipitation. The majority of the locations located in North/Central/West SK (12/17) had a positive and statistically significant (p=0.0493) response to the high seeding rate over the standard, with a 2.3 bu/ac yield gain. The remaining five locations, mostly located in Southern SK had a slight positive response to the standard seeding rate. However, the yield was the same between the standard and very high which were both higher than the high seeding rate.

Southern Sask **exception Plenty* - 29% sites

Density Group[2]	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Protein (%)
Standard	9.6 C	23.7	39.9	24.2
High	14.5 B	20.7	40.3	24.4
Very High	21.9 A	23.7	40.5	24.6
p-value[4]	**<0.0001**	0.5052	0.1668	0.73

North West/Central Saskatchewan (71% sites)

Density Group[2]	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Protein (%)
Standard	11.9 C	19.6 B	41.6	24.3
High	16.8 B	22.0 A	42.5	23.8
Very High	24 A	21.1 AB	43.4	24
p-value[4]	**<0.0001**	**0.0493**	0.1543	0.2846

2024 Combined Results (16 sites)

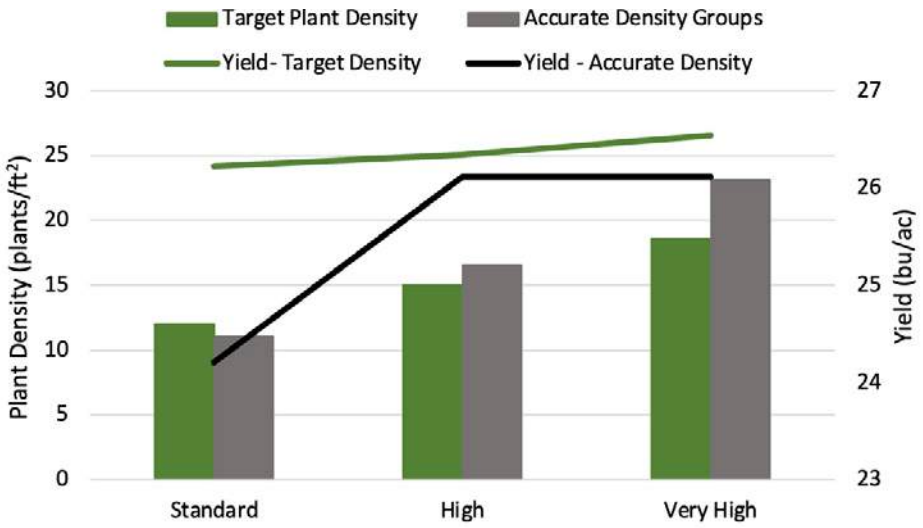
In 2024, the actual plant densities observed differed from the targeted seeding densities. When examining treatments or targeted seeding rates, plant density was the only significant factor influencing seeding rates. While not significant, there was also a 2.3 bu/increase from the very high seeding rate to standard. When analyzing plant density grouping data, significant trends were found between plant density and thousand kernel weights, and while not significant, there was a 1.9 bu/ac yield gain from the high and very high seeding rates compared to the standard. Economically (data not shown), the very high seeding rate yielded the highest return based on treatment yields. However, when examining the results by density groups, the high-density group produced the greatest return.

Treatments	Plant Density (plants/ft^2)	Seedling Mortality (%)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Test Weight (TW) (kg/hL)	Protein (%)
Standard	12.0 C	14.5	24.2	36.8	80.7	12.6
High	15.0 B	26.5	25.1	36.6	81.0	12.7
Very High	18.6 A	31.6	26.5	36.5	81.1	12.7
SE[1]	0.505	2.2	2.3161	0.55	0.26	0.185
p-value[5]	**<0.0001**	**<0.0001**	0.1771	0.8229	0.2882	0.91

Seven sites used twelve-inch row spacing, while nine operated with ten-inch spacing. Seedling mortality was not significantly different between the two row spacings. Yield was not analyzed due to being more dependent on location and precipitation versus row spacing.

Density Group[2]	Plant Density (plants/ft^2)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Test Weight (TW) (kg/hL)	Protein (%)
Standard	11.1 C	24.2	37.0	80.8	12.8
High	16.6 B	26.1	35.9	81.0	12.6
Very High	23.2 A	26.1	36.2	81.0	12.6
p-value[5]	**<0.0001**	0.1479	**0.0483**	0.4377	0.3439

Row Spacing (inches)[2]	Seedling Mortality (%)
Twelve	21.1
Ten	17.3
p-value[5]	0.724



Not shown: In 2024, no trends were observed between locations, indicating that responses were not more likely in specific areas of Saskatchewan. At 44% of sites, a significant yield response was observed with the high seeding rate, resulting in an approximate 3 bu/ac gain compared to the standard rate. At 25% of sites, the response to seeding rates was neutral, with a slight yield increase as seeding rates increased. However, 19% of sites experienced a slight yield decline with higher target seeding rates.

2023 and 2024 Combined (33 site years)

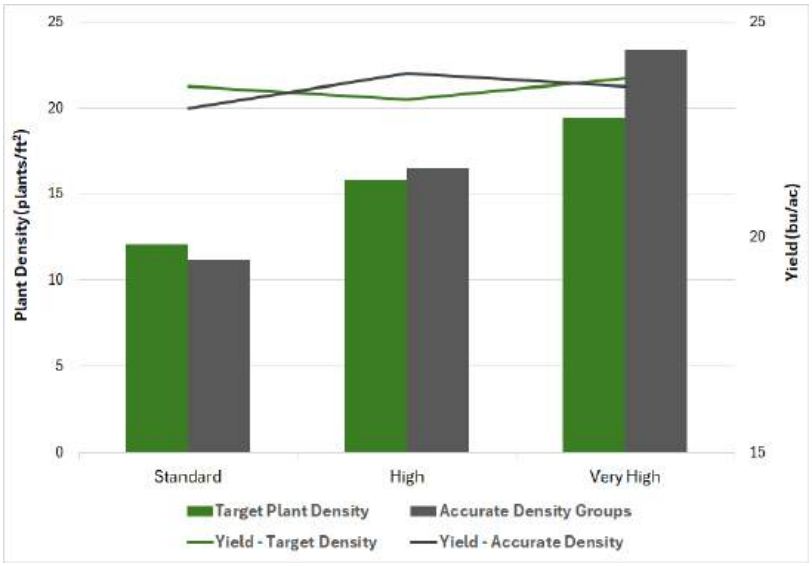
When all 33 site years of data were combined there were some significant trends observed. Plant density ($p<0.0001$) did significantly increase with seeding rates, but lower than targeted rates. This correlates to the fact that as seeding rates increased so did seedling mortality ($p<0.0001$). While not significant, very high had the highest yield but due to additional costs, standard would be the most economical. Alternatively, when looking at results based on density groups, high seeding rate would be the most economical.

Therefore, conducting plant counts is crucial for determining plant density, which helps assess seedling mortality. This information allows producers to make more informed agronomic decisions for their farms. If actual plant densities deviate from expectations, producers can take corrective actions, such as checking thousand kernel weight (TKW), germination rates, and drill calibrations.

Treatments[2]	Plant Density (plants/ft^2)	Seedling Mortality (%)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Protein (%)
Standard	12.1 C	14.2 C	23.5	39.5	19.1
High	15.8 B	22.8 B	23.2	39.7	19.0
Very High	19.4 A	28.1 A	23.7	39.5	19.0
p-value[6]	**<0.0001**	**<0.0001**	0.7283	0.933	0.9491

Density Group[2]	Plant Density (plants/ft^2)	Yield (bu/ac)	Thousand Kernel Weight (TKW)(g/1000s)	Protein (%)
Standard	11.2 C	23.0	39.4	19.0
High	16.5 B	23.8	39.4	19.0
Very High	23.4 A	23.5	40.2	19.1
p-value[6]	**<0.0001**	0.6417	0.3027	0.9633

Row Spacing (inches)[2]	Seedling Mortality (%)
Twelve	23.3
Ten	20.5
p-value[6]	0.3281



Fifteen sites used twelve-inch row spacing, while eighteen operated with ten-inch spacing. Seedling mortality was not significantly different between the two, and yield was not analyzed due to being more dependent on location and precipitation versus row spacing.

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Biggar 1)

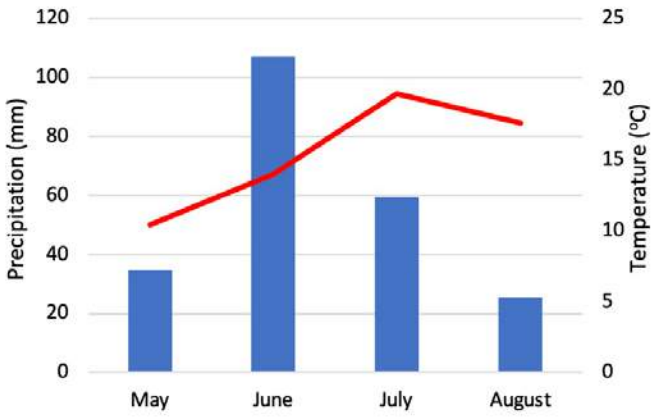
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	46.9
2	High	20	70.3
3	Very High	26	93.8

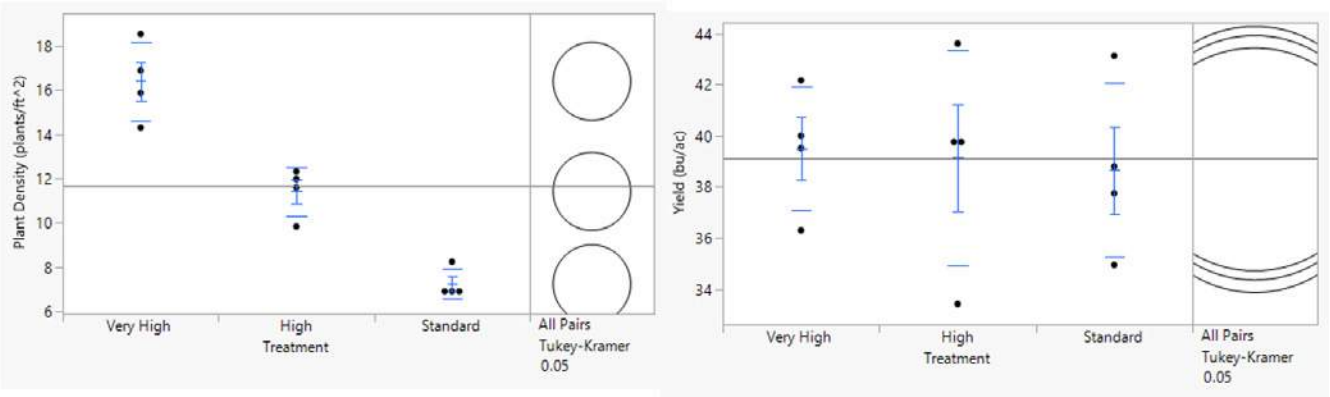
General Trial Information:

Variety	CDC Nimble
Thousand Kernel Weight	36.2 g
Germination	99%
Seed Treatment	Lumivia™ CPL + Active PRIME™ + Cruiser® Maxx with INTEGO®
Inoculant	LALFIX® Start
Previous Crop	Canola
Soil Organic Matter	4.2%
Residual Nitrate-N (0-6")	3 lb/ac
Soil Texture	Medium
Seeding Date	May 4
Seeding Equipment	Bourgault 3320 XTC 0.75" openers
Seeding Depth	1.25-1.5"
Seeding Speed	4.4 mph
Row Spacing	12"
Total Applied Fertilizer (lb/ac N-P-K-S)	4 – 21 – 0 – 0
Crop Protection	Fall '23: Flumioxazin + pyroxasulfone May 9: Imazethapyr + glyphosate June 11: Imazamox July 10: Clethodim + prothioconazole + pyraclostrobin July 23: Prothioconazole + trifloxystrobin + fluopyram August 12: Glyphosate + saflufenacil

Precipitation from rain gauge
Temperature from Environment Canada (Rosetown East)



	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard – 13 plants/ft²	7.2	45.7	38.6	12.6	37.1	81.7
Trt 2 – High – 20 plants/ft²	11.4	42.9	39.1	12.5	36.3	82.8
Trt 3 – Very High – 26 plants/ft²	16.4	38.5	39.5	12.5	37.0	82.8
SE[1]	0.63255	2.8	1.7	0.0716	0.397	0.528
p-value[3]	**<0.0001**	0.233	0.9359	0.2481	0.4099	0.4198



Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	46.9	21.11	3.24	24.35	38.6	18.00	694.80	670.45	0.00
2	70.3	31.64	4.86	36.50	39.1	18.00	704.46	667.96	-2.49
3	93.8	42.21	6.49	48.70	39.5	18.00	694.80	646.10	-24.35

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

As seeding rate increased, plant density also increased ($p<0.0001$); however, this did not lead to significantly higher yields ($p=0.9359$). With yields similar across all treatments, the "standard" seeding rate provided the highest economic return. Seeding rate had no significant effect on seedling mortality or grain quality. It is important to note that actual plant densities observed in the field were substantially lower than the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

NORTHLAND AGRONOMY

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Biggar 2)

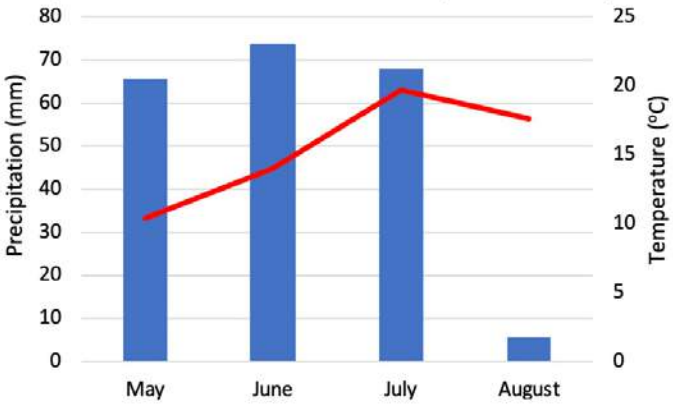
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	53.2
2	High	20	79.8
3	Very High	26	106.4

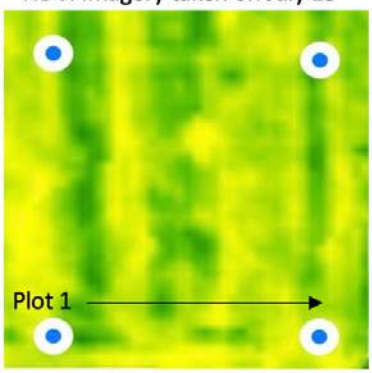
General Trial Information:

Variety	CDC Proclaim
Thousand Kernel Weight	41.1 g
Germination	99%
Seed Treatment	N/A
Inoculant	Primo GX2
Previous Crop	Barley
Soil Organic Matter	4.0%
Residual Nitrate-N (0-6")	15 lb/ac
Seeding Date	April 27
Seeding Equipment	Vaderstad .75" knife
Seeding Depth	1"
Seeding Speed	4.8 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	6 – 26 – 0 – 0
Crop Protection	Fall: Flumioxazin + pyroxasulfone June 11: Imazapyr July 4: Prothioconazole + trifloxystrobin + fluopyram July 25: Lambda-cyhalothrin July 25: Prothioconazole August 14: Diquat

Precipitation from rain gauge
Temperature from Environment Canada (Rosetown East)

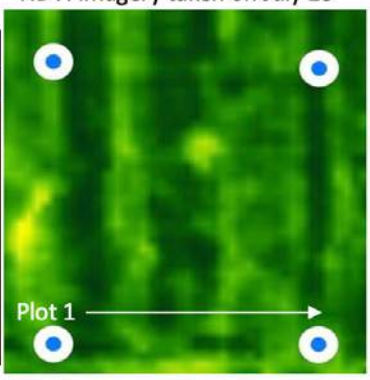


NDVI imagery taken on July 15th

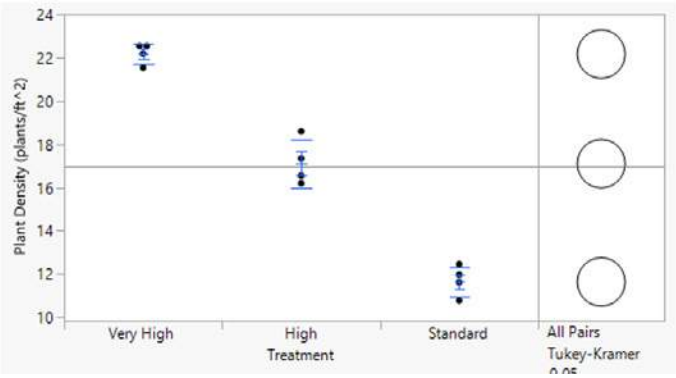


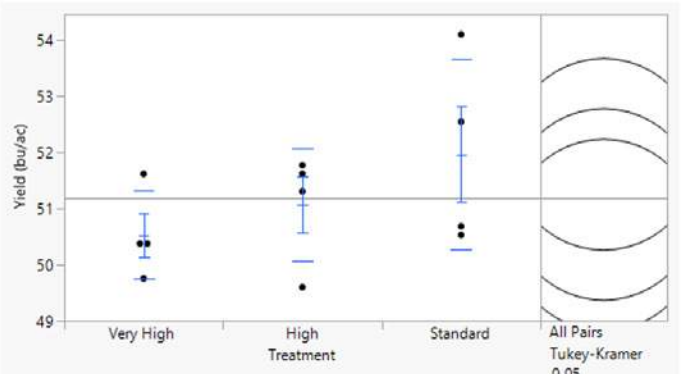
1			2			3			4		
1	2	3	4	5	6	7	8	9	10	11	12
3	2	1	2	1	3	2	3	1	1	2	3
Very High: 24 plants/ft²	High: 18 plants/ft²	Standard: 12 plants/ft²	High: 18 plants/ft²	Standard: 12 plants/ft²	Very High: 24 plants/ft²	High: 18 plants/ft²	Very High: 24 plants/ft²	Standard: 12 plants/ft²	Standard: 12 plants/ft²	High: 18 plants/ft²	Very High: 24 plants/ft²

NDVI imagery taken on July 23rd



	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard –13 plants/ft²	11.6 C	12.7	51.9	13.0	37.5	81.2
Trt 2 – High – 20 plants/ft²	17.1 B	14.5	51.1	13.1	37.7	81.2
Trt 3 – Very High – 26 plants/ft²	22.2 A	16.9	50.5	13.1	38.2	80.9
SE[1]	0.40235	2.3	0.61	0.077	0.38	0.346
p-value[3]	**<0.0001**	0.4188	0.271	0.5122	0.4691	0.6463





Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	53.2	23.94	3.68	27.62	51.9	18.00	934.20	906.58	0.00
2	79.8	35.91	5.52	41.43	51.1	18.00	919.80	878.37	-28.21
3	106.4	47.88	7.36	55.24	50.5	18.00	909.00	853.76	-52.82

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

As seeding rates increased, plant density also rose significantly ($p<0.0001$). However, this increase in density did not correlate with higher yields ($p=0.271$), meaning the “standard” seeding rate provided the highest economic return. Seedling mortality also increased, but this change was not statistically significant ($p=0.4188$). Seeding rates had minimal impact on grain quality, with no significant differences observed. It is important to note that actual plant densities were lower than the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

Hoppe Agronomy

Pulse Replicated On-Farm Independent Trials

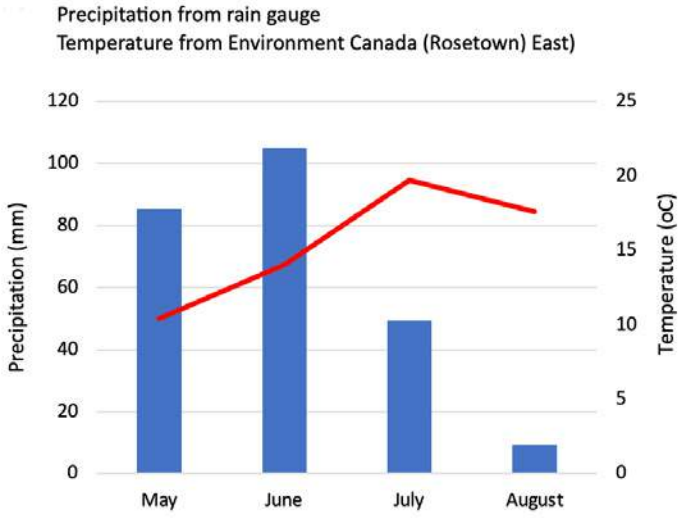
Lentil Seeding Rate (Biggar 3)

Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

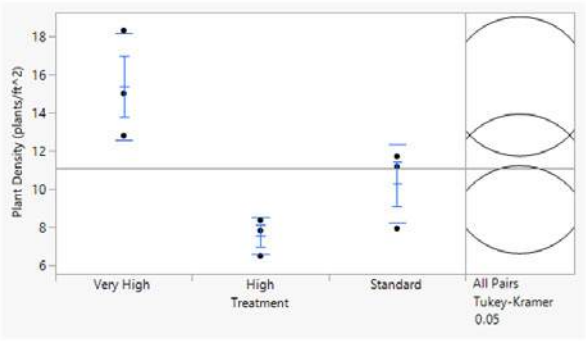
Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	50.2
2	High	20	75.3
3	Very High	26	100.4

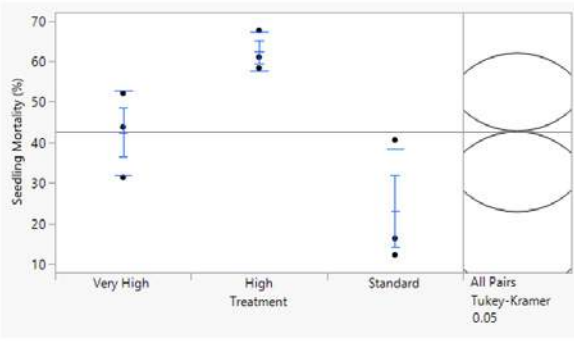
General Trial Information:

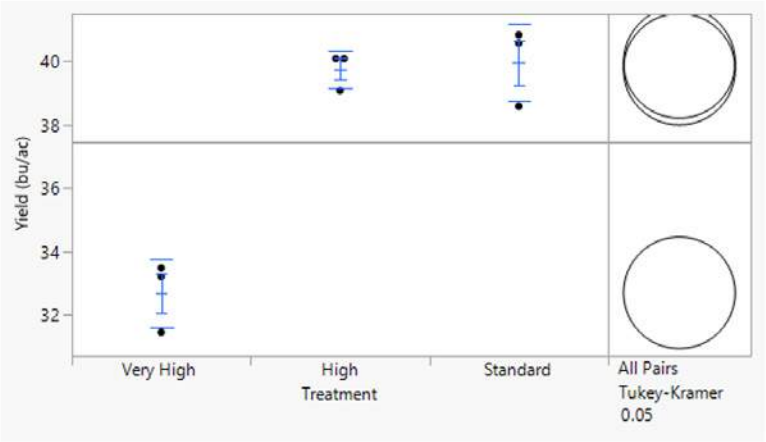
Variety	CDC Proclaim
Thousand Kernel Weight	38.8 g
Germination	99%
Seed Treatment	Insure® Pulse
Inoculant	TagTeam®
Previous Crop	Canola
Soil Organic Matter	3.9%
Residual Nitrate-N (0-6")	8 lb/ac
Soil Texture	Medium
Seeding Date	April 30
Seeding Equipment	Bourgault
Seeding Depth	.75"
Seeding Speed	5.2 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	13 – 62 – 0 – 0
Crop Protection	April 30: Glyphosate + carfentrazone-ethyl June 9: Imazamox + clethodim July 5 + 18: Pyraclostrobin + Boron + picoxystrobin July 18: Lambda-cyhalothrin August 20: Glyphosate August 23: Diquat



	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard – 13 plants/ft²	10.3 AB	23.1 B	40.0 A	13.3	32.9	83.6
Trt 2 – High – 20 plants/ft²	7.5 B	62.3 A	39.7 A	13.3	32.8	83.7
Trt 3 – Very High – 26 plants/ft²	15.4 A	42.4 AB	32.7 B	13.3	33.3	82.5
SE[1]	1.1929	6.4	0.57	0.32	0.4107	0.493
p-value[3]	**0.0085**	**0.0114**	**0.0003**	0.997	0.628	0.9517







Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
1	50.2	22.60	3.47	26.07	40.0	18.00	720.00	693.93	0.00
2	75.3	33.90	5.21	39.11	39.7	18.00	714.60	675.49	-18.44
3	100.4	45.20	6.95	52.15	32.7	18.00	588.60	536.45	-157.47

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Plant density, seedling mortality, and yield all showed significant responses to seeding rates. The “high” seeding rate resulted in the lowest plant density and the highest seedling mortality. In contrast, the “standard” seeding rate produced the highest yields and was the most economical. Seeding rate had no significant impact on grain quality. It is also important to highlight that actual plant densities were lower than the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

NORTHLAND AGRONOMY

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate

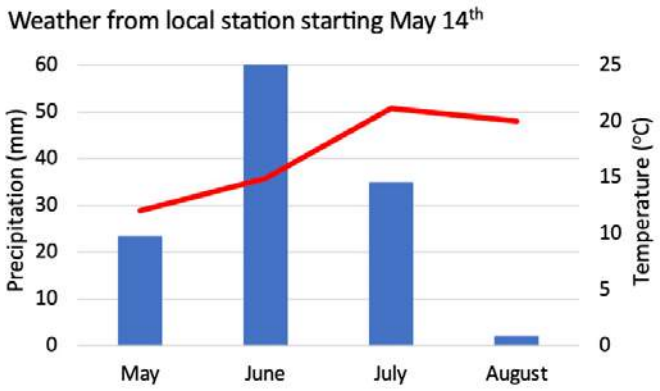
(Elrose 1)

Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	41.3
2	High	20	62.0
3	Very High	26	82.7

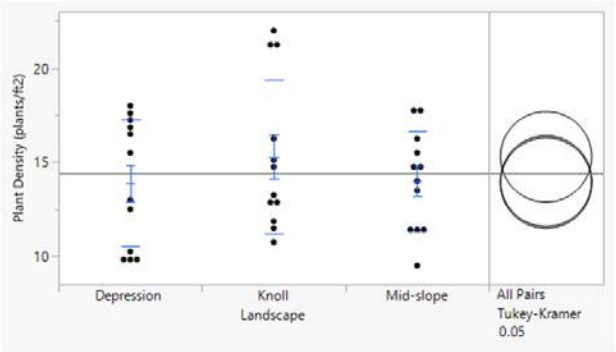
General Trial Information:

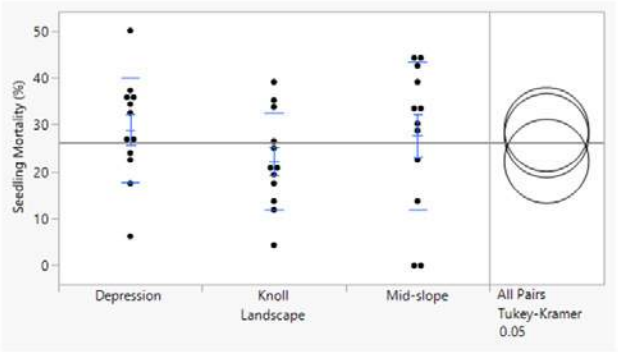
Variety	CDC Kermit
Thousand Kernel Weight	31.9 g
Germination	99%
Seed Treatment	ProTec®
Inoculant	Nodulator® Duo
Previous Crop	Durum
Soil Organic Matter	5.3%
Residual Nitrate-N (0-6")	18 lbs/ac
Soil Texture	Fine
Seeding Date	May 19
Seeding Equipment	K-Hart Spyder
Seeding Depth	1-1.5"
Seeding Speed	4.7-7 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	2 – 10 – 0 – 0
Crop Protection	May 30: Glyphosate June 30: Clethodim July 15: Lambda-cyhalothrin + metribuzin August 10: Diquat



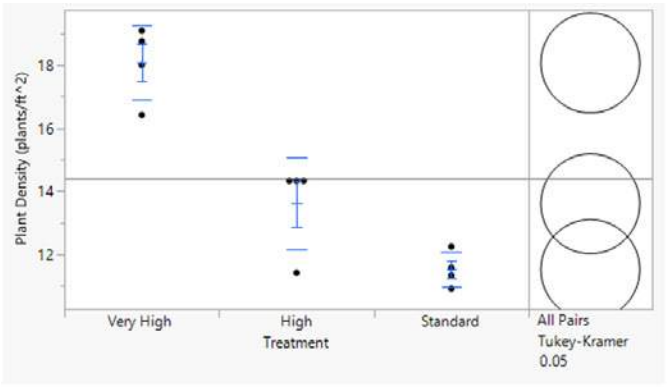
Landscape	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	13.9	29.0
Mid-Slope	14.0	27.7
Knoll	15.3	22.2
SE[1]	1.0	5.1
p-value[3]	0.579	0.3893

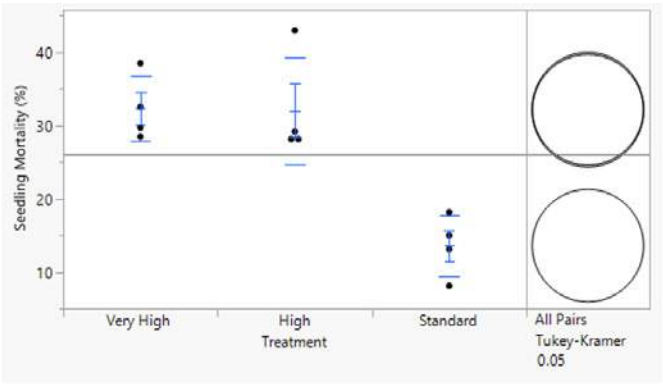
Plant densities increased and seedling mortality decreased from depressions to mid-slopes to knolls, likely due to the higher moisture levels in the depressions. However, no statistically significant differences were observed overall.

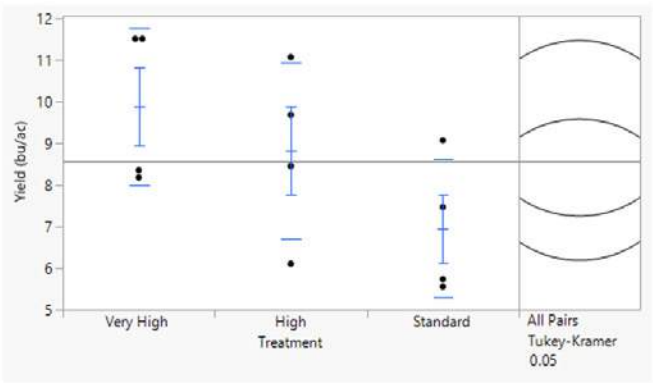




	Plant Density (plants/ft²)	Seedling Mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard – 13 plants/ft²	11.5 B	13.6 B	6.9	18.9	24.5	83.7
Trt 2 – High – 20 plants/ft²	13.6 B	32.0 A	8.8	18.9	26.2	83.5
Trt 3 – Very High –26 plants/ft²	18.1 A	32.3 A	9.9	19.1	25.0	83.6
SE[1]	0.5666	2.7484	0.94	0.2549	0.89	0.26768
p-value[3]	**<.0001**	**0.0025**	0.1251	0.911	0.4224	0.9073







Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
1	41.3	35.11	2.85	37.96	6.9	30.00	207.00	169.04	0.00
2	62.0	52.70	4.29	56.99	8.8	30.00	264.00	207.01	37.97
3	82.7	70.30	5.72	76.01	9.9	30.00	297.00	220.99	51.95

[x]2024 Small Green Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 91lb/ac; seed price $77.35/ac)
[y]2024 Small Green Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 91lb/ac; seed treatment/inoculants $6.29/ac)
2024 Small Green Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $0.50/lb)

Seeding rate had a significant effect on plant density (p<0.0001), with densities increasing as seeding rates rose. However, the “high” and “very high” seeding rates were not fully achieved, which is an important consideration. No significant differences in yield or grain quality were observed across treatments. Despite higher mortality at the “very high” seeding rate, it generally yielded the highest returns, though this difference was not statistically significant. Seedling mortality increased with higher seeding rates (p=0.0025), and as a result, actual plant densities did not align with the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Elrose 2)

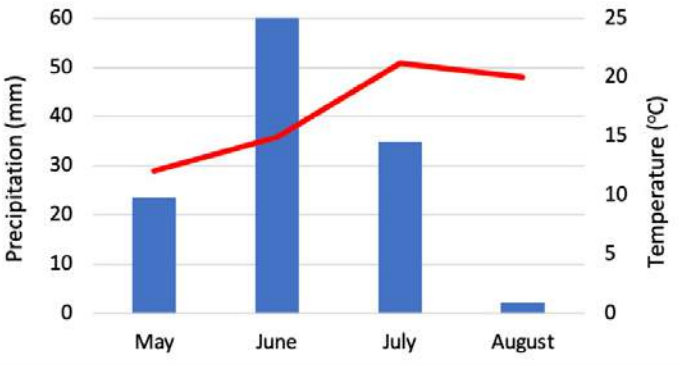
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	50.0
2	High	20	74.9
3	Very High	26	99.9

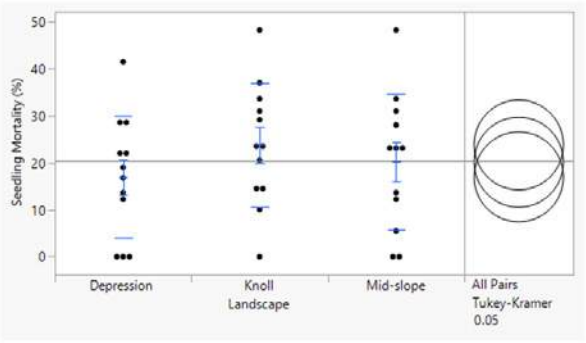
General Trial Information:

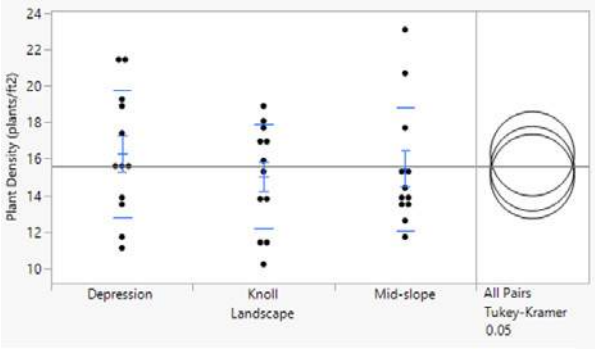
Variety	CDC Simmie
Thousand Kernel Weight	38.6 g
Germination	99%
Seed Treatment	Prosper® EverGol
Inoculant	N-Take™
Previous Crop	Wheat
Soil Organic Matter	3.2%
Residual Nitrate-N (0-6")	10 lb/ac
Soil Texture	Medium
Seeding Date	May 23
Seeding Equipment	K-Hart Spyder
Seeding Depth	1.5"
Seeding Speed	5.6 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	3 – 10 – 10 – 0
Crop Protection	May 22: MCPA + pyraflufen-ethyl + Glyphosate June 18: Rynaxypyr June 19: Metribuzin July 11: Prothioconazole + trifloxystrobin + fluopyram July 30: Lambda-cyhalothrin August 9: Glyphosate + saflufenacil

Weather obtained from local station from May 14th



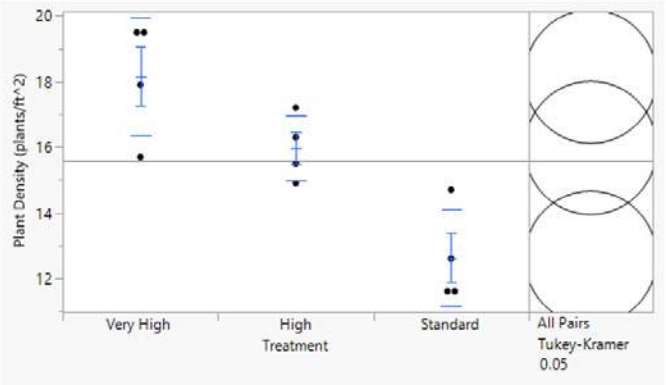
Landscape[2]	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	16.3	17.0
Mid-slope	15.5	20.1
Knoll	15.0	23.8
p-value[3]	0.6214	0.4407

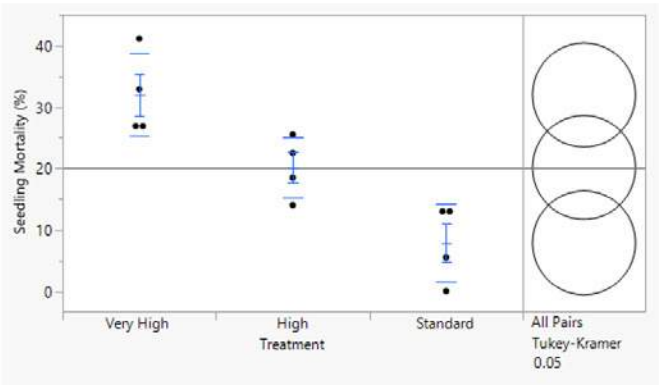




There were no significant responses in plant density or seedling mortality based on landscape topography. On average, depression had the highest plant density and lowest mortality, which could be due to higher moisture.

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard –13 plants/ft²	12.6	7.8	17.1	12.1	28.9	81.1
Trt 2 – High – 20 plants/ft²	16.0	20.1	17.6	11.9	29.0	81.2
Trt 3 – Very High –26 plants/ft²	18.2	31.9	17.3	12.2	28.9	81.5
SE[1]	0.72849	3.03	1.1	0.056	0.45	0.351
p-value[3]	**0.0012**	**0.0009**	0.9498	0.1766	0.9836	0.7517





Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	50.0	22.50	3.46	25.96	17.1	18.00	307.94	281.98	0.00
2	74.9	33.71	5.18	38.89	17.6	18.00	316.22	277.34	-4.65
3	99.9	44.96	6.91	51.86	17.3	18.00	311.12	259.26	-22.73

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Seeding rate significantly effected plant density (p=0.0012) and seedling mortality (p=0.0009), but did not have a significant impact on yield or grain quality. With yields similar across all treatments, the “standard” seeding rate, on average, provided the highest economic return. It is important to note that actual plant densities did not align with the targeted seeding rates, particularly at the “very high” seeding rate, where plant counts were notably lower.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

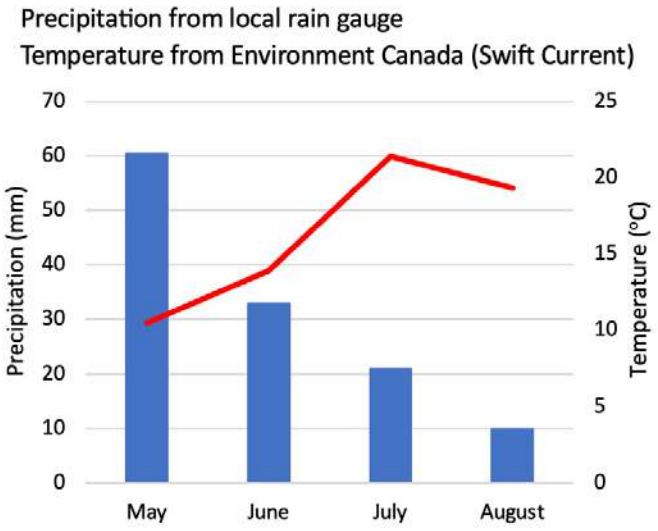
Lentil Seeding Rate
(Gull Lake)

Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

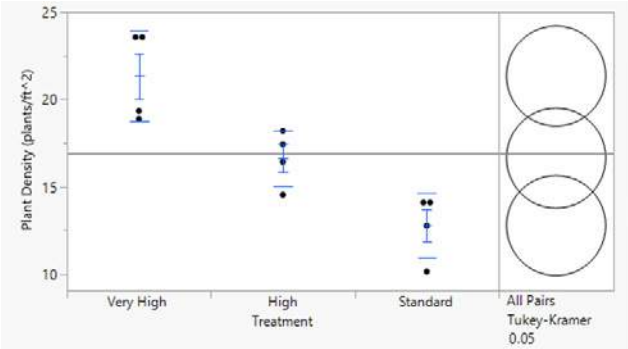
Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	50.4
2	High	20	71.5
3	Very High	26	100.9

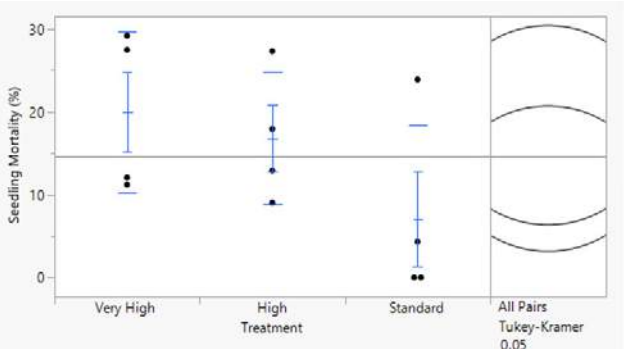
General Trial Information:

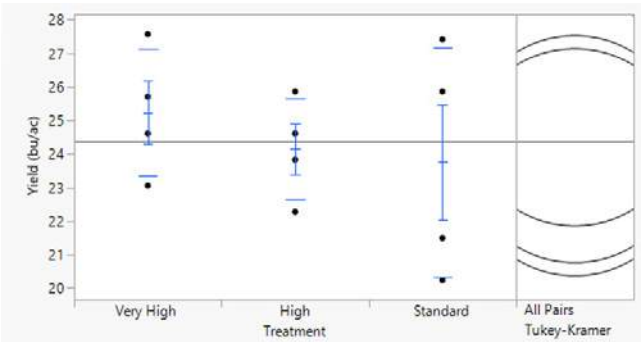
Variety	CDC Proclaim
Thousand Kernel Weight	38.9 g
Germination	99%
Seed Treatment	Vibrance® Maxx + Cruiser®
Inoculant	LALFIX® Spherical
Previous Crop	Durum
Soil Organic Matter	2.8%
Residual Nitrate-N (0-6")	18 lbs
Seeding Date	May 6
Seeding Equipment	Bourgault 3320 .75" knife
Seeding Depth	1"
Seeding Speed	5 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	6 – 26 – 0 – 0
Crop Protection	May 14: MCPA + pyraflufen-ethyl + Glyphosate June 9: imazamox + quizalofop August 5: Diquat

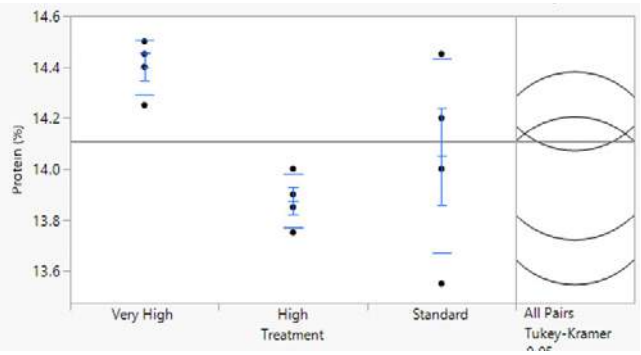


	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weights (TW) (kg/hl)
Trt 1 – Standard – 13 plants/ft²	12.8 B	7.0	23.8	14.0 AB	33.2	77.6
Trt 2 – High – 20 plants/ft²	16.6 B	16.8	24.1	13.8 B	33.2	78.3
Trt 3 – Very High –26 plants/ft²	21.3 A	19.9	25.2	14.4 A	33.5	78.9
SE[1]	1.027	4.8	1.2	0.1185	0.431	0.7071
p-value[3]	**0.0006**	0.2026	0.6748	**0.029**	0.9127	0.4024









Trt No.	Seeding Rate (lbs/ac)	Seed ($/acb)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	50.4	22.70	3.49	26.19	23.8	18.00	428.40	402.21	0.00
2	75.7	34.05	5.23	39.28	24.1	18.00	433.80	394.52	-7.69
3	100.9	45.40	6.98	52.37	25.2	18.00	453.60	401.23	-0.99

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $0.30/lb)

As seeding rates increased, plant densities also rose (p=0.0006). However, this did not result in higher yields (p=0.6748), with the “standard” seeding rate, on average, yielding the highest return. While not statistically significant, seedling mortality tended to increase with higher seeding rates. Protein content responded significantly to seeding rate (p=0.029), while test weight (TW) and thousand kernel weight (TKW) remained consistent across all seeding rates. It is important to note that actual plant densities were lower than the targeted seeding levels.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

SOILS AND SUCH AGRONOMY EST. 2013

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Kerrobert)

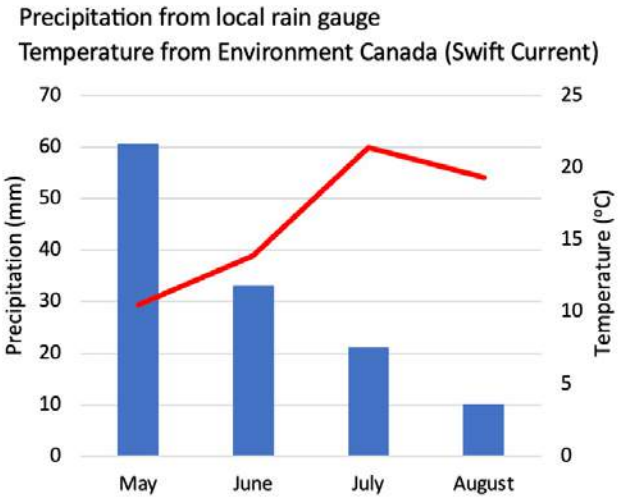
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

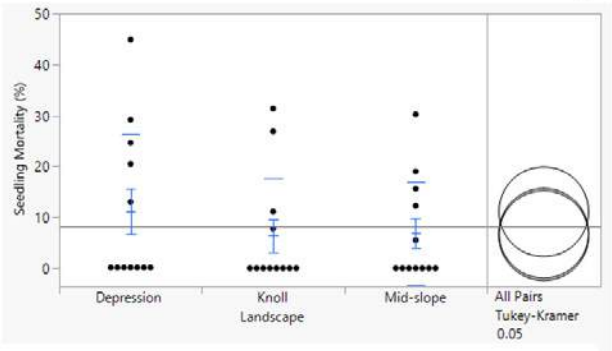
Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	50.7
2	High	20	76.1
3	Very High	26	101.4

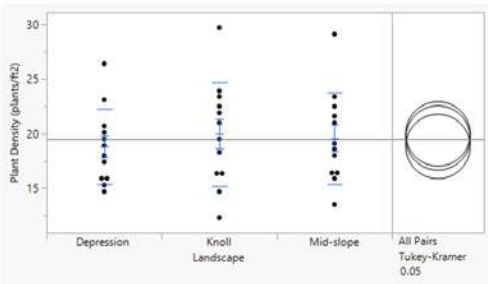
General Trial Information:

Variety	CDC Maxim
Thousand Kernel Weight	39.2 g
Germination	99%
Seed Treatment	EverGol® Energy
Inoculant	N-Charge®
Previous Crop	Wheat
Soil Organic Matter	3.7%
Residual Nitrate-N (0-6")	35 lb/ac
Soil Texture	Medium
Seeding Date	May 22
Seeding Equipment	SeedMaster 70ft double shoot
Seeding Depth	1.5"
Seeding Speed	2-5.3 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	7 – 24 – 0 – 4
Crop Protection	May: Glyphosate June: Clethodim + imazamox + imazethapyr July: Pyraclostrobin August: Diquat

Landscape[2]	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	18.8	11.1
Mid-slope	19.6	6.9
Knoll	20.0	6.4
p-value[3]	0.779	0.6034

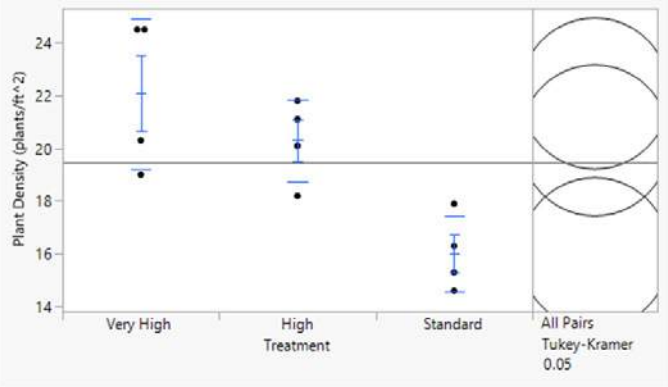


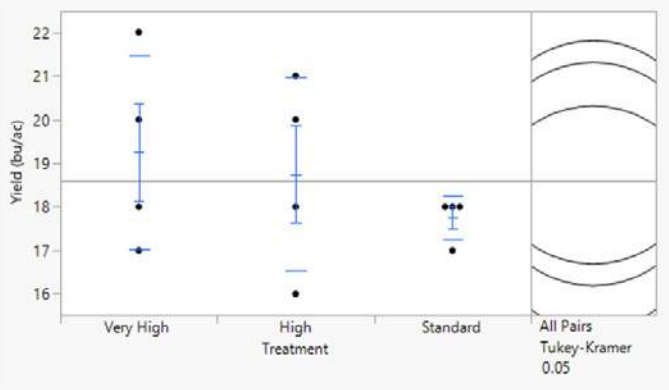




There were no significant effects between landscape position, plant density, and seedling mortality. Overall trends suggest that as plant densities increased, seedling mortality decreased. Depressions exhibited the lowest plant densities and the highest mortality, which may be attributed to elevated spring moisture levels.

	Plant Density (plants/ft^2)	Seedling mortality (%)	Yield (bu/ac)
Trt 1 – Standard – 13 plants/ft^2	16.0 B	0.0 B	17.8 B
Trt 2 – High – 20 plants/ft^2	20.3 A	2.3 B	18.8 AB
Trt 3 – Very High – 26 plants/ft^2	22.1 A	17.2 A	19.3 A
SE[1]	1.0254	3.37	0.916
p-value[3]	**0.0061**	**0.0135**	0.5058





Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	50.7	22.82	3.51	26.32	17.8	18.00	319.50	293.18	0.00
2	76.1	34.25	5.26	39.51	18.8	18.00	337.50	297.99	4.81
3	101.4	45.63	7.01	52.64	19.3	18.00	346.50	293.86	0.68

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

As seeding rates increased, so did plant densities (p=0.0061) and seedling mortality (p=0.0135). There was no significant response between seeding rates and yield (p=0.5058), with a 1.5 bu/ac increase from the “standard” to “very high” seeding rates. The “high” seeding rate of 20 plants/ft2 resulted in the highest economical return with $4.81/ac. Subsamples per plot were not collected at harvest for analysis, therefore grain quality could not be assessed.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

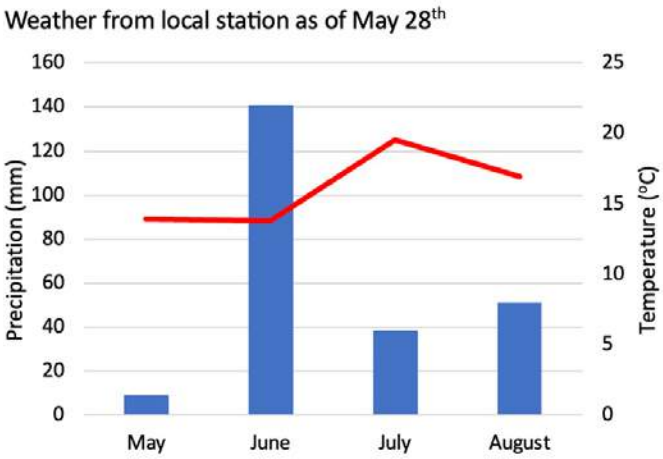
Lentil Seeding Rate (Landis)

Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

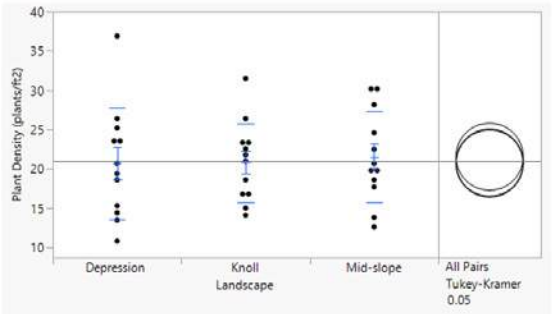
Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	50
2	High	20	75
3	Very High	26	100

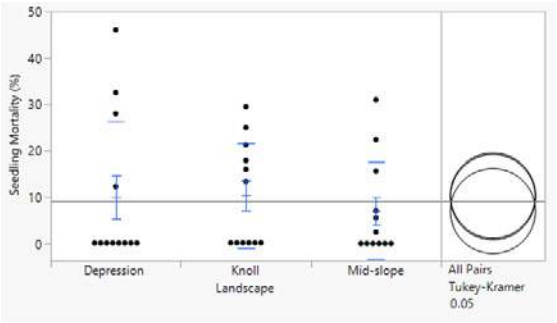
General Trial Information:

Variety	CDC Maxim
Thousand Kernel Weight	38.6 g
Germination	99%
Seed Treatment	N/A
Inoculant	Nodulator® Duo
Previous Crop	Wheat
Soil Organic Matter	4.1%
Residual Nitrate-N (0-6")	22 lbs/ac
Soil Texture	Medium
Seeding Date	May 13
Seeding Equipment	Bourgault 3720
Seeding Depth	1"
Seeding Speed	2.9-5.1 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	7 – 31 – 0 – 0
Crop Protection	May 11: Glyphosate + pyroxasulfone + carfentrazone-ethyl June 9: Imazamox + clethodim July 9: Pyraclostrobin August 20: Glyphosate August 24: Diquat



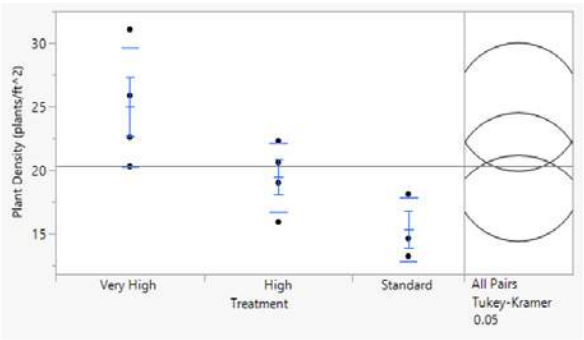
Landscape[2]	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	20.7	10.0
Mid-slope	21.6	7.0
Knoll	20.8	10.3
SE[1]	1.7	3.7
p-value[3]	0.9331	0.8046

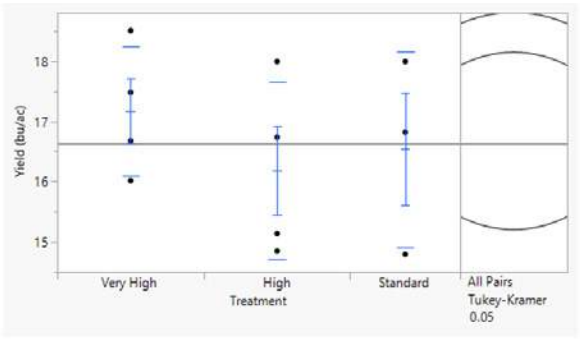




There were no significant responses in plant density or seedling mortality based on landscape topography.

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard –13 plants/ft²	15.3 B	0.3	16.2	12.4	33.2	80.3
Trt 2 – High – 20 plants/ft²	19.4 AB	6.4	16.5	12.2	33.2	80.7
Trt 3 – Very High – 26 plants/ft²	24.9 A	10.5	17.2	12.3	32.7	80.9
SE[1]	1.7	4.5	0.69	0.172	0.391	0.393
p-value[3]	**0.0179**	0.3525	0.5868	0.6636	0.6537	0.6391





Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	50	22.50	3.46	25.96	16.2	18.00	291.60	265.64	0.00
2	75	33.75	5.19	38.94	16.5	18.00	297.00	258.06	-7.58
3	100	45.00	6.92	51.92	17.2	18.00	309.60	257.68	-7.96

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Plant density increased significantly with higher seeding rates (p=0.01790). While seedling mortality also rose with higher seeding rates, the change was not statistically significant. No significant effects of seeding rate were observed on yield or grain quality. As a result, the “standard” seeding rate generally provided the highest economic return. Overall, plant densities closely matched the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Luseland)

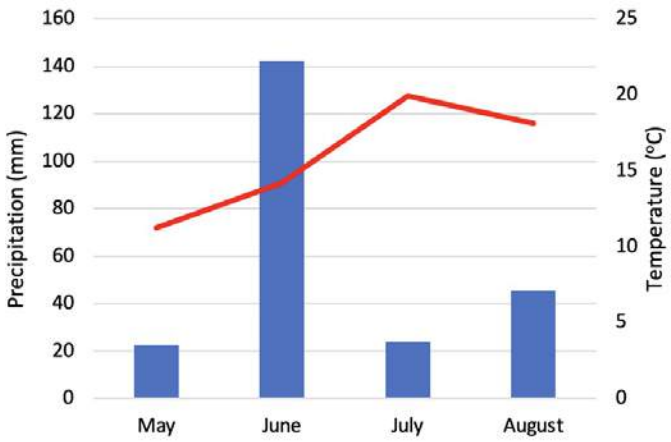
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	54.3
2	High	20	81.4
3	Very High	26	108.5

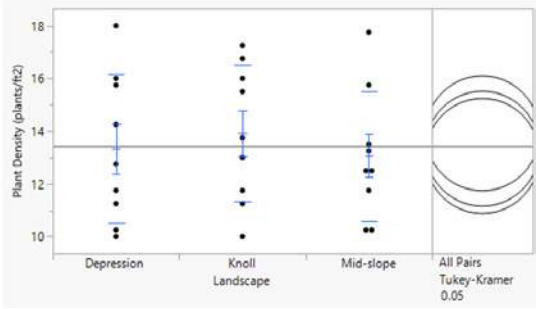
General Trial Information:

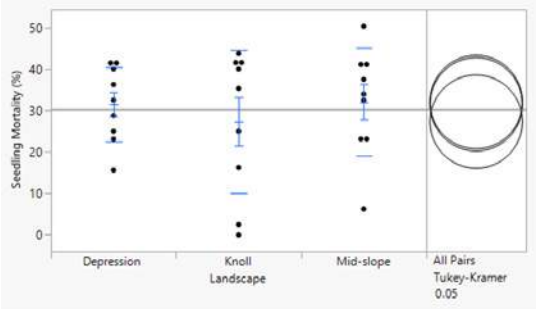
Variety	CDC Nimble
Thousand Kernel Weight	40.6 g
Germination	96%
Seed Treatment	N/A
Inoculant	Nodulator® Duo
Previous Crop	Wheat
Soil Organic Matter	4.3%
Residual Nitrate-N (0-6")	45 lb/ac
Soil Texture	Medium
Seeding Date	May 23
Seeding Equipment	Bourgault
Seeding Depth	1 – 1.5"
Seeding Speed	2.9-5.1 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	4 – 19 – 0 – 0
Crop Protection	May 2: Glyphosate + trifludimoxazin + saflufenacil + Merge® June 13: Imazamox + quizalofop + imazethapyr July 10: Azoxystrobin + benzovindiflupyr August 12: Glyphosate + saflufenacil + Merge®

Weather obtained from local station from May 19th



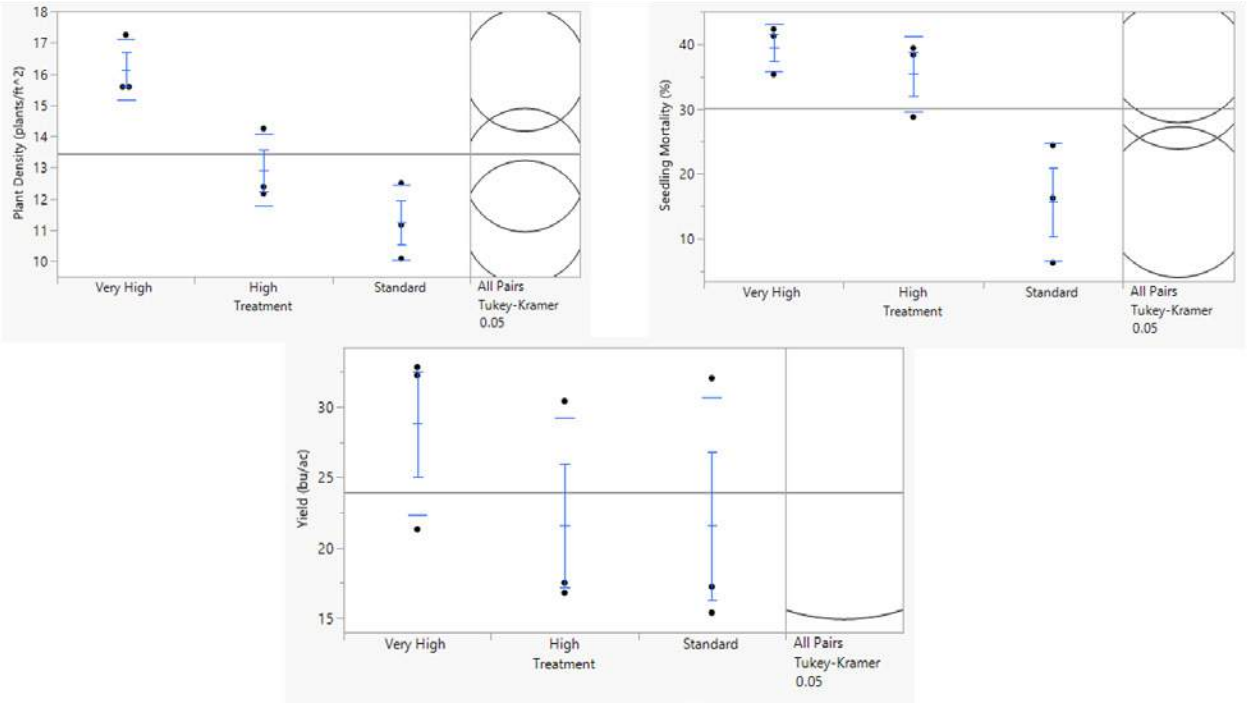
Landscape²	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	13.3	31.5
Mid-slope	13.1	32.0
Knoll	13.9	27.3
SE¹	0.87393	4.5117
p-value³	0.7677	0.7424





Overall, plant densities and seedling mortalities were similar regardless of landscape topography.

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard –13 plants/ft²	11.3 B	15.6	21.5	10.8	30.6	82.2
Trt 2 – High – 20 plants/ft²	12.9 B	35.4	21.6	10.9	30.9	82.3
Trt 3 – Very High –26 plants/ft²	16.1 A	39.5	28.7	10.7	31.4	82.6
SE[1]	0.6445	3.78	4.5	0.13	0.89	0.38
p-value[3]	**0.0041**	**0.0102**	0.5312	0.5557	0.8122	0.7456



Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	54.3	24.44	3.76	28.19	21.5	18.00	387.84	359.65	0.00
2	81.4	36.63	5.63	42.26	21.6	18.00	388.23	345.97	-13.68
3	108.5	48.83	7.50	56.33	28.7	18.00	516.60	460.27	100.62

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

As seeding rates increased, both plant density (p=0.0041) and seedling mortality (p=0.0102) also rose. However, seeding rates had no significant impact on yield or grain quality. On average, the “very high” seeding rate resulted in higher returns, making it the most economic option. It is important to note that the actual plant densities observed during the growing season were considerably lower than the intended seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

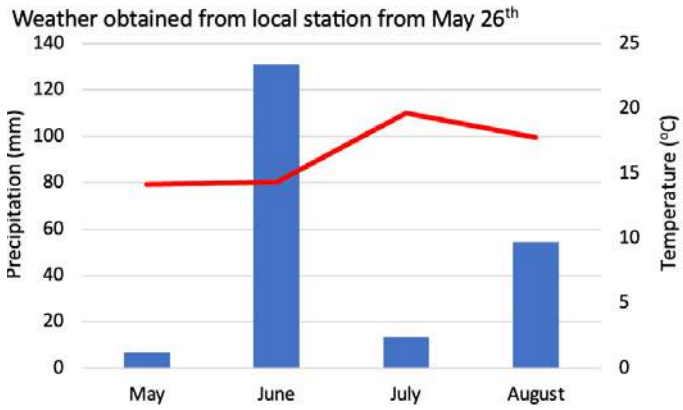
Lentil Seeding Rate (Major)

Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

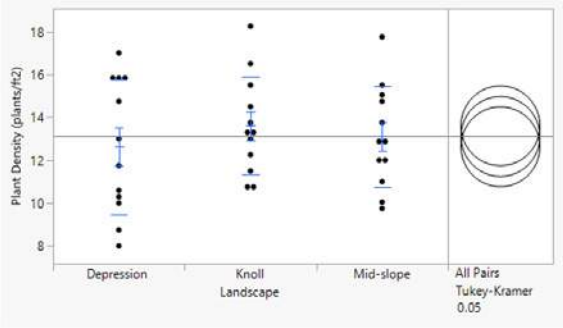
Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	61.7
2	High	20	92.5
3	Very High	26	123.4

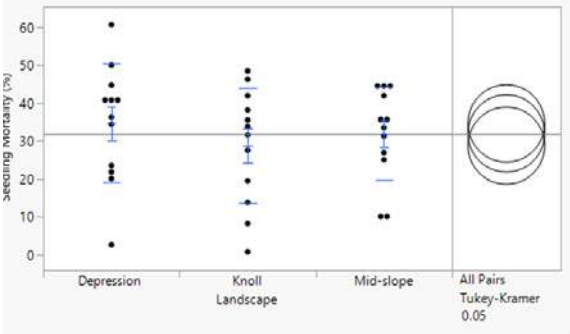
General Trial Information:

Variety	CDC Impulse
Thousand Kernel Weight	43.78 g
Germination	91%
Seed Treatment	N/A
Inoculant	Nodulator® Duo
Previous Crop	Wheat
Soil Organic Matter	4.5%
Residual Nitrate-N (0-6")	31 lb/ac
Soil Texture	Medium
Seeding Date	May 30
Seeding Equipment	Seed Hawk
Seeding Depth	1.5"
Seeding Speed	2.9-5.1 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	5 – 23 – 0 – 0
Crop Protection	May 25: Glyphosate + pyraflufen-ethyl + MCPA ester June 26: Clethodim + imazamox July 15: Azoxystrobin + benzovindiflupyr July 15: Lambda-cyhalothrin August 25: Glyphosate + saflufenacil



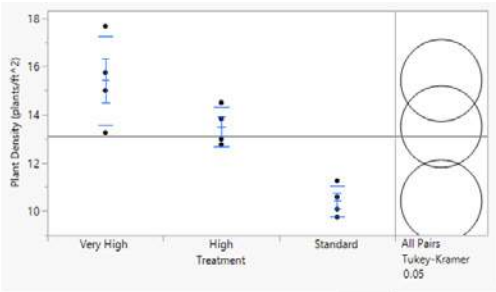
Landscape²	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	12.6	34.6
Mid-slope	13.1	31.9
Knoll	13.6	28.7
SE¹	0.7595	4.1686
p-value³	0.6369	0.5831

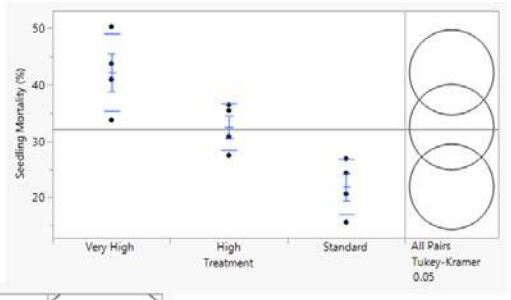


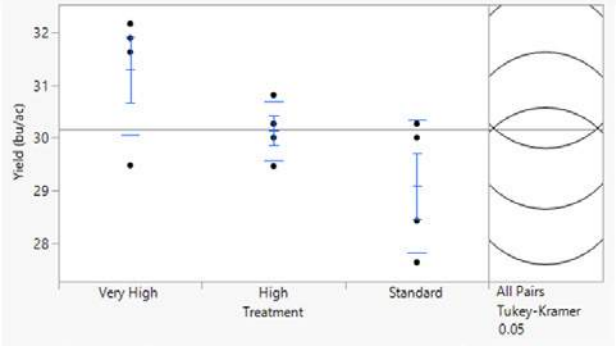


Plant density and seedling mortality were similar regardless of landscape position.

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard –13 plants/ft²	10.4	21.8	29.1	11.0	45.9	79.7
Trt 2 – High – 20 plants/ft²	13.5	32.5	30.1	11.1	45.5	79.7
Trt 3 – Very High – 26 plants/ft²	15.4	42.2	31.3	10.9	44.8	80.3
SE[1]	0.60858	2.7	0.5338	0.115	0.62	0.207
p-value[3]	**0.0007**	**0.0013**	**0.0406**	0.8917	0.4639	0.0945







Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	61.7	27.76	4.27	32.02	29.1	18.00	523.42	491.40	0.00
2	92.5	41.63	6.40	48.03	30.1	18.00	542.40	494.37	2.97
3	123.4	55.51	8.53	64.04	31.3	18.00	563.17	499.13	7.73

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Seeding rates significantly effected plant density (p=0.0007), seedling mortality (p=0.0013), and yield (p=0.0406). The "very high" seeding rate resulted in both the highest yield and the highest economic return. However, no significant responses were observed on grain quality across the different seeding rates. It is important to note that while significant responses were observed, actual plant densities were substantially lower than the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

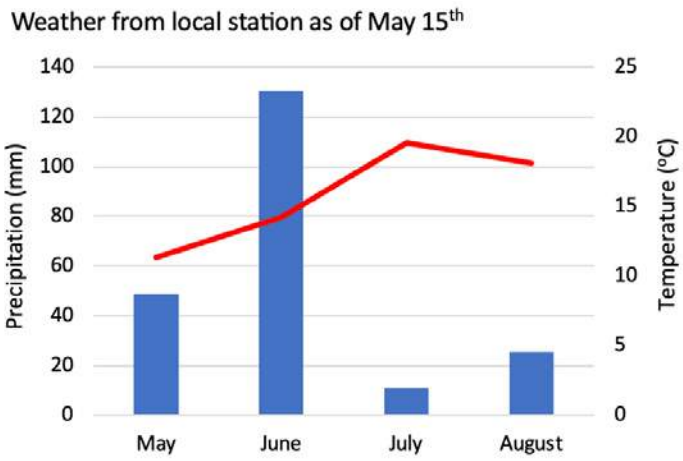
Lentil Seeding Rate (Plenty)

Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

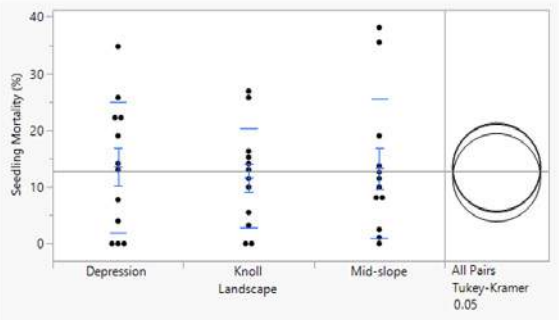
Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	52.3
2	High	20	78.5
3	Very High	26	104.6

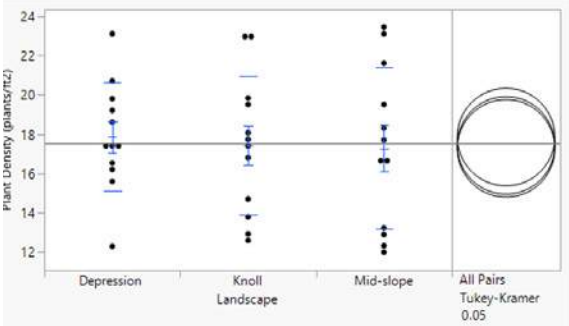
General Trial Information:

Variety	CDC Nimble
Thousand Kernel Weight	40.4 g
Germination	99%
Seed Treatment	N/A
Inoculant	Tag Team® Peat
Previous Crop	Canola
Soil Organic Matter	4.3%
Residual Nitrate-N (0-6")	13 lb/ac
Soil Texture	Fine
Seeding Date	May 27
Seeding Equipment	Bourgault Paralink
Seeding Depth	1.5"
Seeding Speed	3.1-5.3 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	6 – 23 – 0 – 2 – 0.4 Zn – 3 Mg
Crop Protection	May 26: Glyphosate June 20: Imazamox July 16: Prothioconazole + trifloxystrobin July 25: Lambda-cyhalothrin August 20: Diquat



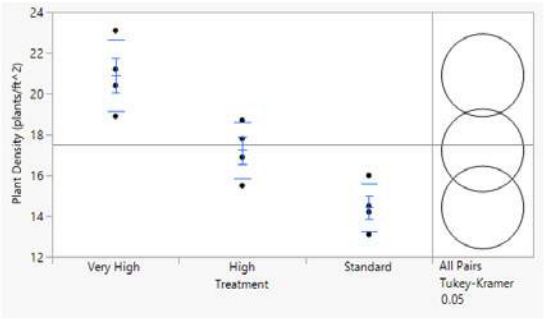
Landscape[2]	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	17.9	13.5
Mid-slope	17.3	13.3
Knoll	17.4	11.6
SE[1]	1.4	4.46
p-value[3]	0.9166	0.9097

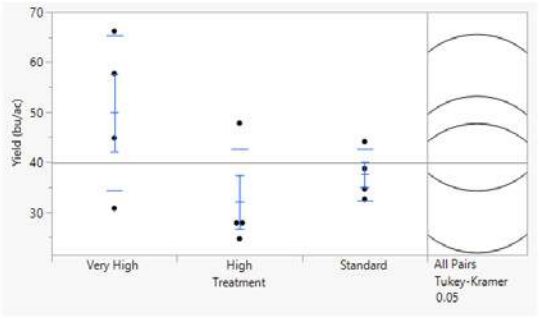




verall, plant densities and seedling mortalities were similar
gardless of landscape positions.

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard –13 plants/ft²	14.4 B	0.4 B	37.5	11.2	35.9	83.5
Trt 2 – High – 20 plants/ft²	17.2 B	13.8 A	32.0	11.2	35.6	83.6
Trt 3 – Very High – 26 plants/ft²	20.9 A	21.6 A	49.8	11.2	35.3	83.4
SE[1]	0.72753	2.7	5.9	0.075	0.204	0.139
p-value[3]	**0.0004**	**0.001**	0.1162	0.8849	0.1628	0.7131





Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	52.3	23.54	3.62	27.16	37.5	18.00	675.31	648.15	0.00
2	78.5	35.31	5.43	40.74	32.0	18.00	576.00	535.26	-112.89
3	104.6	47.09	7.24	54.32	49.8	18.00	896.40	842.08	193.93

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

As seeding rate increased, both plant densities (p=0.0004) and seedling mortality (p=0.001) also increased. The “very high” seeding rate was most economical, as it generally produced higher yields, though the variability in yields prevented statistical significance. No significant trends were observed between seeding rates and grain quality. It should be noted that plant densities were lower than the intended seeding rates.

To review footnote references please refer to overall trial summary on page 92.

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Rosetown)

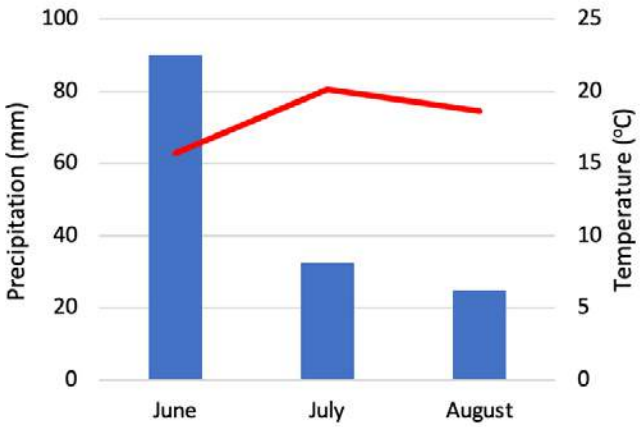
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	49.9
2	High	20	74.7
3	Very High	26	99.7

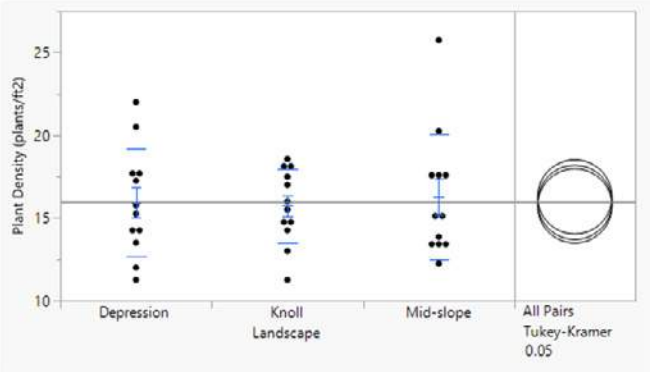
General Trial Information:

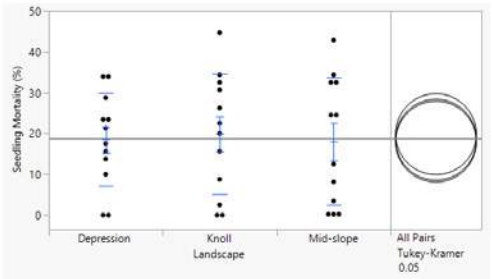
Variety	CDC Redmoon
Thousand Kernel Weight	37.7 g
Germination	97%
Seed Treatment	Insure® Pulse
Inoculant	TagTeam® BioniQ®
Previous Crop	Durum
Soil Organic Matter	3.0%
Residual Nitrate-N (0-6")	10 lb/ac
Soil Texture	Fine
Seeding Date	May 5
Seeding Equipment	Seed Hawk
Seeding Depth	1.5"
Seeding Speed	4.5 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	6 – 20 – 0 – 5 – 0.5 Zn
Crop Protection	Fall '23: Flumioxazin + pyroxasulfone May: Glyphosate + saflufenacil June 24: Quizalofop + metribuzin August 24: Glyphosate + saflufenacil

Weather from local station as of June 10th



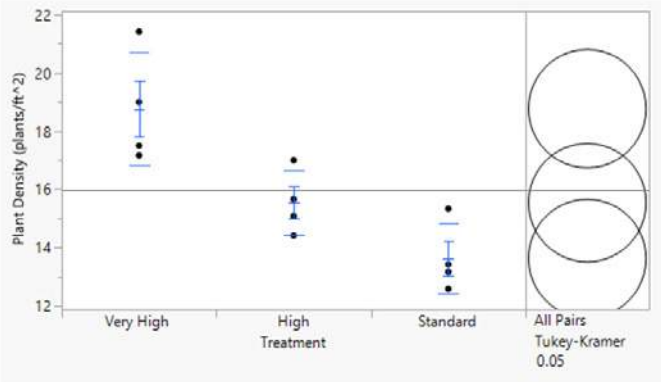
Landscape[2]	Plant Density (plants/ft²)	Seedling Mortality (%)
Depression	15.9	18.5
Mid-slope	16.3	18.0
Knoll	15.7	19.8
SE[1]	1.3	4
p-value[3]	0.9148	0.9469

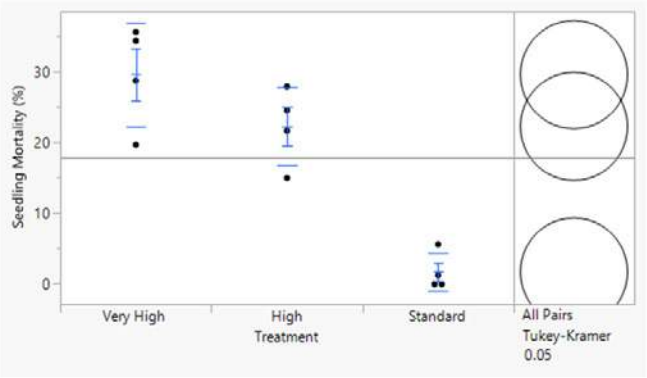




No significant trends were observed between landscape topography and seedling mortality or plant density. Overall, the data were consistent when averaged across all plots.

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard – 13 plants/ft²	13.6	1.7	32.9	11.5	31.0	80.6
Trt 2 – High – 20 plants/ft²	15.5	22.3	31.6	11.6	30.7	80.8
Trt 3 – Very High –26 plants/ft²	18.8	29.6	32.6	11.6	29.6	80.8
SE[1]	1.71	6.42	2.859	0.55808	0.797	1.75
p-value[3]	**0.0007**	**<0.0001**	0.841	0.685	0.162	0.8929





Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	49.9	22.46	3.45	25.91	32.9	18.00	592.83	566.92	0.00
2	74.7	33.62	5.17	38.78	31.6	18.00	568.70	529.92	-37.00
3	99.7	44.87	6.90	51.76	32.6	18.00	586.42	534.66	-32.26

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Overall, higher seeding rates led to a significant increase in plant densities (p=0.0007) and seedling mortality (p<0.0001). However, there were no significant responses in yield or grain quality between treatments. While not significant, from an economic perspective, the “standard” seeding rate resulted in the highest yield and the highest return. It is important to note that actual plant densities were lower than the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Shaunavon 1)

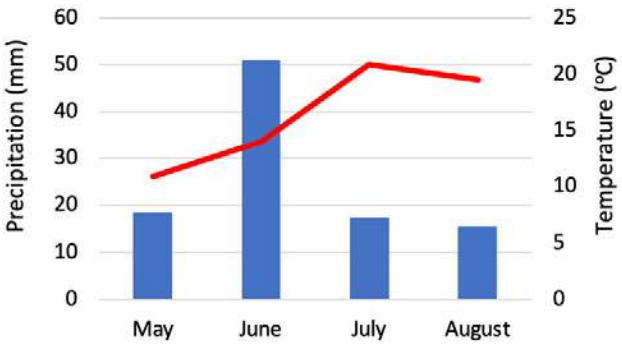
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	94.8
2	High	20	142.2
3	Very High	26	189.6

General Trial Information:

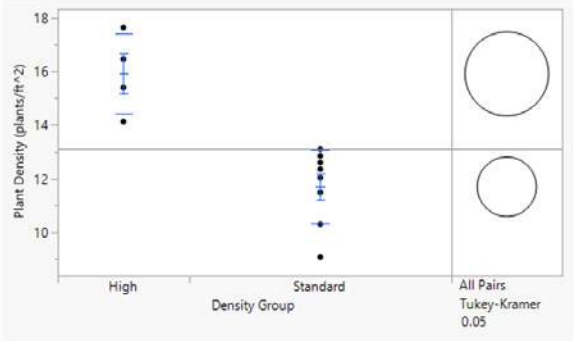
Variety	CDC Greenstar
Thousand Kernel Weight	62.1 g
Germination	84%
Seed Treatment	Vibrance® Maxx
Inoculant	Tagteam® BioniQ®
Previous Crop	Durum
Soil Organic Matter	1.3%
Residual Nitrate-N (0-6")	38 lb/ac
Soil Texture	Medium
Seeding Date	May 14
Seeding Equipment	Bourgault 3320, 0.5" openers
Seeding Depth	1.5"
Seeding Speed	4 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	6 – 26 – 0 – 0
Crop Protection	Fall '23: Flumioxazin + pyroxasulfone June 2: Metribuzin June 28: Azoxystrobin + benzovindiflupyr

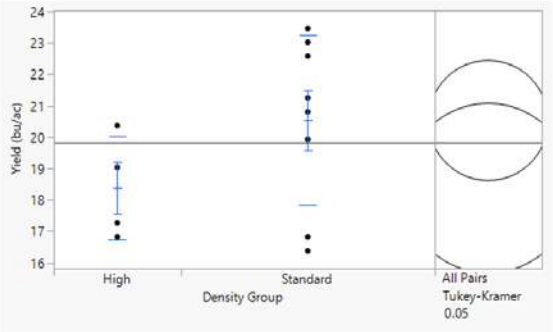
Weather from Environment Canada (Swift Current)



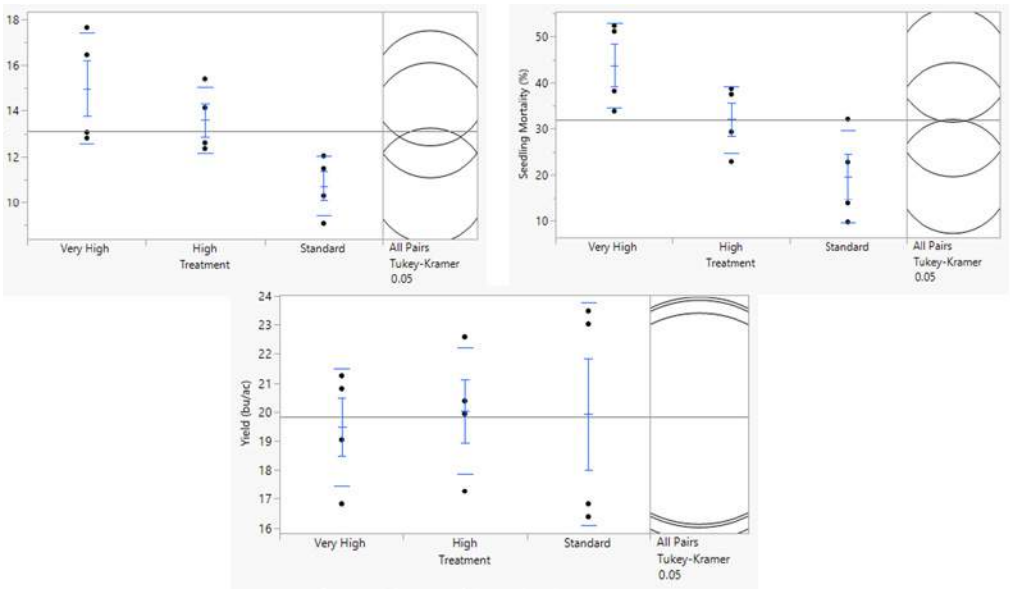
Below, actual plant counts were sorted into the appropriate categories. Where no plant densities achieved the "very high" seeding rate of 26 plants/ft². Therefore, yield, grain quality and disease, were analyzed strictly by true plant counts.

Density Group²	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TWK) (g/1000s)	Test Weight (TW) (kg/hl)	Anthracnose Severity (%)	Anthracnose Incidence (Yes=1; No=0)
Standard	11.7 B	20.5	18.2	49.8	77.3	0.73	0.017
High	15.9 A	18.4	18.1	49.1	76.6	0.725	0.018
p-value³	**0.0006**	0.1773	0.3286	0.2148	**0.0133**	0.8487	0.7428





Treatments	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TWK) (g/1000s)	Test Weight (TW) (kg/hl)	Anthracnose Incidence (Yes=1; No=0)	Anthracnose Severity (%)
Trt 1 – Standard –13 plants/ft²	10.7 B	19.6 B	19.9	18.2	49.5	76.9	0.0148	0.73
Trt 2 – High –20 plants/ft²	13.6 AB	32.0 AB	20.0	18.2	49.6	76.9	0.018	0.71
Trt 3 – Very High –26 plants/ft²	15.0 A	43.8 A	19.5	18.2	49.6	77.2	0.02	0.73
SE[1]	0.90494	4.4	1.4	0.078	0.49	0.27	0.0023	0.026
p-value[3]	**0.0213**	**0.0097**	0.9581	0.6533	0.9327	0.8654	0.2032	0.7902



Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ ac)
1	94.8	80.56	6.55	87.11	19.9	30.00	597.00	509.89	0.00
2	142.2	120.84	9.83	130.67	20.0	30.00	600.00	469.33	-40.56
3	189.6	161.13	13.10	174.23	19.5	30.00	585.00	410.77	-99.11

[x]2024 Large Green Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 91lb/ac; seed price $77.35/ac)
[y]2024 Large Green Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 91lb/ac; seed treatment/inoculants $6.29/ac)
[z]2024 Large Green Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.50/lb)

As seeding rates increased, both plant densities (p=0.0213) and seedling mortality (p=0.0097) also increased. However, no significant responses were observed for yield, grain analysis, or anthracnose ratings. From an economic standpoint, although not statistically significant, the “standard” seeding rate generated the highest return, despite not yielding the most, due to the lower costs associated with seed, seed treatment, and inoculant. It is also important to note that actual plant densities were lower than the intended seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

HAWK'S AGRO

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Shaunavon 2)

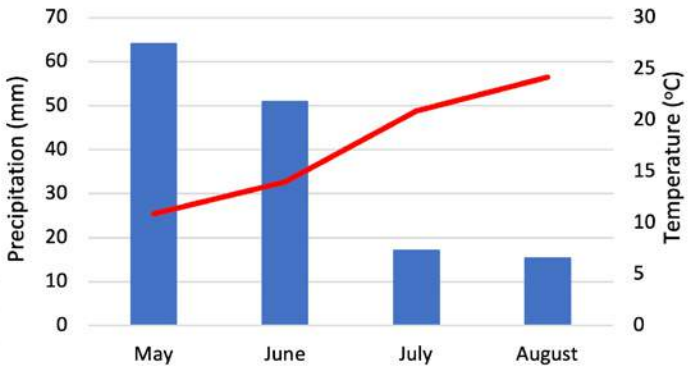
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	62.3
2	High	20	93.5
3	Very High	26	124.7

General Trial Information:

Variety	CDC Impulse
Thousand Kernel Weight	45.7 g
Germination	94%
Seed Treatment	Vibrance® Total + Lumivia®
Inoculant	LALFIX® Spherical
Previous Crop	Durum
Soil Organic Matter	4.2%
Residual Nitrate-N (0-6")	17 lb/ac
Soil Texture	Medium
Seeding Date	June 3
Seeding Equipment	Bourgault 3334 PLX .75" knife
Seeding Depth	1.25"
Seeding Speed	5 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	8 – 20 – 0 – 5
Crop Protection	May 21: Glyphosate June 26: Imazamox July 16: Azoxystrobin + benzovindiflupyr August 24: Glyphosate

Weather from Environment Canada (Swift Current)



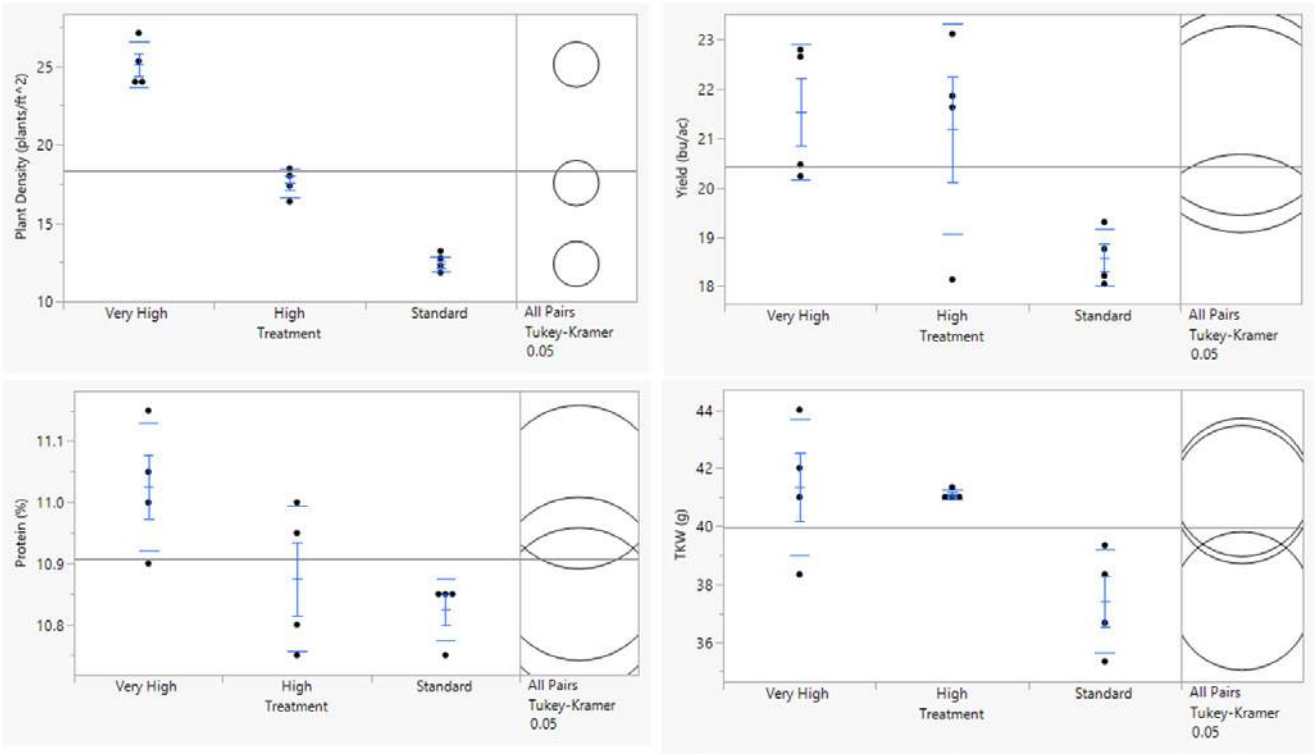
Treatment 1

Treatment 2

Treatment 3

Trt 1 Plant **Trt 2 Plant** **Trt 3 Plant**

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard – 13 plants/ft²	12.4 C	6.2	18.5	10.8 B	37.4 B	80.9
Trt 2 – High – 20 plants/ft²	17.6 B	7.1	21.2	10.9 AB	41.1 A	80.9
Trt 3 – Very High – 26 plants/ft²	25.1 A	12.3	21.5	11.0 A	41.3 A	81.3
SE[1]	0.51471	2.12	0.75	0.0478	0.852	0.419
p-value[3]	**<0.0001**	0.1676	0.0507	**0.0388**	**0.0246**	0.7067



Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	62.3	28.04	4.31	32.34	18.5	18.00	333.00	300.66	0.00
2	93.5	42.08	6.47	48.54	21.2	18.00	381.60	333.06	32.40
3	124.7	56.12	8.63	64.74	21.5	18.00	387.00	322.26	21.60

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Seeding rate had a significant effect on seeding density (p<0.0001), protein content (p=0.0388), and thousand kernel weight (p=0.0246), with all of these factors increasing as seeding rate rose. Although yield was not significantly different (p=0.0507), it was close to significant. The “high” and “very high” seeding rates resulted in yield increases of 2.9 and 2.6 bu/ac, respectively, compared to the standard seeding rate. As a result, the “high” seeding rate was the most economical option. Overall, plant densities were relatively close to the targeted seeding rates.

To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate (Shaunavon 3)

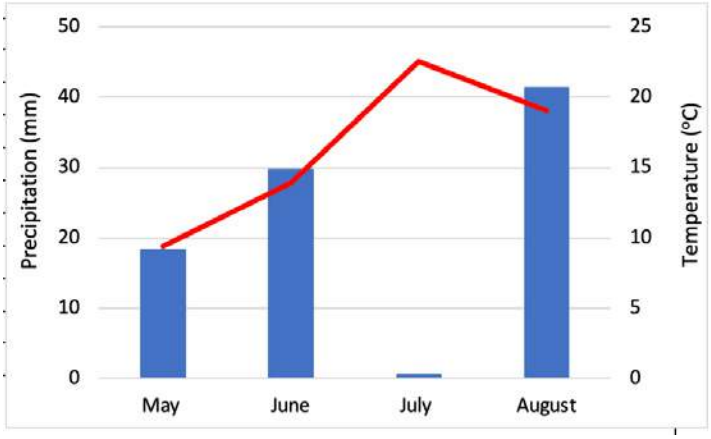
Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	50
2	High	20	74
3	Very High	26	99

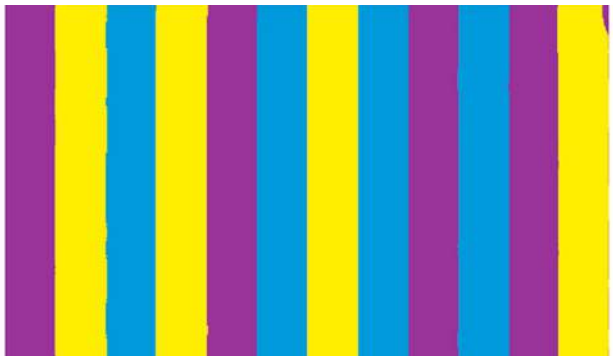
General Trial Information:

Variety	CDC Proclaim
Thousand Kernel Weight	37.5 g
Germination	98%
Seed Treatment	Vibrance® Maxx
Inoculant	Tag Team® BioniQ®
Previous Crop	Barley
Soil Organic Matter	5.6%
Residual Nitrate-N (0-6")	40 lb/ac
Soil Texture	Medium
Seeding Date	May 28
Seeding Equipment	Bourgault 3335
Seeding Depth	1"
Seeding Speed	4.9 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	7 – 22 – 4 – 6 – 4 Ca
Crop Protection	May 19: Pyroxasulfone + carfentrazone-ethyl June 25: Clethodim + Journey® July 10: Prothioconazole + fluopyram July 22: Lambda-cyhalothrin August 20: Diquat

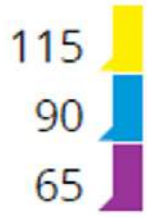
Weather from local station



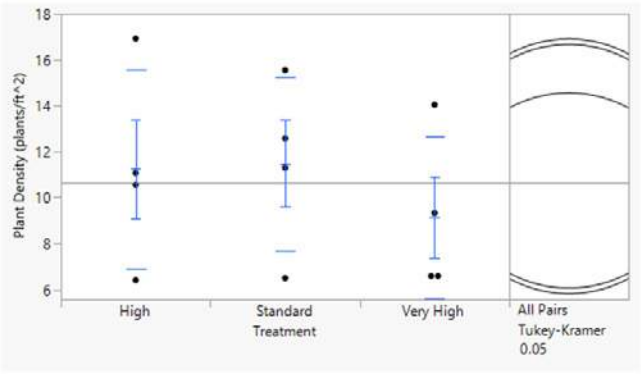
Prescription Seeding Map

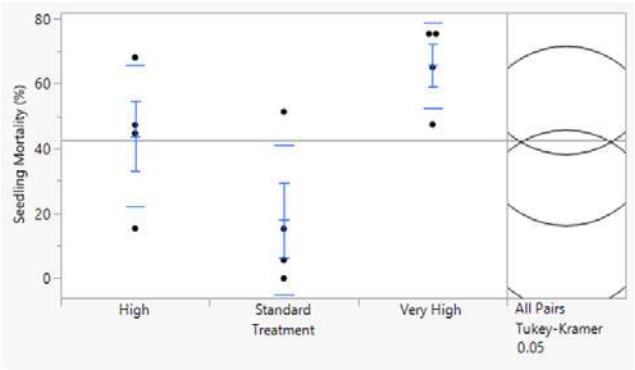


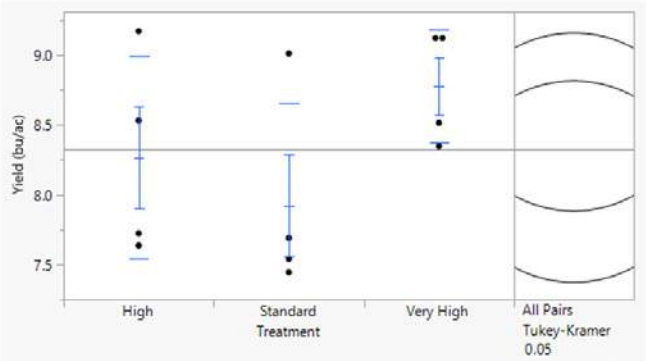
Target Seeding Rates (lb/ac)



	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard - 13 plants/ft²	11.5	18.1 B	7.9	10.8 B	37.4 B	80.9
Trt 2 – High – 20 plants/ft²	11.2	43.8 AB	8.3	10.9 AB	41.1 A	80.9
Trt 3 – Very High – 26 plants/ft²	9.1	65.7 A	8.8	11.0 A	41.3 A	81.3
SE[1]	1.9431	9.885	0.4519	0.0478	0.852	0.419
p-value[3]	0.6814	**0.0191**	0.197	**0.0388**	**0.0246**	0.7067







Trt. No	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	50	22.50	3.46	25.96	7.9	18.00	142.20	116.24	0.00
2	74	33.30	5.12	38.42	8.3	18.00	149.40	110.98	-5.26
3	99	44.55	6.85	51.40	8.8	18.00	158.40	107.00	-9.24

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

As the seeding rate increased, seedling mortality also increased (p=0.0191). However, seeding rates did not have a significant effect on plant density or yield. It is important to note that actual plant densities were considerably lower than the targeted seeding rates. Based on average yields, the “standard” seeding rate proved to be the most economical. No subsamples were taken, so grain quality analysis was not performed.

To review footnote references please refer to overall trial summary on page 92.

Pulse Replicated On-Farm Independent Trials

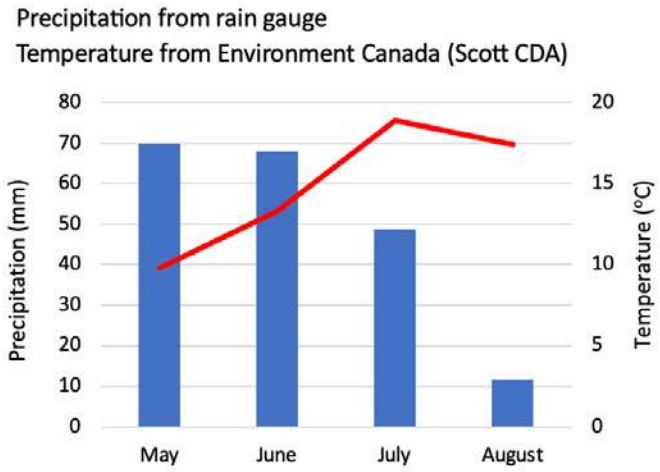
Lentil Seeding Rate (Wilkie)

Objective: Establish a field-scale replicated trial evaluating rate seeding of small red or large green lentil including comparisons of seedling survivability and yield in response to plant population across landscape positions.

Trt #	Description	Target Plant Population (plants/ft²)	Actual Seeding Rate (lb/ac)
1	Standard	13	54.6
2	High	20	81.8
3	Very High	26	109.1

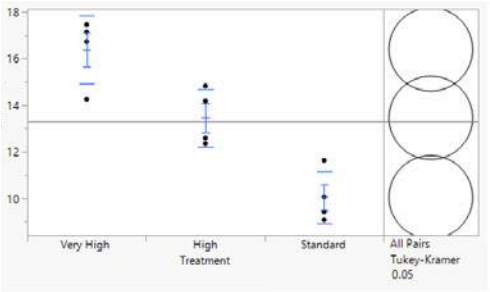
General Trial Information:

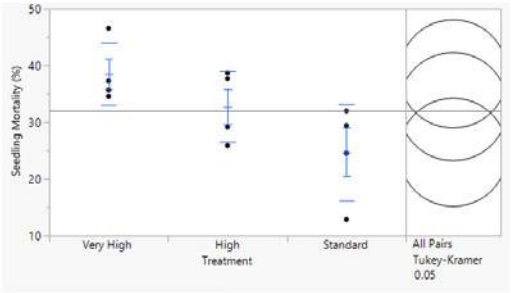
Variety	CDC Nimble
Thousand Kernel Weight	41.3 g
Germination	97%
Seed Treatment	N/A
Inoculant	TagTeam®
Previous Crop	Canola
Soil Organic Matter	5.5%
Residual Nitrate-N (0-6")	15 lb/ac
Soil Texture	Medium
Seeding Date	May 10
Seeding Equipment	John Deere P576
Seeding Depth	.75"
Seeding Speed	4.2 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	7 – 35 – 0 – 0
Crop Protection	October 21: Flumioxazin + pyroxasulfone May 8: Glyphosate + pyraflufen-ethyl + MCPA ester June 13: Metribuzin + MicroBolt® Zn June 20: Imazamox July 5: Azoxystrobin + benzovindiflupyr + MicroBolt® Mo August 25: Diquat

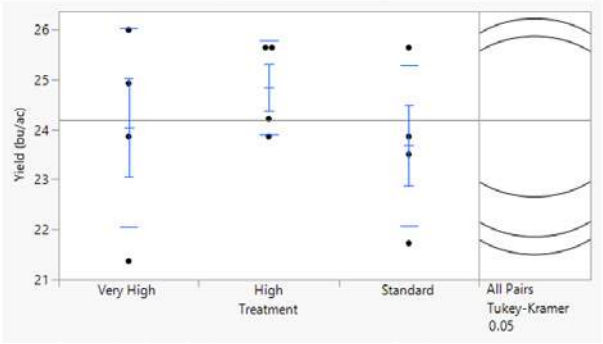


Aerial pictures taken on July 5th

	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – Standard – 13 plants/ft²	10.0 C	24.6 B	23.7	12.4	32.1	80.4
Trt 2 – High – 20 plants/ft²	13.5 B	32.7 AB	24.8	12.4	33.0	81.2
Trt 3 – Very High – 26 plants/ft²	16.4 A	38.5 A	24.0	12.1	30.6	80.7
SE[1]	0.6421	3.4	0.78	0.283	0.939	0.806
p-value[3]	**0.0002**	**0.0451**	0.5702	0.7939	0.2177	0.7882



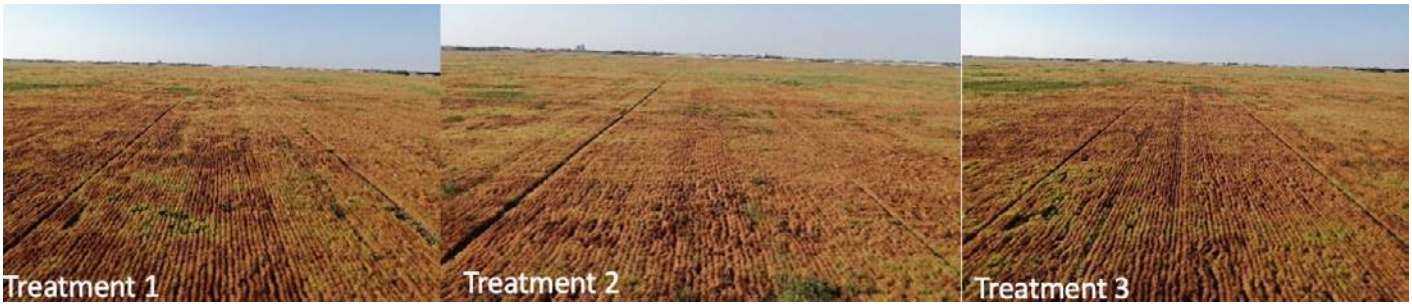




Trt No.	Seeding Rate (lbs/ac)	Seed ($/ac) [x]	Seed Treatment & Inoculant ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
1	54.6	24.57	3.78	28.35	23.7	18.00	426.28	397.94	0.00
2	81.8	36.81	5.66	42.47	24.8	18.00	447.12	404.65	6.71
3	109.1	49.10	7.55	56.64	24.0	18.00	432.69	376.05	-21.88

[x]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed price $27/ac)
[y]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 60lb/ac; seed treatment/inoculants $4.15/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Increasing seeding rates led to higher plant densities (p=0.0002) and greater seedling mortality (p=0.0451), but these factors did not result in a significant increase in yield (p=0.5702). Grain quality showed no significant response to seeding rate. On average, the “high” seeding rate yielded better results and proved to be the most economical, with a cost advantage of $6.71 per acre over the “standard” seeding rate.



To review footnote references please refer to overall trial summary on page 92.

This trial was conducted with the agronomic support of

Western Applied Research Corporation
WARC
Research from our farm to yours

Pulse Replicated On-Farm Independent Trials

Pea Fungicide Trial

Disease in peas is a serious concern and can have dramatic yield implications if not monitored and no appropriate control measures are taken when risk is high. Fungicide decision support check lists can help inform if applications are warranted by rating crop canopy, leaf wetness, crop humidity, weather forecasts, and if disease symptoms already present. In Saskatchewan, the most common species of disease found on peas is Ascochyta pinodes (sexual stage: Mycosphaerella pinodes), also referred to as mycosphaerella blight. Losses attributed to this disease have been reported to be as high as 80%. Although measures can be taken to estimate risk of disease, the use of check strips is still an excellent way of determining if the applications were economically beneficial to the farm's net income. Check strips can be easily incorporated on farm and can help producers in their future fungicide decision support check lists when they have statistically significant, replicated trial results from their own farm to reference.

Objective

To evaluate fungicide performance and farm economics on field pea from a fungicide application vs. untreated check strips.

Treatments

1)	Untreated check
2)	Treated with fungicide

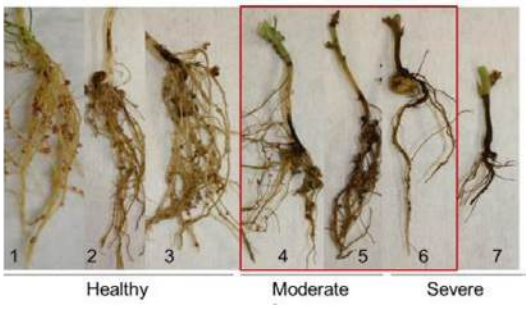
Trials were set up as randomized strip trials, with a minimum 3 replicates per treatment, preferred 4. Untreated check plots were still driven through with the sprayer with the booms turned off to create equal amounts of crop trampling in treated and untreated plots. All plots were managed the same agronomically aside from treatments.

Data Collection

- Seed test of seed lot to be used
- Soil test (N, P, K, S, OM%, pH, CEC, etc.)
- In-season disease assessments at R2-R3 stage (beginning bloom-flat pod)
- Assessments scales included below
- Seeding information (depth, opener type, fertilizer/inoculant placement, speed, etc.)
- Plant density, vigour (plant height) per plot
- Field history and management practices (E.g. fertility, pesticides, etc.)
- Yield by plot
- Harvest subsample per plot for grain analysis
- Economics
- General in-season observations such as weed competition, disease susceptibility, standability, days to flower, and maturity
- Weather data (in-field or nearby weather station)

Root Rot Rating Scale

Rating	Lesions	% affected	Pruning
1	None	0	0
2	Small (<1 cm), lesion near seed attachment	0	0
3	Small coalescing lesions approximately 180° around the stem	10-20%	0
4	Lesions extending and completely encircling the stem	20-95%	5-20%
5	Increasingly discolored and extended epicotyl lesions	100%	20-50%
6	Epicotyl lesions encircling the stem extending up to 2 cm	100%	50-80%
7	Tap root (including epicotyl) completely lesioned	Dead	Dead



Mycosphaerella/Ascochyta Blight Complex Rating Scale

Rating	Description
1	No disease
2	Mild to moderate disease on less than 5% of plant
3	Moderate to severe disease on 5-20% of plant
4	Moderate to severe disease symptoms on 20-50% of plant
5	Moderate to severe disease symptoms 50-80% of plant
6	Disease on all or most of the plant, plant stunted but alive
7	Plant stunted/dying

Bacterial Blight, White Mold and Downy Mildew

1 = Yes symptoms
0 = No symptoms

The follow footnotes will be referred to for the combined and individual site reports for this protocol

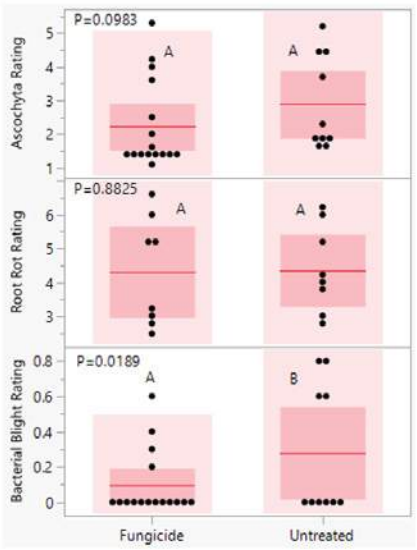
[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

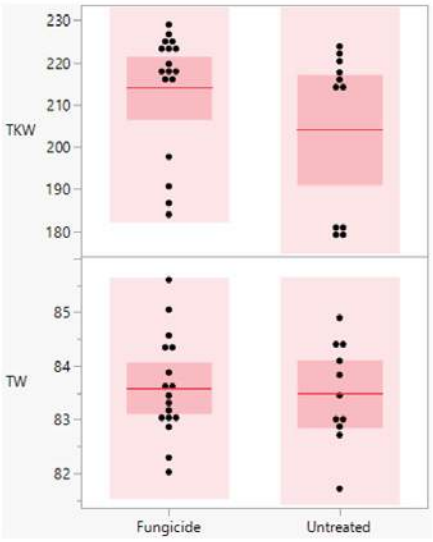
[2]All response data was analyzed using a Standard Least Square Model in JMP. Replicate and location were considered random effects while fungicide application was considered a fixed effect. If the assumptions of normality and equal variance were not met, the data was transformed and back transformed for the data presented. Treatment means were separated using Tukey's test; however, letter groupings for the interactions were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$; however, p-values in the range of 0.5-1.0 and other meaningful trends may also be discussed. P values >0.1 indicate that there is no difference between treatments.

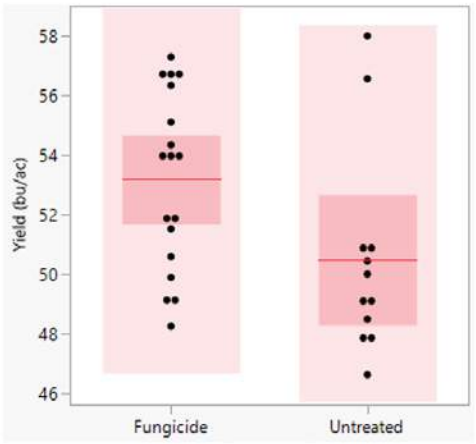
2024 Pea Fungicide Trial Results Summary

The results below are from three sites across Saskatchewan. No significant effects on yield were observed, with only a 1.2 bu/ac difference. Given the cost of fungicides, not applying them in these circumstances would be more economical. However, thousand kernel weights and test weights did increase with fungicide application. Bacterial blight was significantly reduced with fungicide use (p=0.0189). Overall, these results may be attributed to the high temperatures and low precipitation experienced at these locations in July and August.

			Disease Rating						
Treatment	Plant Density (plants/ft^2)	Heights (cm)	Root Rot (1-7)	Mycos/ Ascochyta (1-7)	Bact. Blight (Y=1, N=0)	Yield (bu/ac)	Thousand Kernel Weights (TKW) (g/1000s)	Test Weight (TW) (kg/hL)	Protein (%)
Untreated	8.1	82.3	4.4	2.7	0.2	51.3	205.8	83.1	24.6
Fungicide	7.7	84.5	4.3	2.4	0.1	52.5	210.5	83.5	24.8
SE[1]	0.088	2.96	1.24	0.9	0.05	0.66	1.75	0.23	0.11
p-value[2]	0.0054	0.4781	0.8825	0.0983	**0.0189**	0.0953	**0.0122**	**0.0472**	0.2695







Pulse Replicated On-Farm Independent Trials

Pea Fungicide
(Lone Rock)

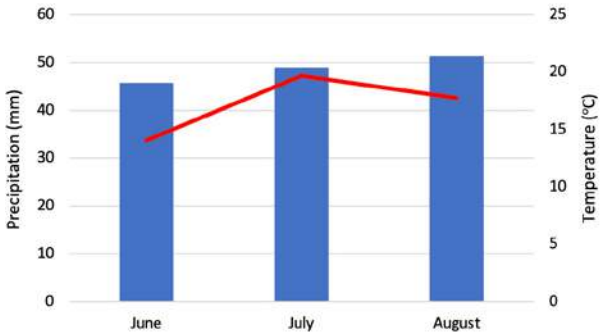
Treatment #	Description
1	Untreated
2	Fungicide

Objective: To evaluate seeding rates of chickpeas including comparisons of seedling survivability, harvested seed size, seed-borne disease, maturity, and yield in response to plant population across various landscapes.

General Trial Information:

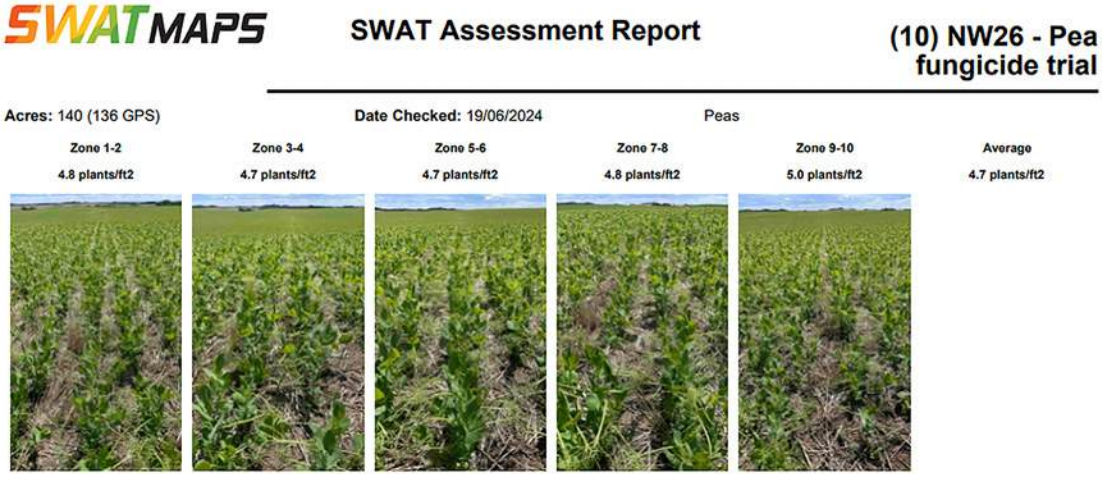
Variety	CDC Canary
Thousand Kernel Weight	263.1 g
Germination	91%
Seed Treatment	Apron Maxx®
Inoculant	Nodulator® Duo
Previous Crop	Wheat
Soil Organic Matter	4.1%
Residual Nitrate-N (0-6")	19 lb/ac
Soil Texture	Medium
Seeding Date	April 27
Seeding Equipment	Bourgault 3320
Seeding Rate	187 lb/ac
Seeding Depth	1"
Seeding Speed	4.7 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	5-24-0-0
Crop Protection	April 25: Glyphosate + trifludimoxazin + saflufenacil June 1: Imazamox + bentazon + UAN August 4: Glyphosate

Weather obtained from local weather station



Fungicide Application

Product	Pydiflumetofen + azoxystrobin + propiconazole
Rate	0.5L/ac
Date	July 4
Crop Stage	2 days after first flower
Tank Mix	NA
Water Volume	10 gal/ac
Speed	10.5 mph
Sprayer	Case 4440, 120', 120 US Gal tank

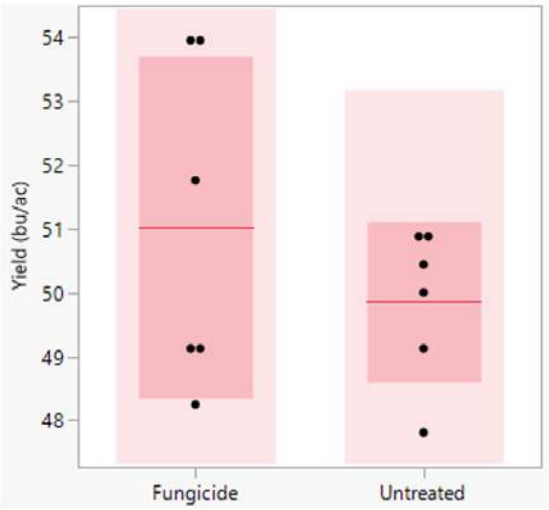


Results

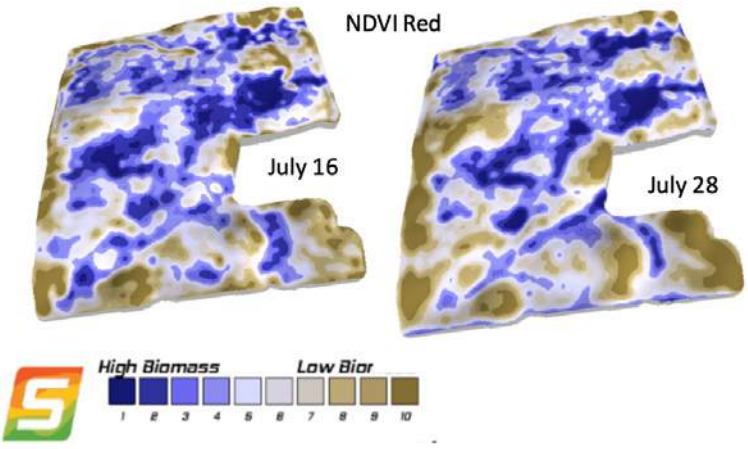
Treatment	Plant Density (plants/ft²)	Heights (cm)	Disease Rating: Root Rot (1-7)	Disease Rating: Mycos/ Ascochyta (1-7)	Disease Rating: White Mold	Disease Rating: Downy Mildew	Disease Rating: Bact. Blight	Yield (bu/ac)	Thousand Kernel Weights (TKW) (g/1000s)	Test Weight (TW) (kg/hL)	Protein (%)
Untreated	8.1	87.6	3.4	1.8	0.0	0.0	0.7	49.8	219.8	84.5	24.3
Fungicide	7.7	91.4	2.9	1.4	0.0	0.0	0.4	51.0	217.2	84.2	24.1
SE[1]	0.088	5.1	0.23	0.08	0	0	0.103	1.03	1.29	0.25	0.11
p-value[2]	0.0054	0.6202	0.1957	**0.0034**	0.1	0.1	**0.0197**	0.1608	0.1933	0.3855	0.0773

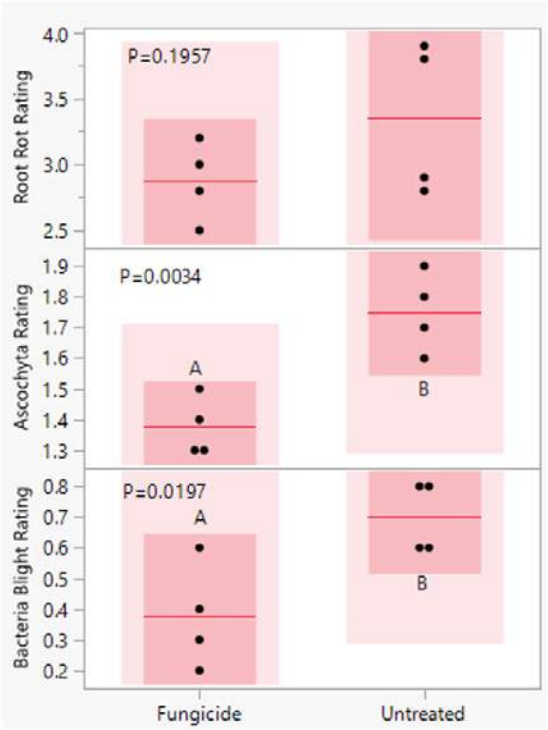
Treatment Description	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
Untreated	0.0	0.00	49.8	11.00	548.39	548.39	0.00
Fungicide	25.1	25.14	51.0	11.00	561.26	536.12	-12.27

[y]2024 Yellow Peas, 2024 Crop Planning Guide, Government of Saskatchewan (fungicide cost $25.14/ac)
[z]2024 Yellow Peas, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $11.00/ac)



Mycosphaerella/Ascochyta blight (p=0.0034) and bacterial blight (p=0.0197) ratings were significantly lower with fungicide application. An average yield increase of 1.2 bu/ac was observed with fungicide use; however, given the cost of fungicides, not applying them in this situation proved to be more economical.





To review footnote references please refer to overall trial summary on page 129.

This trial was conducted with the agronomic support of

SWATMAPS

Pulse Replicated On-Farm Independent Trials

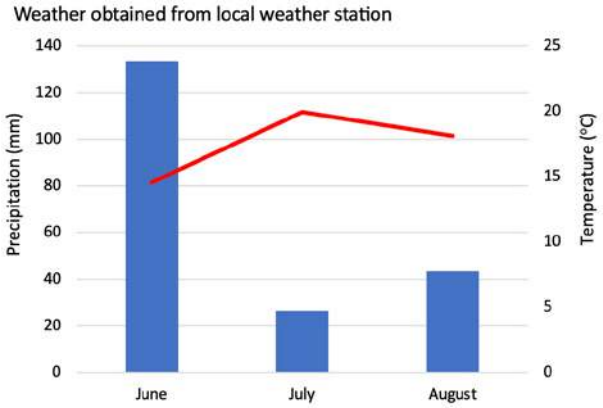
Pea Fungicide
(Luseland)

Treatment #	Description
1	Untreated
2	Fungicide

Objective: To evaluate seeding rates of chickpeas including comparisons of seedling survivability, harvested seed size, seed-borne disease, maturity, and yield in response to plant population across various landscapes.

General Trial Information:

Variety	CDC Spectrum
Thousand Kernel Weight	255.4 g
Germination	98%
Seed Treatment	N/A
Inoculant	Nodulator® Duo
Previous Crop	Canola
Soil Organic Matter	4.0%
Residual Nitrate-N (0-6")	42 lb/ac
Soil Texture	Medium
Seeding Date	May 19
Seeding Equipment	Bourgault twin knife
Seeding Rate	235.51 lb/ac
Seeding Depth	1.5"
Seeding Speed	4.3 mph
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	6-28-0-0
Crop Protection	April 25: Glyphosate + trifludimoxazin + saflufenacil June 1: Imazamox + bentazon + UAN August 4: Glyphosate



Fungicide Application

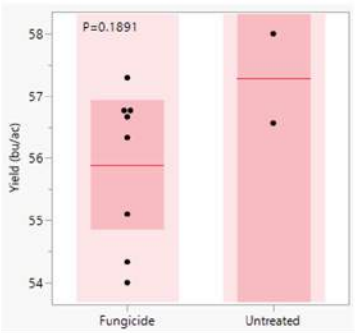
Product	Florylpicoxamid + pyraclostrobin	Prothioconazole + trifloxystrobin	Mefentrifluconazole + prothioconazole
Rate	37.2 L/ac	37.7 L/ac	38.0 L/ac
Date	July 12	July 11	July 12
Speed	12.6 mph	12.8 mph	11.8 mph
Crop Stage	Early Flowering		
Tank Mix	NA		
Water Volume	10 gallons		
Sprayer	100' Millar Nitro		

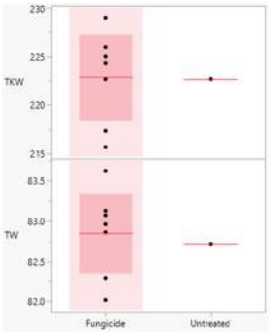
Results

Treatment	Heights (cm)	Disease Rating: Root Rot (1-7)	Disease Rating: Mycos/ Ascochyta (1-7)	Disease Rating: White Mold	Disease Rating: Downy Mildew	Disease Rating: Bact. Blight	Yield (bu/ac)	Thousand Kernel Weights (TKW) (g/1000s)	Test Weight (TW) (kg/hL)	Protein (%)
Untreated	70.9	0.0	2.1	0.0	0.0	0.0	57.3	222.7	82.7	25.8
Fungicide	72.8	0.0	1.6	0.0	0.0	0.0	55.9	222.9	82.8	25.9
SE[1]	4.69	0	0.34	0	0	0	0.96	5.101	0.572	0.35
p-value[2]	0.6862	0.1	0.2362	0.1	0.1	0.1	0.1891	0.9714	0.8188	0.6493

Treatment Description	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
Untreated	0	0	55.9	11.00	614.90	614.90	0.00
Fungicide	25.14	25.14	57.3	11.00	630.30	605.16	-9.74

[y]2024 Yellow Peas, 2024 Crop Planning Guide, Government of Saskatchewan (fungicide cost $25.14/ac)
[z]2024 Yellow Peas, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $11.00/ac)

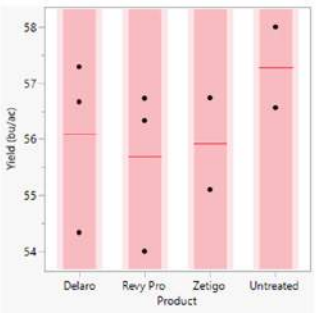




Treatment	Heights (cm)	Disease Rating: Root Rot (1-7)	Disease Rating: Mycos/ Ascochyta (1-7)	Disease Rating: White Mold	Disease Rating: Downy Mildew	Disease Rating: Bact. Blight	Yield (bu/ ac)	Thousand Kernel Weights (TKW) (g/1000s)	Test Weight (TW) (kg/hL)	Protein (%)
Untreated	71.2	0.0	2.1	0.0	0.0	0.0	56.9	222.7	82.6	25.5
Zetigo	69.5	0.0	2.0	0.0	0.0	0.0	55.5	220.0	83.0	26.1
Delaro	72.1	0.0	1.4	0.0	0.0	0.0	56.4	221.7	83.0	25.9
Revy Pro	75.6	0.0	1.5	0.0	0.0	0.0	56.0	227.5	82.5	26.0
SE[1]	5.8	0	0.341	0.0	0.0	0.0	0.52	3.0	0.84	0.115
p-value[2]	0.7485	0.1	0.4457	0.1	0.1	0.1	0.1297	0.427	0.792	0.0516

Treatment Description	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Untreated	0	0	57.3	11.00	630.08	630.08	0.00
Zetigo	25.14	25.14	55.9	11.00	615.12	589.98	-40.10
Delaro	25.14	25.14	56.1	11.00	617.07	591.93	-38.15
Revy Pro	25.14	25.14	55.7	11.00	612.57	587.43	-42.65

[y]2024 Yellow Peas, 2024 Crop Planning Guide, Government of Saskatchewan (fungicide cost $25.14/ac)
[z]2024 Yellow Peas, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $11.00/ac)



Overall, no significant effects were observed between the untreated and fungicide treatments. Additionally, there was little yield difference among the three fungicide products. In this case, opting not to spray was the more economical decision.

To review footnote references please refer to overall trial summary on page 129.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

Pea Fungicide

(Wilkie)

Treatment #	Description
1	Untreated
2	Fungicide

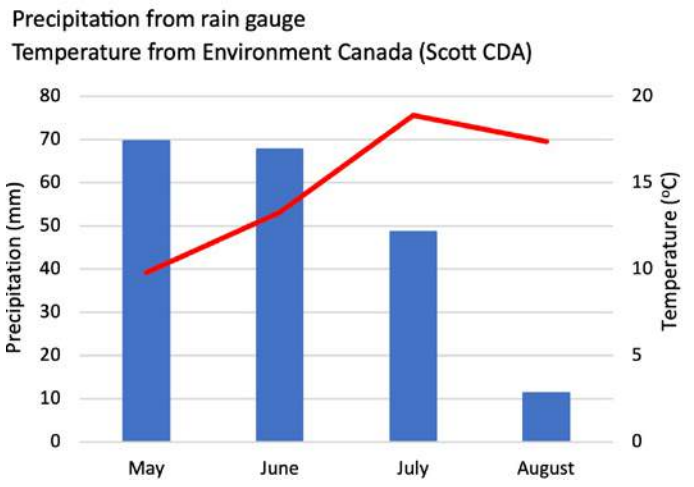
Objective: To evaluate fungicide performance and farm economics on field pea from a fungicide application vs. untreated check strips.

General Trial Information:

Variety	CDC Mosaic
Thousand Kernel Weight	240 g
Germination	84%
Seed Treatment	Insure® Pulse
Inoculant	TagTeam® LCO
Previous Crop	Canola
Seeding Date	May 11
Seeding Equipment	SeedHawk iCon 60-12
Seeding Rate	3.5 bu/ac
Seeding Depth	1.75”
Seeding Speed	5 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	6-13-6-4
Crop Protection	June 9: Imazamox + bentazon + UAN + Bio-Forge™ August 20: Diquat + LI 700®

Fungicide Application

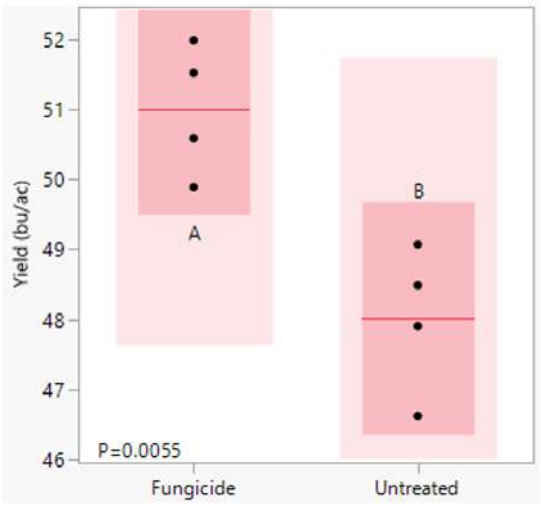
Product	Fluxapyroxad + pyraclostrobin
Date	July 15
Crop Stage	Start of flowering
Tank Mix	N/A
Water Volume	12.6 gal/ac
Speed	12 mph
Sprayer	Case Patriot 4440

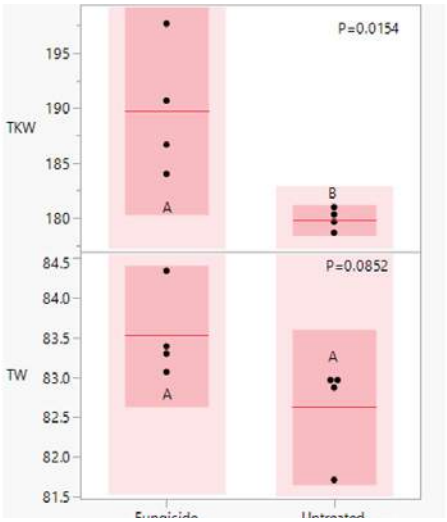


Treatment	Heights (cm)	Disease Rating					Yield (bu/ac)	Thousand Kernel Weights (TKW) (g/1000s)	Test Weight (TW) (kg/hL)	Protein (%)
		Root Rot (1-7)	Mycos/ Ascochyta (1-7)	White Mold	Downy Mildew	Bact. Blight				
Untreated	88.3	5.4	4.5	0.0	0.0	0.0	48.0 B	179.8 B	82.6	24.1
Fungicide	89.8	5.8	4.3	0.0	0.0	0.0	51.0 A	189.8 A	83.5	24.0
SE[1]	2.52	0.393	0.475	0.1	0.1	0.1	0.4973	2.74	0.418	0.23
p-value[2]	0.6983	0.5256	0.7257	0.1	0.1	0.1	**0.0055**	**0.0154**	0.0852	0.8393

Treatment Description	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
Untreated	-	-	48.0	18.00	864.36	864.36	0.00
Fungicide	25.14	25.14	51.0	18.00	917.82	892.68	28.32

[y]2024 Green/Yellow Peas, 2024 Crop Planning Guide, Government of Saskatchewan (fungicide cost $25.14/ac)
[z]Rayglen Commodities, August 21, 2024, online article, https://www.rayglen.com/rayglen-market-comments-august-21-2024/ (target price $18/bu)





Heights, disease ratings, thousand kernel weights, and protein levels showed no significant differences with fungicide application compared to the untreated check. However, the fungicide application resulted in significantly higher yields (p=0.0055), with an increase of 3 bu/ac over the check. Additionally, thousand kernel weights were significantly increased by the fungicide (p=0.0154). Accounting for the cost of the fungicide, the 3 bu/ac yield increase with a target selling price of $18/bu would lead to a profit of $28.32/ac compared to untreated.

To review footnote references please refer to overall trial summary on page 129.

This trial was conducted with the agronomic support of

Western Applied Research Corporation WARC Research from our farm to yours

Pulse Replicated On-Farm Independent Trials

Chickpea Plant Population Trial

Commonly, as stated from the Saskatchewan Ministry of Agriculture, "Seeding rates range from 90-105 kg/ha (80-95 lb/ac) for desi types and 135-210 kg/ha (120-190 lb/ac) for kabuli types. The desired plant population is 33-44 seedlings/m2 (3-4/ft²)". While this conventional seeding rate has successfully produced high-yielding chickpea crops, a more precise approach to target an optimal plant stand and adjust seeding rate according to thousand kernel weight (TKW) and seedling survivability. Also, understanding how much increasing plant density influences foliar and seed-borne disease levels is important. Achieving optimal plant populations may potentially contribute to chickpea yield improvements and help inform agronomic management decisions important to sustaining economical chickpea production.

Objective

To evaluate seeding rates of chickpeas including comparisons of seedling survivability, harvested seed size, seed-borne disease, maturity, and yield in response to plant population across various landscapes.

Treatments (Kabulis)

Low	20 plants/m²
Standard	49 plants/m²
High	78 plants/m²

Trials were set up in randomized strips with four replicates for a total of 12 plots. All plots were managed the same agronomically, besides the targeted seeding rates using TKW and germination, including seeding date, variety, seeding depth, seed treatment and inoculant, and pesticides.

Data Collection

- Seed and soil test
- Seeding information
- Field history and management practices
- In-season plant density, heights and disease assessment
- Weighed yield and harvest sample
- Harvested seed samples sent to an accredited lab for ascochyta testing
- General in-season observations
- Weather data

The follow footnotes will be referred to for individual site report for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

[2] A linear regression was used to assess the effects of seeding rate on plant density and the relationship between plant density and the remaining response variables. The data was also analysed using the Mixed Model procedure in JMP with replicate considered random and seeding rate considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$. However, p-values of 0.05-0.01 may also be acknowledged. P<0.05 = likely that the difference was due to the treatment. P<0.01 = possible that the difference was due to the treatment. P>0.01 = not likely that the difference was due to the treatment

Chickpea Plant Population
(Luseland)

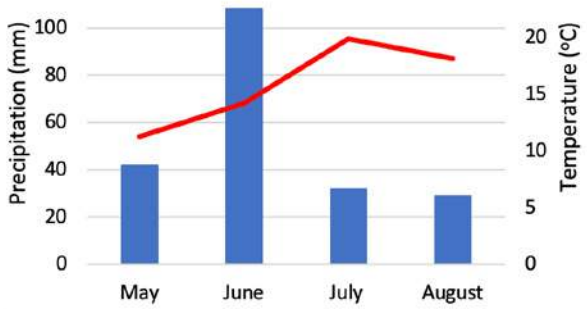
Objective: To evaluate seeding rates of chickpeas including comparisons of seedling survivability, harvested seed size, seed-borne disease, maturity, and yield in response to plant population across various landscapes.

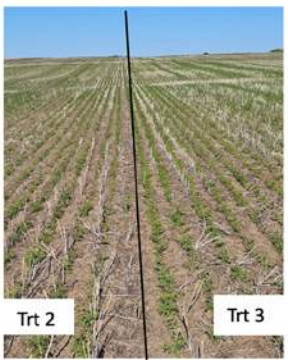
Trt No.	Description	Target Plant Population (plants/ft²)	Target Plant Population (plants/m²)	Actual Seeding Rate (lb/ac)
1	Low	2	20	57.5
2	Standard	5	49	139.3
3	High	7	78	221.1

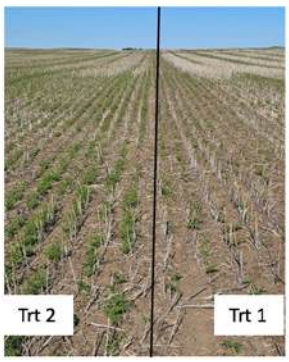
General Trial Information:

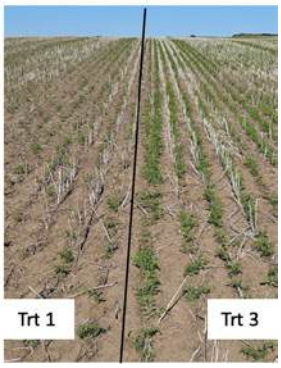
Variety	CDC Lancer
Thousand Kernel Weight	296.4 g
Germination	94%
Seed Treatment	Insure® Pulse
Inoculant	TagTeam® BioniQ® Chickpea
Previous Crop	Canola
Soil Organic Matter	3.1%
Residual Nitrate-N (0-6")	16 lb/ac
Seeding Date	May 10
Seeding Equipment	Bourgault 3335 w/ MRB
Seeding Depth	1.5"
Seeding Speed	4 – 4.5 mph
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	50 lbs/acre 40 Rock (12-40-0-6.5 - 1% Zinc) + 20 lbs/acre Potassium (0-0-50-17) 6-20-10-6-0.5 Zn
Crop Protection	October 22: Sulfentrazone + pyroxasulfone + imazethapyr June 19: Quizalofop + imazamox June 19: Pydiflumetofen + azoxystrobin + propiconazole July 5: Mefentrifluconazole + prothioconazole July 19: Azoxystrobin + benzovindiflupyr August 31: Diquat

Precipitation obtained from rain gauge as of May 1st
Temperature from local station as of May 19th



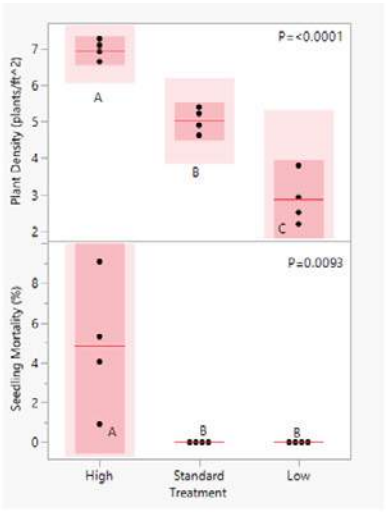


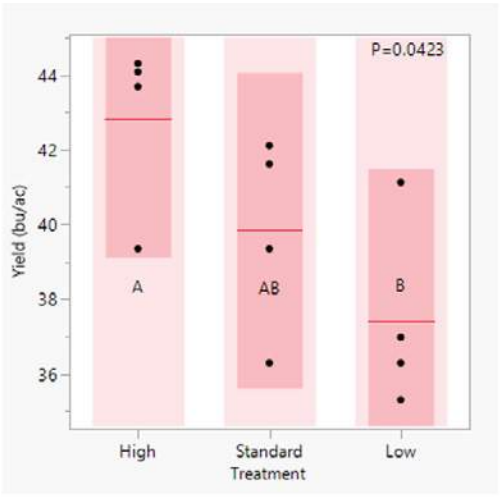


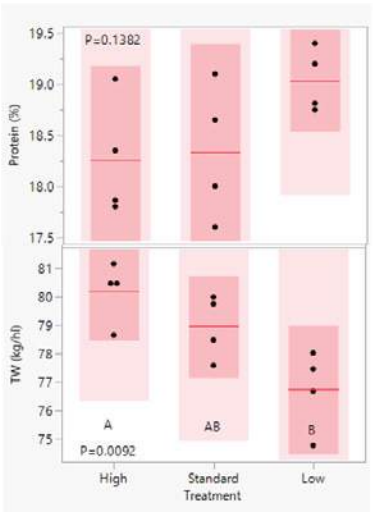


Treatment Description	Plant Density (plants/ft²)	Seedling mortality (%)	Yield (bu/ac)	Thousand Kernel Weight (g/1000s)	Test Weight (kg/hL)	Protein (%)	Moisture (%)
Low - 2 plants/ft²	2.9 C	0.0 B	37.4 B	375.1	76.7 B	19.0	16.0 A
Standard - 5 plants/ft²	5.0 B	0.0 B	39.8 AB	367.0	79.0 AB	18.3	14.2 AB
High - 7 plants/ft²	6.9 A	4.8 A	42.8 A	364.8	80.2 A	18.3	13.5 B
SE[1]	0.471	1.37	1.74	8.8	0.862	0.38	0.761
p-value[2]	**<.0001**	**0.0093**	**0.0423**	0.6937	**0.0092**	0.1382	**0.0217**

Description	24r	22r	20r	18r	16r	14r	Ascochyta (%)
Low - 2 plants/ft²	15.1	142.4	154.7	28.8	5.0	1.5	0.0
Standard - 5 plants/ft²	8.9	117.2	184.2	33.8	3.9	0.8	0.0
High - 7 plants/ft²	11.8	119.8	180.3	32.5	3.9	0.8	0.0
SE[1]	3.86	7.2	10.7	3.012	0.527	0.147	0.1
p-value[2]	0.3177	0.0671	**0.0445**	0.5031	0.277	**0.0012**	0







Treatment Description	Seeding Rate (lbs/ac)	Seed ($/ac)[x]	Seed Treatment & Inoculant ($/ac)[y]	Total Expenses ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Low - 2 plants/ft²	57.5	39.10	3.98	43.08	37.4	27.0	1010.5	967.43	0.00
Standard - 5 plants/ft²	139.3	94.72	9.64	104.36	39.8	27.0	1075.7	971.38	3.95
High - 7 plants/ft²	221.1	150.35	15.29	165.64	42.8	27.0	1156.3	990.64	23.22

[x]2024 Kabuli Chickpea, Large, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 145lb/ac; seed price $98.60/ac)
[y]2024 Kabuli Chickpea, Large, 2024 Crop Planning Guide, Government of Saskatchewan (seed rate 145lb/ac; seed treatment/inoculants $10.03/ac)
[z]2024 Kabuli Chickpea, Large, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.45/lb)

Plant density (p<0.0001) and seedling mortality (p=0.0093) were both significantly impacted by seeding rates. The high seeding rate, targeting 7 plants/ft², had the highest plant density and seedling mortality. Yield (p=0.0423) was also significantly impacted by seeding rate, where, the highest seeding rate also had a 3.0 and 5.4 bu/ac increase over the low and standard seeding rates, respectively. The higher yields, along with the increased seed, seed treatment and inoculant costs, still resulted in the high seeding rate being the most economical. No significance was found with seed size, other than the 20r (p=0.0445) and 14r (p=0.0012).

To review footnote references please refer to overall trial summary on page 139.

Wheat

WHEAT WISE
Plotting the Future

by Sask Wheat
DEVELOPMENT COMMISSION

Overview

In 2022, Sask Wheat launched our On-Farm Trial program, now branded "Wheat Wise - Plotting the Future". Through this program, producers can work alongside Sask Wheat, their agronomist and research experts while implementing field-scale trials under their farm conditions and management practices to get results that matter to them.

The overall goal of the program is to build an on-farm research network that is led and used by producers. This will allow producers to fine-tune recommendations for their specific farm conditions and assist with future management decisions. Although the work is collective, the end goal remains the same: maximize wheat yield, quality and economic return.

Over the years our program has tested everything from seeding rates to biological nitrogen fixation products on wheat. This year our program grew exponentially featuring 26 trial sites around the province testing 5 different protocols.

Moving forward, Sask Wheat is excited to continue to listen to producer areas of interest and offer a variety of protocols while continuing to expand the program.

Protocol: Foliar Applied Nitrogen Fixing Biological Products

Protocol: Split or Top Up Nitrogen

Protocol: Enhanced Efficiency Nitrogen Fertilizer

Protocol: Wheat Variety Trials

Protocol: Wheat Fungicide

WHEAT WISE
Plotting the Future

Wheat Wise On-Farm Trial Program

Foliar-Applied Nitrogen Fixing Biological Products

Wheat generally requires a large supply of nitrogen (N) to support high yields and quality. New commercially available biological products may have the ability to facilitate biological N fixation in non-legume crops, potentially reducing the N fertility requirements of these crops. However, there is little publicly available data regarding the performance of N-fixing biological products on wheat.

Objective

To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatments

1)	Untreated check
2)	Foliar N-fixing biological produc
3)	Foliar N-fixing biological product #2 (optional)

The treatments were replicated four times and applied in randomized strips, for a total of 8 to 12 plots. All plots were managed the same agronomically including seeding date, variety, seeding depth, seed treatment, and pesticide application.

The foliar N-fixing products were applied according to the label, with consideration given to handling, storage, crop stage, application timing, application conditions, water volume and tank mixing. The foliar N-fixing biological product(s) was either tank-mixed at herbicide timing or applied as a separate pass.

Data Collection

- Soil test
- Seeding information
- Field history and management practices
- In season plant density
- Weighed yield and harvest sample
- General in-season observations
- Weather data

The follow footnotes will be referred to for the 2024 combined and 2024 individual site reports for this protocol

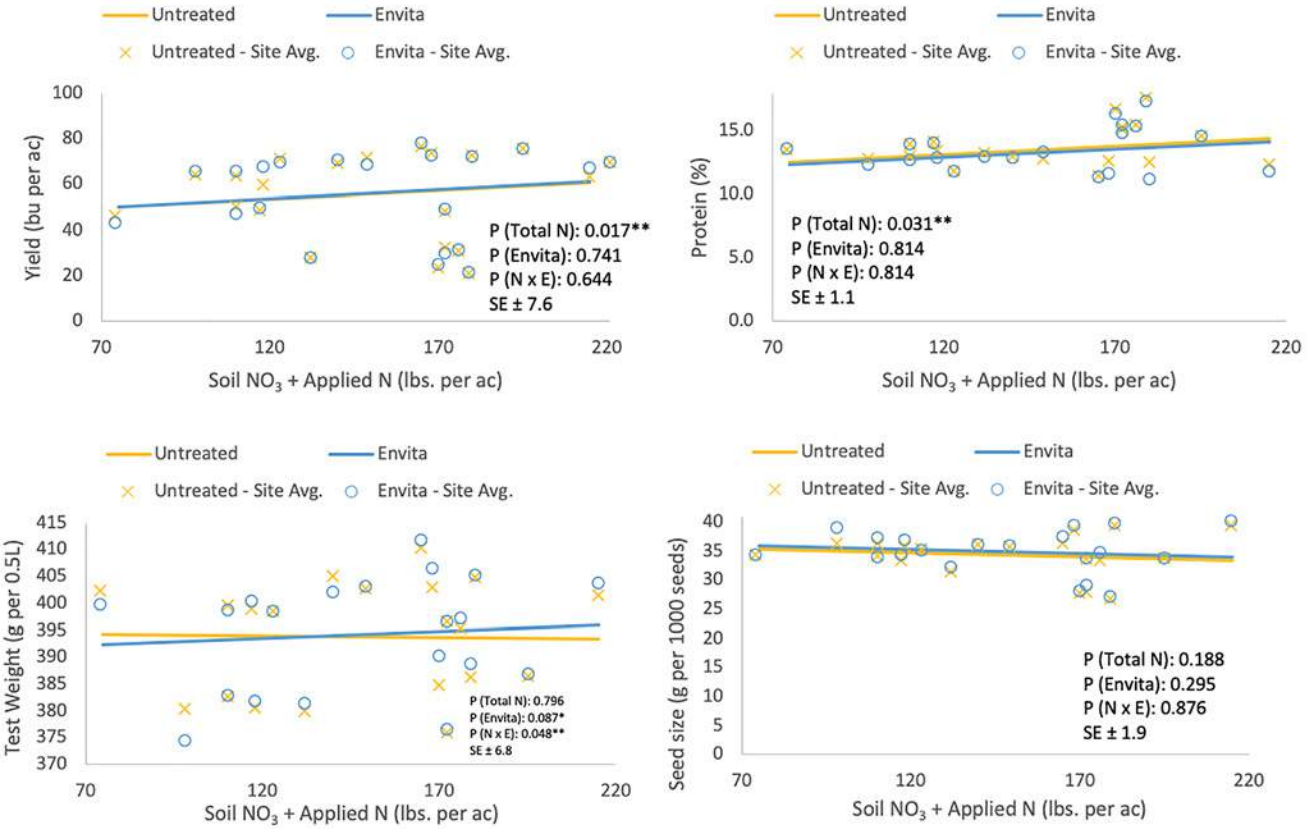
[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate and location considered a random effect and product considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$

[3]SE was not record as the sample sizes are unequal and therefore standard error was different for each sample size

2023 Combined Results (12 sites)

Data from all sites was combined to assess the overall effect of Envita® application and whether the effect differed with nitrogen (N) availability. The amount of applied N was added to the soil residual NO3¯ to estimate N supply for different sites and treatments. Overall, we were unable to detect a significant difference in yield in response to Envita® application under the conditions experienced across the trials in 2023. However, nitrogen supply may have had a positive effect on yield ($p<0.1$). Protein increased significantly with nitrogen supply ($p<0.05$) but was not significantly affected by Envita® application. The effect of N supply on test weight differed when Envita® was applied ($p<0.05$); test weight was unaffected by N supply when untreated, but increased with N supply when Envita® was applied.



The following footnotes will be referred to for the 2023 combined report only:

[1]Yields were adjusted to 14.5% seed moisture content

[2]SE is the standard error which is in the same unit as the measurement and indicates the level of variability or uncertainty in the data.

[3]The p-value indicates the statistical significance, or likelihood that the measured difference was a result of the treatment:
$p < 0.01$ = Very likely; Very high probability that the difference was due to the treatment (***)
$p < 0.05$ = Likely; Good probability that the difference was due to the treatment (**)
$p < 0.1$ = Possibly; Moderate probability that the difference was due to the treatment (*)
$p > 0.1$ = Not likely; Probability too low to confirm if the difference was due to the treatment (not significant)
** Where $p < 0.05$, treatment differences are shown in summary figures.

[4]p-value (N rate) indicates the likelihood of a difference resulting from N rate treatments only;
p-value (Envita®) indicates the likelihood of a difference resulting from Envita® application only; p-value (N x E) indicates the likelihood of N rate treatments having different responses to Envita® application

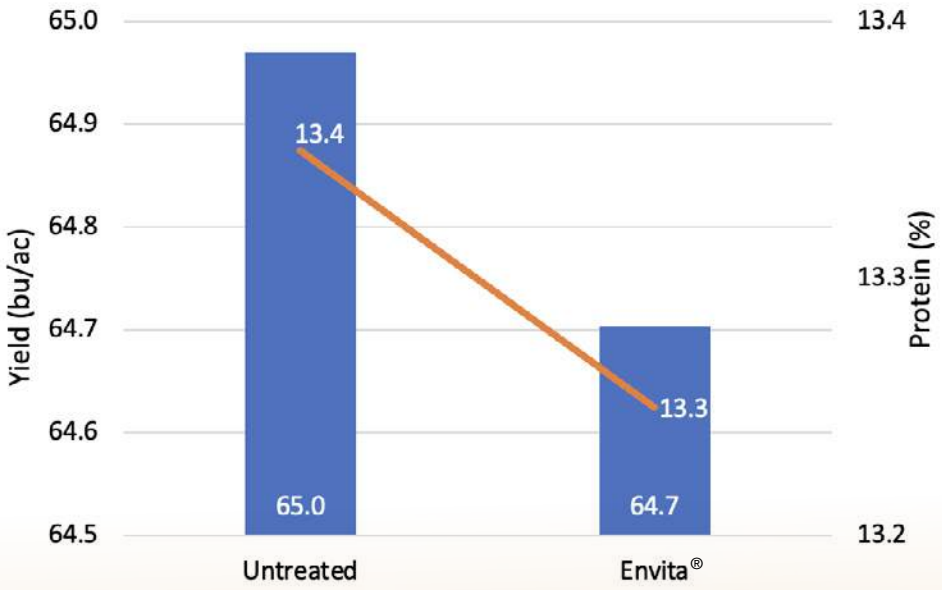
Thank you to Syngenta for donating product in 2023

syngenta

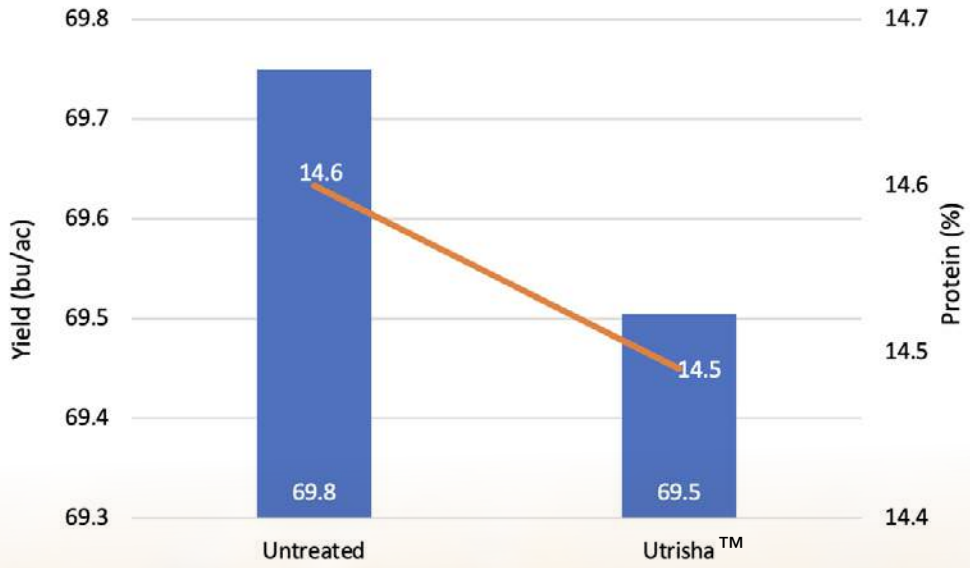
Combined Results 2024 (7 sites)

There were 7 locations in the province (4 Envita®, 2 Utrisha™ and 1 both products). The combined data includes 5 sites with Envita® and 3 sites with Utrisha™. There were no detectable differences in plant densities, yield, or grain quality with the application of a foliar-applied N-fixing bacteria product. Since no significant yield differences were observed between treatments, the most economical option is the control.

Product[3]	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated	25.6	65.0	13.4	32.2	78.6
Envita®	25.6	64.7	13.3	32.1	78.4
p-value[2]	0.9485	0.8489	0.3805	0.8208	0.6015



Product[3]	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated	29.8	69.8	14.6	32.2	79.0
Utrisha™	30.1	69.5	14.5	32.1	79.1
p-value[2]	0.4057	0.7428	0.4206	0.7218	0.739



WHEAT WISE
Plotting the Future

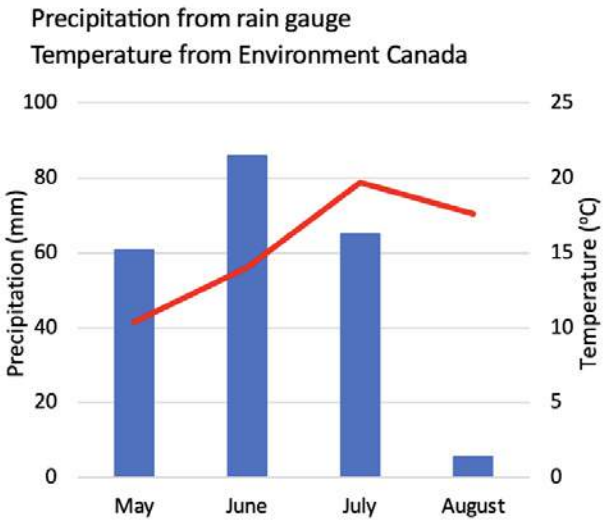
Foliar Applied Nitrogen Fixing Biological Products
(Biggar)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatment	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Envita®)

General Trial Information:

Variety	AAC Wheatland VB
Thousand Kernel Weight	30.2 g
Germination	99%
Previous Crop	Canola
Seeding Date	May 11
Seeding Rate	88 lb/ac
Seeding Equipment	Vaderstad
Seeding Depth	1 ¼”
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	118 – 35 – 0 – 11
Crop Protection	May 8 – Dicamba + Glyphosate June 15 – Forcefighter® + Simplicity™ July 10 – Orious® August 15 – Glyphosate



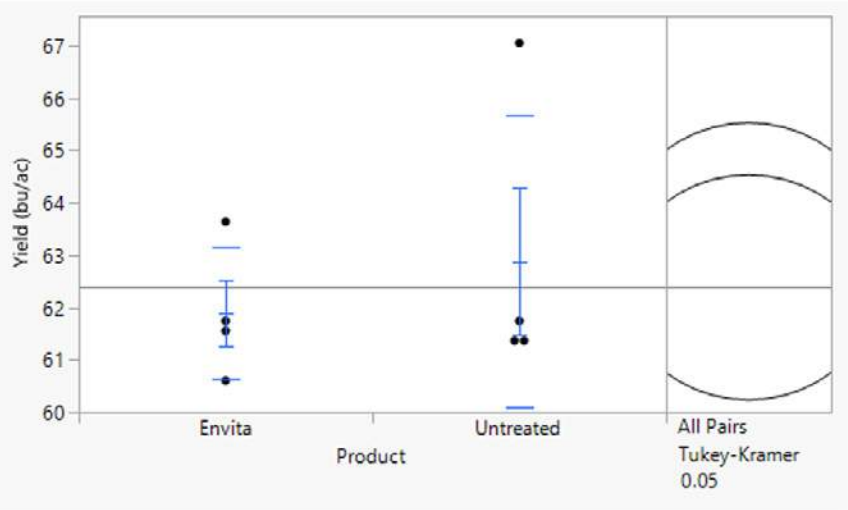
Foliar N-Fixing Biological Product Application

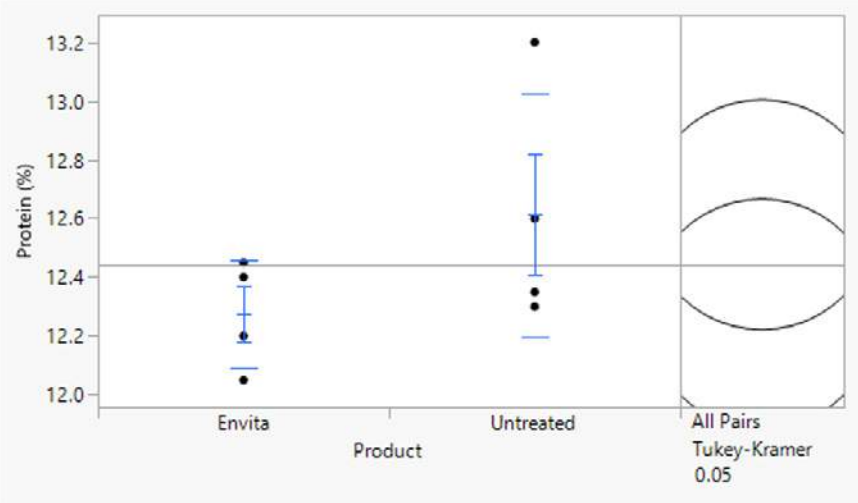
Product	Envita®
Date/Time	June 15 @ 11:00 a.m.
Crop Stage	4-5 leaf
Tank Mix	Forcefighter® + Simplicity™
Water Volume	10 gal/ac
Sprayer	Case 135’
Speed	14 mph
Nozzles	Teejet 08
Weather Conditions	Sunny and cool

Soil Properties

Spring Residual Nitrate- N	
- 0-6”	19 lb/ac
- 6-24”	54 lb/ac
Fall Residual Nitrate- N	N/A
Soil Organic Matter	1.6%

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated Check	27.3	62.9	12.6	32.4	80.5
Envita®	27.5	61.9	12.3	33.1	80.5
SE[1]	0.31549	1.0816	0.16	0.56199	0.40738
p-value[2]	0.6408	0.5397	0.1864	0.4123	0.9834





At this location, no difference in yield or grain quality was observed with the application of Envita® foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 145.

The trial was conducted with the agronomic support of

Hoppe Agronomy

WHEAT WISE
Plotting the Future

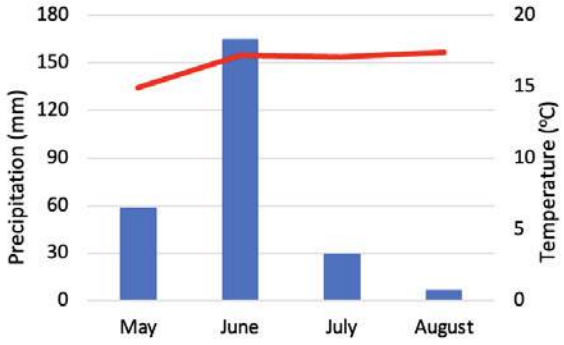
Foliar Applied Nitrogen Fixing Biological Products
(Cando)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatment	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Envita®)

General Trial Information:	
Variety	AAC Hodge VB
Thousand Kernel Weight	35.1 g
Germination	97%
Previous Crop	Canola
Seeding Date	May 5
Seeding Rate	120 lb/ac
Seeding Equipment	Vaderstad & Bourgault tank
Seeding Depth	1”
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	125-62-20-20
Crop Protection	May 1 – Glyphosate June 6 – Rush 24® + Simplicity™ July 5 – Orius®

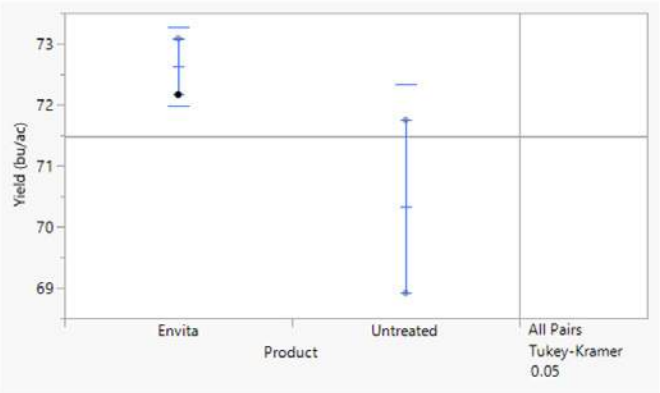
Precipitation from rain gauge
Temperature from Environment Canada (Scott CDA)

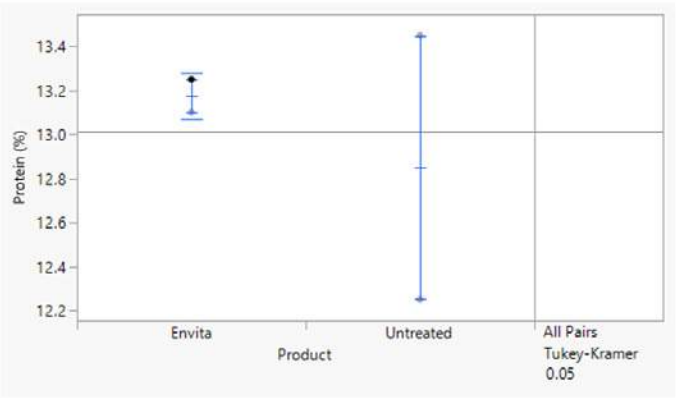


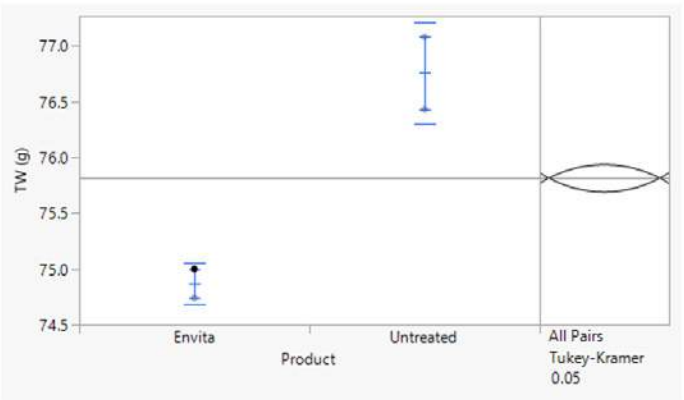
Foliar N-Fixing Biological Product Application	
Product	Envita®
Date/Time	June 6 @ 10:00 a.m.
Crop Stage	4-5 leaf
Tank Mix	Rush 24® + Simplicity™
Water Volume	10 gal/ac
Sprayer	Case 120’
Speed	14 mph
Nozzles	ABJ Brown Easy
Weather Conditions	n/a

Soil Properties	
Spring Residual Nitrate- N	
- 0-6”	32 lb/ac
- 6-24”	33 lb/ac
Fall Residual Nitrate- N	N/A
Soil Organic Matter	4.2%
Soil Texture	Medium

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated Check	25.3	70.3	12.9	31.6	76.8
Envita®	25.1	72.6	13.2	29.3	74.9
SE[1]	0.1755	1.0529	0.42757	0.75166	0.24751
p-value[2]	0.5154	0.2636	0.6447	0.1629	**0.0328**







At this location, differences in yield, protein and TKW were undetectable with the application of Envita® foliar-applied N-fixing bacteria. The untreated check resulted in significantly higher test weights (p=0.0328). Since there was no significant difference in yield between treatments, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 145.

The trial was conducted with the agronomic support of

Hoppe Agronomy

WHEAT WISE
Plotting the Future

Foliar Applied Nitrogen Fixing Biological Products
(Carrot River)

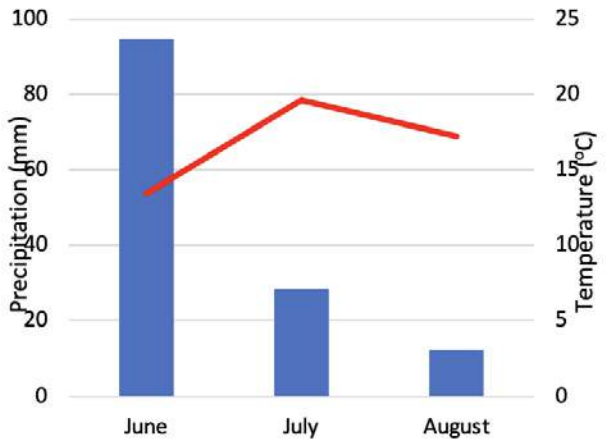
Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatment	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Utrisha™)

General Trial Information:

Variety	AAC Starbuck VB
Thousand Kernel Weight	43.6 g
Germination	99%
Seed Treatment	Raxil Pro®
Previous Crop	Canola
Seeding Date	May 14
Seeding Rate	141 lb/ac
Seeding Equipment	45 Series Seedhawk
Seeding Depth	½”
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	107-45-40-0
Crop Protection	June 15 – Flucarbazone + Barricade II® + MCPA 600 Ester July 14 – Prosaro Pro® September 3 – Glyphosate

Precipitation from rain gauge
Temperature from Environment Canada (Nipawin)



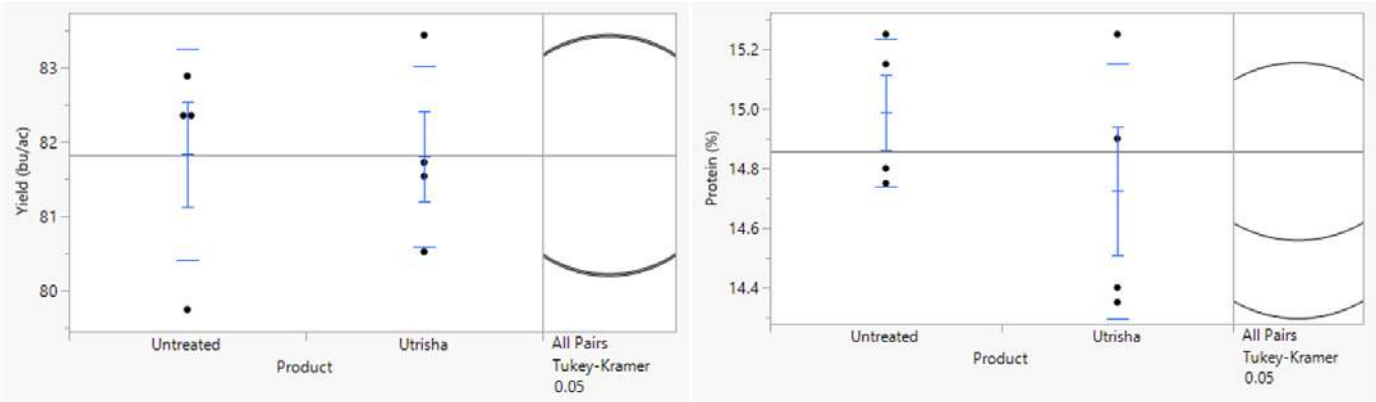
Foliar N-Fixing Biological Product Application

Product	Utrisha™
Date/Time	June 27 @ afternoon
Crop Stage	5-6 leaf, 2-3 tillers
Tank Mix	N/A
Water Volume	10 gal/ac
Sprayer	John Deere 412R
Speed	13 mph
Nozzles	03 & 04 Flat Fan
Weather Conditions	Warm weather

Soil Properties

Spring Residual Nitrate- N	
- 0-6”	77 lb/ac
- 6-24”	57 lb/ac
Fall Residual Nitrate- N	
1. Untreated Check:	
- 0-6”	12 lb/ac
- 6-24”	15 lb/ac
2. Foliar N-Fixing Biological Product	
- 0-6”	28 lb/ac
- 6-24”	18 lb/ac
Soil Organic Matter	2.9%

	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated Check	29.0	81.8	34.9	15.0	80.8
Utrisha™	29.8	81.8	35.0	14.7	81.3
SE[1]	0.55756	0.65797	0.83417	0.17552	0.45949
p-value[2]	0.3425	0.976	0.9352	0.331	0.4219



At this location, no differences in yield or grain quality were observed with the application of Utrisha™ foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 145.

The trial was conducted with the agronomic support of

Ag Grow Consulting Ltd.

WHEAT WISE
Plotting the Future

Foliar Applied Nitrogen Fixing Biological Products
(Craik)

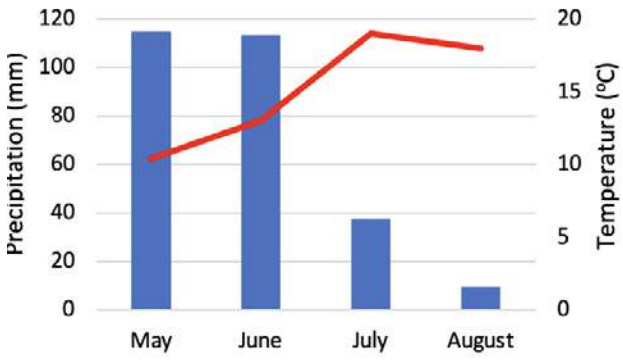
Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatment	Description	Nitrogen Rate (lbs/ac)	Total Applied Fertilizer (lbs/ac N – P – K – S)
1	100% Fertility	125	63 – 26 – 0 – 0 (125 lb/ac 46-0-0 sideband + 50 lb/ac 11-52-0 seed placed)
2	100% Fertility + N Fixing Biological	125	
3	80% Fertility	100	51.5 – 26 – 0 – 0 (100 lb/ac 46-0-0 sideband + 50 lb/ac 11-52-0 seed placed)
4	80% Fertility + N Fixing Biological	100	
5	50% Fertility	62	34 – 26 – 0 – 0 (62 lb/ac 46-0-0 sideband + 50 lb/ac 11-52-0 seed placed)
6	50% Fertility + N Fixing Biological	62	

General Trial Information:

Variety	AAC Brandon
Thousand Kernel Weight	36.7 g
Germination	95%
Previous Crop	Canola
Seeding Date	May 19
Seeding Rate	115 lb/ac
Seeding Equipment	SeedHawk
Seeding Depth	1 ¼”
Row Spacing	12”
Crop Protection	May 19 – Glyphosate + Korrex II™ June 19 – PP2525® + Perimeter® + Traxos®

Weather from local station



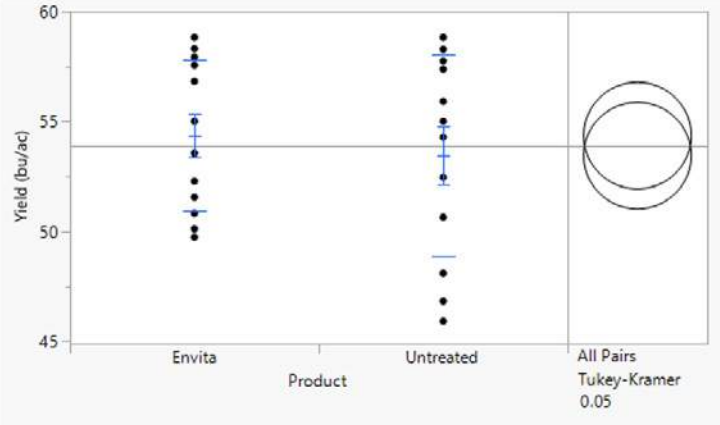
Foliar N-Fixing Biological Product Application

Product	Envita®
Date/Time	July 5 @ 3:00 p.m.
Crop Stage	Early Flag Leaf
Tank Mix	N/A
Water Volume	10 gal/ac
Sprayer	John Deere 4830
Speed	10.5 mph
Nozzles	Flat Fan
Weather Conditions	23°C, light wind

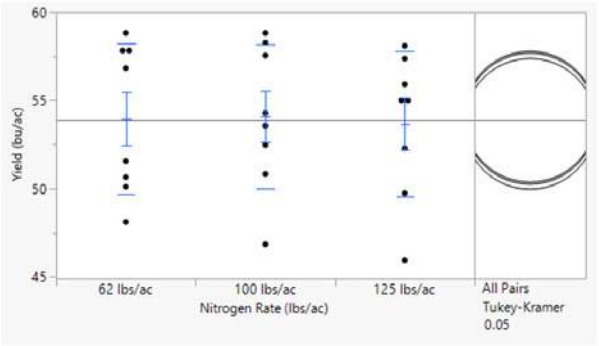
Soil Properties

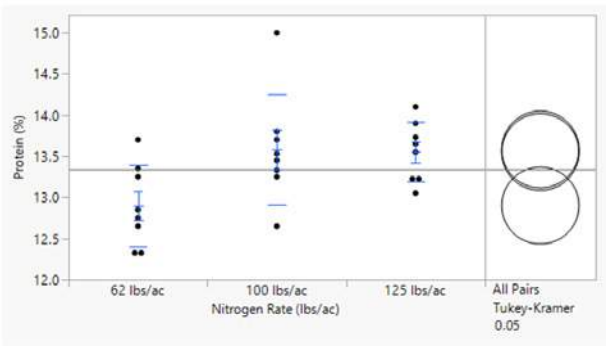
Spring Residual Nitrate- N	
- 0-6”	20 lb/ac
- 6-24”	42 lb/ac
Fall Residual Nitrate- N	
Untreated Check:	
- 0-6”	16 lb/ac
- 6-24”	12 lb/ac
Soil Organic Matter	4.4%
Soil Texture	Medium

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated Check	27.4	53.5	13.5	27.9	74.4
Envita®	27.7	54.4	13.2	28.3	74.3
SE[1]	0.43090528	1.28107	0.208	0.295	0.4716
p-value[2]	0.6301	0.6224	0.1504	0.2299	0.7573



	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
125 lbs/ac	27.3	53.7	13.6 AB	27.7 B	74.4
100 lbs/ac	27.5	54.1	13.6 A	27.8 B	74.0
62 lbs/ac	27.8	54.0	12.9 B	28.7 A	74.7
SE[1]	0.52774903	2.2187	0.2547	0.3613	0.5776
p-value[2]	0.7389	0.9821	**0.025**	**0.022**	0.5672





At this location, no differences in yield or grain quality were found with the application of Envita®. Since there was no significant yield improvement between treatments, the most cost-effective option was the control.

When analyzing nitrogen rates, a significant effect on protein content was observed (p=0.025), with higher nitrogen rates leading to higher protein levels. In contrast, lower nitrogen fertility resulted in a greater thousand kernel weight (TKW). Although not statistically significant, the 62 lb/ac nitrogen rate yielded the highest average yield, making it the most economical choice.

To review footnote references please refer to overall trial summary on page 145.

WHEAT WISE
Plotting the Future

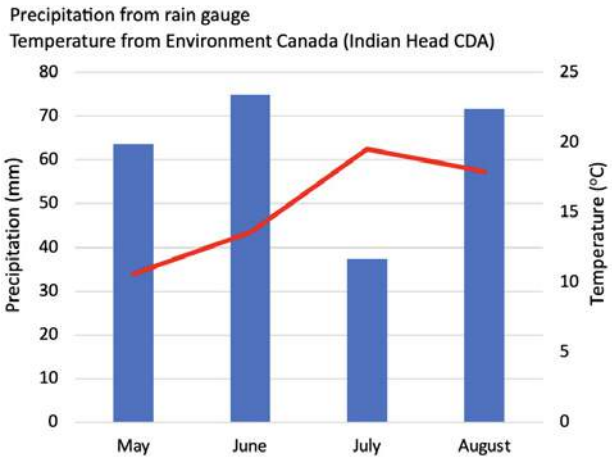
Foliar Applied Nitrogen Fixing Biological Products
(Indian Head)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatment	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product 1 (Envita®)
3	Foliar N-Fixing Biological Product 2 (Utrisha™)

General Trial Information:

Variety	AAC Wheatland VB
Thousand Kernel Weight	36.3 g
Germination	96%
Seed Treatment	Raxil Pro®
Previous Crop	Chickpea/Flax Intercrop
Seeding Date	May 12
Seeding Rate	116.7 lb/ac
Seeding Equipment	2021 SeedMaster 40' CT with UltraPro II onboard tank
Seeding Depth	⅞"
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	120 – 40 – 0 – 10
Crop Protection	May 19 – Glyphosate June 9 – Varrox FX® + 2,4-D Ester 700 June 12 – Miravis Era®



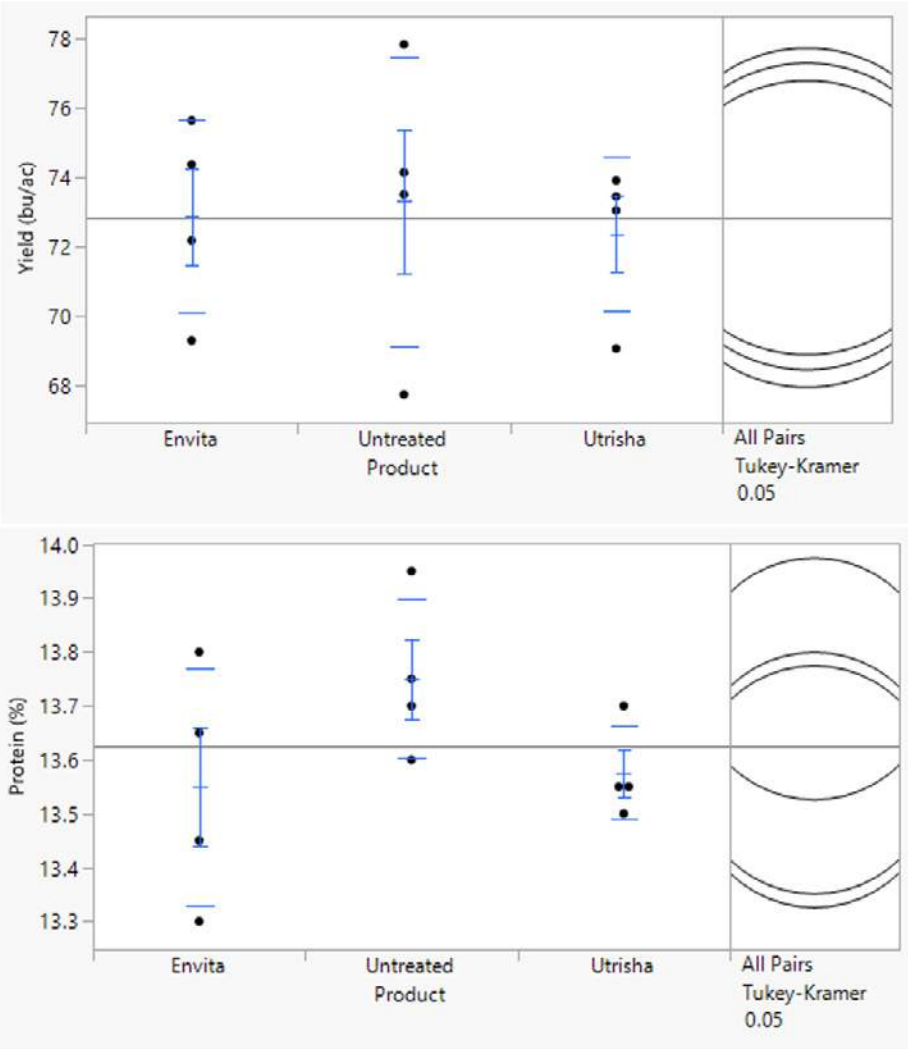
Foliar N-Fixing Biological Product Application

Product	Envita®	Utrisha™
Date/Time	July 7 @ 1:00 – 3:30 p.m.	
Crop Stage	Late flag, swollen boot	
Tank Mix	N/A	
Water Volume	20 US gal/ac	
Sprayer	2008 Case SPX 3320	
Speed	13 mph	
Nozzles	TTJ 60 110-04	
Weather Conditions	24°C, 20 km wind, 66% RH	

Soil Properties

Spring Residual Nitrate- N	N/A
Fall Residual Nitrate- N	N/A
Soil Organic Matter	3.3%

	Yield (bu/ ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/ 1000seeds)	Test Weight (TW) (kg/hL)
Untreated Check	73.3	13.8	33.3	79.7
Envita®	72.9	13.6	33.6	79.8
Utrisha™	72.4	13.6	33.7	79.8
SE[1]	1.5805	0.08036	0.62959	0.29827
p-value[2]	0.9089	0.2368	0.896	0.9474



At this location, no differences in yield or grain quality were observed with the application of Envita® or Utrisha™ foliar-applied N-fixing bacteria. Since there was no significant yield difference between treatments, the most cost-effective option is the check.

To review footnote references please refer to overall trial summary on page 145.

The trial was conducted with the agronomic support of

IHARF
INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

WHEAT WISE
Plotting the Future

Foliar Applied Nitrogen Fixing Biological Products
(St. Walburg)

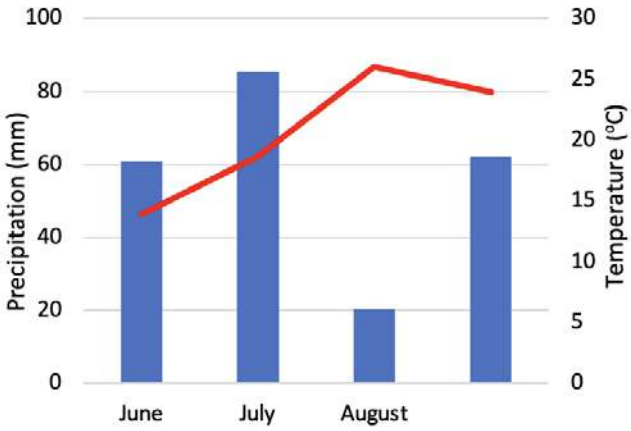
Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatment	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Utrisha™)

General Trial Information:

Variety	AAC Viewfield
Germination	95%
Previous Crop	Canola
Seeding Date	May 15
Seeding Rate	2 bu/ac
Seeding Equipment	Bourgault 3310
Seeding Depth	1”
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	120 – 40 – 0 – 10
Crop Protection	May 12 – Blitz® + Glyphosate June 21 – Velocity® + AMS August 29 – Glyphosate + Heat LQ®

Weather from local station



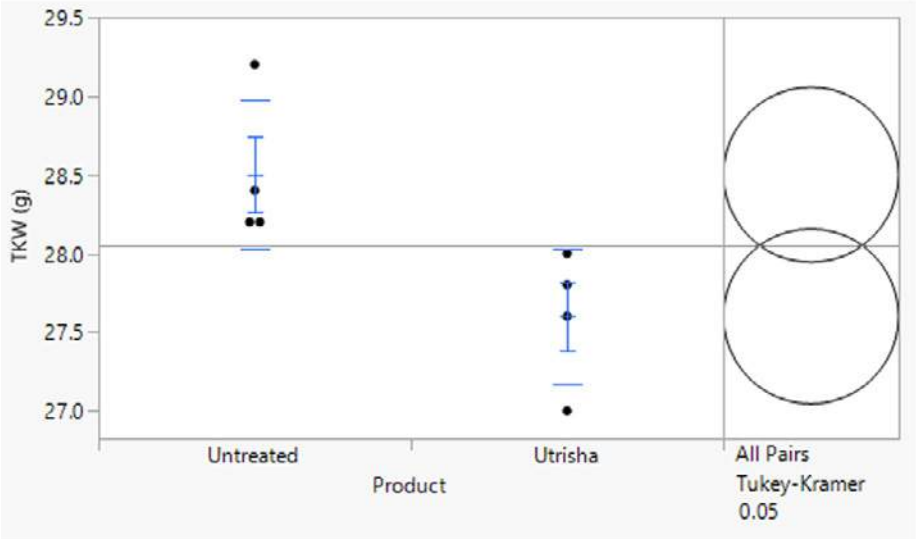
Foliar N-Fixing Biological Product Application

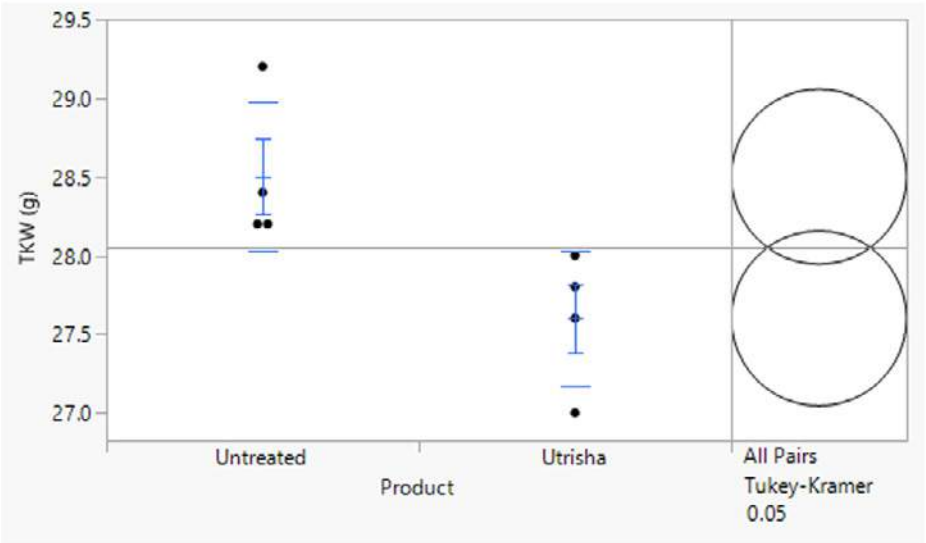
Product	Utrisha™
Date/Time	July 5
Crop Stage	5 leaf, 2 tiller
Tank Mix	N/A
Water Volume	10 gal/ac
Sprayer	Rogator 1184
Speed	10 mph
Nozzles	11025 TeeJet
Weather Conditions	20°C, 24km wind

Soil Properties

Spring Residual Nitrate- N	
- 0-6”	32 lb/ac
- 6-24”	36 lb/ac
Fall Residual Nitrate- N	
1. Untreated Check:	
- 0-6”	20 lb/ac
- 6-24”	18 lb/ac
2. Foliar N-Fixing Biological Product	
- 0-6”	11 lb/ac
- 6-24”	21 lb/ac
Soil Organic Matter	2.5%
Soil Texture	Course

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated Check	30.5	54.1	15.1	28.5	76.5
Utrisha™	30.4	54.1	15.2	27.6	76.2
SE[1]	0.13416	1.9288	0.24807	0.2273	0.53248
p-value[2]	0.5504	0.9438	0.8114	**0.0312**	0.7181





At this location, differences in yield, protein and test weights were undetectable with the application of Utrisha™ foliar-applied N-fixing bacteria. The untreated check resulted in significantly higher thousand kernel weights (p=0.0312). Since there was no significant difference in yield between treatments, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 145.

WHEAT WISE
Plotting the Future

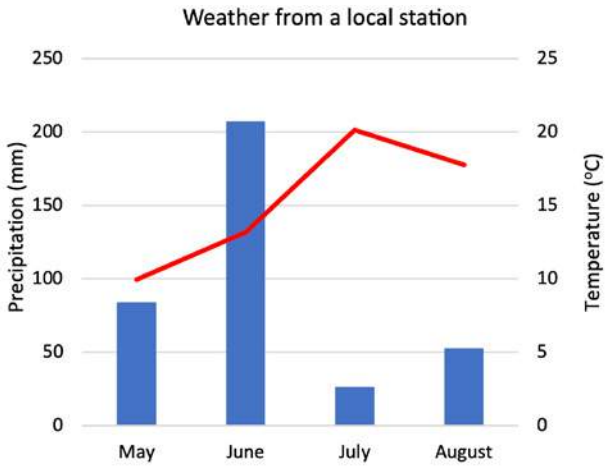
Foliar Applied Nitrogen Fixing Biological Products
(Wakaw)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat.

Treatment	Description
1	Untreated Check
2	Foliar N-Fixing Biological Product (Envita®)

General Trial Information:

Variety	AAC Broadacres VB
Thousand Kernel Weight	37.4 g
Germination	96%
Previous Crop	Canola
Seeding Date	May 13
Seeding Rate	130 lb/ac
Seeding Equipment	Bourgault 5710
Seeding Depth	¾”
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	62-56-0-21
Crop Protection	May 9 – Korrex™ + Glyphosate June 15 – Axial Xtreme® + MCPA Ester 600 July 13 – Miravis Ace® + Li 700® August 27 – Glyphosate + Li 700®



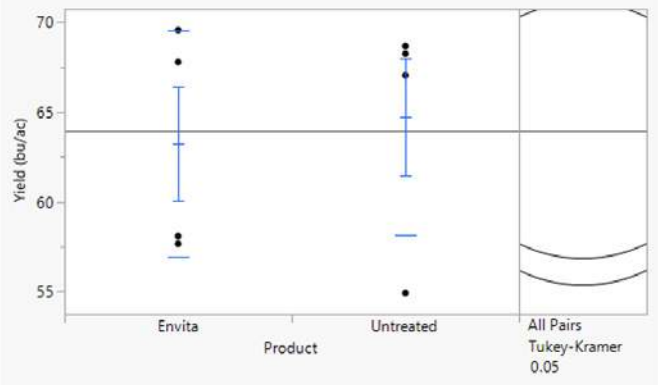
Foliar N-Fixing Biological Product Application

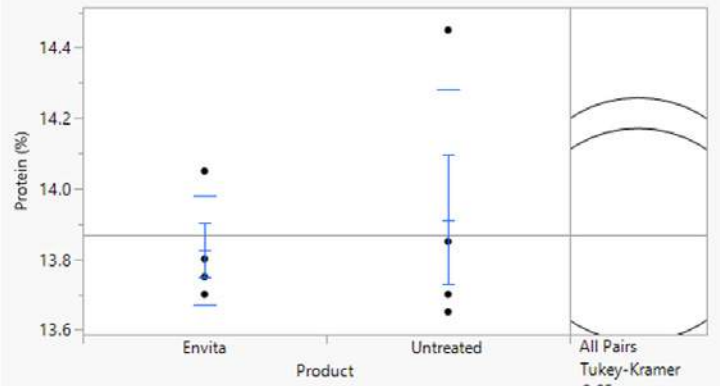
Product	Envita®
Date/Time	June 15 @ 6:00 p.m.
Crop Stage	4 leaf, 2 tiller
Tank Mix	N/A
Water Volume	10 gpa
Sprayer	Patriot 3185
Speed	10 mph
Nozzles	Green Leaf Turbo Drop 02
Weather Conditions	Sunny, 19^{0}C, 14km wind

Soil Properties

Spring Residual Nitrate- N	
- 0-6”	74 lb/ac
- 6-24”	186 lb/ac
Fall Residual Nitrate- N	
Untreated Check:	
- 0-6”	32 lb/ac
- 6-24”	57 lb/ac
Soil Organic Matter	45.7%
Soil Texture	Medium

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
Untreated Check	22.8	64.7	13.9	36.1	82.0
Envita®	22.2	63.2	13.8	36.4	82.2
SE[1]	0.27717	3.2276	0.14133	1.0302	0.32804
p-value[2]	0.1619	0.7552	0.6769	0.8181	0.6413





At this location, differences in yield and grain quality were undetectable with the application of Envita® foliar-applied N-fixing bacteria. Since there was no significant difference in yield between treatments, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 145.

The trial was conducted with the agronomic support of

Sara Olexsyn

WHEAT WISE
Plotting the Future

Wheat Wise On-Farm Trial Program

Split or Top Up Nitrogen

Nitrogen (N) plays a critical role in wheat production in Saskatchewan. Producers are tasked with increasing yield quality and economic return while using applied nutrients efficiently. They also must consider factors such as cost and environmental impact.

Two related management practices to potentially increase efficiency and reduce the economic risk of N fertilizer application are split N application and top-dressing N. Split application is primarily a risk management approach, where only part of the total N required based on yield goals, is applied at or before seeding, and the remainder applied in-crop if conditions are conducive. Top-dressing entails applying 100% of the recommended N at seeding and supplementing with additional N later in-season if growing conditions are conducive to further improving the yield or quality of the crop. These methods could potentially help utilize N more effectively, boost productivity, reduce costs and/or minimize environmental impact from N losses.

Objective

To determine if there is an agronomic and economic advantage to using a split or top up N application compared to applying all nitrogen at seeding on wheat yield, quality and economic return under various soil and weather conditions in Saskatchewan.

Treatments

Option A: Split N		Option B: Split N + Top dress	
1)	100% N at seeding	1)	100% N at seeding
2)	70% N at seeding + 30% in-crop	2)	70% N at seeding + 30% in-crop
		3)	100% N at seeding + additional in-crop

Trials were set up in randomized strips with four replications, for a total of 8 (option A) or 12 plots (option B). All plots were managed the same agronomically, besides N fertility, including seeding date, variety, seeding depth, seed treatment, and pesticide application.

Data Collection

- Soil test
- Seeding information
- Field history and management practices
- In season plant density
- Weighed yield and harvest sample
- General in-season observations
- Weather data

The follow footnotes will be referred to or the combined and individual site reports for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate considered a random effect and location and fertilizer treatment considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$

[3]SE was not record as the sample sizes are unequal and therefore standard error was different for each sample size

2024 Combined Results (5 sites)

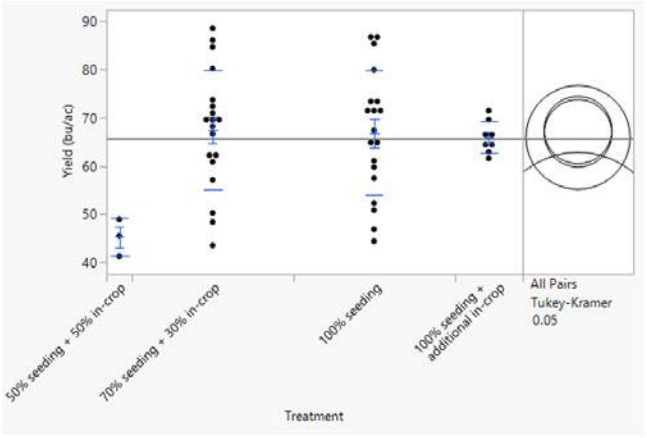
All five sites consisted of 70% seeding + 30% in-crop, and 100% N at seeding treatments. In addition to those treatments, two sites also consisted of 100% N seeding + additional in-crop, and lastly, one site also consisted of 50% N seeding + 50% N in-crop.

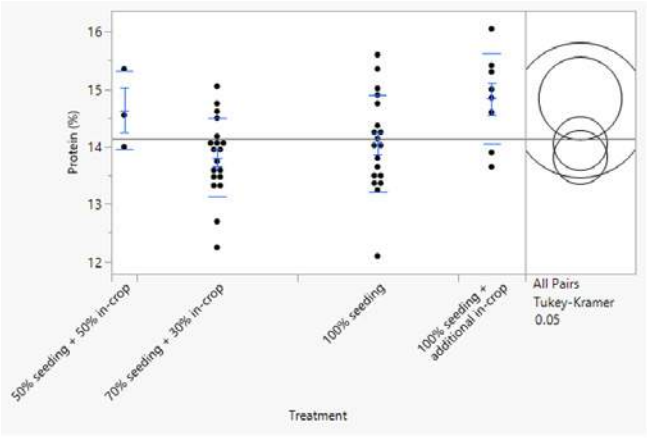
Significant differences were found in yield (p=0.0224), protein content (p=0.0135), and moisture (p=0.0194) based on treatment. Regarding yield, the 50% N seeding + 50% N in-crop treatment produced significantly lower yields. There were no significant differences between 100% N seeding, 70% N seeding + 30% N in-crop, and 100% N seeding + additional in-crop treatments.

The 50% N seeding + 50% N in-crop treatment resulted in lower plant densities, but due to a wide range of plant densities in the other treatments, no significant differences were observed. Thousand kernel weight and test weight remained relatively consistent across all treatments.

From an economic perspective, the 70% N seeding + 30% N in-crop treatment offered the highest return, largely due to its average yield. However, it should be noted that it was only more economical than the 50% N seeding + 50% N in-crop treatment and had similar returns to the other two treatments. The highest protein content was observed in the 100% N seeding + additional in-crop treatment, although all treatments were classified as high protein.

Treatment[3]	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Moisture (%)
100% N seeding	26.7	66.8 A	14.1 AB	28.0	75.3	14.8 A
70% N seeding + 30% N in-crop	26.1	67.5 A	13.8 AB	28.3	75.7	14.8 A
50% N seeding + 50% N in-crop	22.2	45.3 B	14.6 B	26.6	74.3	11.9 B
100% N seeding + add. in-crop	27.6	65.9 A	14.8 A	27.6	76.4	14.1 AB
p-value[2]	0.373	**0.0224**	**0.0135**	0.7923	0.7337	**0.0194**





Treatment	Total Cost of Nitrogen ($/ac)[x]	Yield (bu/ac)[y]	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	52.19	66.8	8.44	563.79	511.60	0.00
70% N at seeding + 30% in-crop	55.64	67.5	8.44	569.70	514.06	2.46
50% seeding + 50% in-crop	68.02	45.3	8.44	382.33	314.31	-197.29
100% N at seeding + add. in-crop	78.75	65.9	8.44	556.20	477.45	-34.15

[A]Average Total Cost of Nitrogen from all sites
[y]Average Yield from all sites
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

WHEAT WISE
Plotting the Future

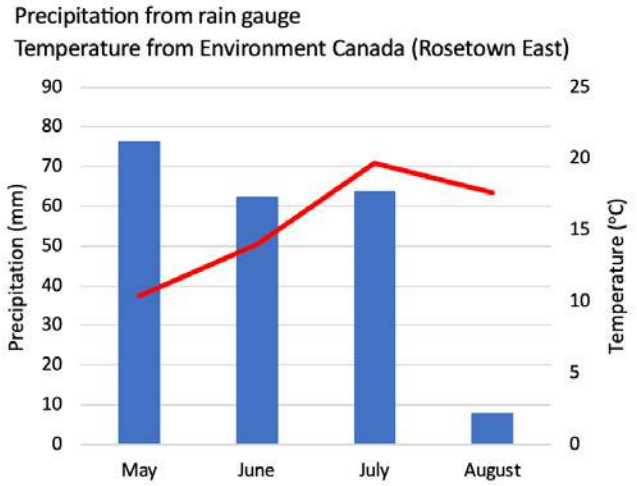
Split or Top Up Nitrogen
(Biggar)

Treatment	Description
1	100% N at seeding
2	70% N at seeding & 30% in-crop

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on wheat yield, quality and economic return under various soil and weather conditions in Saskatchewan.

General Trial Information:

Variety	CPSR SY Rorke
Thousand Kernel Weight	34.3 g
Germination	98%
Seed Treatment	Raxil® Pro
Previous Crop	Canola
Soil Organic Matter	4.0%
Residual Nitrate-N	
- **0-6”**	15 lb/ac
- **6-24”**	99 lb/ac
Seeding Date	May 10
Seeding Rate	135 lb/ac
Seeding Equipment	Bourgault 3335
Seeding Depth	¾”
Row Spacing	10”
Crop Protection	May 10: Glyphosate + Pilot® June 6: Varro ® + Foxxy RCK® July 14: Fusaro™ September 10: Glyphosate

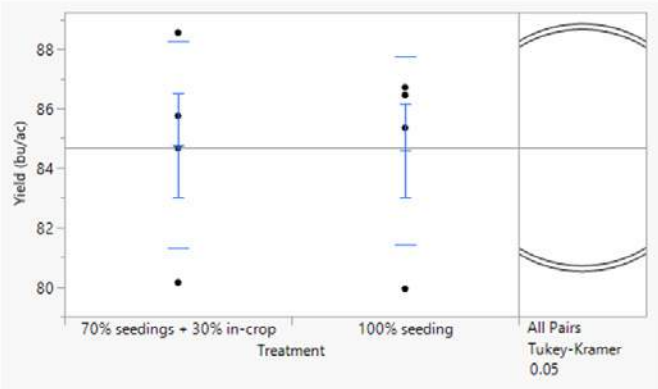


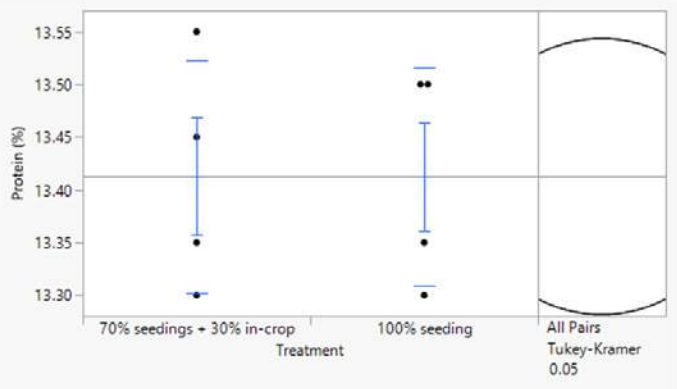
N Application

Seeding		In-Crop	
Product	28-0-0 (UAN)	Product	28-0-0 (UAN)
Date	May 10	Date	June 3
Placement	Foliar	Crop Stage	3 leaf
App Rate	10 gal/ac	Water Volume	0 gal/ac
Water Volume	0 gal/ac	App Rate	10 gal/ac
Speed	14 mph	Speed	14 mph
Sprayer	John Deere 616R	Sprayer	John Deere 616R
Nozzles	Teejet 5J3-20	Nozzles	Teejet 5J3-20

Nitrogen Application	Seeding							In Crop		Total Actual			
Treatments	28-0-0 (gal/ac)	Actual N (28-0)	11-52 (lb/ac)	Actual N (11-52)	Actual P (11-52)	0-0-60 (lb/ac)	Actual K (0-0-60)	UAN (gal/ac)	Total N	N	P	K	S
100% seeding	34	102	115	13	60	62	38	0	0	115	42	38	0
70% seeding + 30% in-crop	24	72	115	13	60	62	38	10	30	115	42	38	0

	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
100% N at seeding	32.6	84.6	13.4	27.6	71.7
70% N at seeding & 30% in-crop	34.4	84.8	13.4	27.7	71.7
SE[1]	1.3402	1.65	0.053	0.138	0.31
p-value[2]	0.3745	0.9376	1	0.6278	0.9062





Treatment	Seeding N (gal/ac)	Seeding N ($/ac)[y]	In-Crop N (gal/ac)	In-Crop N ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	34	69.48	0	0.00	69.48	84.6	8.44	713.9	644.38	0.00
70% N at seeding + 30% in crop	24	49.04	10	20.43	69.48	84.8	8.44	715.5	646.07	1.69

[y]28-0-0 price, Local Retailer, July 8, 2024 ($425/MT)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

Images taken on June 20th

No significant interactions were found at this site. Both treatments showed high variability, leading to similar outcomes across parameters. Although not statistically significant, the 70% N at seeding + 30% in-crop treatment yielded slightly higher average yield, resulting in a marginally better return.

To review footnote references please refer to overall trial summary on page 162.

The trial was conducted with the agronomic support of

NORTHLAND AGRONOMY

WHEAT WISE
Plotting the Future

Split or Top Up Nitrogen
(Cut Knife 1)

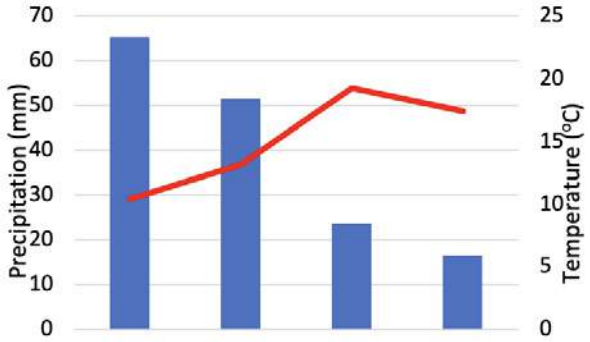
Treatment	Description
1	100% N at seeding
2	70% N at seeding & 30% in-crop

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on wheat yield, quality and economic return under various soil and weather conditions in Saskatchewan.

General Trial Information:

Variety	AAC Wheatland VB
Thousand Kernel Weight	39.2 g
Germination	98%
Seed Treatment	Cruiser Vibrance Quattro®
Previous Crop	Canola
Soil Organic Matter	5.0%
Residual Nitrate-N	
- **0-6”**	21 lb/ac
- **6-24”**	27 lb/ac
Seeding Date	May 9
Seeding Rate	120 lb/ac
Seeding Equipment	70ft spreader
Seeding Depth	1 / 1 ½””
Row Spacing	12”
Crop Protection	May 9: Korrex II™ + Glyphosate June 10: Rezuvant™ July 11: Miravis Era® August 18: Glyphosate

Precipitation from rain gauge
Temperature from Environment Canada
(North Battleford RCS)

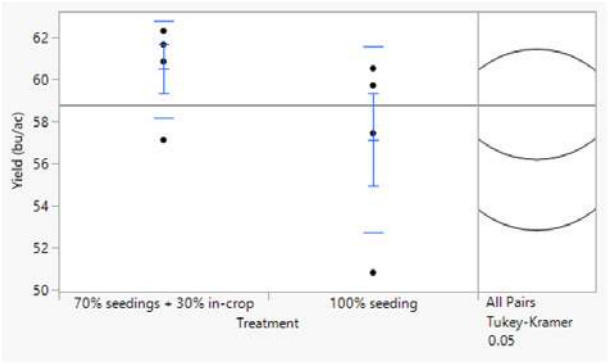


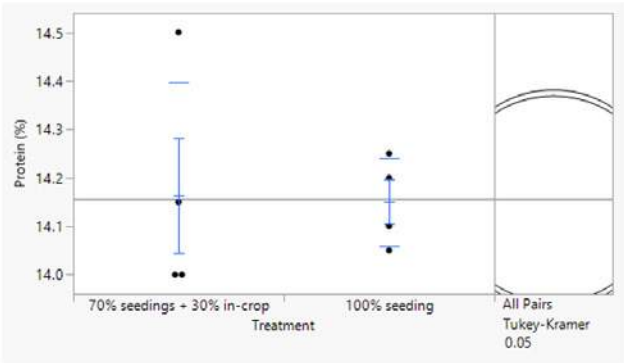
Nitrogen Application	Seeding			N Application After Seeding		In Crop		Total Actual (lbs/ac)			
Treatments:	11-52 (lb/ac)	Actual N (11-52)	Actual P (11-52)	46-0-0 (lb/ac)	Actual N	46-0-0 (lb/ac)	Actual N	N	P	K	S
100% seeding	60	7	31	250	115	0	0	122	31	0	0
70% seeding + 30% in-crop	60	7	31	170	78	80	37	122	31	0	0

N Application

1 Day After Seeding		In-Crop	
Product	46-0-0 treated with Agrotain™	Product	46-0-0 treated with Agrotain ™
Date	May 10	Date	June 7
Crop Stage	Pre-emergence	Crop Stage	3 leaf, 1 tiller
Placement	Broadcast	Placement	Broadcast
Form	Granular	Form	Granular
Speed	15-17 mph	Speed	15-17 mph
Applicator	Case Flex Air 810	Applicator	Case Flex Air 810

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
100% N at seeding	22.4	57.1	14.1	28.1	76.8
70% N at seeding & 30% in-crop	23.9	60.5	14.2	28.9	76.7
SE[1]	1.8719	1.7	0.089	0.57699	0.446
p-value[2]	0.5994	0.2258	0.9245	0.3377	0.8379





	N after seeding (lb/ac)	N after seeding ($/ac)[xy]	In-Crop N (lb/ac)	In-Crop N ($/ac)[xy]	N Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	250	$90.6	0	$0.00	$90.63	57.1	8.44	481.9	391.30	0.00
70% N at seeding + 30% in crop	170	$61.6	80	$29.00	$90.63	60.5	8.44	510.6	419.99	28.70

[x]Agrotain™, Local Retailer, July 8, 2024 ($888/11.25kg)
[y]46-0-0 price, Local Retailer, July 8, 2024 ($700/MT)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

No significant trends were observed at this site, as all parameters showed variability and were similar when averaged. Although not statistically significant, the 70% N at seeding + 30% in-crop treatment resulted in a 3.4 bu/ac increase, leading to a higher average return.

To review footnote references please refer to overall trial summary on page 162.

The trial was conducted with the agronomic support of

Western Applied Research Corporation
WARC
Research from our farm to yours

WHEAT WISE
Plotting the Future

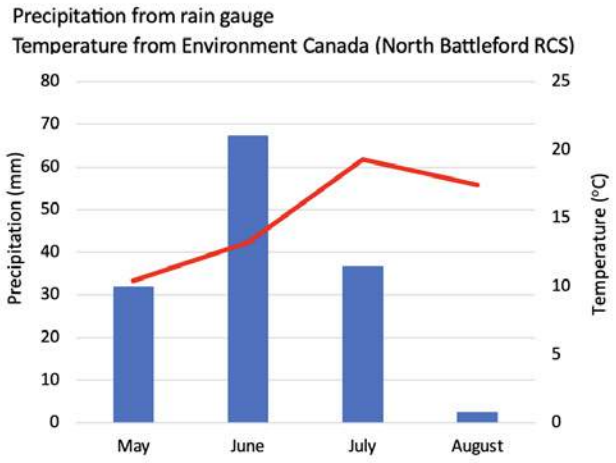
Split or Top Up Nitrogen
(Cut Knife 2)

Treatment	Description
1	100% N at seeding
2	70% N at seeding & 30% in-crop
3	100% N at seeding + additional in-crop

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on wheat yield, quality and economic return under various soil and weather conditions in Saskatchewan.

General Trial Information:

Variety	AAC Starbuck VB
Thousand Kernel Weight	36.7 g
Germination	97%
Seed Treatment	120 lbs
Previous Crop	Vibrance Quattro®
Soil Organic Matter	6.4%
Residual Nitrate-N - **0-6”** - **6-24”**	 19 lb/ac 33 lb/ac
Seeding Date	May 9
Seeding Equipment	Bourgault
Seeding Depth	1”
Row Spacing	12”
Crop Protection	May 8: Glyphosate June 8: Erebus Xtreme™ July 12: Miravis Ace®

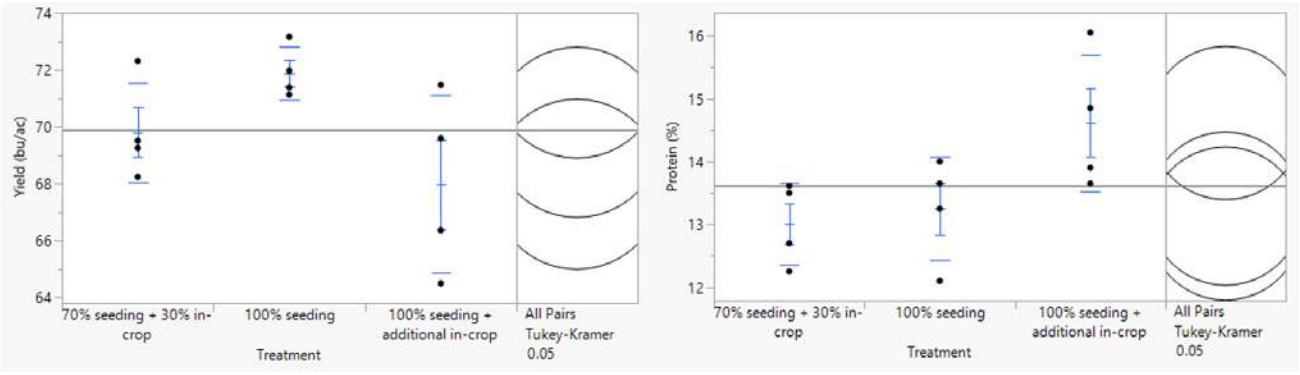


Nitrogen Application	Seeding					In Crop		Total Actual			
Treatments	UAN (gal/ac)	Actual N	11-52 (lb/ac)	Actual N (11-52)	Actual P (11-52)	UAN (gal/ac)	Total N	N	P	K	S
100% seeding	30	90	80	9	42	0	0	99	42	0	0
70% seeding + 30% in-crop	21	63	80	9	42	9	27	99	42	0	0
100% seeding + add. in crop	30	90	80	9	42	9	27	126	42	0	0

N Application

Seeding		In-Crop	
Product	28-0-0 (UAN)	Product	28-0-0 (UAN)
Date	May 9	Date	June 12
Placement	Sideband	Crop Stage	4 leaf, 1 tiller
Form	Liquid	Form	Liquid
Water Volume	0 gal/ac	Water Volume	0 gal/ac
Application Rate	21 or 30 gal/ac	Application Rate	9 gal/ac
		Speed	10 mph
		Sprayer + Nozzles	Case 4440 + stream

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds))	Test Weight (TW) (kg/hL)
100% N at seeding	25.6	71.8	13.3	33.2	79.9
70% N at seeding & 30% in-crop	23.6	67.9	13.0	32.5	79.9
100% N at seeding + additional in crop	27.1	69.7	14.6	30.0	76.6
SE[1]	1.0496	1.0718	0.4366	1.034	1.45
p-value[2]	0.1043	0.0694	0.0684	0.132	0.2926



Treatment	N at seeding (gal/ac)	N at seeding ($/ac)[y]	In-Crop N (gal/ac)	In-Crop N ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	30	61.30	0	0.00	61.30	71.8	8.44	606.0	544.69	0.00
70% N at seeding + 30% in crop	21	42.91	9	18.39	61.30	67.9	8.44	573.1	511.77	-32.92
100% N at seeding + add. In-crop	30	61.30	9	18.39	79.69	69.7	8.44	588.3	508.57	-36.11

[y]UAN (28-0-0) price, Local Retailer, July 8, 2024
[z]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

No significant differences were observed between fertilizer treatments. Plant densities showed a slight increase from 70% to 100% N at seeding but were not statistically significant. Similarly, yield was slightly higher with 100% N applied at seeding, making it the most economical option. Protein levels were highest with 100% N at seeding combined with 30% additional in-crop N, although this result was also not statistically significant. It is important to note that while trends can be observed, the lack of statistical significance means these findings cannot be considered conclusive.

Trt 1

Trt 2

Trt 3

To review footnote references please refer to overall trial summary on page 162.

The trial was conducted with the agronomic support of

WHEAT WISE
Plotting the Future

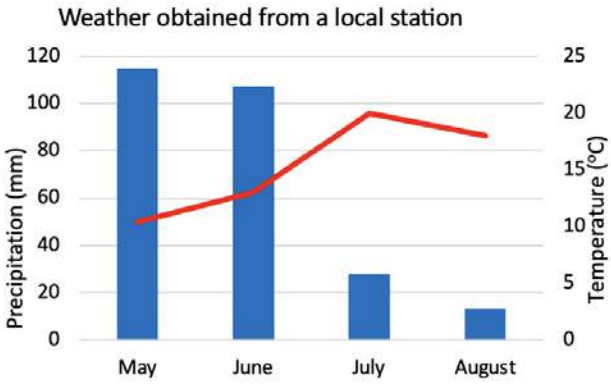
Split or Top Up Nitrogen
(Davidson)

Treatment	Description
1	100% N at seeding
2	70% N at seeding & 30% in-crop
3	50% seeding + 50% in-crop

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on wheat yield, quality and economic return under various soil and weather conditions in Saskatchewan.

General Trial Information:

Variety	CDC Adamant VB
Thousand Kernel Weight	32.78 g
Germination	94%
Seed Treatment	N/A
Previous Crop	Canola
Soil Organic Matter	3.6 %
Residual Nitrate-N - **0-6”** - **6-24”**	 17 lb/ac 24 lb/ac
Seeding Date	April 26
Seeding Rate	105 lb/ac
Seeding Equipment	Bourgault, ¾” knives
Seeding Depth	1.25”
Row Spacing	12”
Crop Protection	April 25: Korrex II™ + Glyphosate June 9: 2,4-D + Erebus Xtreme™

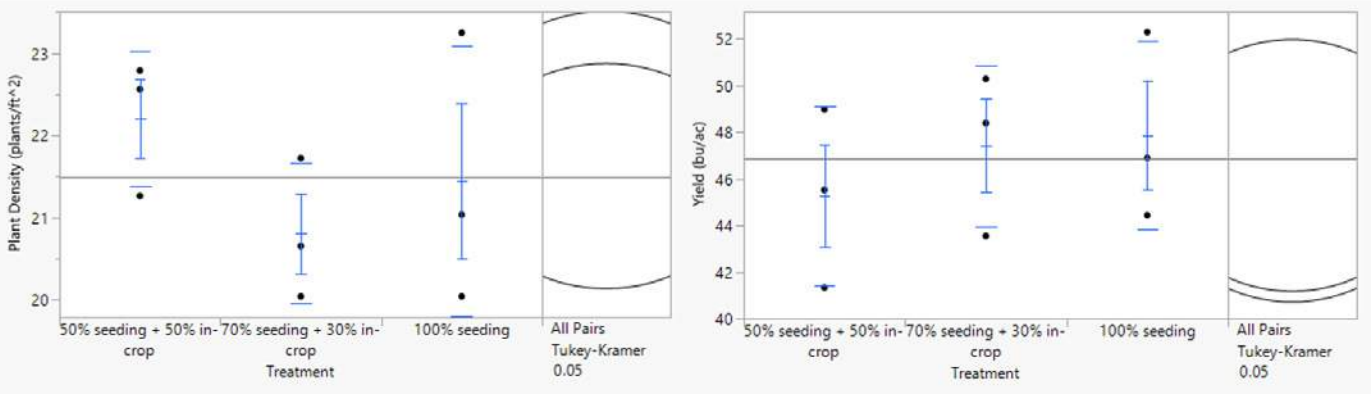


Nitrogen Application	Seeding						In Crop	Total Actual				
Treatments	39-10-0 (lb/ac)	Actual N (39-10)	Actual P (39-10)	11-52 (lb/ac)	Actual N (11-52)	Actual P (11-52)	UAN (gal/ac)	Total N	N	P	K	S
100% seeding	175	68	18	25	3	13	0	0	71	31	0	0
70% seeding + 30% in-crop	120	47	12	35	4	18	7	20	71	30	0	0
50% seeding + 50% in-crop	80	31	8	43	5	22	12	35	71	30	0	0

N Application

Seeding		In-Crop	
Product	39-10-0; 11-52-0	Product	28-0-0 (UAN)
Date	April 26	Date	June 24
Placement	Midrow; Seed placed	Crop Stage	Flag leaf
		Application Rate	12 gal/ac
		Speed	12 mph
Sprayer Nozzles		JD R4044 (120”) 6 stream fertilizer	

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hl)
100% N at seeding	21.4	47.9	14.5	26.8	74.0
70% N at seeding + 30% in-crop	20.8	47.4	14.3	27.3	74.5
50% seeding + 50% in-crop	22.2	45.3	14.6	26.6	74.3
SE[1]	0.67347	2.1	0.414	0.737	1.02
p-value[2]	0.3692	0.6939	0.7996	0.8049	0.936



Treatment	39-10-0 (lb/ac)	39-10-0 ($/ac)[w]	11-52-0 (lb/ac)	11-52-0 ($/ac)[x]	In-Crop UAN (gal/ac)	In-Crop UAN ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	175	54.77	25	11.91	0	0.00	66.68	47.9	8.44	404.28	337.60	0.00
70% N at seeding + 30% in-crop	120	37.56	35	16.67	7	13.13	67.35	47.4	8.44	400.06	332.70	-4.89
50% seeding + 50% in-crop	80	25.04	43	20.48	12	22.50	68.02	45.3	8.44	382.33	314.31	-23.29

[w]39-10-0 price, Producer, Nov. 25, 2024 ($690/MT)
[x]11-52-0 price, Producer, Nov. 25, 2024 ($1050/MT)
[y]28-0-0 price, Producer, Nov. 25, 2024 ($390 MT)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

No significant interactions were observed between the treatments. Plant density and grain quality remained consistent across all treatments. Although yield differences were not statistically significant, there was a slight increase in yield with the 50% seeding + 50% in-crop treatment. Based on these non-significant averages, the combination of 70% nitrogen at seeding and 30% in-crop may offer the highest economic return.

To review footnote references please refer to overall trial summary on page 162.

The trial was conducted with the agronomic support of

VAgS WARKENTIN AG SERVICES

WHEAT WISE
Plotting the Future

Split or Top Up Nitrogen
(Scott)

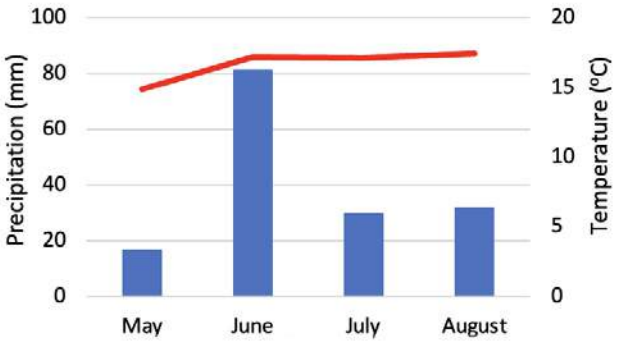
Treatment	Description
1	100% N at seeding
2	70% N at seeding & 30% in-crop
3	100% N at seeding + additional in-crop

Objective: To determine if there is an agronomic and economic advantage to using a split N application or top-dressing N compared to applying all nitrogen at seeding on wheat yield, quality and economic return under various soil and weather conditions in Saskatchewan.

General Trial Information:

Variety	AAC Viewfield
Thousand Kernel Weight	32.9 g
Germination	97%
Seed Treatment	N/A
Previous Crop	Canola
Soil Organic Matter	4.7 %
Residual Nitrate-N	
- **0-6”**	21 lb/ac
- **6-24”**	24 lb/ac
Seeding Date	May 11
Seeding Rate	1120 lb/ac
Seeding Equipment	Bourgault
Seeding Depth	1 ¼”
Row Spacing	10” with 5” mid-row banders
Crop Protection	May 3: Glyphosate June 7: Velocity® July 15: Prosaro Pro® August 20: Glyphosate

Weather from Environment Canada (Scott CDA)

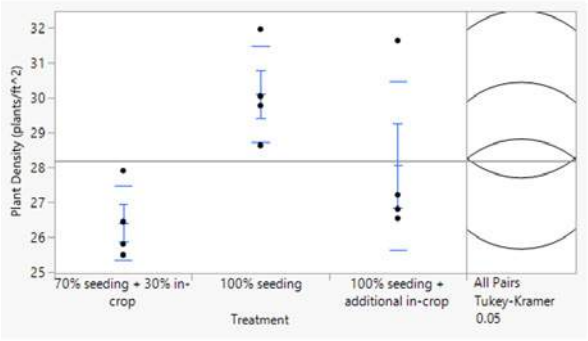


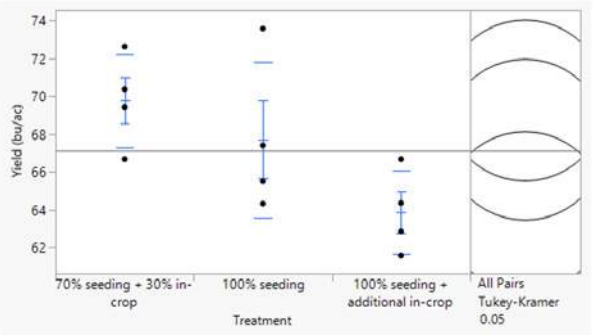
N Application

Seeding		In-Crop	
Product	46-0-0	Product	28-0-0 (UAN)
Date	May 11	Date	June 15
Placement	Mid-row	Crop Stage	4 leaf
Form	Granular	Water Volume	0 gal/ac
		Application Rate	7 gal/ac
		Speed	12 mph
		Sprayer	RG1100
		Nozzles	TeeJet Triple Stream

Nitrogen Application	Seeding					In Crop		Total Actual (lbs/ac)			
Treatments	46-0-0 (lb/ac)	Actual N (46-0)	11-52 (lb/ac)	Actual N (11-52)	Actual P (11-52)	UAN (gal/ac)	Actual N	N	P	K	S
100% seeding	200	92	80	9	42	0	0	101	42	0	0
70% seeding + 30% in-crop	154	71	80	9	42	7	21	101	42	0	0
100% seeding + add. in-crop	200	92	80	9	42	7	21	122	42	0	0

Treatment	Plant Density (plants/ft²)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW) (kg/hL)
100% N at seeding	30.1 A	67.7	15.1	24.1	73.6
70% N at seeding & 30% in-crop	26.4 B	69.7	14.3	25.2	75.1
100% N at seeding + additional in-crop	28.0 AB	63.8	15.1	25.2	76.2
SE[1]	0.8622	1.52	0.0815	0.773	0.186
p-value[2]	**0.0341**	0.0539	0.3283	0.1073	0.0529





Treatment	N at seeding (lb/ac)	N at seeding ($/ac)[x]	In-Crop N (gal/ac)	In-Crop N ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
100% N at seeding	200	$63.5	0	$0.00	$63.50	67.7	8.44	571.3	507.80	0.00
70% N at seeding + 30% in-crop	154	$48.9	7	$14.30	$63.20	69.7	8.44	588.3	525.07	17.27
100% N at seeding + add. in-crop	200	$63.5	7	$14.30	$77.81	63.8	8.44	538.5	460.66	-47.14

[x]46-0-0-0 price, Local Retailer, July 8, 2024 ($700/MT)
[y]28-0-0 price, Local Retailer, July 8, 2024 ($425 MT)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

There was a significant response between treatments and plant densities, with the 70% nitrogen applied at seeding resulting in the lowest plant density. In theory, both 100% N at seeding treatments, regardless of the additional in-crop application, should have resulted in similar plant counts, since the in-crop application wasn't made until after counts.

Due to variability, yield was not significantly affected by nitrogen treatments, although there were some averaged differences. The lowest yield was observed with 70% N at seeding + 30% in-crop while the highest yield recorded was 100% N at seeding + 30% in-crop treatment. Grain quality was similar across all treatments. On average, the 70% N at seeding + 30% in-crop treatment resulted in the highest economic return at this site.

Images taken on July 5th

To review footnote references please refer to overall trial summary on page 162.

The trial was conducted with the agronomic support of

WHEAT WISE
Plotting the Future

Wheat Wise On-Farm Trial Program

Enhanced Efficiency Nitrogen Fertilizer

Nitrogen (N) is one of the most important nutrients for wheat production in Saskatchewan. Producers have been challenged with maximizing nitrogen use efficiency while increasing wheat yield and quality.

As part of a nitrogen management plan producers can consider the use of enhanced efficiency nitrogen fertilizer (EENF) products including urease inhibitors, nitrification inhibitors and controlled release nitrogen or combination products. These products have the potential to reduce nutrient loss and increase N fertilizer efficiency. Producers are interested in using an EENF to sustain or increase yield and quality on their farm but are unsure of the best practices in terms of rates for their growing conditions and operation and whether it is economical.

Objective

To examine different rates of untreated and EENF fertilizers on wheat establishment, yield, and quality under various management, soil, and weather conditions in Saskatchewan.

Treatments

1)	100% untreated N fertilizer
2)	25% treated with EENF product + 75% untreated nitrogen fertilizer
3)	50% treated + 50% untreated

Trials were set up in randomized strips with four replications, for a total of 12 plots. All plots were managed the same agronomically, besides N fertility, including seeding date, variety, seeding depth, seed treatment, and pesticide application

Data Collection

- Soil test
- Seeding information
- Field history and management practices
- In-season disease assessment
- Plant density, vigour, and height
- Weighed yield and harvest sample
- General in-season observations
- Weather data

The follow footnotes will be referred to for the individual site report for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate considered a random effect and fertilizer treatment considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$.

WHEAT WISE
Plotting the Future

Enhanced Efficiency Nitrogen Fertilizer (EENF)

(Lone Rock)

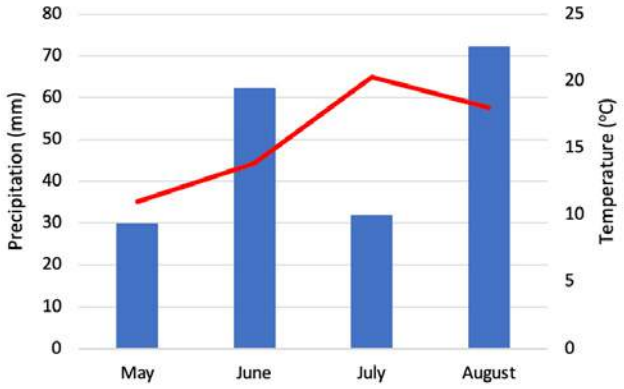
Objective: To examine different rates of untreated and EENF fertilizers on wheat establishment, yield, and quality under various management, soil, and weather conditions in Saskatchewan.

Treatment	Description
1	100% untreated nitrogen fertilizer
2	25% treated with EENF product: 75% untreated nitrogen fertilizer
3	50% treated with EENF product: 50% untreated nitrogen fertilizer

General Trial Information:

Variety	AAC Viewfield
Thousand Kernel Weight	35.1 g
Germination	95%
Seed Treatment	None
Previous Crop	Canola
Soil Organic Matter	4.5%
Variety	AAC Viewfield
Thousand Kernel Weight	35.1 g
Germination	95%
Seed Treatment	None
Previous Crop	Canola
Soil Organic Matter	4.5%
Residual Nitrate-N	
- **0-6”**	24 lb/ac
- **6-20”**	19 lb/ac
Soil Texture	Medium
Seeding Date	May 12
Seeding Rate	120 lbs/ac
Seeding Equipment	Bourgault knife
Seeding Depth	2”
Seeding Speed	4.6 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	95-35-12-12
Crop Protection	May 10: RU Transorb® + Blackhawk EVO® June 11: Axial® + Stellar™ July 11: Miravis Neo® September 6: Glyphosate

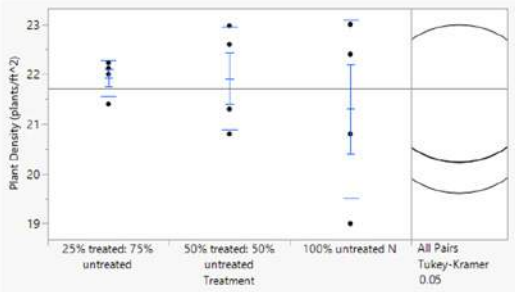
Weather from local station

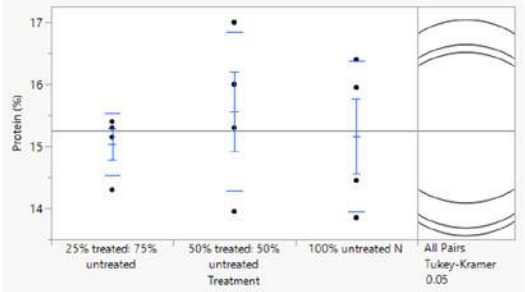


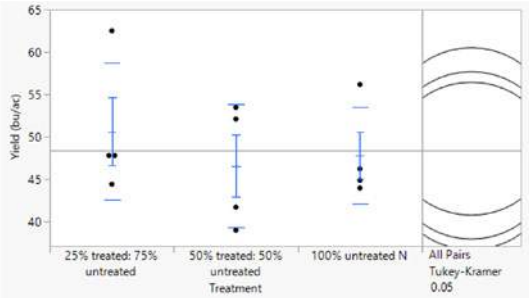
	Untreated N Rate (lb/ac)	Untreated N Cost ($/ac)[x]	Treated N Rate (lb/ac)	Treated N Cost ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Trt 1 – 100% untreated N fertilizer	95.0	31.75	0	0.00	31.75	46.5	8.44	392.8	361.01	0.00
Trt 2 – 25% treated + 75% untreated	23.8	7.56	71.25	40.37	47.93	50.6	8.44	427.2	379.23	18.23
Trt 3 – 50% treated + 50% untreated	47.5	15.08	47.50	19.18	34.26	47.8	8.44	403.3	369.01	8.01

[x]Untreated N price, Local Retailer, July 8, 2024 ($700/MT)
[y]Treated N price, Local Retailer, July 8, 2024 ($890/MT)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

	Plant Density (plants/ft^2)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Trt 1 – 100% untreated N fertilizer	21.3	46.5	15.2	31.4	77.3
Trt 2 – 25% treated + 75% untreated	21.9	50.6	15.0	30.7	77.0
Trt 3 – 50% treated + 50% untreated	21.9	47.8	15.6	30.0	76.0
SE[1]	0.857	5.1	0.747	1	1.02
p-value[2]	0.7137	0.7156	0.7701	0.4186	0.4341







Analysis revealed no significant differences between the nitrogen fertilizer treatments. Overall, yield was highest with the 25% untreated and 75% untreated fertilizer rate. Plant density and grain quality were similar across all treatments. From an economic standpoint, despite the added cost of the EENF fertilizer, the 25% untreated and 75% untreated treatment had the highest return on investment.

To review footnote references please refer to overall trial summary on page 175.

The trial was conducted with the agronomic support of

SWATMAPS

WHEAT WISE
Plotting the Future

Wheat Wise On-Farm Trial Program

Wheat Variety Trials

Variety selection is a critical component of crop success as it influences yield, quality, agronomic performance and resistance to abiotic/biotic stresses. Each year new varieties are available offering producers options in terms of maturity, lodging, pest resistance, seed size, yield and quality. Being able to compare varieties on farm along with information from the Saskatchewan Seed Guide are important ways to find what works best for a producer for their area, operation and typical management practices.

Objective

To compare the yield and quality of different spring wheat or durum varieties under various management and environmental conditions throughout Saskatchewan.

Treatments

1)	Variety 1
2)	Variety 2
3)	Variety 3 (optional)
4)	Variety 4 (optional)

Seeding rate was calculated based on thousand kernel weight (TKW) and seed quality to achieve desired plant population. Trials were set up in randomized strips with four replications, for a total of 8 to 16 plots, depending on number of treatments. All plots were managed the same agronomically, besides variety, including seeding date, seeding depth, seed treatment, fertility and pesticide application.

Data Collection

- Seed and soil test
- Seeding information
- Field history and management practices
- In season plant density
- Weighed yield and harvest sample
- General in-season observations
- Weather data

The follow footnotes will be referred to ffor the combined and individual site reports for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data

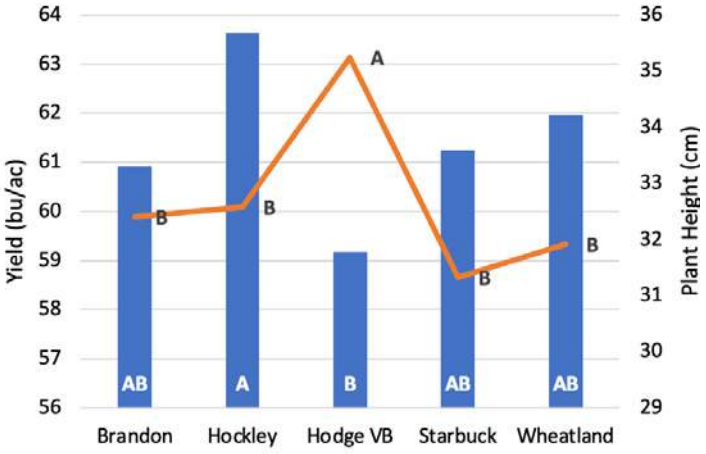
[2]All response data was analyzed using the Mixed Model procedure in JMP with replicate and location considered random and seeding rate considered a fixed effect. Treatment means were separated using Tukey's test; however, letter groupings were only presented when they were significant according to the overall tests of fixed effects. All treatment effects and differences between means were considered significant at $p \leq 0.05$. Locations were combined when treatment by location interaction was not significant, indicating that the trends were relatively the same among sites. A linear regression was also used to assess and provide visual representation of the effects of plant density on the response variables.

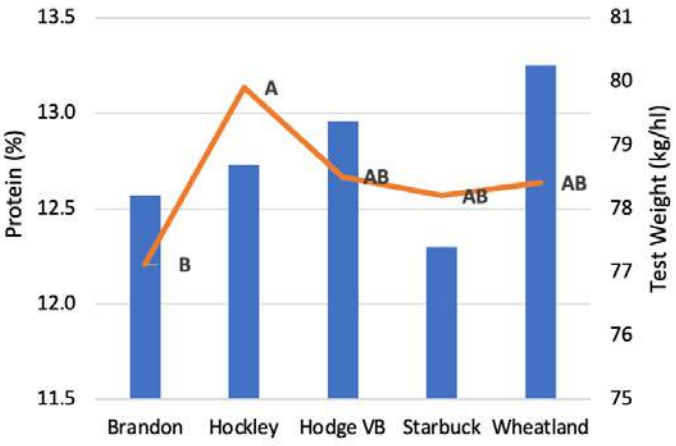
[3]SE was not record as the sample sizes are unequal and therefore standard error was different for each sample size

2024 Combined Results (3 sites)

When data from all three sites were combined, a significant effect was observed between wheat varieties and yield (p=0.0065). Additionally, a significant effect was observed between wheat varieties and plant heights (p<0.0001), as well as between wheat varieties and test weight (p=0.0165). Overall, for these specific sites, AAC Hodge VB was the tallest variety but had the lowest yield, possibly due to lodging. While AAC Hockley, produced the highest yields, resulting in the greatest economic returns.

Varieties[3]	Plant Height (cm)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Moisture (%)
AAC Brandon	32.4 B	60.9 AB	12.6	30.1	77.1 B	13.3
AAC Hockley	32.6 B	63.6 A	12.7	29.0	79.9 A	13.2
AAC Hodge VB	35.2 A	59.2 B	13.0	28.9	78.5 AB	13.4
AAC Starbuck VB	31.3 B	61.2 AB	12.3	29.8	78.2 AB	13.1
AAC Wheatland VB	31.9 B	62.0 AB	13.3	30.7	78.4 AB	13.1
p-value[2]	**<0.0001**	**0.0065**	0.1948	0.2114	**0.0165**	0.4367





Treatment Description	Seeding Rate (lbs/ac)[w]	Seed Cost ($/lb)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
AAC Brandon	114.3	28.84	7.59	36.43	60.9	8.44	514.00	477.57	0.00
AAC Hockley	103.6	26.14	6.88	33.02	63.6	8.44	536.78	503.76	26.19
AAC Hodge VB	103.1	26.02	6.85	32.88	59.2	8.44	499.65	466.77	-10.79
AAC Starbuck	101.0	25.49	6.71	32.21	61.2	8.44	516.53	484.32	-19.44
AAC Wheatland VB	88.0	22.21	5.85	28.06	62.0	8.44	523.28	495.22	28.45

[w]Averaged from all sites reported seeding rates
[x]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed cost $24.08/ac)
[y]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed treatment cost $6.34/ac)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $8.44/lb)

WHEAT WISE
Plotting the Future

Wheat Variety Trial
(Biggar)

Objective: To compare the yield and quality of different spring wheat or durum varieties under various management and environmental conditions throughout Saskatchewan.

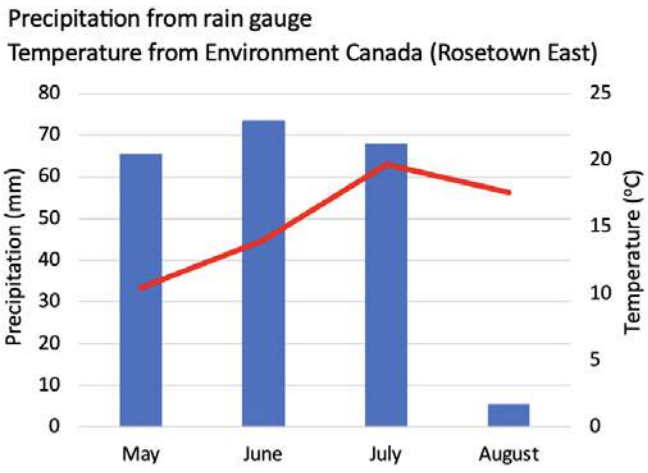
Treatment	Description
1	AAC Wheatland VB
2	AAC Hockley
3	AAC Hodge VB
4	AAC Starbuck VB

Seed Information

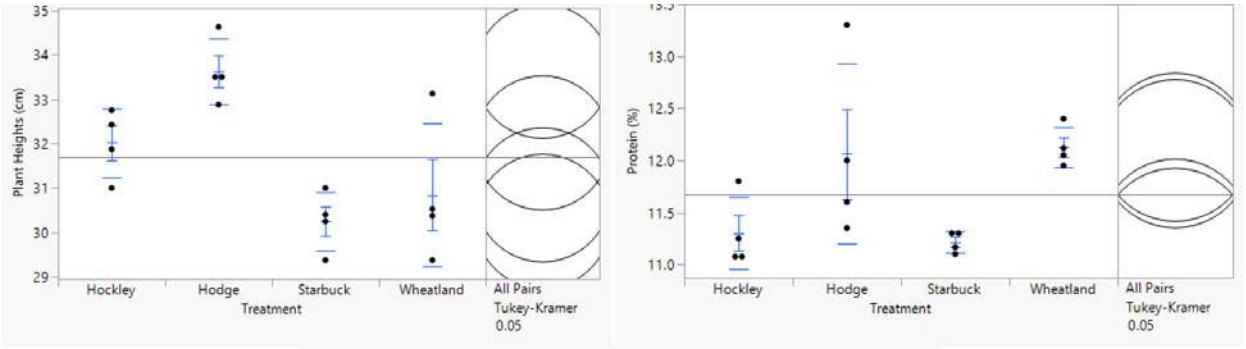
Variety 1: AAC Wheatland VB (Grower Standard)		Variety 2: AAC Hockley	
Thousand Kernel Weight	30.2 g	Thousand Kernel Weight	28.6 g
Germination	99%	Germination	95%
Seeding Rate	88 lbs/ac	Seeding Rate	87 lb/ac
Seed Treatment	None	Seed Treatment	Vibrance Quattro®
Variety 3: AAC Hodge VB		**Variety 4: AAC Starbuck VB**	
Thousand Kernel Weight	27.6 g	Thousand Kernel Weight	33.3 g
Germination	97%	Germination	95%
Seeding Rate	82 lbs/ac	Seeding Rate	101 lbs/ac
Seed Treatment	Vibrance Quattro®	Seed Treatment	Vibrance Quattro®

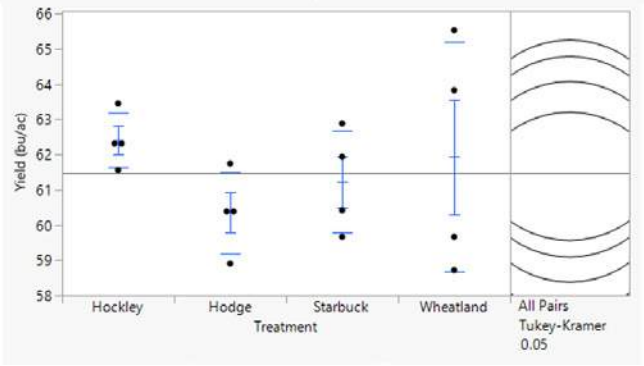
General Trial Information:

Previous Crop	Canola
Soil Organic Matter	3.1%
Residual Nitrate-N (0-6”)	40 lb/ac
Seeding Date	May 11
Seeding Equipment	Vaderstad knife ¾” openers
Seeding Depth	1 ¼”
Seeding Speed	5.2 mph
Row Spacing	12”
Total Applied Fertilizer (lbs/ac N-P-K-S)	Fall: 42-0-0-4 @ 264 lbs/ac Seeding: 11-52 @ 67 lbs/ac 118-35-0-11
Crop Protection	May 8: Glyphosate + Dicamba June 15: Forcefighter® + Simplicity™ July 10: Orius® August 15: Glyphosate



	Plant Density (plants/ft²)	Plant Height (cm)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Moisture (%)
AAC Wheatland VB	26.9	30.8 B	61.9	12.1	33.8 A	81.1 B	13.0
AAC Hockley	28.5	33.6 AB	62.4	11.3	33.0 A	82.6 A	13.2
AAC Hodge VB	28.0	33.6 A	60.4	12.1	31.4 B	81.2 B	13.2
AAC Starbuck VB	28.4	30.3 B	61.2	11.2	33.0 A	80.8 B	13.0
SE[1]	0.40229	0.508	0.96	0.23	0.224	0.154	0.045
p-value[2]	0.0672	**0.0025**	0.4611	0.0801	**<0.0001**	<0.0001	0.0567





Treatment Description	Seeding Rate (lbs/ac)	Seed Cost ($/lb)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
AAC Wheatland VB	88	22.21	5.85	28.06	61.9	8.44	522.44	494.38	0.00
AAC Hockley	87	21.96	5.78	27.74	62.4	8.44	526.66	498.91	4.54
AAC Hodge VB	82	20.70	5.45	26.15	60.4	8.44	509.78	483.63	-10.75
AAC Starbuck	101	25.49	6.71	32.21	61.2	8.44	516.53	484.32	-10.05

[x]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed cost $24.08/ac)
[y]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed treatment cost $6.34/ac)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $8.44/lb)

A significant response was observed between wheat varietiy and plant height (p=0.0025), as well as between wheat variety and TKW (p<0.0001). AAC Hockley and AAC Hodge VB exhibited the tallest plant height while AAC Wheatland VB and AAC Starbuck VB were 3 cm shorter. Yields ranged from 60.4 to 62.4 bu/ac, but due to variability, no significant differences were found. When considering seeding rates, calculated based on TKW and germination, along with average yields, AAC Hockley may provide the greatest return.

To review footnote references please refer to overall trial summary on page 178.

The trial was conducted with the agronomic support of

Hoppe Agronomy

WHEAT WISE
Plotting the Future

Wheat Variety Trial
(Kerrobert)

Objective: To compare the yield and quality of different spring wheat or durum varieties under various management and environmental conditions throughout Saskatchewan.

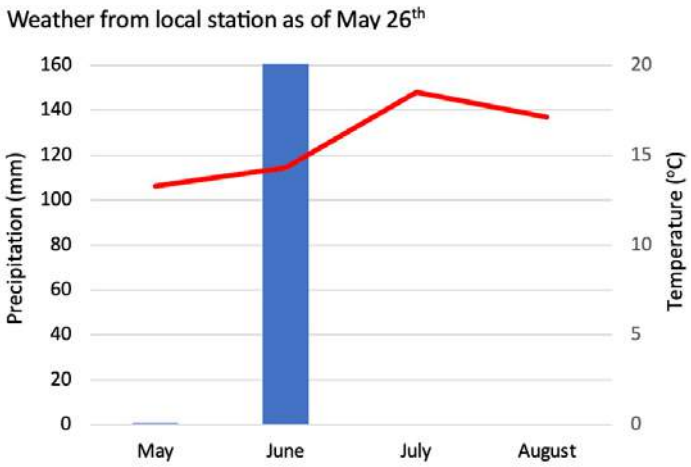
Trt #	Description
1	AAC Brandon
2	AAC Hockley
3	AAC Hodge VB

Seed Information

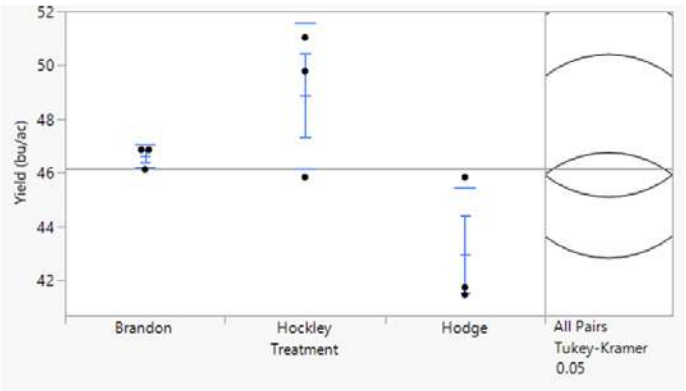
Variety 1: AAC Brandon (Grower Standard)	
Thousand Kernel Weight	33.7 g
Germination	97%
Seeding Rate	104.6 – 138 lb/ac
Seed Treatment	Assure®
Variety 2: AAC Hockley	
Thousand Kernel Weight	32.1 g
Germination	99%
Seeding Rate	104.6 – 138 lbs/ac
Seed Treatment	Assure®
Variety 3: AAC Hodge VB	
Thousand Kernel Weight	33.3 g
Germination	99%
Seeding Rate	104.6 – 138 lb/ac
Seed Treatment	Assure®

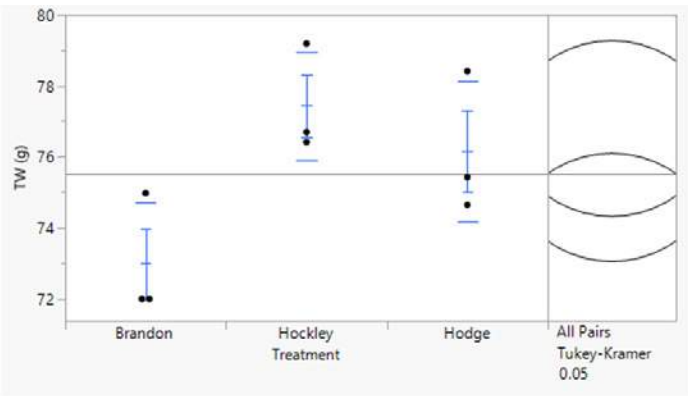
General Trial Information:

Previous Crop	Canola
Soil Organic Matter	3.4%
Residual Nitrate-N (0-6")	9 lb/ac
Seeding Date	May 27 – 28
Seeding Equipment	SeedMaster, double shoot
Seeding Depth	1 ½"
Seeding Speed	6.7-9.4 km/h
Row Spacing	10"
Total Applied Fertilizer (lbs/ac N-P-K-S)	76 – 20 – 0 – 3
Crop Protection	May 26 : Glyphosate June 1: Himalya® + Foxy Pro®



	Plant Height (cm)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Moisture (%)
AAC Brandon	30.0	46.6 AB	13.7	24.5	73.0 B	12.6
AAC Hockley	29.8	48.9 A	14.3	23.7	77.4 A	12.5
AAC Hodge VB	32.5	43.0 B	14.0	24.9	76.2 AB	12.6
SE[1]	0.78322	1.23	0.619	1.17	1.015	0.27
p-value[2]	0.1149	**0.0339**	0.6518	0.7617	**0.0481**	0.8805





Treatment Description	Seeding Rate (lbs/ac)[w]	Seed Cost ($/lb)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
AAC Brandon	121.3	30.62	8.06	38.68	46.6	8.44	393.30	354.63	0.00
AAC Hockley	121.3	30.62	8.06	38.68	48.9	8.44	412.72	374.04	19.41
AAC Hodge VB	121.3	30.62	8.06	38.68	43.0	8.44	362.92	324.24	-30.38

[w]Seeding Variable Rate Average (104.6 - 138 lb/ac)
[x]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed cost $24.08/ac)
[y]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed treatment cost $6.34/ac)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $8.44/lb)

At this site a significant trend was observed between wheat varieties and yield (p=0.0339). Hockley was the highest yielding at 48.9 bu/ac, followed by Brandon at 46.6 bu/ac and then Hodge at 43 bu/ac. As shown in the graph above, AAC Brandon demonstrated the most consistent yield, ranging between 46 and 47 bu/ac. AAC Hockley and AAC Hodge VB exhibited more yield variability, but Hockley's higher average yield resulted in the greatest economic return. Although not statistically significant, Hockley had slightly higher protein levels compared to the other two varieties. Additionally, a significant effect was found between wheat varieties and test weights (p=0.0481), with Hockley having the highest kg/hl, followed by Hodge, and then Brandon.

To review footnote references please refer to overall trial summary on page 178.

WHEAT WISE
Plotting the Future

Wheat Variety Trial
(Plenty)

Objective: To compare the yield and quality of different spring wheat or durum varieties under various management and environmental conditions throughout Saskatchewan.

Trt #	Description
1	AAC Brandon
2	AAC Hockley
3	AAC Hodge VB

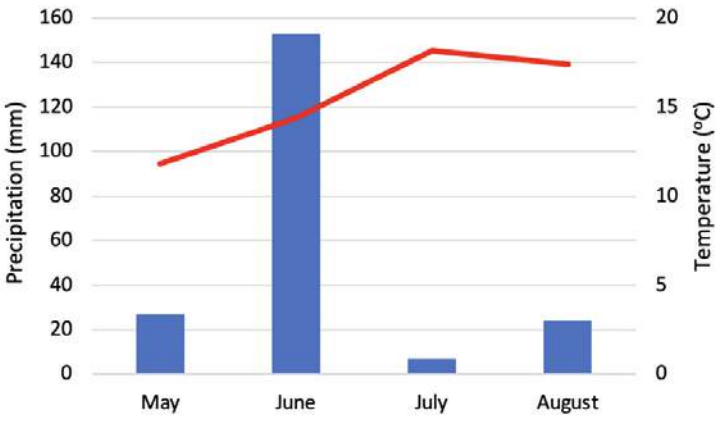
Seed Information

Variety 1: AAC Brandon (Grower Standard)	
Thousand Kernel Weight	32.3 g
Germination	98%
Seeding Rate	107.2 lb/ac
Seed Treatment	Vibrance Quattro®
Variety 2: AAC Hockley	
Thousand Kernel Weight	32.1 g
Germination	99%
Seeding Rate	102.4 lbs/ac
Seed Treatment	Vibrance Quattro®
Variety 3: AAC Hodge VB	
Thousand Kernel Weight	33.3 g
Germination	99%
Seeding Rate	106.0 lb/ac
Seed Treatment	Vibrance Quattro®

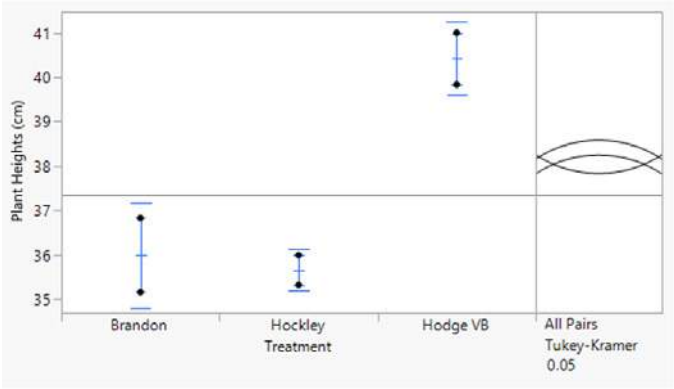
General Trial Information:

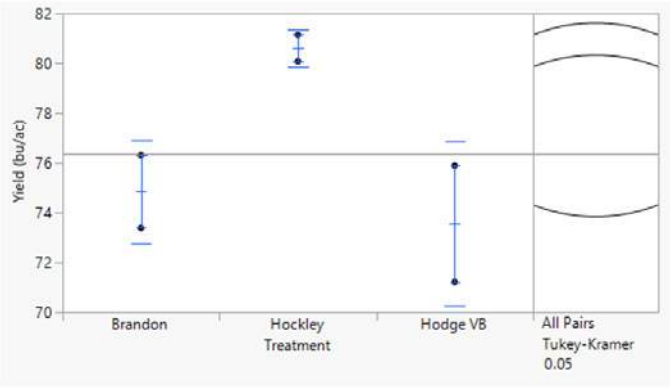
Previous Crop	Lentils
Residual Nitrate-N (0-6")	10 lb/ac
Seeding Date	May 13 – 14
Seeding Equipment	SeedHawk
Seeding Depth	1 ½"
Seeding Speed	5.0-6.7 km/h
Row Spacing	12"
Total Applied Fertilizer (lbs/ac N-P-K-S)	Variable Rate (Average) 75-35-20-7
Crop Protection	May 10: Stonewall + DB-878 June 13: HyActivate® + Perimeter II® + CS-75-2525®

Weather from local station as of May 20th



	Plant Height (cm)	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)	Moisture (%)
AAC Brandon	36.0 B	74.8	12.6	32.6	79.4	13.9
AAC Hockley	35.7 B	80.6	12.8	29.5	79.6	13.9
AAC Hodge VB	40.4 A	73.5	12.7	30.5	77.8	14.3
SE[1]	0.3535	2.29	0.502	1.38	1.27	0.266
p-value[2]	**0.0088**	0.1022	0.9663	0.2192	0.4783	0.3056





Treatment Description	Seeding Rate (lbs/ac)	Seed Cost ($/lb)[x]	Seed Treatment ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
AAC Brandon	107.2	27.06	7.12	34.18	74.8	8.44	631.31	597.13	0.00
AAC Hockley	102.4	25.85	6.81	32.65	80.6	8.44	680.26	647.61	50.48
AAC Hodge VB	106	26.76	7.04	33.80	73.5	8.44	620.34	586.54	-10.59

[x]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed cost $24.08/ac)
[y]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (seed treatment cost $6.34/ac)
[z]2024 Hard Red Spring Wheat, 2024 Crop Planning Guide, Government of Saskatchewan (estimated farm gate price $8.44/lb)

At this site, wheat varieties showed a significant effect on plant height (p=0.0088) with AAC Hodge VB being significantly taller than both AAC Hockley and AAC Brandon. No significant response was observed between varieties and yield, or between wheat variety and grain quality. In terms of yield, AAC Hockley exhibited relatively consistent performance, while AAC Brandon and AAC Hodge VB were more variable. Although not statistically significant, AAC Hockley proved to be the most economical, with the lowest seeding rate and the highest average yield.

To review footnote references please refer to overall trial summary on page 178.

The trial was conducted with the agronomic support of

MNP AgINTELLECT

WHEAT WISE
Plotting the Future

Wheat Wise On-Farm Trial Program

Wheat Fungicide

Fusarium Head Blight (FHB) is a serious fungal disease that results in a reduction in wheat yield and quality. An integrated management approach is needed to manage FHB. Part of this integrated approach could include a fungicide application if conditions are conducive. While a great tool, application of a fungicide to help manage FHB in wheat comes at a cost often leaving producers wondering if an application was worth it for their operation.

Objective

To evaluate fungicide performance on wheat yield, quality and economic return.

Treatments

1)	Untreated check
2)	Treated with fungicide

Fungicides will be applied according to label recommendations. The treatments will be replicated four times, for a total of 8 strips and randomized within the field. Apart from fungicide application, all strips must be managed the same agronomically including seeding, fertility and pesticide (excluding fungicide) application. Variable rate (VR) fertilizer application can be used.

Data Collection

- Soil test
- Seeding information
- Field history and management practices
- In-season disease assessment
- Plant density, vigour and height
- General in-season observations
- Hail damage assessments (if required)
- Weighed yield and harvest sample
- Weather data
- Economics

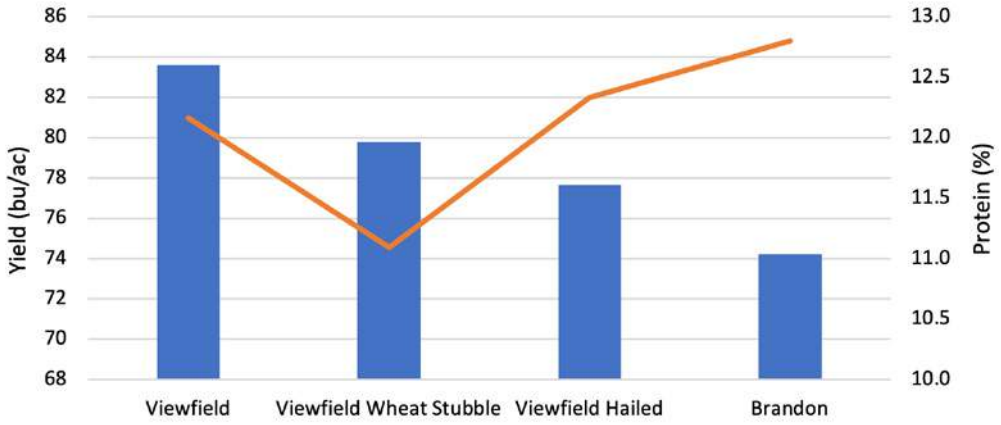
The follow footnotes will be referred to for the combined and individual site reports for this protocol

[1]SE is the standard error which is the same unit as the measurement and indicates the level of variability or uncertainty in the data.

[2]All response data was analyzed using a Standard Least Square Model in JMP. The effects replicate was considered random effects for all response data at each location and location was considered a random effect when combing sites. $p < 0.01$ = very likely that the difference was due to the treatment. Treatment means were separated using Tukey's test to test whether the overall responses were linear, quadratic, or not significant. All treatment effects and differences between means were considered significant at $p \leq 0.05$; however, p-values of 0.05-0.1 may also be acknowledged.
$p<0.05$ = likely that the difference was due to the treatment
$p<0.1$ = possible that the difference was due to the treatment
$p>0.1$ = not likely that the difference was due to the treatment

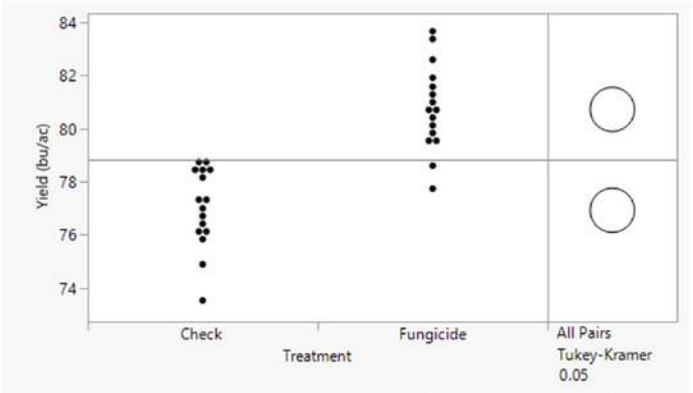
2024 Combined Results (4 sites)

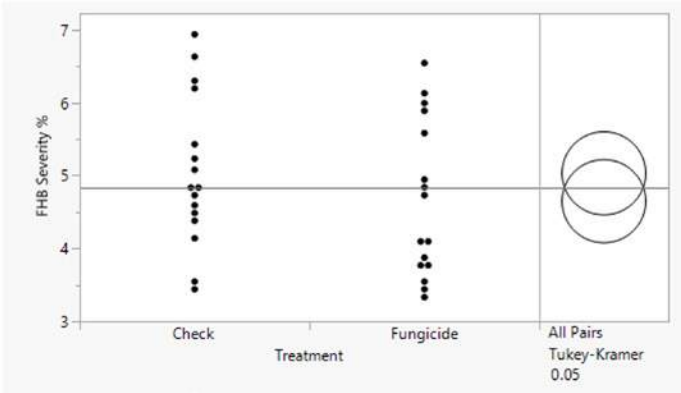
Trial	Yield (bu/ac)	FBH Severity (%)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
AAC Viewfield	83.4	5.4	12.2	32.4	79.9
AAC Viewfield on Wheat Stubble	79.8	4.6	11.1	32.7	80.6
AAC Viewfield Hailed	77.7	5.6	12.3	32.9	81.4
AAC Brandon	74.4	3.7	12.8	32.9	81.3



When examining each site individually, regardless of treatment, AAC Viewfield had the highest average yield, followed by AAC Viewfield on wheat stubble, AAC Viewfield hailed and finally AAC Brandon. A 9 bu/ac difference was observed between AAC Viewfield and AAC Brandon. Thousand kernel weight (TKW) and test weight (TW) were similar across the sites, while AAC Brandon had the highest protein.

	Yield (bu/ac)	FBH Severity (%)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000s)	Test Weight (TW) (kg/hl)
Untreated	76.9	5.0	12.2	32.0	80.2
Fungicide	80.7	4.6	12.0	33.4	81.4
Standard Error	1.988	0.27856	0.0843	0.2772	0.2718
Probability	**<0.0001**	0.3398	0.3807	**0.0015**	**0.0064**





When all sites were combined, the yield was significant ($p<0.0001$), with a fungicide application resulting in a 3.8 bu/ac increase. Overall, the remaining parameters - FHB severity, protein, TKW, and TW, showed similar results and were therefore insignificant.

WHEAT WISE
Plotting the Future

Wheat Fungicide
(Wilkie – AAC Brandon)

Objective: To evaluate fungicide performance on wheat yield, quality and economic return.

Treatment	Description
1	Untreated
2	Fungicide

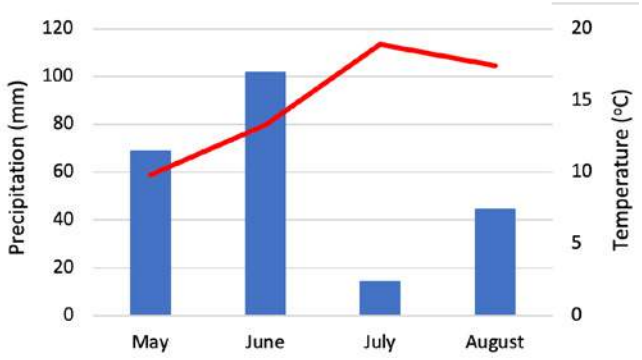
General Trial Information:

Variety	AAC Brandon
Thousand Kernel Weight	35.2 g
Germination	99%
Seed Treatment	None
Previous Crop	Canola
Seeding Date	May 10
Seeding Rate	115 lb/ac
Seeding Depth	1”
Seeding Speed	4.7 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	95-35-12-12
Crop Protection	May 9: Priority + Glyphosate June 9: Velocity August 21: Glyphosate

Fungicide Application

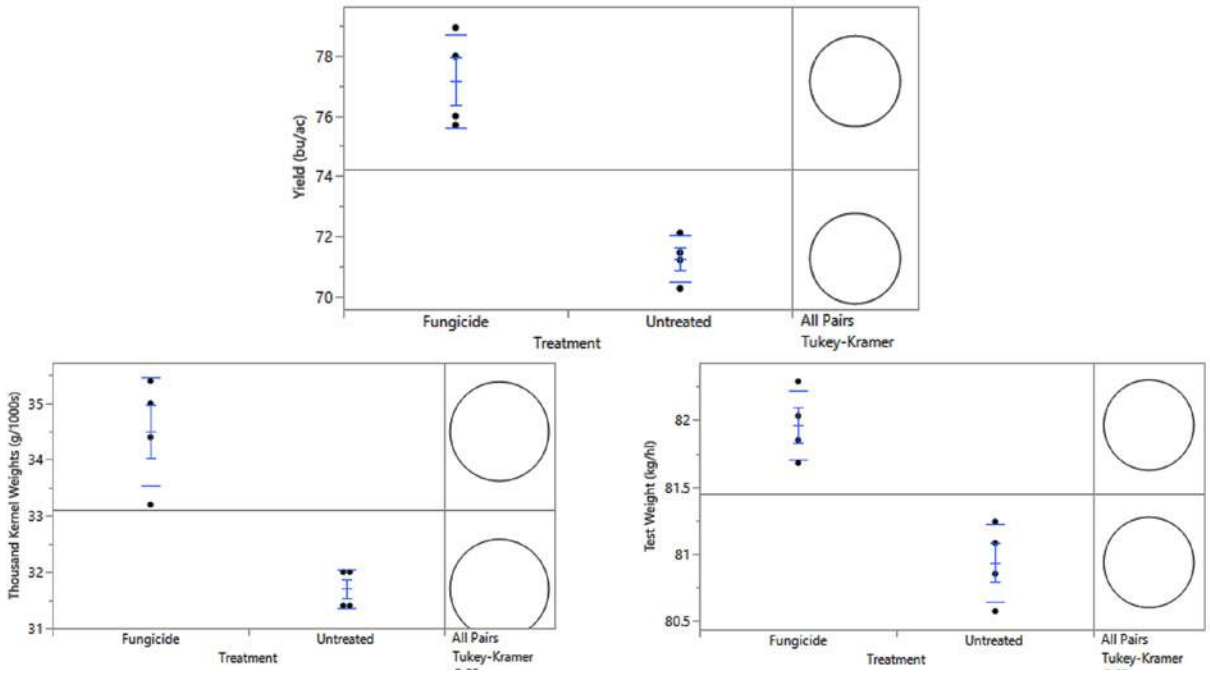
Product	Soraduo (Prothioconazole + Tebuconazole)
Rate	162mL/ac Soraduo A + 94mL/ac Soraduo B
Date/Time	July 17, 2024 @ 11:00 AM
Crop Stage	Anthesis
Tank Mix	N/A
Water Volume	12.5 gal/ac
Speed	10 mph

Precipitation from local weather station
Temperature from Environment Canada (Scott, SK)



Results:

Treatment	Yield (bu/ac)	FHB Disease Severity (%)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW)(kg/hl)
Untreated	71.3	3.9	12.8	31.7	80.9
Fungicide	77.2	3.5	12.8	34.5	82.0
SE[1]	0.866371	1.000208	0.243242	0.509902	0.1955281
p-value[2]	**0.0005**	0.5102	0.8439	**0.0015**	**0.0019**



Treatments	Grade	Dockage	HVK*	Midge	Smudge	Fusarium	Falling Number	Vomitoxin
Untreated	No. 1 CWRS	0.4%	84%	0.40%	0.00%	0.20%	403 seconds	<0.5ppm
Fungicide	No. 1 CWRS	0.3%	79%	0.20%	0.00%	0.20%	400 seconds	<0.5ppm

Treatments	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
Untreated	0.00	0.00	71.3	8.44	601.60	601.60	0.00
Fungicide	19.35	19.35	77.2	8.44	651.11	631.76	30.16

[y]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (fungicide cost $19.35/ac)
[z]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

Yield was significantly higher with a fungicide application, resulting in a 5.86 bu/ac increase (p=0.005). Visual FHB disease severity, assessed 14 days after application, was not significant. Protein, regardless of fungicide application, was also not significant and would be classified as low protein. Thousand kernel weight (p=0.0015) and test weight (p=0.0019) were significantly higher with a fungicide application, correlating to larger, fuller seeds. SGS Labs graded both treatments as No. 1. Economically, the application of a fungicide resulted in a $30.16/acre increase.

To review footnote references please refer to overall trial summary on page 186.

Product Donated by Hamlin

This trial was conducted with the agronomic support of Western Applied Research Corporation WARC Research from our farm to yours

WHEAT WISE
Plotting the Future

Wheat Fungicide
(Wilkie – AAC Viewfield)

Objective: To evaluate fungicide performance on wheat yield, quality and economic return.

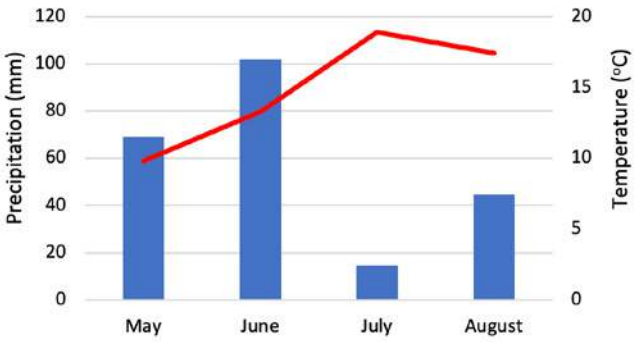
Treatment	Description
1	Untreated
2	Fungicide

1		2		3		4	
1	2	3	4	5	6	7	8
1	2	2	1	1	2	2	1
Untreated	Fungicide	Fungicide	Untreated	Untreated	Fungicide	Fungicide	Untreated

General Trial Information:

Variety	AAC Brandon
Thousand Kernel Weight	31.9 g
Germination	99%
Seed Treatment	None
Previous Crop	Canola
Seeding Date	May 11
Seeding Rate	115 lb/ac
Seeding Depth	1”
Seeding Speed	4.7 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	90-35-12-12
Crop Protection	May 9: Priority + Glyphosate June 11: Force fighter + Signal August 21: Glyphosate

Precipitation from local weather station
Temperature from Environment Canada (Scott, SK)



Fungicide Application

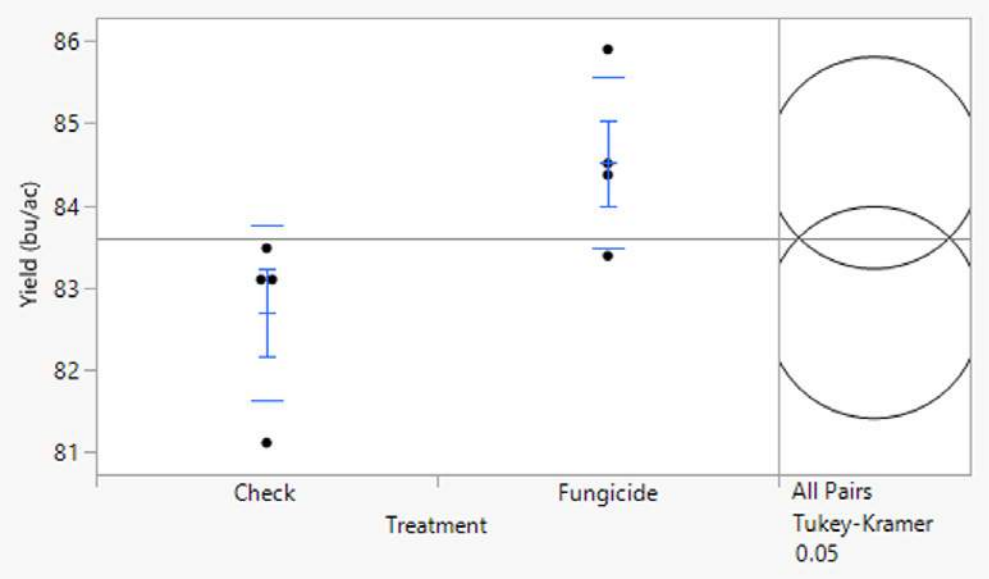
Product	Soraduo (Prothioconazole + Tebuconazole)
Rate	162mL/ac Soraduo A + 94mL/ac Soraduo B
Date/Time	July 17, 2024 @ 11:00 AM
Crop Stage	Anthesis
Tank Mix	N/A
Water Volume	12.5 gal/ac
Speed	10 mph


Fungicide


Untreated

Results:

Treatment	Yield (bu/ac)	FHB Disease Severity (%)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW)(kg/hl)
Untreated	82.7	5.7	12.2	31.3	78.9
Fungicide	84.5	5.4	12.1	32.6	80.3
SE[1]	0.7468142	0.902283	0.3569255	0.9336309	1.100506
p-value[2]	0.0503	0.7809	0.6889	0.2132	0.2643



Treatments	Grade	Dockage	HVK*	Midge	Smudge	Fusarium	Falling Number	Vomitoxin
Untreated	No. 1 CWRS	0.8%	83%	0.20%	0.00%	0.15%	425 seconds	<0.5 ppm
Fungicide	No. 1 CWRS	0.5%	85%	0.10%	0.00%	0.05%	440 seconds	<0.5 ppm

Analysis conducted by SGS Labs in Saskatoon, SK
*Hard vitreous kernels

Treatments	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Untreated	0.00	0.00	82.7	8.44	697.93	697.93	0.00
Fungicide	19.35	19.35	84.5	8.44	713.33	693.98	-3.96

[y]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (fungicide cost $19.35/ac)
[z]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

No significant differences were found in any of the evaluated data at this site. Although the yield (p=0.0503) was nearly significant with the use of a fungicide, it ultimately was not. The yield increased by 1.8 bushels per acre, resulting in a net loss of $-3.92 per acre with the application of the fungicide. Therefore, in this case, applying a fungicide was not economically viable.

To review footnote references please refer to overall trial summary on page 186.

Thank you to Nutrien for the use of their weigh wagon

Product Donated by Hamlin

This trial was conducted with the agronomic support of WARC

WHEAT WISE
Plotting the Future

Wheat Fungicide
(Wilkie – AAC Viewfield Hailed)

Objective: To evaluate fungicide performance on wheat yield, quality and economic return.

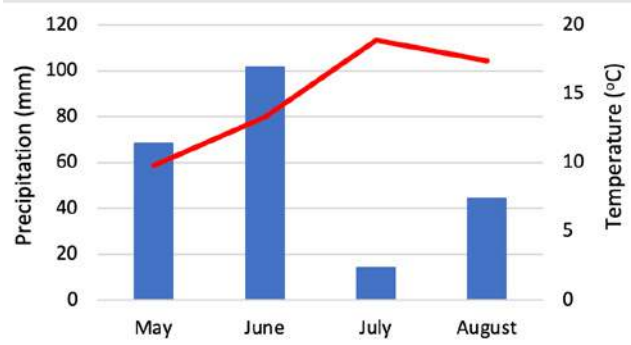
Treatment	Description
1	Untreated
2	Fungicide

1		2		3		4	
1	2	3	4	5	6	7	8
2	1	1	2	2	1	1	2
Fungicide	Untreated	Untreated	Fungicide	Fungicide	Untreated	Untreated	Fungicide

General Trial Information:

Variety	AAC Viewfield
Thousand Kernel Weight	31.9 g
Germination	99%
Seed Treatment	None
Previous Crop	Canola
Seeding Date	May 13
Seeding Rate	115 lb/ac
Seeding Depth	1”
Seeding Speed	4.7 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	90-35-12-12
Date of Hail	July 11, 2024
Hail Damage **WARC Assessment** **Adjuster Assessment**	 30% - July 24, 2024 45% - July 28, 2024
Crop Protection	May 12: Priority + Glyphosate June 14: Force Fighter + Signal August 25: Glyphosate

Precipitation from local weather station
Temperature from Environment Canada (Scott, SK)

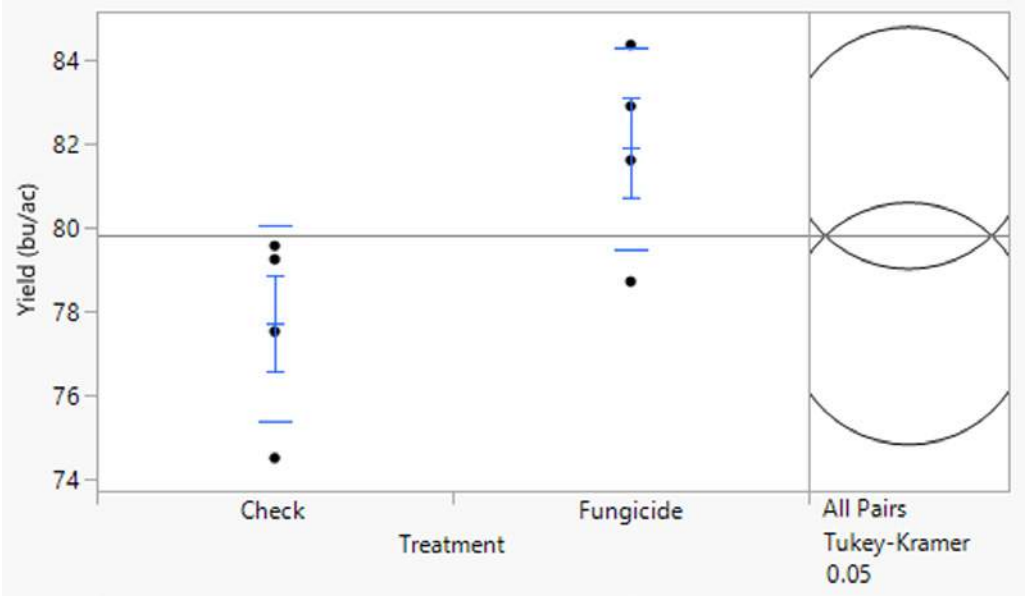


Fungicide Application

Product	Soraduo (Prothioconazole + Tebuconazole)
Rate	162mL/ac Soraduo A + 94mL/ac Soraduo B
Date/Time	July 17, 2024 @ 11:00 AM
Crop Stage	Anthesis
Tank Mix	N/A
Water Volume	12.5 gal/ac
Speed	10 mph

Results:

	Yield (bu/ac)	FHB Disease Severity (%)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW)(kg/hl)
Untreated	77.7	4.8	11.1	32.4	80.0
Fungicide	81.9	4.4	11.1	32.8	81.0
SE[1]	1.662692	0.754397	0.185265	0.993311	1.087955
p-value[2]	**0.046**	0.5831	0.6534	0.7011	0.3979



Treatments	Grade	Dockage	HVK*	Midge	Smudge	Fusarium	Falling Number	Vomitoxin
Untreated	No. 2 CWRS	1.6%	85%	0.35%	0.00%	0.45%	416 seconds	<0.5 ppm
Fungicide	No. 1 CWRS	0.7%	83%	0.55%	0.00%	0.05%	406 seconds	<0.5 ppm

Analysis conducted by SGS Labs in Saskatoon, SK
*Hard vitreous kernels

Treatments	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/ Loss ($/ac)
Untreated	0.00	0.00	77.7	8.44	655.93	655.93	0.00
Fungicide	19.35	19.35	81.9	8.44	691.13	671.78	15.85

[y]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (fungicide cost $19.35/ac)
[z]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

Yield (p=0.046) was significant with the application of a fungicide, resulting in an increase of 4.17 bu/ac. Economically, this resulted in a $15.85/ac increase. However, protein, thousand kernel weight and test weight were not significant. SGS Labs graded the untreated sample as a No. 2 and the fungicide sample as a No. 1. Additionally, the untreated sample had a higher fusarium percentage than the fungicide treated sample.

To review footnote references please refer to overall trial summary on page 186.

Product Donated by Hamlin

This trial was conducted with the agronomic support of Western Applied Research Corporation WARC Research from our farm to yours

WHEAT WISE
Plotting the Future

Wheat Fungicide

(Wilkie – AAC Viewfield on Wheat Stubble)

Objective: To evaluate fungicide performance on wheat yield, quality and economic return.

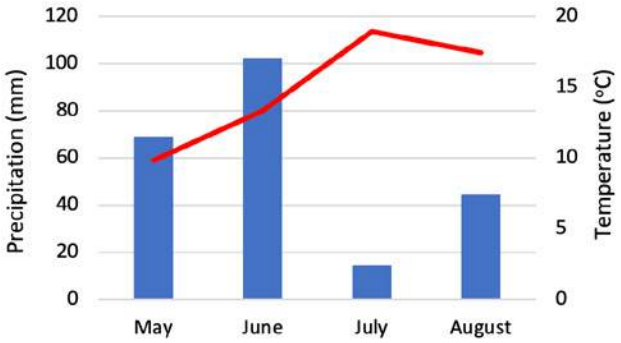
Treatment	Description
1	Untreated
2	Fungicide

1		2		3		4	
1	2	3	4	5	6	7	8
1	2	2	1	1	2	2	1
Untreated	Fungicide	Fungicide	Untreated	Untreated	Fungicide	Fungicide	Untreated

General Trial Information:

Variety	AAC Viewfield
Thousand Kernel Weight	31.9 g
Germination	99%
Seed Treatment	None
Previous Crop	Wheat
Seeding Date	May 11
Seeding Rate	115 lb/ac
Seeding Depth	1”
Seeding Speed	4.7 mph
Row Spacing	10”
Total Applied Fertilizer (lbs/ac N-P-K-S)	90-35-12-12
Crop Protection	May 9: Priority + Glyphosate June 11: Force fighter + Signal August 21: Glyphosate

Precipitation from local weather station
Temperature from Environment Canada (Scott, SK)

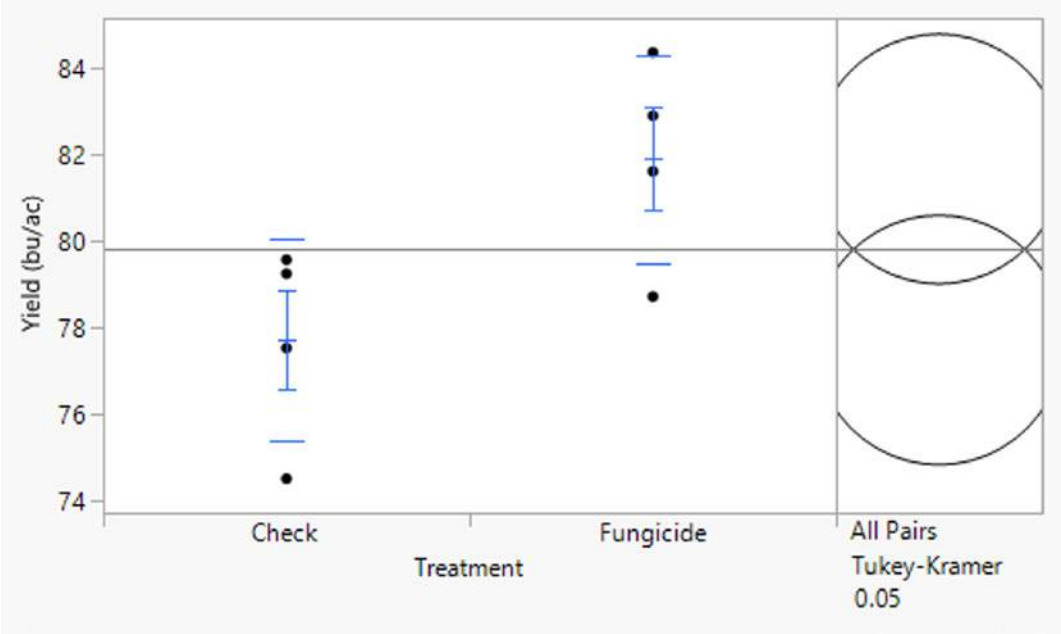


Fungicide Application

Product	Soraduo (Prothioconazole + Tebuconazole)
Rate	162mL/ac Soraduo A + 94mL/ac Soraduo B
Date/Time	July 17, 2024 @ 11:00 AM
Crop Stage	Anthesis
Tank Mix	N/A
Water Volume	12.5 gal/ac
Speed	10 mph

Results:

	Yield (bu/ac)	FHB Disease Severity (%)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000seeds)	Test Weight (TW)(kg/hl)
Untreated	77.7	4.8	11.1	32.4	80.0
Fungicide	81.9	4.4	11.1	32.8	81.0
SE[1]	1.662692	0.754397	0.185265	0.993311	1.087955
p-value[2]	**0.046**	0.5831	0.6534	0.7011	0.3979



Treatments	Grade	Dockage	HVK*	Midge	Smudge	Fusarium	Falling Number	Vomitoxin
Untreated	No. 2 CWRS	1.6%	85%	0.35%	0.00%	0.45%	416 seconds	<0.5 ppm
Fungicide	No. 1 CWRS	0.7%	83%	0.55%	0.00%	0.05%	406 seconds	<0.5 ppm

Analysis conducted by SGS Labs in Saskatoon, SK
*Hard vitreous kernels

Treatments	Fungicide ($/ac)[y]	Total Cost ($/ac)	Yield (bu/ac)	Target Price ($/bu)[z]	Gross Revenue ($/ac)	Net Revenue ($/ac)	Profit/Loss ($/ac)
Untreated	0.00	0.00	77.7	8.44	655.93	655.93	0.00
Fungicide	19.35	19.35	81.9	8.44	691.13	671.78	15.85

[y]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (fungicide cost $19.35/ac)
[z]2024 Hard Red Spring Wheat, Crop Planning Guide, Government of Saskatchewan (target price $8.44/bu)

Yield (p=0.046) was significant with the application of a fungicide, resulting in an increase of 4.17 bu/ac. Economically, this resulted in a $15.85/ac increase. However, protein, thousand kernel weight and test weight were not significant. SGS Labs graded the untreated sample as a No. 2 and the fungicide sample as a No. 1. Additionally, the untreated sample had a higher fusarium percentage than the fungicide treated sample.

To review footnote references please refer to overall trial summary on page 186.

Product Donated by Hamlin

This trial was conducted with the agronomic support of WARC Western Applied Research Corporation — Research from our farm to yours

NOTES

NOTES

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