SASKATCHEWAN ON-FARM RESEARCH TRIALS 2023

Acknowledgments

SaskCanola, 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

Christiane Catellier from IHARF for her role in the organization, management, and data analysis for these trials.

Table of Contents

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.

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

Barley

theBarleyBin Field Lab

by SaskBarley DEVELOPMENT COMMISSION

Overview

SaskBarley launched the BarleyBin Field Lab in 2023. 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.

SaskBarley will continue the BarleyBin Field Lab beyond 2023, collaborating with producers and agronomists to adapt research for use on the farm.

Protocol: Barley Seeding Rates

the BarleyBin Field Lab
Brought to you by SaskBarley

Barley Seeding Rates Protocol

Objective

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

Rationale

The recommended seeding rate for malt barley is 300 live seeds/m^2, which corresponds to 20-22 plants/ft^2. Researchers found that 300 live seeds/m^2 optimized agronomics including yield and lodging, as well as malt characteristics including protein and plump kernels. Applying these small-plot results at field scale allows producers to fine-tune based on seeding equipment, soil zone and management practices.

Treatments and Methodology

The treatments were replicated four times and applied in randomized strips. All plots were managed the same agronomically (apart from seeding rates) including seeding date, variety, seeding depth, seed treatment, and pesticide application.

Actual seeding rates for each treatment varied depending on the producers needs and current rates.

On request, an additional treatment of a variable seeding rate with adjustments for landscape position (knoll, mid-slope, and depression), was applied.

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 post-harvest quality analysis consistent with malting barley quality analyses.

Treatment 1:
Target 250 seeds/m^2 – Reduced rate
Treatment 2:
Target 300 seeds/m^2 – Standard rate
Treatment 3:
Target 350 seeds/m^2 – High rate

Rep	Treatment
Rep 1	Treatment 2
	Treatment 1
	Treatment 3
Rep 2	Treatment 1
	Treatment 3
	Treatment 2
Rep 3	Treatment 3
	Treatment 2
	Treatment 1
Rep 4	Treatment 2
	Treatment 3
	Treatment 1

Data collected

- Soil and seed testing data
- Crop stand density
- Height
- Lodging
- Maturity
- Yield
- Grain quality

the BarleyBin Field Lab
Brought to you by SaskBarley

Barley Seeding Rate
(Dodsland)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of barley.

Treatments:

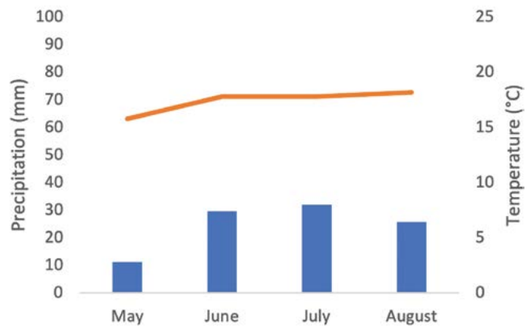
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	Low (19)	102
2	Standard (22)	118
3	High (26)	140
4	VR	141 (Depression) 142 (Midslope) 161 (Knoll)

Replicates: Four

General Trial Information:

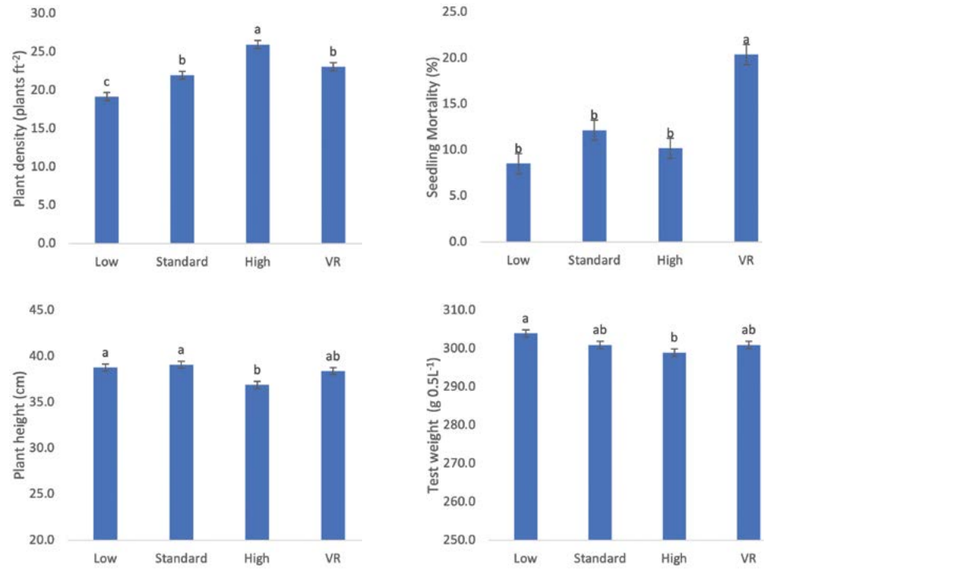
Variety	AAC Connect
Thousand kernel weight	49.88 g
Germination	99%
Seed treatment	Insure Cereal FX4
Previous crop	Lentils
Soil organic matter	3.6%
Residual Nitrate-N (0-6")	8 lbs. ac^{-1}
Seeding date	May 14
Seeding depth	1.5 in.
Seeding speed	4.6 mph
Row spacing	12 in.
Total applied fertilizer	Average 50 N – 34 P – 19 K – 0 S lbs. ac^{-1} actual (VR)
Crop protection	May 11: Glyphosate 540 + DB-878 June 7: Axial Extreme + MCPA 600 Ester

Weather: *In-field precip + Environment Canada (Kindersley) for temp*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Height (in)	Yield [1] (bu ac^{-1})	Protein (%)	Test weight (g 0.5L^{-1})	Plumps (%)	Thins (%)
19	19.2	8.5	15.3	32.6	14.0	304	80.9	0.69
22	22.0	12.2	15.4	30.3	14.2	301	78.8	0.71
26	26.0	10.2	14.5	29.3	14.2	299	74.5	0.87
VR	23.1	20.4	15.1	29.8	14.5	301	74.9	0.75
SE [2]	± 0.3	± 1.1	± 0.2	± 1.7	± 0.2	± 0.9	± 1.8	± 0.1
P-value [3]	*<0.001****	*<0.001****	*0.011***	*0.341*	*0.185*	*0.019***	*0.067**	*0.268*



The effect of seeding rate on plant density, seedling mortality, plant height and test weight was significant. Treatments labeled with the same letter are not significantly different. Error bars indicate the standard error.

Summary:
Higher barley seeding rate increased plant density (P<0.01). Seedling mortality was significantly higher with variable seeding rate than with the flat rates which had consistent seedling mortality. We were not able to detect a significant difference in yield, protein, or plumps and thins with increased seeding rates. However, plant height and test weight decreased significantly with seeding rates.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with seeding rate.

1. Yields were adjusted to 13.5% 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. Linear regression was used to assess the relationship between seeding rate and the response variables, thus the P-value indicates the likelihood that a change in the response variable with increased seeding rate is significantly different than zero:
   P < 0.01 = Very likely that seeding rate affected the response variable (***)
   P < 0.05 = Likely that the seeding rate affected the response variable (**)
   P < 0.1 = Possible that the seeding rate affected the response variable (*)
   P > 0.1 = Not likely that the seeding rate affected the response variable (not significant)

This trial was conducted with the agronomic support of
MAX AG CONSULTING Ltd.

the BarleyBin Field Lab
Brought to you by SaskBarley

Barley Seeding Rate
(Luseland)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of barley.

Treatments:

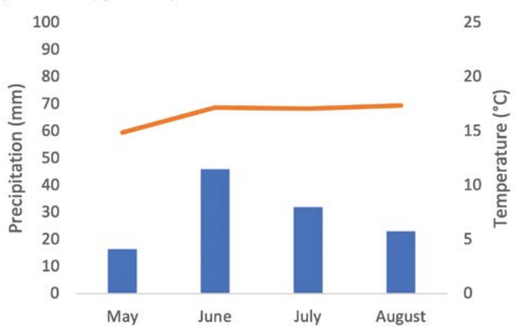
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	Low (19)	89
2	Standard (22)	104
3	High (26)	122
4	VR	118 (Depression) 119 (Midslope) 135 (Knoll)

Replicates: Four

General Trial Information:

Variety	AAC Synergy
Thousand kernel weight	43.2 g
Germination	98%
Seed treatment	Terraxxa
Previous crop	Canola
Soil organic matter	4.7%
Residual Nitrate-N (0-6")	11 lbs. ac^{-1}
Seeding date	May 12
Seeding depth	1 in.
Seeding speed	3.7 mph
Row spacing	12 in.
Total applied fertilizer	55 N – 28 P – 20 K – 0 S lbs. ac^{-1} actual (VR)
Crop protection	May 9: M-Power + Ammo June 6: Rumour + Bison 400 + MSO + Foxxy

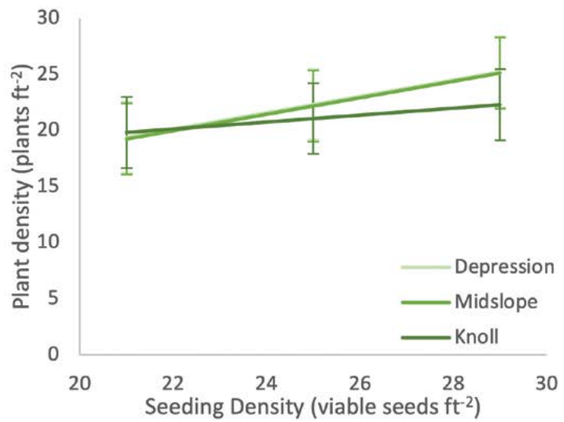
Weather: *In-field precip + Environment Canada (Scott CDA) for temp*

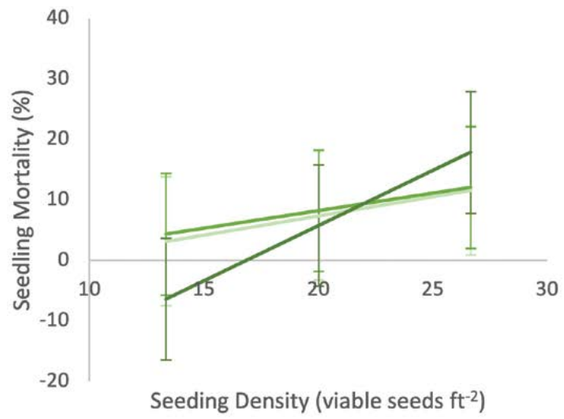


Results:

Plant density assessments were completed separately for depression, mid-slope, and knoll areas within each of the four treatments to determine if the effect of seeding rate on plant population and seedling mortality differed by landscape position.

	Plant density	Seedling mortality
P-value *(Seeding Rate)* [3]	*<0.001***	*0.001***
P-value *(Landscape Position)*	*0.018***	*0.058**
P-value *(SR x LP)*	*0.005****	*0.017***

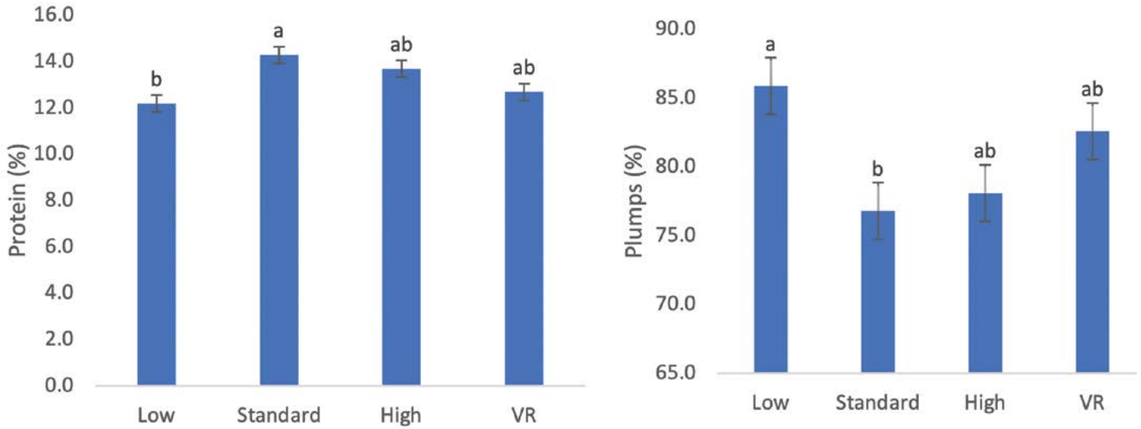




Plant density significantly increased with seeding rate in depressions and midslope positions, but did not differ with seeding rate on knolls. Accordingly, seedling mortality was low overall and more uniform across seeding rates in the depression and midslope positions, where seedling mortality increased significantly with seeding rate on knolls.

Target plant population (plant ft^{-2})	Height (in)	Yield [1] (bu ac^{-1})	Protein (%)	Test weight (g 0.5L^{-1})	Plumps (%)	Thins (%)
19	20.5	70.4	12.2	287.0	85.9	1.5
22	20.1	65.0	14.3	266.0	76.8	2.6
26	20.9	62.6	13.7	272.0	78.1	2.3
VR	21.0	69.6	12.7	280.0	82.6	2.0
SE [2]	± 0.5	± 2.7	± 0.4	± 5.6	± 2.1	± 0.3
P-value [3]	*0.288*	*0.176*	*0.006****	*0.100*	*0.025***	*0.108*

Barley Seeding Rate (Luseland) continues...



The effect of seeding rate on protein and plumps was significant. Treatments labeled with the same letter are not significantly different. Error bars indicate the standard error.

Summary:
Higher barley seeding rate did not significantly affect plant height, yield, test weight, or percent thins under these trial conditions. However, protein was significantly lower and percent plumps significantly higher in the low compared to the standard seeding rate.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with seeding rate.

1. Yields were adjusted to 13.5% 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. Linear regression was used to assess the relationship between seeding rate and the response variables, thus the P-value indicates the likelihood that a change in the response variable with increased seeding rate is significantly different than zero:
   P < 0.01 = Very likely that seeding rate affected the response variable (***)
   P < 0.05 = Likely that the seeding rate affected the response variable (**)
   P < 0.1 = Possible that the seeding rate affected the response variable (*)
   P > 0.1 = Not likely that the seeding rate affected the response variable (not significant)

This trial was conducted with the agronomic support of

MAX AG CONSULTING Ltd.

Canola

TOP NOTCH Trials
FARMING
by SaskCanola

Overview

In its inaugural year, SaskCanola's Top Notch Farming trials marked a milestone with a dedicated focus on field-scale research. This investment of levy dollars directly benefits canola farmers by addressing on-farm challenges and questions they may have specific to their farm. By investing in research applicable at the farm level, SaskCanola emphasizes its commitment to growing producer prosperity.

The goal of our program is to actively seek input from farmers and agronomists to shape future projects, and cultivate a collaborative network between SaskCanola, farmers, agronomists, and research specialists. Anticipating growth and evolution, we look forward to expanding this program in the years to come.

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

TOP NOTCH Trials
FARMING

Foliar-Applied Nitrogen-Fixing Biological Products For Canola

Wheat and canola generally require 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 canola.

Objective

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

Treatments

Option A: Two treatments		Option B: Four treatments	
1)	Untreated check	1)	Normal N rate + Untreated
2)	Envita® at recommended rate and timing	2)	Normal N rate + Envita®
		3)	Reduced N rate + Untreated
		4)	Reduced N rate + Envita®

The treatments were replicated and applied in randomized strips. Option A trials were replicated four times (8 plots total) and Option B trials were replicated three times (12 plots total). All plots were managed the same agronomically including seeding date, variety, seeding depth, seed treatment, and pesticide application.

Procedure

The following procedure was followed at all trial sites, unless otherwise specified in the individual site reports:

1. Spring soil samples were collected at each trial site prior to seeding and fertilizer application to assess residual soil nutrient levels. A minimum of 12 soil cores were collected throughout the trial area, separated by 0–6" and 6–24" depths.
2. The normal N fertilizer rate was determined by the producer and their agronomist as per their management practices. The reduced N rate treatments were 90 percent or less of the normal N rate. Actual applied N rates were documented.
3. For Option A, the entire field was seeded at the normal N fertilizer rate and Envita® treatment strips were established at the recommended timing using the provided randomized field plan.
4. For Option B, N fertility treatments were established at seeding time (or N fertilizer application time) and Envita® application was completed at the recommended timing using the provided field plan.
5. Envita® was either tank-mixed at herbicide timing or applied as a separate pass. Label recommendations were followed.
6. Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale.
7. Grain samples were collected from each plot separately for grain quality analysis.

Data Collection

- Spring soil sample
- Spring plant density
- Yield (corrected for moisture content)
- Grain quality (protein content, oil content)
- General observations throughout the season
- Weather data (Daily temperature and precipitation)
- Management (applied fertilizer rates, seeding date, pesticide applications, etc.)

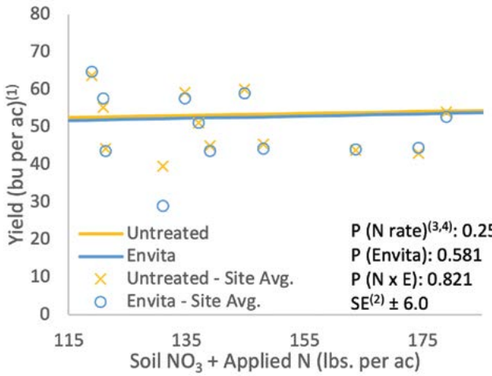
SaskCanola wishes to thank Syngenta for their support by donating Envita®.

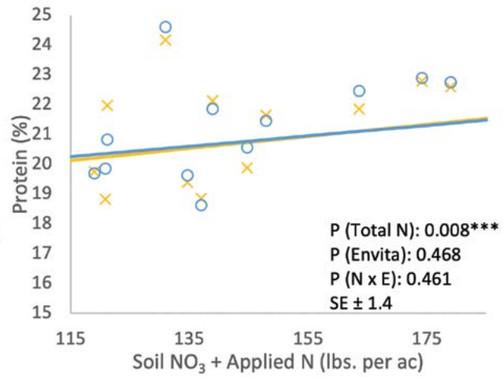
syngenta

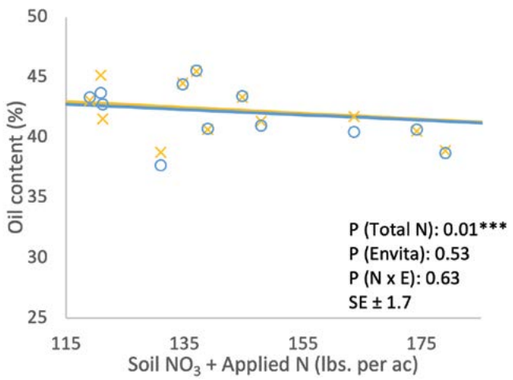
Foliar-Applied Nitrogen-Fixing Biological Products For Canola: Results Summary

Data from all sites was combined to assess the overall effect of Envita® application and whether the effect differed with nitrogen availability. The amount of applied N was added to the soil residual NO_{3-} 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.







Individual site reports are provided to indicate the variability in management, environmental conditions, and responses to N supply and Envita® application that was observed across trial sites this growing season. The 2024 suggested retail price (SRP) of Envita® is $16.48 per acre.

The following footnotes will also be referred to in the individual site reports for this trial:

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

TOP NOTCH FARMING

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 (Envita®) in canola.

Treatments:
1. Untreated check
2. Envita® application

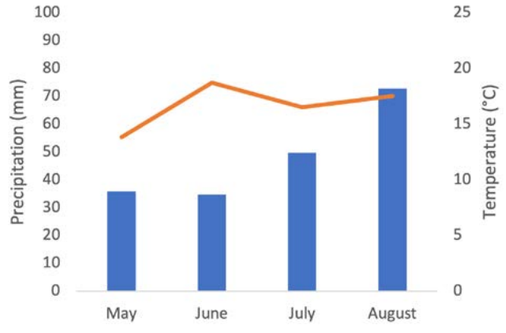
Replicates: Four

General Trial Information:	
Variety	InVigor L340PC
Seeding date	May 13
Previous crop	Wheat
Soil organic matter	3.0%
Residual Nitrate-N (0-24")	190 lbs N ac^{-1}
Applied N	100 lbs N ac^{-1}, treated with Agrotain
Plant density / Row spacing	6 plants ft^{-2} on 12" spacing

Envita® Application:	
Date / Time	June 13 at 1:00 p.m.
Crop stage	5-6 leaf
Tank mix	Liberty
Water volume	10 gal ac^{-1}
Weather conditions	24°C, Hazy, North wind

In-crop pesticide applications:	
June 2	Liberty
June 13	Liberty

Weather: *Environment Canada – Nipawin*



Results:

Treatment	Yield (1) (lbs. ac^{-1})	Yield (1) (bu. ac^{-1})	Protein (%)	Oil content (%)
Check	3919	78.4	19.7	42.2
Envita®	3905	78.1	19.1	42.5
SE (2)	± 44	± 0.9	± 0.3	± 0.3
P-value (3)	*0.824*		*0.213*	*0.389*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to canola under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of

Ag Grow Consulting Ltd.

Foliar-Applied Nitrogen-Fixing Biological Products In Canola
(Davidson)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in canola under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®
5. Low N rate – Untreated
6. Low N rate + Envita®

Replicates: Three

General Trial Information:

Variety	InVigor L350PC	
Seeding date	May 26	
Previous crop	Wheat	
Soil organic matter	3.3%	
Residual Nitrate-N (0-24")	64 lbs ac^{-1}	
Applied N	Urea midrow band	110 lbs N ac^{-1} (Normal) 100 lbs N ac^{-1} (Reduced) 57 lbs N ac^{-1} (Low)
Plant density / Row spacing	6.5 plants ft^{-2} on 12 in. spacing	

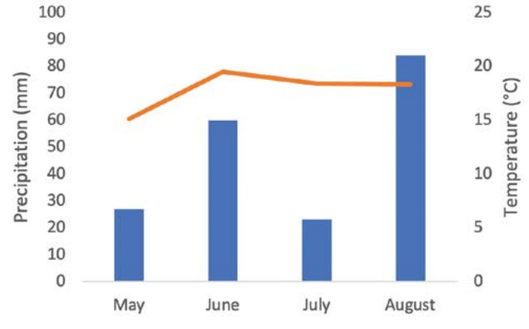
Envita® Application:

Date / Time	June 16 at 11:00 a.m.
Crop stage	3-4 leaf
Tank mix	No
Water volume	10 gal ac^{-1}
Weather conditions	Warm, partly cloudy, 26°C

In-crop pesticide applications:

June 12	Liberty

Weather: *in-field weather station*

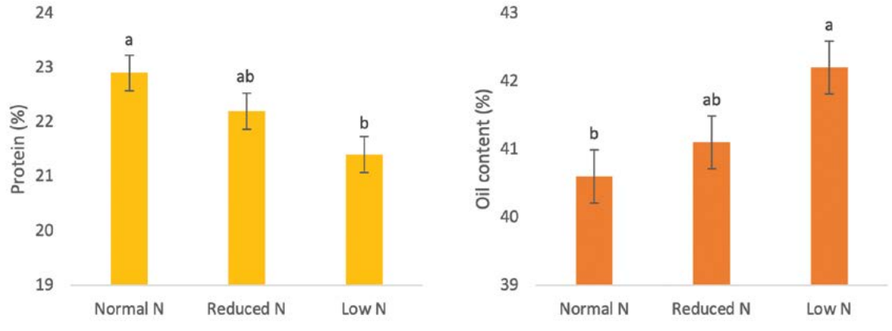


Results:

Treatment	Yield [1] (lbs. ac^{-1})	Yield [1] (bu. ac^{-1})	Protein (%)	Oil content (%)
Normal N Check	2154	43.1	22.8	40.5
Normal N + Envita®	2218	44.4	22.9	40.7
Reduced N Check	2193	43.9	21.9	41.8
Reduced N + Envita®	2204	44.1	22.5	40.5
Low N Check	2208	44.2	22.0	41.6
Low N + Envita®	2180	43.6	20.8	42.8
SE [2]	± 62	± 1.2	± 0.5	± 0.5
P-value (N rate) [3]	*0.98*		*0.03***	*0.02***
P-value (Envita®)	*0.75*		*0.68*	*0.94*
P-value (N x E) [4]	*0.75*		*0.18*	*0.05**

Summary:
There were no significant differences in yield of canola resulting from application of Envita® foliar-applied N-fixing bacteria, regardless of applied N rate, under these trial conditions.
Protein and oil content were significantly (P<0.05) affected by applied N rate but not by application of Envita®. Protein was significantly lower and oil content was significantly higher with the low N rate compared to the normal N rate.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.



The effect of applied N rate on canola protein content (left) and oil content (right) at Davidson. Treatments labeled with the same letter are not significantly different.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of

WARKENTIN AG SERVICES

TOP NOTCH FARMING

Foliar-Applied Nitrogen-Fixing Biological Products In Canola
(Indian Head - IHARF)

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

Treatments:
1. Untreated check
2. Envita® application

Replicates: Four

General Trial Information:

Variety	InVigor L350PC
Seeding date	May 20
Previous crop	Canaryseed
Soil organic matter	5.8%
Residual Nitrate-N (0-24")	17 lbs N ac^{-1}
Applied N	120 lbs N ac^{-1}
Plant density / Row spacing	7-9 plants ft^{-2} on 12 in. spacing

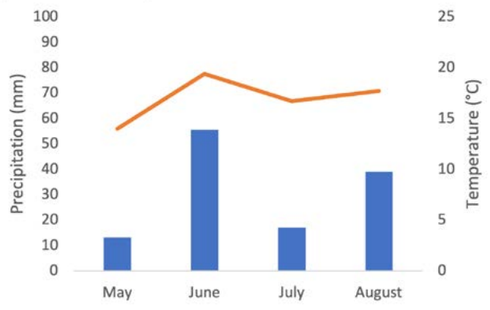
Envita® Application:

Date / Time	June 19
Crop stage	6 leaf
Tank mix	Agral 90
Water volume	13 gal ac^{-1}
Weather conditions	Light rain overnight, Max 23°C, Daytime RH 43-68%

In-crop pesticide applications:

June 12	Liberty + Centurion + Amigo
July 7	Cotegra

Weather: *In-field precip + Environment Canada Temps (Indian Head CDA)*



Results:

Treatment	Yield [1] (lbs. ac^{-1})	Yield [1] (bu. ac^{-1})	Protein (%)	Oil content (%)
Check	2553	51.1	18.9	45.5
Envita®	2552	51.0	18.6	45.5
SE [2]	± 24	± 0.5	± 0.2	± 0.2
P-value [3]	*0.93*		*0.35*	*0.85*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to canola under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of IHARF INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION and AAFC Indian Head

TOP NOTCH FARMING

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 (Envita®) in canola.

Treatments:
1. Normal N rate - Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®

Replicates: One

General Trial Information:

Variety	InVigor L340PC	
Seeding date	May 23	
Previous crop	Wheat	
Soil organic matter	4.9%	
Residual Nitrate-N (0-24”)	68 lbs N ac^{-1}	
Applied N	Fall ATS + midrow UAN at seeding	147 lbs N ac^{-1} (Normal) 120 lbs N ac^{-1} (Reduced)
Plant density / Row spacing	7-9 plants ft^{-2} on 9” spacing	

Envita® Application:

Date / Time	June 13 at 11:30 a.m.
Crop stage	4-5 leaf
Tank mix	Liberty + Centurion
Water volume	12 gal ac^{-1}
Weather conditions	Max 31°C, Daytime RH 25-40%

In-crop pesticide applications:

None

Weather: *Nearby in-field precip + Environment Canada Temps (Indian Head CDA)*

Results:

Treatment	Yield [1]	
	(lbs. ac^{-1})	(bu. ac^{-1})
Normal N Check	2782	55.6
Normal N + Envita®	2836	56.7
Reduced N Check	2891	57.8
Reduced N + Envita®	2945	58.9

Summary:
This trial was not replicated and so the probability of a significant treatment effect can not be determined.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of

IHARF INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

TOP NOTCH FARMING

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 (Envita®) in canola under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®

Replicates: Three

General Trial Information:

Variety	InVigor L340PC	
Seeding date	May 20	
Previous crop	Barley	
Soil organic matter	3.5%	
Residual Nitrate-N (0-24”)	39 lbs ac^{-1}	
Applied N	Variable Rate Urea	Average 109 lbs N ac^{-1} (Normal) Average 100 lbs N ac^{-1} (Reduced)
Plant density / Row spacing	7 plants ft^{-2} on 10” spacing	

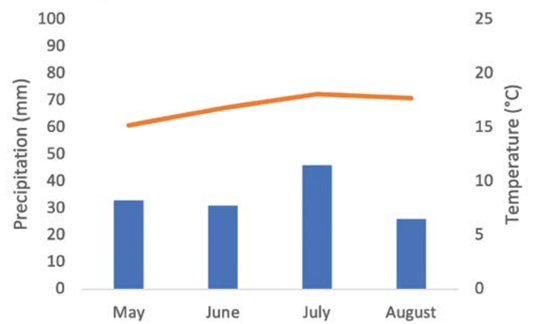
Envita® Application:

Date / Time	June 11
Crop stage	4-5 leaf
Tank mix	Liberty + Arrow All-In + AMS
Water volume	10 gal ac^{-1}
Weather conditions	Low 12°C, High 30°C, no rain

In-crop pesticide applications:

June 12	Liberty + Arrow All-In + AMS

Weather: *In-field or nearby weather station (Jun-Aug precip) + Kindersley A EC station*



Results:

Treatment	Yield [1] (lbs. ac^{-1})	Yield [1] (bu. ac^{-1})	Protein (%)	Oil content (%)
Normal N Check	2267	45.3	21.6	41.4
Normal N + Envita®	2209	44.2	21.5	41.0
Reduced N Check	2251	45.0	22.1	40.6
Reduced N + Envita®	2183	43.7	21.9	40.7
SE [2]	± 60	± 1.2	± 1.0	± 1.1
P-value (N rate) [3]	*0.67*		*0.67*	*0.65*
P-value (Envita®)	*0.22*		*0.82*	*0.88*
P-value (N x E) [4]	*0.93*		*0.96*	*0.83*

Summary:
There were no differences in yield or grain quality of canola resulting from application of Envita® foliar-applied N-fixing bacteria, regardless of applied N rate, under these trial conditions.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of

MAX AG CONSULTING Ltd.

Foliar-Applied Nitrogen-Fixing Biological Products In Canola
(Maidstone)

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

Treatments:
1. Untreated check
2. Envita® application

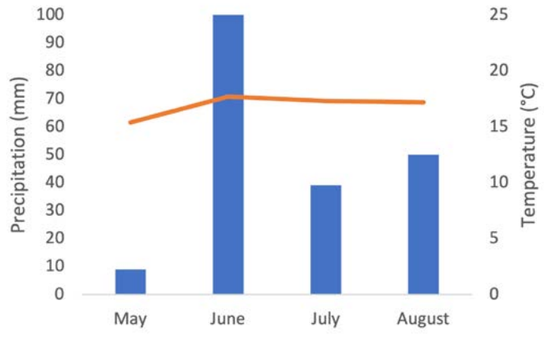
Replicates: Four

General Trial Information:	
Variety	Pioneer P506L
Seeding date	May 25
Previous crop	Wheat
Soil organic matter	3.5%
Residual Nitrate-N (0-24")	9 lbs N ac^{-1} (fall soil test prior to NH3 application)
Applied N	Average 110 lbs N ac^{-1}, Variable Rate Fall-applied NH3
Plant density / Row spacing	7 plants ft^{-2} on 12" spacing

Envita® Application:	
Date / Time	June 16
Crop stage	4-5 leaf
Tank mix	No
Water volume	10 gal ac^{-1}
Weather conditions	Hot and dry

In-crop pesticide applications:	
June 17	Liberty

Weather: *In-field measurement (June-Aug precip) + Waseca EC weather station*



Results:

Treatment	Yield (1) (lbs. ac^{-1})	Yield (1) (bu. ac^{-1})	Protein (%)	Oil content (%)
Check	3189	63.8	19.8	43.0
Envita®	3241	64.8	19.7	43.3
SE (2)	± 49	± 1.0	± 0.1	± 0.3
P-value (3)	*0.30*		*0.81*	*0.49*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to canola under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of SWATMAPS

TOP NOTCH FARMING

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 (Envita®) in canola.

Treatments:
1. Untreated check
2. Envita® application

Replicates: Two

General Trial Information:

Variety	InVigor L340PC
Seeding date	May 30
Previous crop	Barley
Soil organic matter	4.3%
Residual Nitrate-N (0-12”)	22 lbs N ac^{-1}
Applied N	91 lbs N ac^{-1}
Plant density / Row spacing	2.6 plants ft^{-2} on 10” spacing

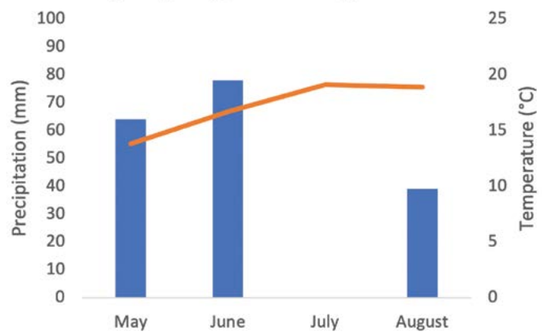
Envita® Application:

Date / Time	June 21
Crop stage	4 leaf
Tank mix	No
Water volume	10 gal ac^{-1}
Weather conditions	High 19°C

In-crop pesticide applications:

June 18	Liberty + Yuma
July 5	Coragen Max

Weather: *in-field (precip) + Eastend Cypress EC station*



Results:

Treatment	Yield [1] (lbs. ac^{-1})	Yield [1] (bu. ac^{-1})	Protein (%)	Oil content (%)
Check	1972	39.4	24.2	38.8
Envita®	1445	28.9	24.6	37.7
SE [2]	± 285	± 5.7	± 0.1	± 0.3
P-value [3]	*0.32*		*0.11*	*0.10*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to canola under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

TOP NOTCH FARMING

Foliar-Applied Nitrogen-Fixing Biological Products In Canola
(Vibank)

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

Treatments:
1. Untreated check
2. Envita® application

Replicates: Four

General Trial Information:

Variety	InVigor L340PC
Seeding date	May 19
Previous crop	Spring wheat
Soil organic matter	2.6%
Residual Nitrate-N (0-12")	24 lbs N ac^{-1}
Applied N	100 lbs N ac^{-1} spring dribble band + 55 lbs N ac^{-1} urea side-band
Plant density / Row spacing	4.6 plants ft^{-2} on 10" spacing

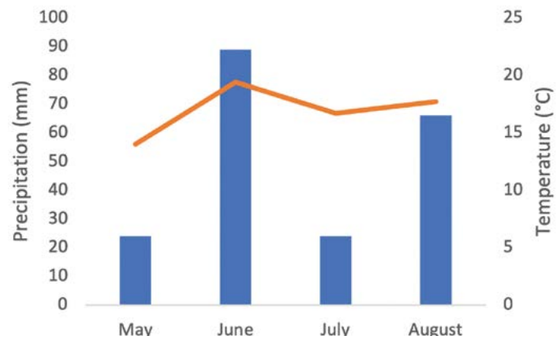
Envita® Application:

Date / Time	June 16
Crop stage	7 leaf to bolting
Tank mix	No
Water volume	10 gal ac^{-1}
Weather conditions	20°C

In-crop pesticide applications:

June 9	Clethodim + Liberty

Weather: *Climate FieldView (precip) + Qu'Appelle 1 EC weather station (temp)*



Results:

Treatment	Yield [1] (lbs. ac^{-1})	Yield [1] (bu. ac^{-1})	Protein (%)	Oil content (%)
Check	2696	53.9	22.6	38.9
Envita®	2634	52.7	22.7	38.7
SE [2]	± 54	± 1.1	± 0.2	± 0.3
P-value [3]	*0.44*		*0.87*	*0.68*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to canola under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of CORE AG INPUTS **in White Butte**

TOP NOTCH FARMING

Foliar-Applied Nitrogen-Fixing Biological Products In Canola
(Wynyard)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in canola under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®
5. Low N rate – Untreated
6. Low N rate + Envita®

Replicates: Three

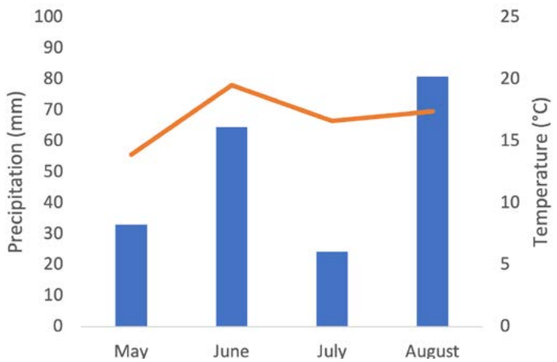
General Trial Information:

Variety	Victory V25-3T	
Seeding date	May 23	
Previous crop	Flax	
Soil organic matter	3.0%	
Residual Nitrate-N (0-12”)	48 lbs ac^{-1}	
Applied N	Urea (37 lbs N ac^{-1} for all treatments) + N-lock treated urea to total:	97 lbs N ac^{-1} (Normal) 87 lbs N ac^{-1} (Reduced) 73 lbs N ac^{-1} (Low)
Plant density / Row spacing	6-8 plants ft^{-2} on 12” spacing	

Envita® Application:

Date / Time	June 26 at 3:00 p.m.
Crop stage	Start of bolting
Tank mix	Agral 90
Water volume	10 gal ac^{-1}
Weather conditions	24°C, 52% RH, wind 11 km hr^{-1}

Weather: *Environment Canada station - Wynard*



Results:

Treatment	Yield [1] (lbs. ac^{-1})	Yield [1] (bu. ac^{-1})	Protein (%)	Oil content (%)
Normal N Check	3004	60.1	19.9	43.3
Normal N + Envita®	2960	59.2	20.6	43.4
Reduced N Check	2964	59.3	19.4	44.5
Reduced N + Envita®	2886	57.7	19.6	44.4
Low N Check	2763	55.3	18.8	45.1
Low N + Envita®	2878	57.6	19.9	43.7
SE [2]	± 62	± 1.2	± 0.4	± 0.5
P-value (N rate) [3]	*0.08**		*0.13*	*0.19*
P-value (Envita®)	*0.96*		*0.07**	*0.33*
P-value (N x E) [4]	*0.25*		*0.55*	*0.38*

Summary:
There was a moderate probability (P<0.1) that yield decreased with N rate (not shown), but there was no significant effect of Envita® application, regardless of applied N rate, under these trial conditions.
There was a moderate probability (P<0.1) that protein increased with Envita® application, when averaged across N rates. Oil content was not significantly affected by Envita® application, regardless of N rate.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 21.

This trial was conducted with the agronomic support of

IHARF INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

Cargill

Pulses

Pulse Replicated On-Farm Independent Trials (PROFIT) 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 trial sites established: 17 lentil seeding rate trials organized by Christiane Catellier at the Indian Head Agricultural Research Foundation (IHARF) and three trials organized by SPG including dry bean plant population, dry bean foliar biological, and faba bean fungicide efficacy. For 2024, the PROFIT program will continue with another year of the lentil seeding rate trials targeting a minimum of 15 trial sites and up to six other industry-led trials pertaining to integrated pest management, fertility, or other agronomic practices on pulse crops.

Protocol: Lentil Seeding Rate

Protocol: Faba Bean Pathogen Fungicide Efficacy

Protocol: Dry Bean Response To Varying Plant Populations

Protocol: Foliar-Applied Nitrogen Fixing Biological For Dry Bean

Pulse Replicated On-Farm Independent Trials

Foliar-Applied Nitrogen Fixing Biological For Dry Bean Trial

Biological nitrogen fixation (BNF) of dry beans is relatively low in comparison to other legume crops with roughly 50% of the plant derived N coming from BNF. Although there is the ability for inoculation of dry bean using Rhizobium leguminosarum biovar phaseoli, due to the poorer nitrogen fixation ability of dry bean and inoculant not being widely available, the recommendation is to fertilize dry beans like a non-legume crop. As dry bean is a poor nitrogen fixer, a supplemental nitrogen option using a nitrogen fixing foliar biological may offer plant available nitrogen at peak demands when soil nitrogen is inadequate.

Objective

To compare the response of irrigated dry beans to an application of a foliar applied N fixing biological product versus an untreated check. This evaluation aims to examine crop performance of a single variety of dry bean under typical field management practices.

Treatments

Treatments (Envita® vs untreated check) were arranged in randomized strips, the width of one sprayer boom per strip, with three replicates.

Methodology

- The trial was seeded and fertilized per usual practices and biological treatment strips were established at herbicide timing.
- Envita® was applied following label recommendations.
- Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale.
- Composite grain samples were collected from each treatment for quality analysis.

Data Collection

- Spring soil test
- Spring plant density
- Harvest data
- Weather data
- Field history and management practices
- General in-season observations

SPG thanks Syngenta for their support by donating Envita®.

Foliar-Applied Nitrogen-Fixing Biological Products In Dry Bean
(Riverhurst)

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

Treatments:
1. Untreated check
2. Envita®

Replicates: Three

General Trial Information:	
Variety	CDC Blackstrap
Soil type & texture	Orthic Brown Chernozem, sandy loam/fine sandy loam
Seeding date	May 26
Seeding depth	1.5 inches
Seeding speed	6 mph
Seed treatments	Vibrance Maxx® (sedaxane + metalaxyl + fludioxonil)
Row spacing	15 inch
Drill & opener type	Vacuum planter - disc type opener
Previous crop	Durum
Soil organic matter	2.4%
Residual Nitrate-N (0-24")	80.6 lbs/ac
Fertility and placement	300 lbs 28.5-26-0 (urea + MAP blend) - banded fall 2022
Harvest date	Sept 6

Envita® Application:	
Date / Time	June 20
Crop stage	2nd Trifoliate
Tank mix	Viper® (imazamox + bentazon + Merge + 28% UAN) + Basagran® (bentazon)
Water volume	20 gal/ac
Weather conditions	Sunny 20 degrees

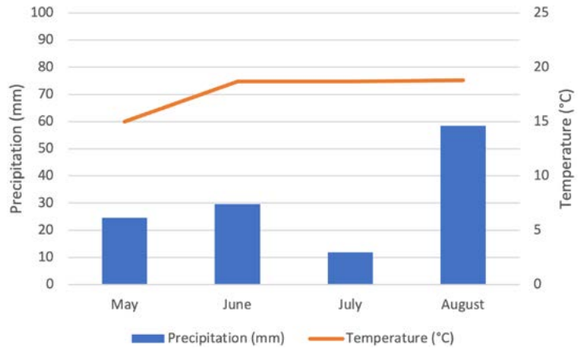
In-crop pesticide applications:	
July 19	Cotegra® (boscalid + prothioconazole)
Aug 2	Acapela™ (picoxystrobin) + Parasol® (copper hydroxide)
Aug 31	Reglone® (diquat)

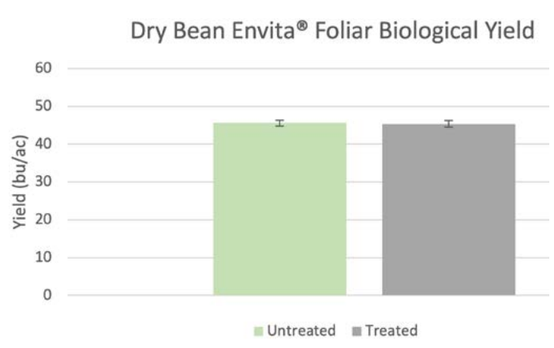
Results:	
Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})
Untreated	2740 / 45.67
Envita®	2720 / 45.33
SE[1]	± 0.78
P-value [2]	*0.32*

Summary:
We were unable to detect differences in yield as a result of the application of Envita® foliar-applied N-fixing bacteria to dry bean under these trial conditions.

Economics:
There was no significant difference in yield resulting from Envita® application. Therefore, the most economical treatment in regard to Envita® application is the untreated check.

Weather: nearby or in-field weather station.





*An additional 228.6 mm of water was applied through pivot irrigation to this field.

1. 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.
2. 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)

SASKATCHEWAN pulse Growers

Pulse Replicated On-Farm Independent Trials

Faba Bean Pathogen Fungicide Efficacy Trial

The fungal pathogens identified as most concerning for faba bean producers are Stemphylium vesicarium, Stemphylium botryosum, Ascochyta fabae, Botrytis cinerea, and Botrytis fabae. Very few products are registered in faba bean with activity on Botrytis spp. and none registered with activity on Stemphylium spp. A final report on the efficacy of fungicide actives registered for use on faba beans can be submitted to the Prairie Pesticide Minor Use Consortium for label expansions after analyzing results for controlling and/or suppressing faba bean pathogens.

Objective

To evaluate fungicide active ingredient performance of four new fungicides on faba bean pathogens under typical field management practices.

Treatments

Treatments were arranged in randomized strips with three replicates. Fungicides were applied at optimal economic threshold timing for control of foliar leaf diseases.

Fungicide	Active Ingredient	Manufacturer	Rate	Diseases Controlled	Not Controlled
Miravis® Neo	Pydiflumetofen	Syngenta	75g/L	*Sclerotinia sclerotiorum, Phakopsora pachyrihizi, Colletotrichum truncatum*	*Botrytis fabae*
	Azoxystrobin		100g/L		*Stemphylium botryosum*
	Propiconazole		125g/L		*Ascochyta fabae*
RevyPro®	Mefentrifluconazole	BASF	50g/L	*Botrytis cinerea, Aschochyta spp., Sclerotinia sclerotiorum*	*Botrytis fabae*
	Prothioconazole		50g/L		*Stemphylium botryosum*
Delaro®	Prothioconazole	Bayer	175g/L	*Botrytis cinerea, Sclerotinia sclerotiorum*	*Botrytis fabae*
	Trifloxystrobin		150g/L		*Stemphylium botryosum*
					Ascochyta fabae
Zolera® FX	Fluoxastrobin	UPL	200g/L	*Mycosphaerella pinodes, Ascochyta spp., Phakopsora spp., Sclerotinia sclerotiorum*	*Botrytis fabae*
	Tetraconazole		200g/L		*Stemphylium botryosum*

Methodology

- Apart from fungicide treatments, all plots were managed the same agronomically.
- Treatments were applied at label rates and restrictions with a minimum of 10 US gal/ac of water at mid-flower or when 2–4 flowers were open on the main raceme of the majority of the field.
- Leaves were collected from across the field prior to fungicide application and submitted for DNA pathogen identification.
- Leaves were collected from new growth 14 days following application and submitted for DNA pathogen identification.
- Visual data was captured from each treatment 14 days following application evaluating differences between each treatment and the check.
- Composite grain samples were collected from each rep per treatment and submitted for quality analysis.

Data Collection

- Disease evaluation and efficacy assessments from new growth tissue samples
- Plant images comparing treatments to check
- Yield by plot
- Grain quality by treatment (grading, protein, moisture)
- General in-season observations and management actions
- Site characterization: soil test, seed test, field history and management, weather data

Faba Bean Fungicide Efficacy Trial
(Tisdale)

Objective: To determine the efficacy of fungicide applications on faba bean pathogens causing Chocolate Spot (Botrytis spp.), Stemphylium Blight, Alternaria oxford, and Sclerotinia stem rot.

Treatments:

1. RevyPro® (mefentrifluconazole + prothioconazole)
2. Miravis Neo® (pydiflumetofen + azoxystrobin + propiconazole)
3. Delaro® (prothioconazole + trifloxystrobin)
4. Zolera® (fluoxastrobin + tetraconazole)
5. Check

Replicates: Three

General Trial Information:	
Variety	Fabelle
Seeding date	May 6
Previous crop	Oats
Soil organic matter	5.6%
Residual Nitrate-N (0-24")	44 lb/ac $N0^{3-}$
Applied fertilizer	MAP at 80 lb/ac product + Nodulator Duo granular
Plant density / Row spacing	4 bu/ac seeding rate through 1" opener on 10" spacing

Fungicide Application:	
Date / Time	June 28 at 12:30 p.m.
Crop stage	5 open flowers per main stem
Tank mix	n/a
Water volume	12.8 gal ac^{-1}
Weather conditions	overcast, 19°C with 62% humidity

In-crop pesticide applications:	
June 5	Viper® ADV (imazamox + bentazon)
Sept.1	Diquat®

Results:

Treatment	Yield (lbs ac^{-1})	Yield (bu ac^{-1})	Plant stage (node)	Infection point (diseased node)
RevyPro®	2669	44.5	21.8	9.6
Delaro®	2807	46.8	21.1	10.5
Miravis Neo®	2572	42.9	21.7	9.2
Zolera®	2776	46.3	21.8	9.6
Check	2541	42.2	20.8	10.3
SE(1)	1.12		0.49	0.55
P-value (Treatment) (2)	*0.14*(3)		*0.21*	*0.52*

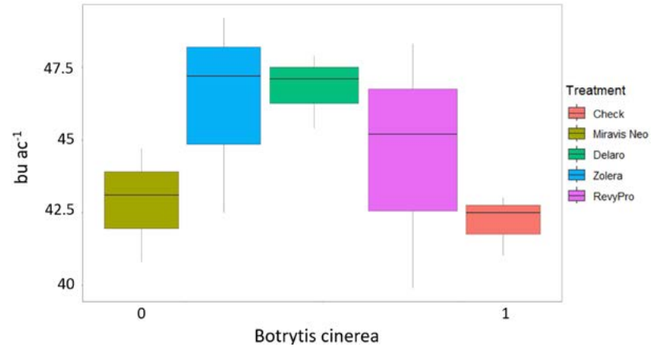


Fig. 1 Fungicide treatment efficacy on Stemphylium Blight (0 = pathogen controlled; 1= pathogen not controlled) and yield response in faba bean at Tisdale, SK.

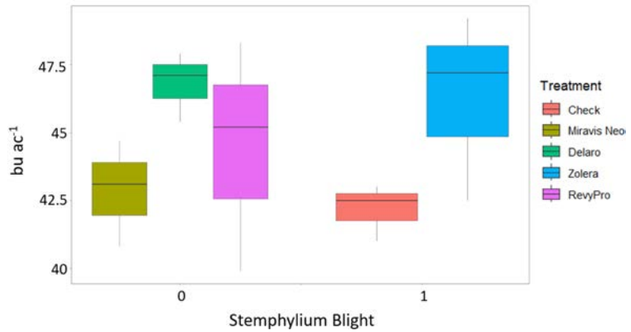


Fig. 2 Fungicide treatment efficacy on *Botrytis cinerea* (0 = pathogen controlled; 1= pathogen not controlled) and yield response in faba bean at Tisdale, SK.

Summary:
There was no statistical difference in faba bean yield, plant stage, or visual infection point on the plant as a result of fungicide treatment. *Stemphylium* and *Botrytis cinerea* were confirmed on diseased plant samples collected during the efficacy check. As seen in Fig. 2 all fungicide products controlled *Stemphylium blight* except Zolera®, while RevyPro® was the only product without efficacy on *Botrytis cinerea* (Fig. 1). *Alternaria* and *Ascochyta* were detected in all samples but none of the fungicides tested had activity on those pathogens. *Sclerotinia* and *Botrytis fabae* were not detected in any samples collected. While there was no significant impact in yield, differences were observed in disease control where Miravis Neo® had the greatest efficacy on fungal pathogens but yielded the least.

1. 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.
2. 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 tables.
3. *P-value (Treatment)* indicates the likelihood of a difference resulting from fungicide application.

This trial was conducted with the agronomic support of

Pulse Replicated On-Farm Independent Trials

Dry Bean Response To Varying Plant Populations Trial

Recommendations for dry bean seeding under irrigation and wide-row production vary across different dry bean growing regions in western Canada and suggested targets are 95,000- 100,000 live plants per acre (Alberta Pulse Growers, 2022) and 90,000 to 120,000 live plants per acre (Manitoba Pulse and Soybean Growers, 2022; North Dakota State University, 2019). Fine-tuning seeding rate recommendations is of interest to dry bean growers and agronomists. Achieving optimal plant populations may potentially improve yields and help inform economic and agronomic management decisions for dry bean production.

Objective

To evaluate crop performance of a single variety of dry bean under typical field management practices at varying plant populations.

Treatments

Seeding rates were determined using the TKW and germination of the seed lot, and an estimated seedling mortality to target three plant populations:

- **Low Rate:** 90,000 live plants per acre (2.07 plants/ft^2)
- **Mid Rate/Grower Standard:** 120,000 live plants per acre (2.75 plants/ft^2)
- **High Rate:** 150,000 live plants per acre (3.44 plants/ft^2)

Treatments were arranged in randomized strips with three replicates, for a total of nine plots.

Methodology

- Apart from seeding rates, all plots were managed the same agronomically.
- A minimum of two plant population assessments were completed during the growing season targeting V1 (1st trifoliate) and R2 (beginning pod) stages.
- Plant height (ground to top of plant) and pod clearance (ground to bottom of lowest pod) were assessed between R9 (full maturity) and prior to harvest.
- Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale.
- Composite grain samples collected from each treatment for quality analysis.

Data Collection

- In-season plant density assessments
- Harvest data
- General in-season observations and management actions
- Site characterization: field history and management practices, seed test, soil test, weather data

Plant Population In Dry Bean
(Riverhurst)

Objective: To determine the agronomic and economic response of a single variety of dry bean under varying plant populations.

Treatments:
1. Low (90,000 plants/ac)
2. Mid (120,000 plants/ac)
3. High (150,000 plants/ac)

Replicates: Three

General Trial Information:

Variety	CDC Blackstrap
Soil type & texture	Orthic Brown Chernozem, sandy loam/fine sandy loam
Seeding date	May 26
Seeding depth	1.5 inches
Seeding speed	6 mph
Seed treatments	Vibrance Maxx® (sedaxane + metalaxyl + fludioxonil)
Row spacing	15 inch
Drill & opener type	Vacuum planter - disc type opener
Previous crop	Durum
Soil organic matter	2.4%
Residual Nitrate-N (0-24")	80.6 lbs/ac
Fertility and placement	300 lbs 28.5-26-0 (urea + MAP blend) - banded fall 2022
Harvest date	Sept 6

In-crop pesticide applications:

June 20	Viper® (imazamox + bentazon + Merge + 28% UAN) + Basagran® (bentazon)
July 19	Cotegra® (boscalid + prothioconazole)
Aug 2	Acapela™ (picoxystrobin) + Parasol® (copper hydroxide)
Aug 31	Reglone® (diquat)

Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Average plant counts (plants ac^{-1})	Average plant height (cm)	Average pod clearance (cm)
Low (90,000 plants/ac)	3060 / 51.0	80,279	30.3	3.9
Mid (120,000 plants/ac)	3040 / 50.67	104,544	30.3	3.7
High (150,000 plants/ac)	3120 / 52.0	130,874	31.3	3.8
SE [1]	± 1.87	± 5416	± 0.69	± 0.18
P-value [2]	*0.69*	*<0.001****	*0.49*	*0.54*

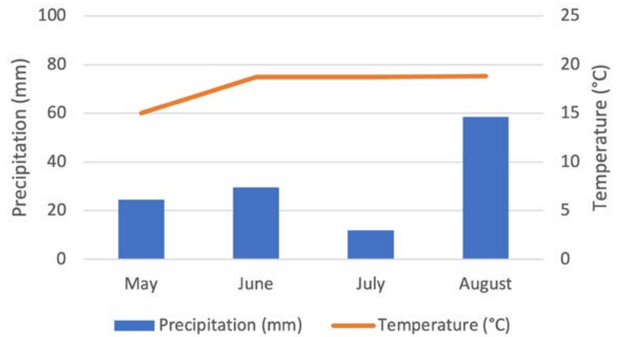
Summary:
We were unable to detect differences in yield as a result of the seeding rates to target various plant populations in dry bean under these trial conditions.

Economics:

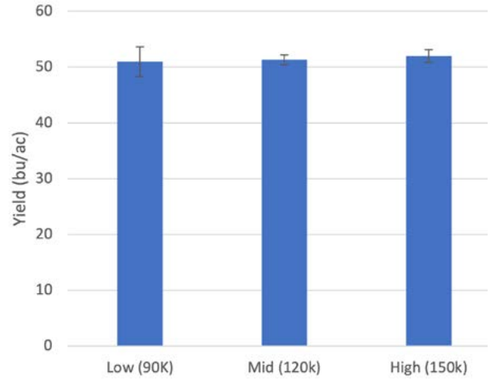
Target plant population (plants ac^{-1})	Seeding rate (ac^{-1})	Seed cost[3] (ac^{-1})	Yield (bu ac^{-1})	Grain profit[4] (ac^{-1})	Net profit (ac^{-1})
90,000	0	0	0	0	0
120,000	+ 17 lbs	- $24.48	- 0.3	- $10.80	- $35.28
150,000	+ 34 lbs	- $48.96	+ 1.0	+ $36.00	- $12.96

There was no significant difference in yield resulting from various plant populations. Therefore, the most economical treatment in regard to plant population would be the lowest target of 90,000 plants/ac.

Weather: nearby or in-field weather station.



*An additional 228.6 mm of water was applied through pivot irrigation to this field.



Dry bean yield under various plant populations

1. 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.
2. 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)
3. Seed cost of $1.44 per lb. calculated from Saskatchewan Ministry of Agriculture's 2023 Crop Planning Guide.
4. Grain price of $0.60 per lb. calculated from Saskatchewan Ministry of Agriculture's 2023 Crop Planning Guide.

This trial was conducted with the agronomic support of

E3 Ag Ventures

Pulse Replicated On-Farm Independent Trials

Lentil Seeding Rate Trial

A common seeding practice of small red and large green lentil is a flat seed rate of 60 lbs/ac (1 bu/ac) and 90–95 lbs/ac (1.5–1.6 bu/ac), respectively. While this conventional seeding rate has successfully produced high-yielding lentil crops, a more precise approach is to target an optimal plant stand and adjust seeding rate according to seed size (thousand kernel weight, TKW) and seedling survivability. A target lentil population of 12 plants/sq ft is generally recommended but research has shown that populations up to 22 plants/sq ft can provide the highest yield.

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 various landscape positions.

Treatments

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

- **Standard:** 12 plants/sq ft
- **High:** 18 plants/sq ft
- **Very High:** 24 plants/sq ft

Seeding rates were determined precisely using the TKW and germination rate of each seed lot as indicated by a seed quality test at each site.

Trials were set up in randomized strips with four replicates, for a total of 12 plots.

Methodology

- Apart from seeding rates, all plots were managed the same agronomically.
- To evaluate the influence of variable topography on plant populations, sections of plots could be further identified by landscape position (knoll, mid-slope, and depression), and data collected separately within these subplots.
- 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 quality analysis.

Data Collection

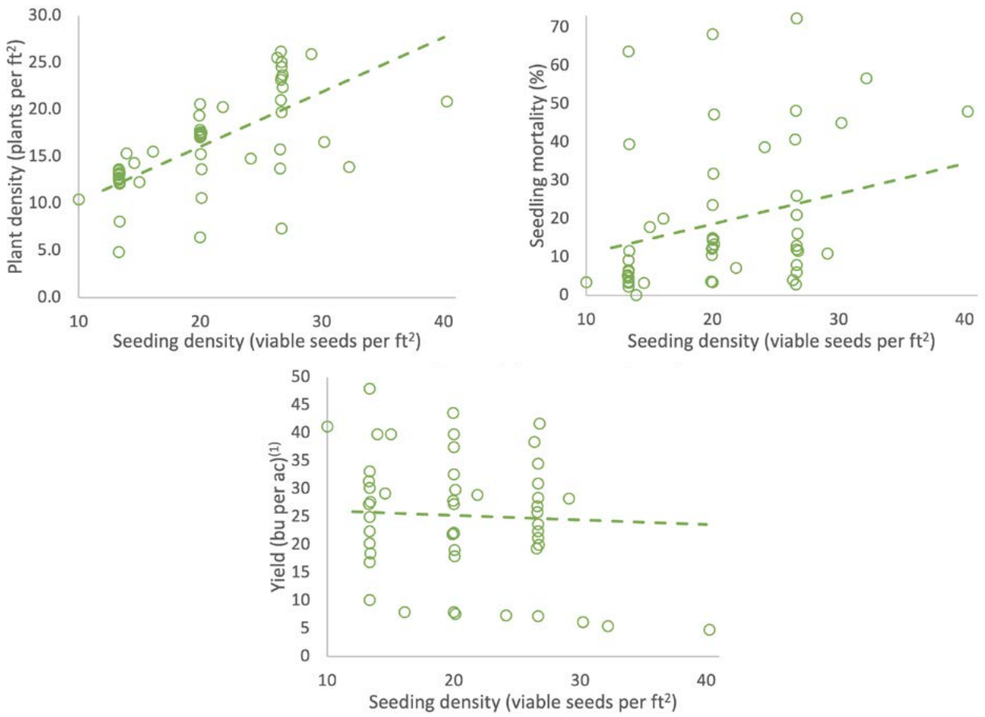
- Seed test
- Soil test
- In-season plant density, by landscape position within plots, if applicable
- Field history and management practices
- Yield by plot (corrected for moisture content at harvest)
- General in-season observations such as weed competition, disease susceptibility, standability, and maturity
- Weather data
- Beneficial but not required:
  - As-applied files for seeding rates within the trial area.
  - Digital map layer identifying topography / landscape position (knoll, mid-slope, depression) within the trial area.
  - Digital yield data.

Lentil Seeding Rate: Results Summary

Data from all sites was combined to assess the overall effect of seeding rate on seedling survivability across landscape positions, and on yield and grain quality of small red and large green lentils.

Overall, plant density and seedling mortality did not differ significantly by landscape position at the five sites where this was assessed (not shown). However, plant density and seedling mortality both significantly increased with seeding rates across all sites (P<0.01). Across sites, yield decreased significantly with higher seeding rates (P<0.05), but protein and seed size were not affected (not shown). Thus, the additional seed cost was not economical overall[4,5].

	Plant density	Seedling Mortality	Yield	Protein	Seed size
P (Seed Rate)[3,6]	*<0.001***	*<0.001***	*0.013***	*0.710*	*0.615*
SE[2]	±1.2	±4.8	±2.8	±0.4	±1.7



The effect of lentil seeding rate on plant density, seedling mortality, and yield at all sites overall.

Individual site reports are provided in the following pages to indicate the variability in management, environmental conditions, yield potential, and responses to seeding rates across landscape positions that was observed across trial sites this growing season.

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

1. Yields were adjusted to 13% 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. Linear regression was used to assess the relationship between seeding rate and the response variables, thus the P-value indicates the likelihood that a change in the response variable with increased seeding rate is significantly different than zero:
   P < 0.01 = Very likely that seeding rate affected the response variable (***)
   P < 0.05 = Likely that the seeding rate affected the response variable (**)
   P < 0.1 = Possible that the seeding rate affected the response variable (*)
   P > 0.1 = Not likely that the seeding rate affected the response variable (not significant)
4. Seed cost of $0.53 per lb. for small red lentils and $0.72 for large green lentils was calculated from values provided in the Saskatchewan Ministry of Agriculture's 2023 Crop Planning Guide and includes the cost of seed treatment and inoculant.
5. Grain price of $34.76 per cwt for small red lentils and $57.40 for large green lentils is an average of weekly prices in 2023 as reported on the Government of Saskatchewan website.
6. P-value (Seed Rate) indicates the likelihood of a difference resulting from seeding rate only;
   P-value (Landscape Position) indicates the likelihood of a difference resulting from landscape position only;
   P-value (SR x LP) indicates the likelihood of seeding rates having differing effects on plant density and seedling mortality depending on landscape position.

Lentil Seeding Rate
(Cabri)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Treatments:

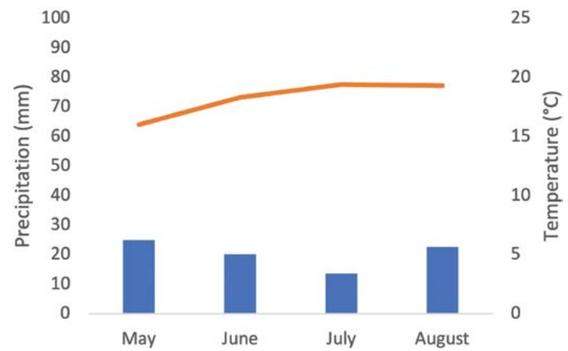
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	13	60
2	20	89
3	26	119

Replicates: Four

General Trial Information:

Variety	CDC Proclaim Clearfield® (CL)	
Thousand kernel weight	36.12 g	
Germination	85%	
Seed treatment	None	
Inoculant	Nodulator XL Liquid®	
Previous crop	Durum wheat	
Soil organic matter	4.3%	
Residual Nitrate-N (0-6")	9 lbs ac^{-1}	
Soil type & Texture	Brown Chernozem, heavy clay	
Seeding date	May 11	
Seeding implement & openers	0.75 in. shank	
Seeding depth	1.75 in.	
Seeding speed	4.8 mph	
Row spacing	10 in.	
Total applied fertilizer	4 N – 18 P – 3 K – 0 S lbs. ac^{-1} actual – Seed-placed	
Crop protection	May 5: Advantage 540 + MCPA + Aim® June 8: Sencor®	June 16: Antler® July 20: Coragen®

Weather: *Environment Canada – Leader Airport*



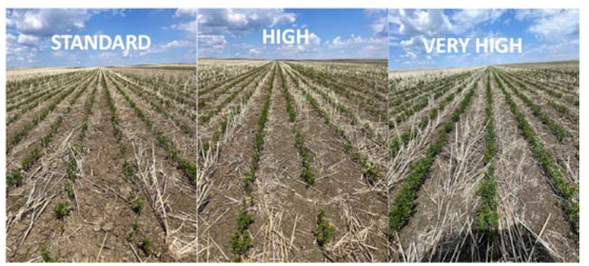
Results:

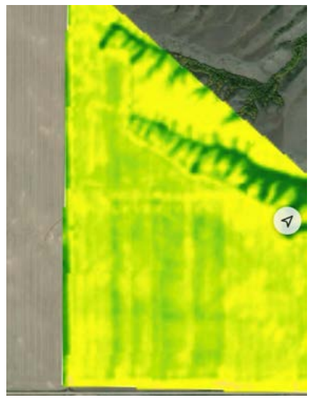
Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
13	14.4	3.3	29.3	24.9	42.7
20	20.2	7.1	28.8	25.0	42.3
26	26.0	11.0	28.4	25.1	42.0
SE [2]	± 1.4	± 5.7	± 1.9	± 0.6	± 0.5
P-value [3,4]	*<0.001***	*0.065**	*0.368*	*0.692*	*0.047***

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.001), even though seedling mortality may have been higher (P<0.1). Yield and protein were not significantly affected by differences in plant populations, but seed size decreased significantly with seeding rate (P<0.05). The lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
13	-	-	-	-	$0.00
20	+ 29 lbs.	- $15.37	+ 0 bu	+ $0	(- $15.37)
26	+ 59 lbs.	- $31.27	+ 0 bu	+ $0	(- $31.27)





There were visual differences in emergence and vegetation index between treatments.

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Gravelbourg)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of large green lentils.

Treatments:

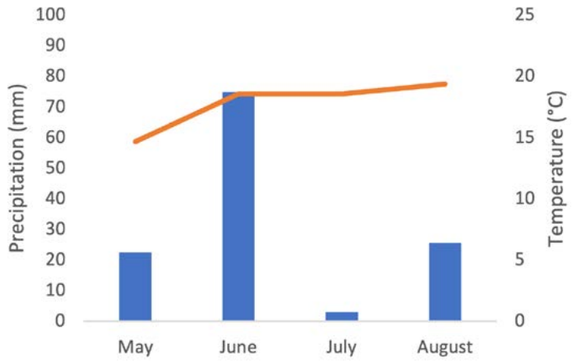
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	97
2	18	146
3	24	195

Replicates: Four

General Trial Information:

Variety	CDC Greenstar (Large Green)
Thousand kernel weight	72.1 g
Germination	95%
Seed treatment	Vibrance Maxx®
Inoculant	TagTeam® BioniQ®
Previous crop	Durum wheat
Soil organic matter	2.7%
Residual Nitrate-N (0-12")	24 lb ac^{-1}
Soil type & Texture	Brown Chernozem,clay
Seeding date	May 17
Seeding implement & openers	Bourgault 3320, 0.75 in. bourgault openers
Seeding depth	1.25 in.
Seeding speed	4.5 mph
Row spacing	10 in.
Total applied fertilizer	5.5 N – 26 P actual lbs. ac^{-1} – seed-placed
Crop protection	Fall 2022: Fierce® EZ June 2: Sencor® June 28: Elatus® + Coragen®

Weather: *Environment Canada – Assiniboia Airport*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	13.4	4.5	9.8	23.1	63.7
18	16.7	15.2	8.4	22.9	63.8
24	20.0	25.8	7.0	22.7	63.8
SE [2]	± 2.8	± 11.4	± 4.2	± 0.3	± 1.2
P-value [3,4]	*0.004***	*0.001****	*0.334*	*0.054**	*0.900*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01) even though seedling mortality also significantly increased with seeding rate (P<0.01). Much of the trial area was affected by root rot due to early season moisture, and dry conditions in the remainder of the growing season resulted in low yield potential. Thus, yield and seed size were not significantly affected by seeding rate, but protein content may have been slightly lower at higher seeding rates (P<0.1). The lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declines with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 49 lbs.	- $35.28	+ 0 bu	+ $0	(- $35.28)
24	+ 98 lbs.	- $70.56	+ 0 bu	+ $0	(- $70.56)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Lentil Seeding Rate
(Indian Head)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Treatments:

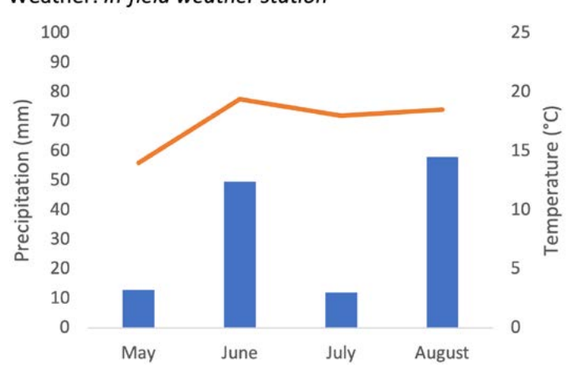
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	9	42
2	13.5	63
3	18	84

Replicates: Four

General Trial Information:

Variety	CDC Proclaim (CL)
Thousand kernel weight	41.85 g
Germination	96%
Seed treatment	Vibrance Maxx® RFC + Intego®
Inoculant	Nodulator® + AGTIV® Peat
Previous crop	Canaryseed
Soil organic matter	4.5%
Residual Nitrate-N (0-6")	10 lbs ac^{-1}
Soil type & Texture	Black Chernozem, clay
Seeding date	May 9
Seeding implement & openers	Morris C2, Dutch universal opener
Seeding depth	0.75 in.
Seeding speed	4.5 mph
Row spacing	12 in.
Total applied fertilizer	10 N – 46 P – 30 K – 0 S lbs. ac^{-1} actual, all side-banded
Crop protection	Fall: Glyphosate + Fierce® + Express® June 5: Odyssey Ultra® Q June 22: Dyax® + Arrow® July 3: Cotegra®

Weather: *In-field weather station*



Results:

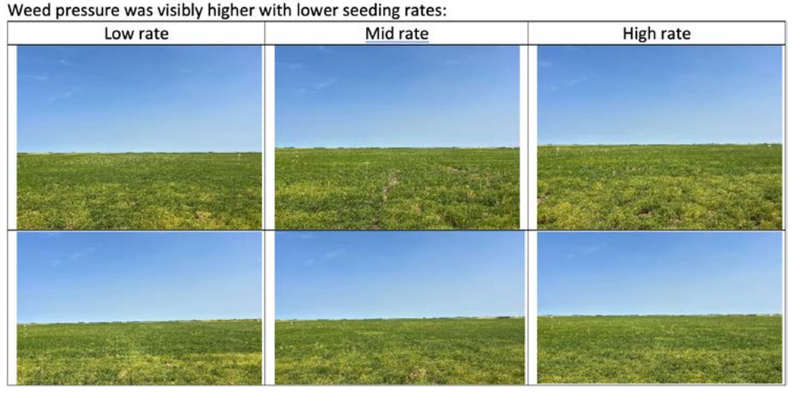
Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
9	10.3	5.0	41.0	24.7	41.8
13.5	12.7	15.1	40.3	23.9	42.2
18	15.1	25.2	39.5	23.0	42.5
SE [2]	± 1.5	± 9.0	± 3.8	± 2.5	± 0.9
P-value [3,4]	*0.001***	*0.006***	*0.543*	*0.319*	*0.250*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01), even with increased seedling mortality (P<0.01). Yield, protein, and seed size were not significantly affected by differences in plant populations. The lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
9	-	-	-	-	$0.00
13.5	+ 21 lbs.	- $11.13	+ 0 bu	+ $0	(- $11.13)
18	+ 42 lbs.	- $22.26	+ 0 bu	+ $0	(- $22.26)

Weed pressure was visibly higher with lower seeding rates:



To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of
IHARF INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

Lentil Seeding Rate
(Kindersley)

Objective: To evaluate the effect of seeding rate on seedling survivability and yield of small red lentils.

Treatments:

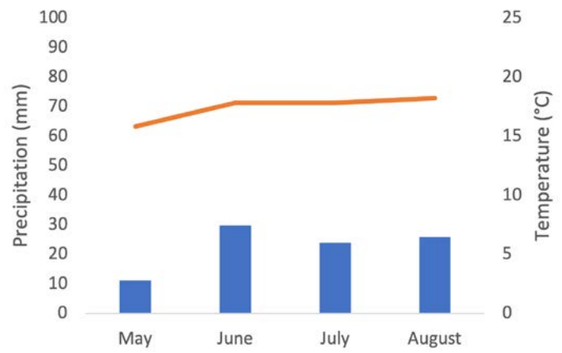
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	49
2	18	73
3	24	97

Replicates: Four

General Trial Information:

Variety	CDC Maxim (CL)
Thousand kernel weight	37.12 g
Germination	98%
Seed treatment	Insure Pulse®
Inoculant	TagTeam Granular®
Previous crop	Barley
Soil organic matter	3.9%
Residual Nitrate-N (0-6")	14 lbs ac^{-1}
Soil type & Texture	Brown Chernozem, Variable texture - clay loam to heavy clay
Seeding date	May 17
Seeding implement & openers	Bourgault, 0.75 in. knives
Seeding depth	1.5 in.
Seeding speed	4.9 mph
Row spacing	10 in.
Total applied fertilizer	6 N – 20 P – 0 K – 5 S + 0.5 Zn lbs ac^{-1} actual (50 lbs ac^{-1} MESZ) All seed-placed
Crop protection	Fall: Edge® May 15: Voraxor® + Glyphosate June 10: Solo® Ultra Q® June 22: Decis®

Weather: *Environment Canada – Kindersley Airport*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})
12	12.8	5.7	31.9
18	17.0	13.6	31.7
24	21.1	21.5	31.5
SE [2]	± 1.3	± 6.5	± 2.4
P-value [3,4]	*<0.001***	*0.003***	*0.696*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01), even though seedling mortality was also significantly higher (P<0.01). Yield was average overall and was not significantly affected by differences in plant populations. Thus, the lowest seeding rate was the most economical. Grain quality was not assessed at this site.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 24 lbs.	- $12.72	+ 0 bu	+ $0	(- $12.72)
24	+ 48 lbs.	- $25.44	+ 0 bu	+ $0	(- $25.44)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Lucky Lake)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Treatments:

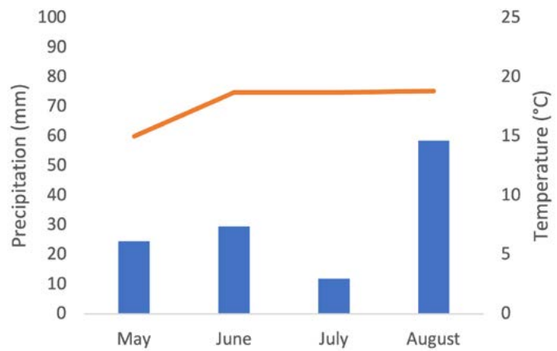
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	46
2	18	69
3	24	92

Replicates: Four

General Trial Information:

Variety	CDC Maxim (CL)
Thousand kernel weight	35.46 g
Germination	99%
Seed treatment	Vibrance Maxx® RFC
Inoculant	Agtiv® Fuel™ Liquid
Previous crop	Durum wheat
Soil organic matter	2.8%
Residual Nitrate-N (0-6")	3 lb ac^{-1}
Soil type & Texture	Brown Chernozem, fine sandy loam
Seeding date	May 10
Seeding implement & openers	Flexicoil™ 5000, paired row
Seeding depth	1 in.
Seeding speed	4.2 mph
Row spacing	12 in.
Total applied fertilizer	4.5 N – 23 P – 3.5 K – 0 S lbs. ac^{-1} actual
Seed-placed fertilizer	None
Crop protection	Pre-emerg: Goldwing® + Glyphosate; June 6: Davai® + Antler®; July 6: Elatus®

Weather: *Environment Canada – Lucky Lake*



Results:

Target plant population	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	4.9	63.8	24.7	23.9	39.1
18	6.2	68.1	22.8	24.0	39.0
24	7.5	72.4	20.8	24.0	38.9
SE [2]	± 0.9	± 5.7	± 3.2	± 0.7	± 0.5
P-value [3,4]	*0.002***	*0.040***	*0.101*	*0.886*	*0.543*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01), even though seedling mortality was very high overall, and also increased with seeding rates (P<0.05). Yield, protein, and seed size were not significantly affected by differences in plant populations. The lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 23 lbs.	- $12.19	+ 0 bu	+ $0	(- $12.19)
24	+ 46 lbs.	- $24.38	+ 0 bu	+ $0	(- $24.38)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Luseland)

Objective: To evaluate the effect of seeding rate on seedling survivability across landscape positions, and on yield and grain quality of small red lentils.

Treatments:

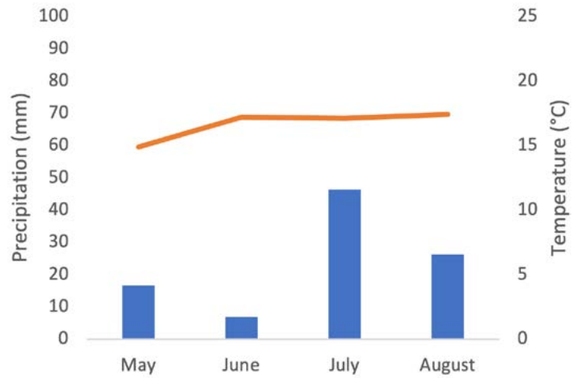
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	55
2	18	83
3	24	111
4	Variable Rate (VR)	55 (depression) 69 (midslope) 99 (knoll)

Replicates: Four

General Trial Information:

Variety	CDC Proclaim (CL)
Thousand kernel weight	42.28 g
Germination	98%
Seed treatment	Insure Pulse®
Inoculant	Verdesian LIFT-kit™
Previous crop	Wheat
Soil organic matter	4.2%
Soil type & Texture	Dark Brown Chernozem, Various – loam, clay, heavy clay
Seeding date	May 16
Seeding depth	1.25 in.
Seeding speed	3.6 mph
Row spacing	12 in.
Total applied fertilizer	VR: Average 7 N – 27 P – 1 K – 0 S actual lbs. ac + Mg
Crop protection	May 13: Leopard® + Revenge® + M-power® June 9: Independence® + Assassin II® + Alpine G22® + Ninja® July 6: Spade® + Boron

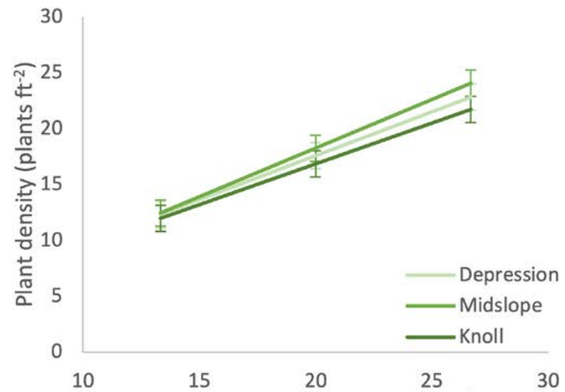
Weather: *Local station for precip + Environment Canada – Scott CDA for temps*

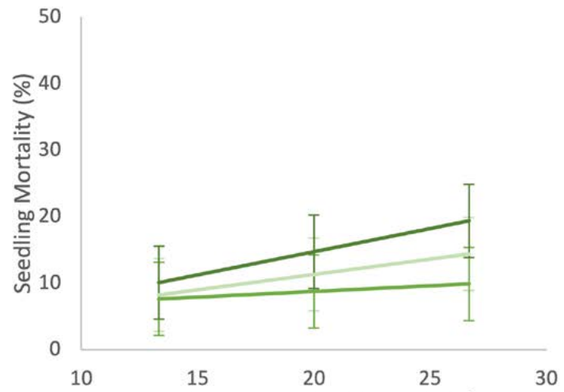


Results:

Plant density assessments were completed separately for depression, mid-slope, and knoll areas within each of the four treatments to determine if the effect of seeding rate on plant population and seedling mortality differed by landscape position.

	Plant density	Seedling mortality
P-value *(Seeding rate)* [6]	*<0.001***	*0.017***
P-value *(Landscape position)*	*0.750*	*0.874*
P-value *(SR x LP)*	*0.339*	*0.504*





Plant density significantly increased with seeding rate (P<0.01), even though mortality also increased (P<0.05). Neither plant density nor mortality were affected by landscape position.

Target plant population (plant ft^{-2})	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	34.6	24.4	43.7
18	35.2	24.7	43.3
24	35.8	25.1	42.8
SE [2]	± 5.4	± 0.6	± 0.5
P-value [3,4]	*0.664*	*0.069**	*0.012***

An average seeding rate was determined for the VR treatments and included in the yield and grain quality regression analyses.

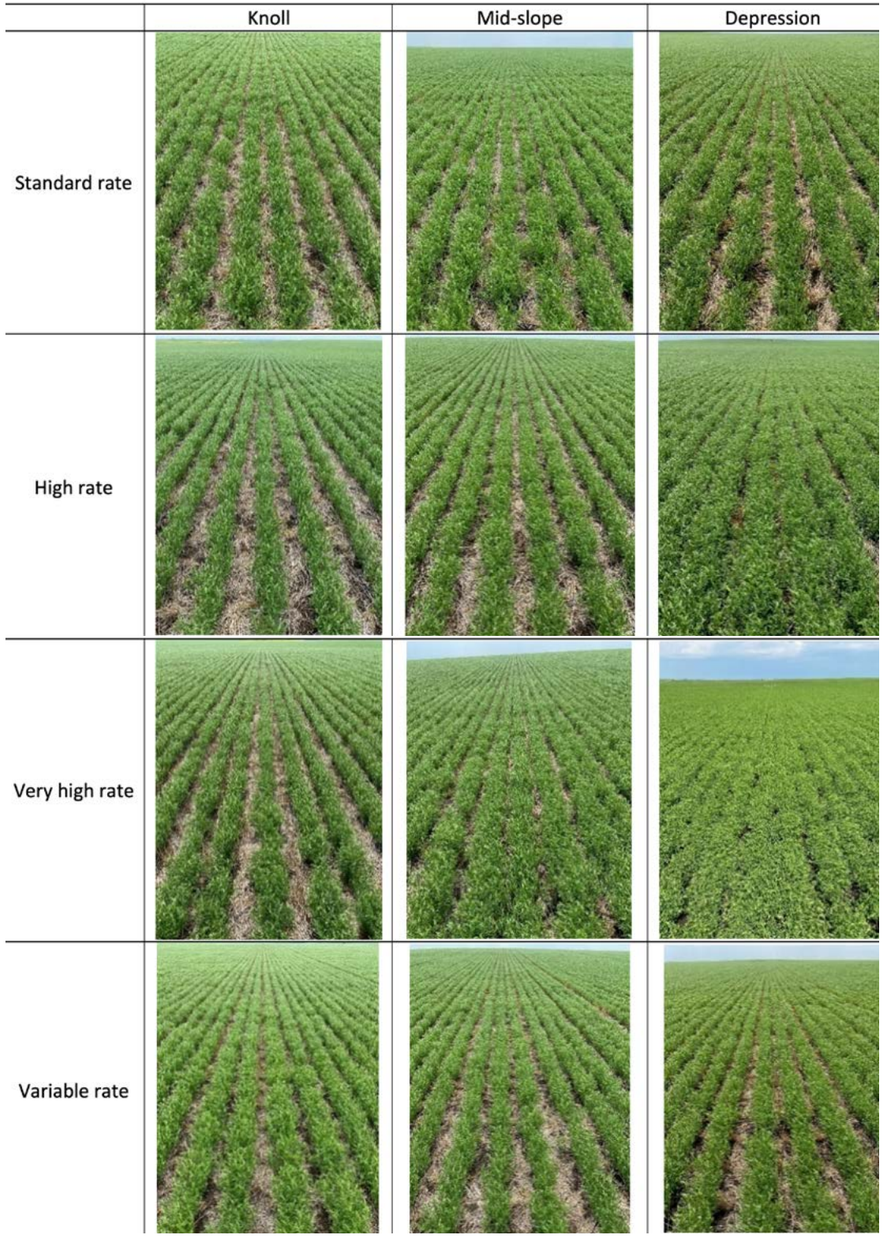
Lentil Seeding Rate (Luseland) continues...

Summary:
Higher plant populations with increased seeding rates did not have a significant effect on yield. Thus, the lowest seeding rate was the most economical. Higher seeding rates negatively affected seed size ($P<0.05$) and may have resulted in increased protein content ($P<0.1$). Yield may also be differentiated by landscape position within seeding rate treatments using yield monitor data, but this analysis has not been completed at this time.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
VR	+ 19 lbs.	$10.07	+ 0 bu	+ $0	(-$10.07)
18	+ 28 lbs.	$14.84	+ 0 bu	+ $0	(-$14.84)
24	+ 56 lbs.	$29.68	+ 0 bu	+ $0	(-$29.68)

There were visual differences in emergence and canopy closure with different seeding rates.



To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

MAX AG CONSULTING Ltd.

Lentil Seeding Rate
(Major)

Objective: To evaluate the effect of seeding rate on seedling survivability across landscape positions, and on yield and grain quality of small red lentils.

Treatments:

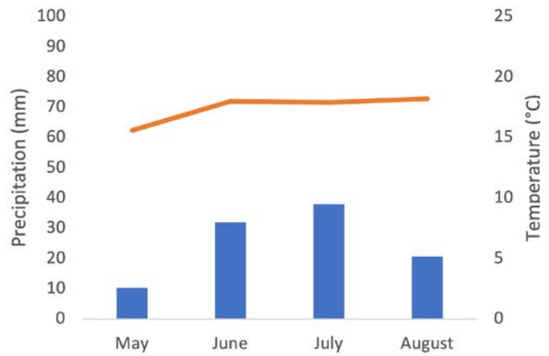
Replicates: Four

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	55
2	18	83
3	24	110
4	Variable Rate (VR)	55 (depression) 69 (midslope) 99 (knoll)

General Trial Information:

Variety	CDC Proclaim (CL)
Thousand kernel weight	43 g
Germination	100%
Seed treatment	None
Inoculant	Nodulator Duo®
Previous crop	Barley
Soil organic matter	3.6%
Soil type & Texture	Dark Brown Chernozem, heavy clay
Seeding date	May 27
Seeding depth	1.25 in.
Seeding speed	4 mph
Row spacing	12 in.
Total applied fertilizer	VR: Average 7 N – 33 P actual lbs. ac^{-1}
Crop protection	May 27: Glyphosate + Voraxor® June 17: Davai® + Leopard®

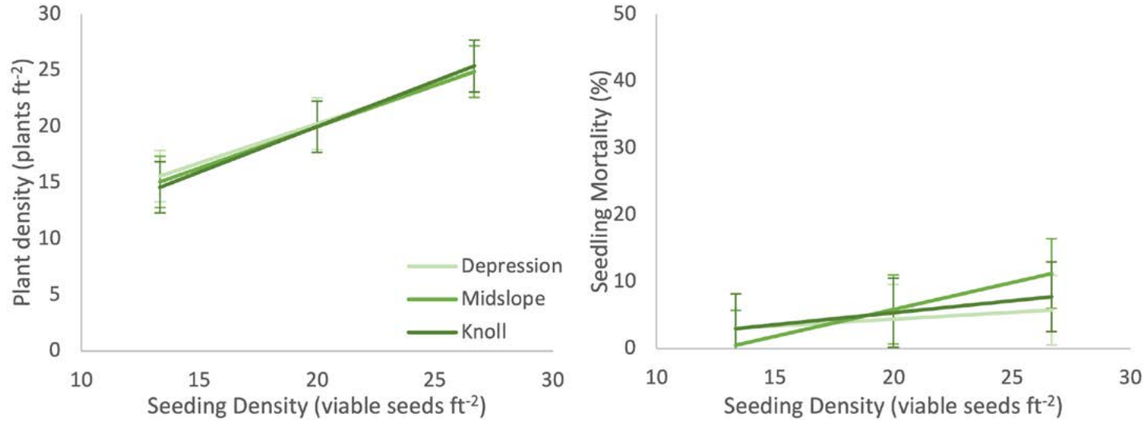
Weather: *Local station for precip + Environment Canada – Kindersley A for temps*



Results:

Plant density assessments were completed separately for depression, mid-slope, and knoll areas within each of the four treatments to determine if the effect of seeding rate on plant population and seedling mortality differed by landscape position.

	Plant density	Seedling mortality
P-value *(Seeding rate)* [6]	*<0.001***	*0.039***
P-value *(Landscape position)*	*0.769*	*0.268*
P-value *(SR x LP)*	*0.801*	*0.204*



Plant density significantly increased with seeding rate (P<0.01), even though mortality also increased (P<0.05). Neither plant density no mortality were affected by landscape position.

Target plant population (plant ft^{-2})	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	30.1	24.8	38.4
18	29.0	24.9	38.5
24	28.0	24.9	38.7
SE [2]	± 2.5	± 0.6	± 0.4
P-value [3,4]	*0.118*	*0.973*	*0.217*

An average seeding rate was determined for the VR treatments and included in the yield and grain quality regression analyses.

Lentil Seeding Rate (Major) continues...

Summary:
Higher plant populations resulting from increased seeding rates did not have a significant effect on yield. Thus, the lowest seeding rate was the most economical. Higher seeding rates did not affect protein content or seed size. Yield may also be differentiated by landscape position within seeding rate treatments using yield monitor data, but this analysis has not been completed at this time.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
VR	+ 19 lbs.	$10.07	+ 0 bu	+ $0	(-$10.07)
18	+ 28 lbs.	$14.84	+ 0 bu	+ $0	(-$14.84)
24	+ 55 lbs.	$29.15	+ 0 bu	+ $0	(-$29.15)

Lentil stand under varying seeding rates, visual differences can be noted in canopy closure between treatments.

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

MAX AG CONSULTING Ltd.

Lentil Seeding Rate
(Marengo)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Treatments:

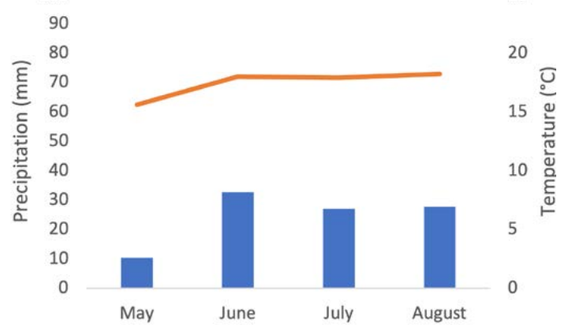
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	52
2	18	78
3	24	104

Replicates: Four

General Trial Information:

Variety	CDC Maxim (CL)
Thousand kernel weight	40.24 g
Germination	99%
Seed treatment	Vibrance Maxx® RFC
Inoculant	TagTeam® BioniQ® Granular
Previous crop	Durum wheat
Soil organic matter	4.6%
Residual Nitrate-N (0-6")	13 lbs ac^{-1}
Soil type & Texture	Brown Chernozem, clay
Seeding date	May 4
Seeding implement & openers	Bourgault 3320 – 0.75 in. openers
Seeding depth	1.5 in.
Seeding speed	4 mph
Row spacing	10 in.
Total applied fertilizer	20 N – 20 P – 0 K – 5 S lbs ac^{-1} actual – all seed-placed
Crop protection	April 29: Glyphosate + Aim® May 29: Imazomox + Clethodim June 23: Elatus® + Coragen®

Weather: *Environment Canada – Kindersley A*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	12.5	7.2	27.7	26.0	37.9
18	19.0	6.1	27.0	25.1	38.3
24	25.6	5.1	26.3	24.1	38.7
SE [2]	± 1.6	± 6.0	± 2.0	± 3.8	± 1.1
P-value [3,4]	*<0.001****	*0.590*	*0.207*	*0.441*	*0.303*

Summary:
Plant population increased significantly with seeding rate (P<0.01), and seedling mortality did not differ between seeding rates. Yield or grain quality were not significantly affected by the differences in plant populations. Thus, the lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plants ac^{-1})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 26 lbs.	- $13.78	+ 0 bu	+ $0	(- $13.78)
24	+ 52 lbs.	- $27.56	+ 0 bu	+ $0	(- $27.56)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Mendham)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Replicates: Four

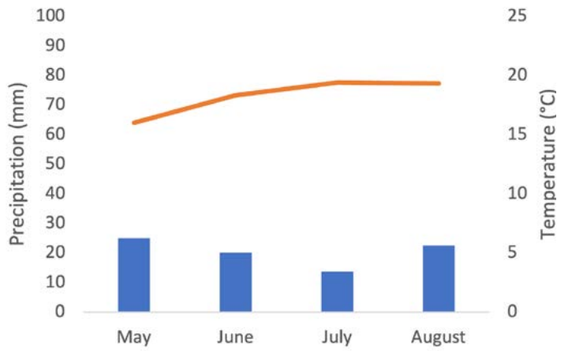
Treatments:

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	18	60
2	27	90
3	36	120

General Trial Information:

Variety	CDC Maxim (CL)
Thousand kernel weight	30.7 g
Germination	99%
Seed treatment	None
Inoculant	LALFIX® Spherical
Previous crop	Durum wheat
Soil organic matter	2.4%
Residual Nitrate-N (0-6")	16 lbs. ac^{-1}
Soil type & Texture	Brown chernozem, silty loam
Seeding date	May 19
Seeding implement & openers	Disc
Seeding depth	2 in.
Seeding speed	6.7 mph
Row spacing	10 in.
Total applied fertilizer	4.6 N – 16.5 P – 3.2 K – 9.6 S + 7.3 Ca actual lbs. ac^{-1} – Seed-placed
Crop protection	May 18: Glyphosate + Aim® May 31: Insecticide

Weather: *Environment Canada – Leader Airport*



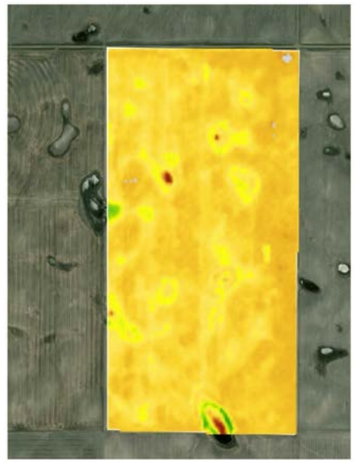
Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
18	10.9	46.3	7.6	24.5	38.2
27	16.0	46.8	6.2	24.4	38.2
36	21.2	47.2	4.8	24.2	38.2
SE [2]	± 2.6	± 7.5	± 2.7	± 0.6	± 0.5
P-value [3,4]	*<0.001****	*0.795*	*0.148*	*0.402*	*0.936*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01). Seedling mortality was very high overall and did not differ significantly with seeding rate. Dry conditions throughout the growing season resulted in low yield potential. Thus, yield and grain quality were not significantly affected by seeding rate. The lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plants ac^{-1})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
18	-	-	-	-	$0.00
27	+ 30 lbs.	- $15.90	+ 0 bu	+ $0	(- $15.90)
36	+ 60 lbs.	- $31.80	+ 0 bu	+ $0	(- $31.80)



NDVI Imagery taken June 19.

Visual differences in maturity with different seeding rates.

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Milden 1)

Objective: To evaluate the effect of seeding rate on seedling survivability across landscape positions, and on yield and grain quality of small red lentils.

Treatments:

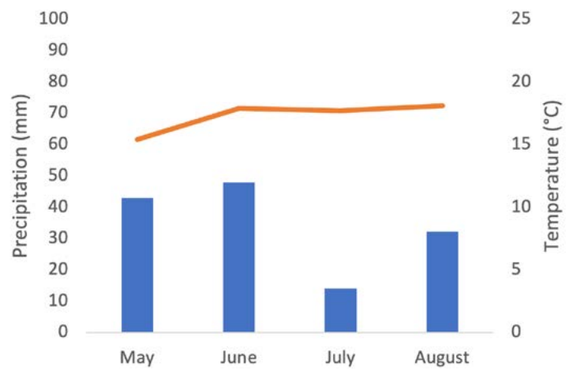
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	54
2	18	81
3	24	108

Replicates: Four

General Trial Information:

Variety	CDC Maxim (CL)
Thousand kernel weight	37.78 g
Germination	90%
Seed treatment	Vitaflo™
Inoculant	Xite Bio™
Previous crop	Wheat
Soil organic matter	3.9%
Residual Nitrate-N (0-6")	76 lbs. ac^{-1}
Soil type & Texture	Dark Brown Chernozem, loam / clay loam
Seeding date	May 13
Seeding implement & openers	John Deere 1830 single shoot air drill
Seeding depth	1 in.
Seeding speed	4.5 mph
Row spacing	12 in.
Total applied fertilizer	5 N – 16 P – 0 K – 4 S + 0.4 Zn actual lbs. ac^{-1} – seed-placed
Crop protection	May 11: Voraxor® Complete + Glyphosate June 12: Davai®+ Antler® Unpacked Silencer®

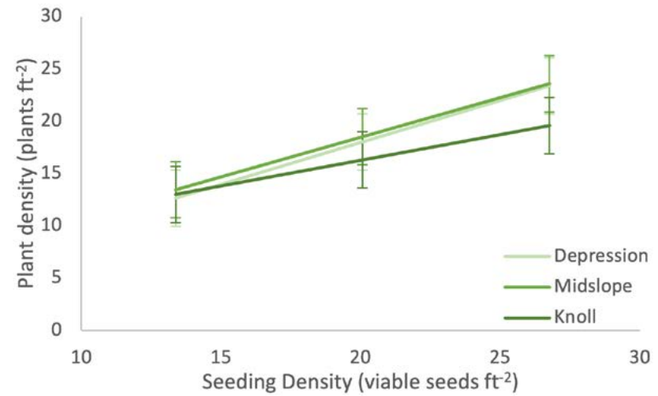
Weather: *Environment Canada – Rosetown East*



Results:

Plant density assessments were completed separately for depression, mid-slope, and knoll areas within each of the four treatments to determine if the effect of seeding rate on plant population and seedling mortality differed by landscape position.

	Plant density	Seedling mortality
P-value *(Seeding rate)* [6]	*<0.001****	*0.055**
P-value *(Landscape position)*	*0.393*	*0.638*
P-value *(SR x LP)*	*0.133*	*0.256*



Seeding rate significantly increased plant populations overall (P<0.01) but did not differ significantly by landscape position. Error bars indicate the standard error.

Target plant population (plant ft^{-2})	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	16.8	21.9	33.5
18	18.3	22.7	33.7
24	19.9	23.9	33.8
SE [2]	± 1.4	± 0.9	± 0.5
P-value [3,4]	*0.006****	*0.013***	*0.450*

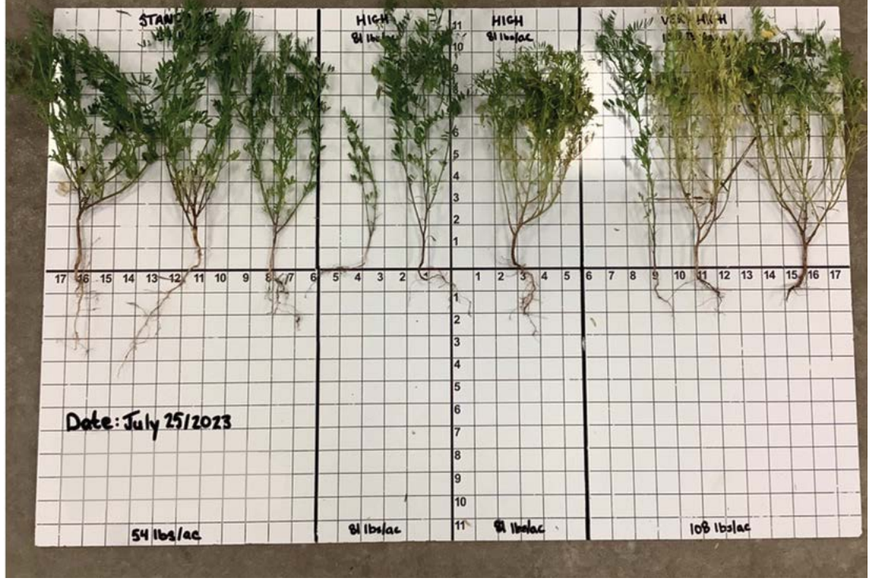
Lentil Seeding Rate (Milden 1) continues...

Summary:
Plant populations increased significantly with seeding rates (P<0.01), even though seedling mortality may also have been higher as a result of increased seeding rates (P<0.1, not shown). Neither plant density or mortality varied significantly with landscape position. Yield and protein both increased with seeding rates, so the higher seeding rates were economically beneficial. Seed size did not differ between seeding rates.

Economics:
Seeding rate had a positive effect on yield. The increase in grain profit was more than the additional seed cost, thus net profit increased with higher seeding rates.

Target plant population (plants ac^{-1})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 27 lbs.	- $14.31	+ 1.5 bu	$31.28	$16.97
24	+ 54 lbs.	- $28.62	+ 3.1 bu	$64.65	$36.03

Lentil emergence on rows seeded at 54 lbs/ac (left) and 81 lbs/ac (right).



Visual differences in plant development in response to seeding rate.

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Milden 2)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Replicates: Four

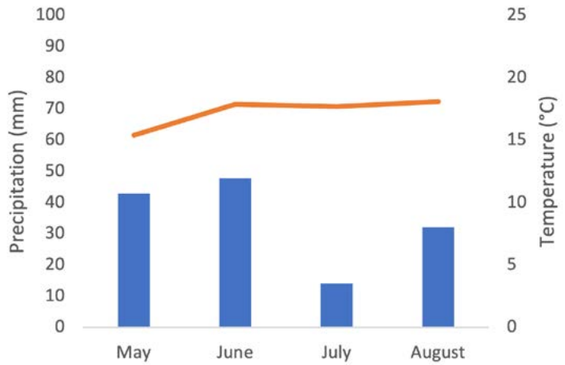
Treatments:

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	57
2	18	85
3	24	114

General Trial Information:

Variety	CDC Proclaim (CL)
Thousand kernel weight	41.34 g
Germination	93%
Seed treatment	Vibrance Maxx® RFC
Inoculant	XiteBio® PulseRhizo
Previous crop	Barley
Soil organic matter	4.1%
Residual Nitrate-N (0-6")	19 lbs. ac^{-1}
Soil type & Texture	Dark Brown Chernozem, heavy clay
Seeding date	May 18
Seeding implement & openers	Seedhawk 1 in. openers
Seeding depth	1 in.
Seeding speed	4.8 mph
Row spacing	12 in.
Total applied fertilizer	7 N – 24 P – 0 K – 6 S lbs. ac^{-1} actual (S10) – Seed-placed
Crop protection	May 16: Aim® + Glyphosate June 9: Squadron® + Power2L June 29: Elatus® Silencer® + Coragen Max®

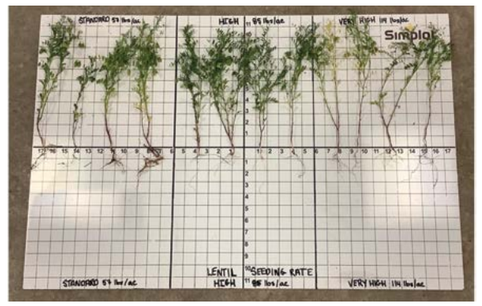
Weather: *Environment Canada – Rosetown East*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1,000 seeds^{-1})
12	13.6	2.6	20.3	24.8	40.7
18	19.1	4.9	22.0	24.9	40.9
24	24.7	7.4	23.6	25.1	41.1
SE [2]	± 1.2	± 4.5	± 1.5	± 0.8	± 0.7
P-value [3,4]	*<0.001***	*0.041***	*0.008****	*0.464*	*0.484*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01), even though seedling mortality was also significantly higher at higher seeding rates (P<0.05). Yield increased significantly with seeding rate (P<0.01), but grain quality was not affected. Increasing the seeding rate was economically beneficial at this site.



Visual differences in plant development under different seeding rates.

Weed pressure was visibly lower with very high seeding rate compared to high and standard rates.

Economics:
Seeding rate had a positive effect on yield. The increase in grain profit was greater than the cost of additional seed, thus net profit increased with higher seeding rates.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 28 lbs.	- $14.84	+ 1.7 bu	+ $35.46	+ $20.62
24	+ 57 lbs.	- $30.21	+ 3.3 bu	+ $68.82	+ $38.61

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Plenty)

Objective: To evaluate the effect of seeding rate on seedling survivability across landscape positions, and on yield and grain quality of small red lentils.

Replicates: Four

Treatments:

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	55
2	18	82
3	24	110
4	Variable Rate (VR)	55 (Depression) 68 (Midslope) 99 (Knoll)

General Trial Information:

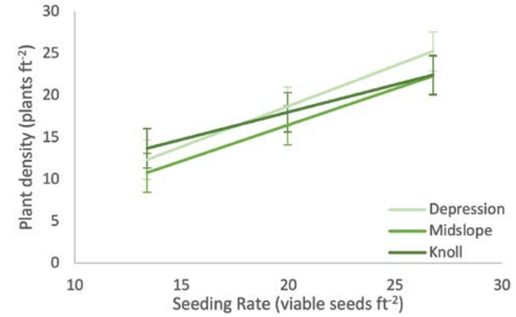
Variety	CDC Maxim (CL)
Thousand kernel weight	41.02 g
Germination	96%
Seed treatment	Vitaflo™
Inoculant	Agtiv® Fuel® Granular
Previous crop	Durum Wheat
Soil organic matter	4.1%
Residual Nitrate-N (0-6")	9 lbs ac^{-1}
Soil type & Texture	Dark Brown Chernozem, heavy clay
Seeding date	May 21
Seeding depth	1 in.
Seeding speed	6-8 mph
Row spacing	10 in.
Total applied fertilizer	VR: Average 4 N – 20 P + 2 Mg actual lbs. ac^{-1}
Crop protection	May 19: Glyphosate + Goldwing® June 11: Sencor® June 16: Solo® + Centurion®+ Nexicor®

Weather: *Local station for precip + Environment Canada – Kindersley Airport for temps*

Results:

Plant density was assessed separately for depression, mid-slope, and knoll areas within each of the four treatments to determine if the effect of seeding rate on plant population and seedling mortality differed by landscape position.

	Plant density	Seedling mortality
P-value *(Seeding rate)* [6]	<0.001***	0.406
P-value *(Landscape position)*	0.265	0.103
P-value *(SR x LP)*	0.235	0.162



The effect of seeding rate on plant density was significant (P<0.01) but did not differ significantly by landscape position. Error bars indicate the standard error.

Target plant population (plant ft^{-2})	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	47.0	24.7	40.9
18	44.1	24.6	41.0
24	41.1	24.4	41.1
SE [2]	± 3.2	± 0.6	± 0.6
P-value [3,4]	*0.014***	*0.419*	*0.580*

An average seeding rate was determined for the VR treatments and included in the yield and grain quality regression analyses.

Summary:
Plant populations increased significantly with seeding rates but seedling mortality was not affected by seeding rate, regardless of landscape position. Yield decreased with increased seeding rates, thus the lowest seeding rate was the most economical. Grain quality was not significantly affected by seeding rate. Yield may also be differentiated by landscape position within treatments using yield monitor data, but this analysis has not been completed at this time.

Economics:
There was a negative effect of seeding rate on yield, thus net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
VR	+ 19 lbs. (avg)	- $10.07	- 2.0 bu (avg)	(- $41.71)	(- $31.64)
18	+ 27 lbs.	- $14.31	- 2.9 bu	(- $60.48)	(- $74.79)
24	+ 55 lbs.	- $29.15	- 5.9 bu	(- $123.05)	(- $152.20)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

MAX AG CONSULTING Ltd.

Lentil Seeding Rate
(Rosetown 1)

Objective: To evaluate the effect of seeding rate on seedling survivability across landscape positions, and on yield and grain quality of small red lentils.

Treatments:

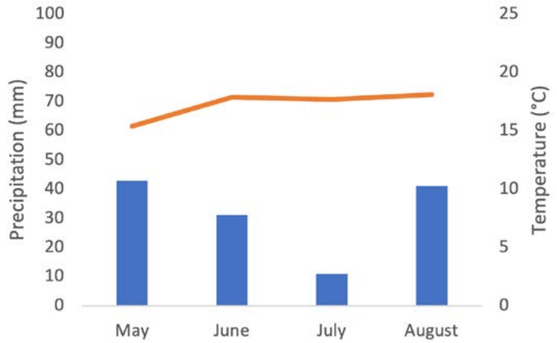
Replicates: Four

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	50
2	18	75
3	24	100
4	Variable Rate (VR)	50 (Depression) 66 (Midslope) 90 (Knoll)

General Trial Information:

Variety	CDC Maxim (CL)
Thousand kernel weight	38.35 g
Germination	98%
Seed treatment	Vibrance Maxx®
Inoculant	Liquid Nodulator®
Previous crop	Malt barley
Soil organic matter	4.3%
Soil type & Texture	Brown Chernozem, clay loam
Seeding date	May 19
Seeding depth	2 in.
Seeding speed	4.6 mph
Row spacing	12 in.
Total applied fertilizer	VR: Average 6 N – 14 P – 1 K – 0 S (MAP + Alpine)
Crop protection	May 19: Goldwing® + Glyphosate June 10: Metribuzin June 15: Coragen® Max

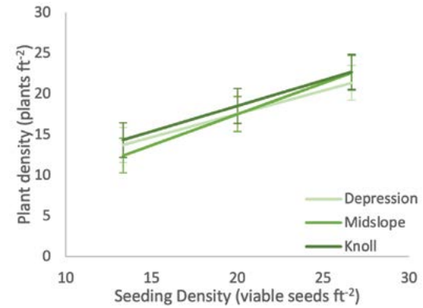
Weather: *Local station for precip + Environment Canada – Rosetown East for temps*



Results:

Plant density was assessed separately for depression, mid-slope, and knoll areas within each of the four treatments to determine if the effect of seeding rate on plant population and seedling mortality differed by landscape position.

	Plant Density	Seedling Mortality
P-value *(Seeding rate)* [6]	*<0.001****	*0.052**
P-value *(Landscape position)*	*0.348*	*0.411*
P-value *(SR x LP)*	*0.382*	*0.450*



Plant density significantly increased with seeding rate (P<0.01), but was not affected by landscape position. Seedling mortality may have increased with seeding rate (P<0.1, not shown), but also was unaffected by landscape position.

Target plant population (plant ft^{-2})	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	21.9	23.3	37.7
18	22.1	23.4	38.0
24	22.2	23.5	38.3
SE [2]	± 1.9	± 0.6	± 0.4
P-value [3,4]	*0.794*	*0.629*	*0.030***

An average seeding rate was determined for the VR treatments and included in the yield and grain quality regression analyses.

Summary:
Higher plant populations with increased seeding rates did not have a significant effect on yield. Thus, the lowest seeding rate was the most economical. Higher seeding rates positively affected seed size (P<0.05) but did not result in increased protein content. Yield may also be differentiated by landscape position within seeding rate treatments using yield monitor data, but this analysis has not been completed at this time.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
VR	+ 19 lbs.	$10.07	+ 0 bu	+ $0	(-$10.07)
18	+ 25 lbs.	$13.25	+ 0 bu	+ $0	(-$13.25)
24	+ 50 lbs.	$26.50	+ 0 bu	+ $0	(-$26.50)

Plant growth across various treatments was observed on July 17.

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

MAX AG CONSULTING Ltd.

Lentil Seeding Rate
(Rosetown 2)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Replicates: Four

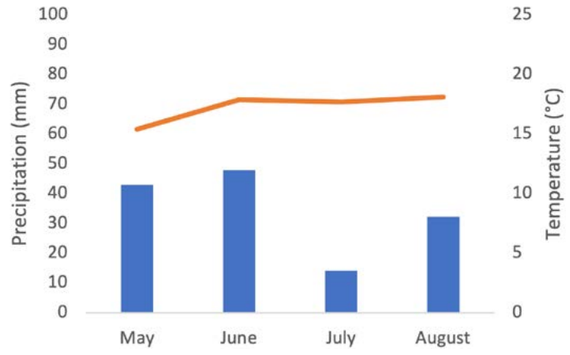
Treatments:

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	56
2	18	84
3	24	111

General Trial Information:

Variety	CDC Maxim (CL)
Thousand kernel weight	40.4 g
Germination	93%
Seed treatment	Vibrance Maxx® RFC
Inoculant	N-Row®
Previous crop	Durum wheat
Soil organic matter	5.2%
Residual Nitrate-N (0-6")	70 lbs. ac^{-1}
Soil type & Texture	Dark Brown Chernozem, heavy clay
Seeding date	May 13
Seeding implement & openers	Bourgault .75 in. knives
Seeding depth	1.75 in.
Seeding speed	4.5 mph
Row spacing	12 in.
Total applied fertilizer	4.5 N – 20.3 P actual lbs. ac^{-1}, Seed-placed
Crop protection	Fall: Fierce® May 12: Glyphosate June 17: Antler® Unpack July 27: Silencer®

Weather: *Environment Canada – Rosetown East*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	8.7	36.8	18.6	26.4	39.7
18	12.6	37.3	19.0	25.6	39.3
24	16.3	37.8	19.4	24.8	39.0
SE [2]	± 1.8	± 8.5	± 1.5	± 4.0	± 1.8
P-value [3,4]	*<0.001****	*0.861*	*0.429*	*0.544*	*0.593*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01). Seedling mortality was very high overall and did not differ significantly with seeding rate. Dry conditions throughout the growing season resulted in low yield potential. Thus, yield and grain quality were not significantly affected by seeding rate. The lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 28 lbs.	- $14.84	+ 0 bu	+ $0	(- $14.84)
24	+ 55 lbs.	- $29.15	+ 0 bu	+ $0	(- $29.15)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Shaunavon)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Replicates: Four

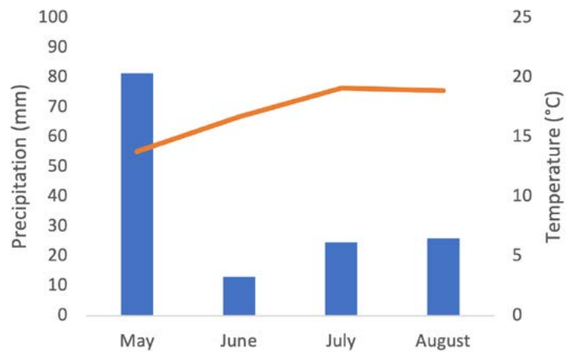
Treatments:

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	15	60
2	22	90
3	29	120

General Trial Information:

Variety	CDC Proclaim (CL)
Thousand kernel weight	38.75 g
Germination	100%
Seed treatment	Vibrance Maxx®
Inoculant	LALFIX®
Previous crop	Barley
Soil organic matter	3.4%
Residual Nitrate-N (0-6”)	13 lbs. ac^{-1}
Soil type & Texture	Dark Brown Chernozem, clay loam
Seeding date	June 2
Seeding implement & openers	Bourgault 0.75 in.
Seeding depth	1 in.
Seeding speed	4.9 mph
Row spacing	10 in.
Total applied fertilizer	9.5 N – 24 P – 0 K – 11 S + 0.3 B lbs. ac^{-1} actual – Seed-placed
Crop protection	May 19: Focus® June 28: Coragen Max®

Weather: *Environment Canada – Eastend Cypress*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
15	15.6	20.3	8.2	24.7	39.8
22	14.8	38.6	7.0	24.7	39.9
29	14.0	56.8	5.8	24.6	39.9
SE [2]	± 5.3	± 13.9	± 1.2	± 0.8	± 0.7
P-value [3,4]	*0.644*	*0.002****	*0.003****	*0.897*	*0.787*

Summary:
Increased seeding rate did not significantly affect plant populations, as seedling mortality was significantly higher with increased seeding rate (P<0.01). Heavy weed pressure as well as hot and dry growing conditions at this site resulted in low yields overall. Yield declined significantly with increased seeding rate (P<0.001) but grain quality was not affected. The lowest seeding rate was the most economical.

Economics:
Seeding rate had a significant negative effect on yield and so higher seeding rates resulted in a loss in grain profit. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
15	-	-	-	-	$0.00
22	+ 30 lbs.	- $15.90	- 1.2 bu	(- $25.03)	(- $40.93)
29	+ 60 lbs.	- $31.80	- 2.4 bu	(- $50.05)	(- $81.85)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Stranraer)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of small red lentils.

Treatments:

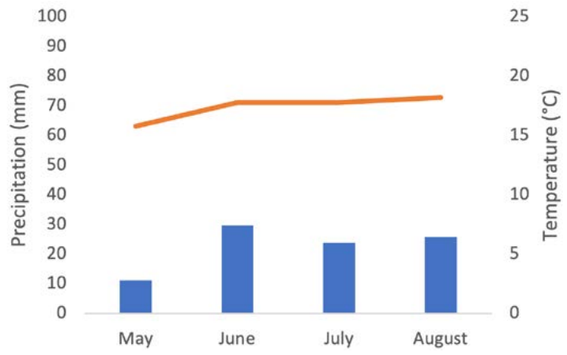
Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	62
2	18	93
3	24	123

Replicates: Four

General Trial Information:

Variety	CDC Impulse (CL)
Thousand kernel weight	47.62 g
Germination	99%
Seed treatment	Trilex® Evergol®
Inoculant	Cell-Tech® Liquid
Previous crop	Spring wheat
Soil organic matter	3.1%
Residual Nitrate-N (0-6”)	10 lbs. ac^{-1}
Soil type & Texture	Dark Brown Chernozem, heavy clay
Seeding date	May 9
Seeding implement & openers	Pillar disc drill, disc style opener
Seeding depth	1 in.
Row spacing	10 in.
Total applied fertilizer	10 N – 3 P actual lbs. ac^{-1} – Seed-placed
Crop protection	9.5 N – 24 P – 0 K – 11 S + 0.3 B lbs. ac^{-1} actual – Seed-placed
Crop protection	April 27: Edge® June 13: Squadron® June 19: Centurion® June 23: Labamba®

Weather: *Environment Canada station – Kindersley airport*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	13.8	6.1	28.5	23.8	50.5
18	14.5	24.6	28.2	24.0	50.5
24	15.3	42.6	27.8	24.3	50.6
SE [2]	± 3.6	± 14.7	± 4.4	± 0.8	± 1.0
P-value [3,4]	*0.526*	*0.005****	*0.789*	*0.342*	*0.833*

Summary:
Plant populations did not differ significantly between seeding rates, and seedling mortality was significantly higher at higher seeding rates (P<0.01). Yield and grain quality did not differ significantly with seeding rates, but this could be a result of increased seedling mortality and lower than targeted plant populations with higher seeding rates. Thus, the lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
18	+ 31 lbs.	- $16.43	+ 0 bu	+ $0	(- $16.43)
24	+ 61 lbs.	- $32.33	+ 0 bu	+ $0	(- $32.33)

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

Simplot GROWER SOLUTIONS

Lentil Seeding Rate
(Vibank)

Objective: To evaluate the effect of seeding rate on seedling survivability, yield, and grain quality of French green lentils.

Replicates: Four

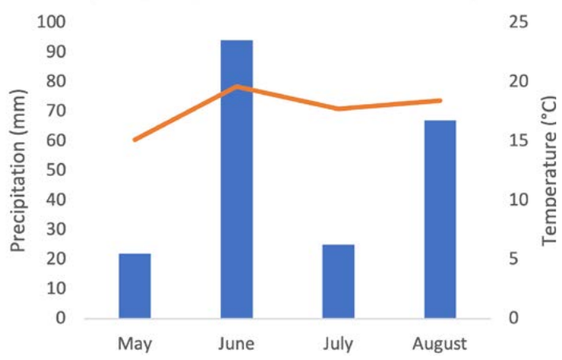
Treatments:

Treatment No.	Target plant population (plants ft^{-2})	Actual seeding rate (lbs. ac^{-1})
1	12	46
2	24	87

General Trial Information:

Variety	CDC Plato (French greens)
Thousand kernel weight	31.6 g
Germination	92%
Seed treatment	Vibrance Maxx® RFC
Inoculant	AGTIV® Fuel™ Liquid
Previous crop	Spring wheat
Soil organic matter	3.5%
Residual Nitrate-N (0-6")	8 lbs. ac^{-1}
Soil type & Texture	Dark Brown Chernozem, loam
Seeding date	May 10
Seeding implement & openers	Morris Paired Row
Seeding depth	1.5 in.
Seeding speed	4.3 mph
Row spacing	10 in.
Total applied fertilizer	4 N – 21 P – 21 K – 40 S lbs. ac^{-1} actual
Crop protection	May 9: Glyphosate (Valtera™ EZ in fall) June 6: Solo® ADV + Quizalofop July 16: Coragen® Elatus®

Weather: *In-field precip + Environment Canada temps*



Results:

Target plant population (plant ft^{-2})	Plant density (plants ft^{-2})	Seedling mortality (%)	Yield [1] (bu ac^{-1})	Protein (%)	Seed size (g 1000 seeds^{-1})
12	15.4	0.0	39.8	22.7	38.2
24	25.5	4.0	38.5	22.6	38.6
SE [2]	± 1.3	± 2.6	± 2.1	± 0.2	± 0.4
P-value [3,4]	*0.001***	*0.067**	*0.650*	*0.326*	*0.158*

Summary:
Increased seeding rate resulted in significantly higher plant populations (P<0.01). Plant populations were higher than targeted, so estimated seedling mortality was low. The trial area was affected by root rot early in the season but visibly appeared to recover as the season progressed. Yield, protein, and seed size were not significantly affected by seeding rate, so the lowest seeding rate was the most economical.

Economics:
The effect of seeding rate on yield was not significant, thus the yield difference between treatments is zero. Net profit declined with increased seeding rate.

Target plant population (plant ft^{-2})	Seeding rate	Seed cost [4]	Yield	Grain profit [5]	Net profit
12	-	-	-	-	$0.00
24	+ 41 lbs.	$29.52	+ 0 bu	+ $0	(- $29.52)

Visual differences in plant emergence with different seeding rates.

To review footnote references please refer to overall trial summary on page 57.

This trial was conducted with the agronomic support of

WHEAT WISE
Plotting the Future

by Sask Wheat
DEVELOPMENT COMMISSION

Overview

During the 2022 growing season, Sask Wheat launched its "On-Farm Trial" program now branded to "Wheat Wise – Plotting the Future". Through this program, producers have the opportunity to 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 their farm.

The overall goal of the program is to build an on-farm research network which 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.

The inaugural year of trials examined wheat seeding rates while 2023 looked at biological nitrogen fixation products on wheat. Moving forward, Sask Wheat is excited to continue to listen to producer interests and offer a variety of protocols while we continue to expand the program around the province.

Wheat

Protocol: Foliar-Applied Nitrogen-Fixing Biological Products For Wheat

WHEAT WISE
Plotting the Future

Wheat Wise On-Farm Trial Program

Foliar-Applied Nitrogen-Fixing Biological Products For Wheat

Wheat and canola generally require 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 (Envita®) in wheat.

Option A: Two treatments		Option B: Four treatments	
1)	Untreated check	1)	Normal N rate + Untreated
2)	Envita® at recommended rate and timing	2)	Normal N rate + Envita®
		3)	Reduced N rate + Untreated
		4)	Reduced N rate + Envita®

The treatments were replicated and applied in randomized strips. Option A trials were replicated four times (8 plots total) and Option B trials were replicated three times (12 plots total). All plots were managed the same agronomically including seeding date, variety, seeding depth, seed treatment, and pesticide application.

Procedure

The following procedure was followed at all trial sites, unless otherwise specified in the individual site reports:

1. Spring soil samples were collected at each trial site prior to seeding and fertilizer application to assess residual soil nutrient levels. A minimum of 12 soil cores were collected throughout the trial area, separated by 0–6″ and 6–24″ depths.
2. The normal N fertilizer rate was determined by the producer and their agronomist as per their management practices. The reduced N rate treatments were 90 percent or less of the normal N rate. Actual applied N rates were documented.
3. For Option A, the entire field was seeded at the normal N fertilizer rate and Envita® treatment strips were established at the recommended timing using the provided randomized field plan.
4. For Option B, N fertility treatments were established at seeding time (or N fertilizer application time) and Envita® application was completed at the recommended timing using the provided field plan.
5. Envita® was either tank-mixed at herbicide timing or applied as a separate pass. Label recommendations were followed.
6. Yield was determined for each plot separately by weighing with a weigh wagon or grain cart with scale.
7. Grain samples were collected from each plot separately for grain quality analysis.

Data Collection

- Spring soil sample
- Spring plant density
- Yield (corrected for moisture content)
- Grain quality (protein content, test weight, seed size)
- General observations throughout the season
- Weather data (Daily temperature and precipitation)
- Management (applied fertilizer rates, seeding date, pesticide applications, etc.)

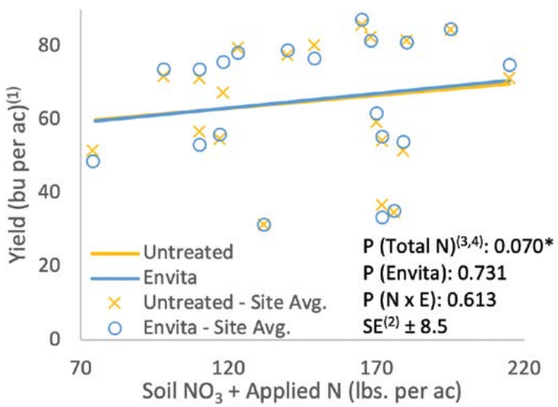
Sask Wheat wishes to thank Syngenta for their support by donating Envita®.

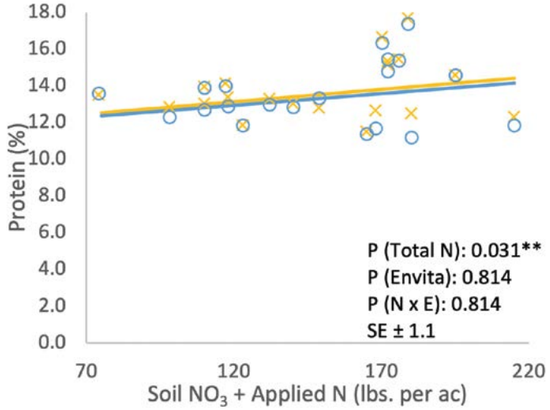
syngenta

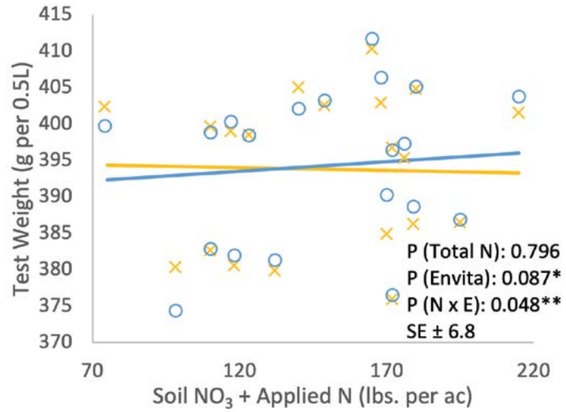
Foliar-Applied Nitrogen-Fixing Biological Products For Wheat: Results Summary

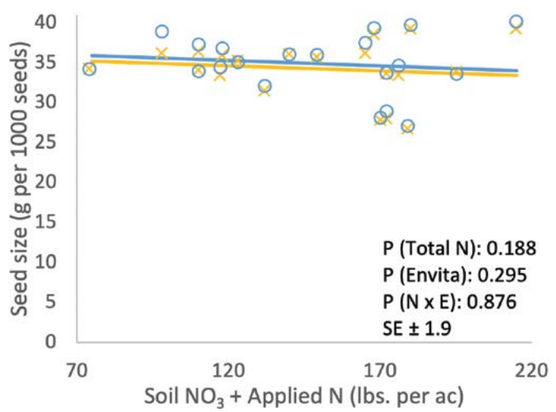
Data from all sites was combined to assess the overall effect of Envita® application and whether the effect differed with nitrogen (N) availability. The amount of applied N was added to the soil residual NO_{3-} to estimate N supply for different sites and treatments.

Overall, we were unable to detect a significant difference in yield in response to Envita® application under the conditions experienced across the trials this growing season, however N supply may have had a positive effect on yield (P<0.1). Protein increased significantly with N 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. Seed size was not significantly affected by Envita® application or N supply overall.









Individual site reports are provided to indicate the variability in management, environmental conditions, and responses to N supply and Envita® application that was observed across trial sites this growing season. The 2024 suggested retail price (SRP) of Envita® is $16.48 per acre.

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

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

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Balgonie)

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

Treatments:
1. Untreated check
2. Envita® application

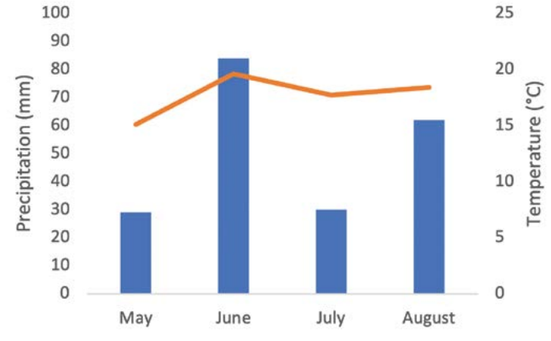
Replicates: Four

General Trial Information:	
Variety	AAC Wheatland VB
Seeding date	May 13
Previous crop	Canola
Soil organic matter	2.7%
Residual Nitrate-N (0-12”)	28 lbs N ac^{-1}
Applied N	80 lbs N ac^{-1} Fall-applied + 57 lbs N ac^{-1} at seeding
Plant density / Row spacing	20 plants ft^{-2} on 10” spacing

Envita® Application:	
Date / Time	June 9 at 4:00 p.m.
Crop stage	4-5 leaf
Tank mix	No
Water volume	10 gal ac^{-1}
Weather conditions	Sunny, 23°C

In-crop pesticide applications:	
June 8	Manipulator + Simplicity + Stellar XL
July 3	Miravis Ace + Keysal 90

Weather: *Climate FieldView (precip) + Qu’Appelle 1 EC weather station (temp)*



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Check	4592 (76.5)	11.5	410	36.3
Envita®	4677 (77.9)	11.4	412	37.6
SE [2]	± 63 (1.0)	± 0.3	± 0.7	± 0.9
P-value [3]	*0.27*	*0.73*	*0.14*	*0.21*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to spring wheat under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of CORE AG INPUTS **in White Butte**

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Craik)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in wheat under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®

Replicates: Three

General Trial Information:

Variety	AAC Viewfield	
Seeding date	May 29	
Previous crop	Canola	
Soil organic matter	2.8%	
Residual Nitrate-N (0-24")	89 lbs ac^{-1}	
Applied N	UAN sideband	90 lbs N ac^{-1} (Normal) 81 lbs N ac^{-1} (Reduced)
Plant density / Row spacing	24 plants ft^{-2} on 12" spacing	

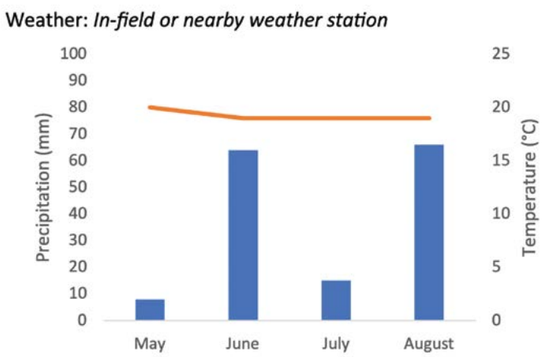
Envita® Application:

Date / Time	June 30 at 7:30 a.m.
Crop stage	5 leaf on main stem
Tank mix	HiActivate
Water volume	15 gal ac^{-1}
Weather conditions	Clear skies, 20°C

In-crop pesticide applications:

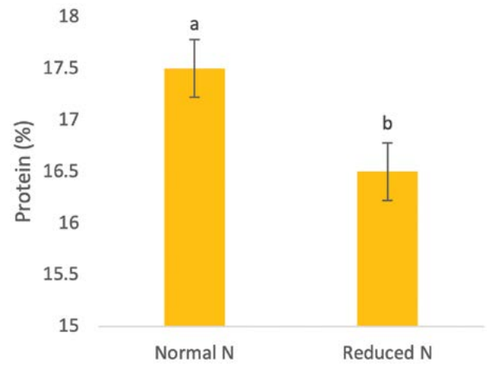
June 26	Horizon + Barricade II

Weather: *In-field or nearby weather station*



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g 0.5L^{-1})	Seed size (g 1000 seeds^{-1})
Normal N Check	1239 (20.6)	17.7	386	26.8
Normal N + Envita®	1295 (21.6)	17.4	389	27.2
Reduced N Check	1422 (23.7)	16.7	385	27.9
Reduced N + Envita®	1485 (24.8)	16.4	390	28.2
SE [2]	± 94 (1.6)	± 0.40	± 3.0	± 0.53
P-value (N rate) [3]	*0.08**	*0.04***	*0.97*	*0.08**
P-value (Envita®)	*0.53*	*0.48*	*0.23*	*0.52*
P-value (N x E) [4]	*0.97*	*0.98*	*0.65*	*0.90*



The effect of applied N rate on wheat protein content at Craik. Treatments labeled with the same letter are not significantly different.

Summary:
Protein content was significantly lower (P<0.05) with the reduced N-rate compared to the normal rate N. Rate may have also influenced yield and seed size. However, there were no differences in yield or grain quality of spring wheat resulting from application of Envita® foliar-applied N-fixing bacteria, regardless of applied N rate, under these trial conditions.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of
Sask Wheat DEVELOPMENT COMMISSION

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Cutknife)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in wheat under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®

Replicates: Three

General Trial Information:

Variety	AAC Wheatland VB	
Seeding date	May 14	
Previous crop	Wheat	
Soil organic matter	4.7%	
Residual Nitrate-N (0-24")	55 lbs ac^{-1}	
Applied N	UAN with seed	94 lbs N ac^{-1} (Normal) 85 lbs N ac^{-1} (Reduced)
Plant density / Row spacing	23 plants ft^{-2} on 12" spacing	

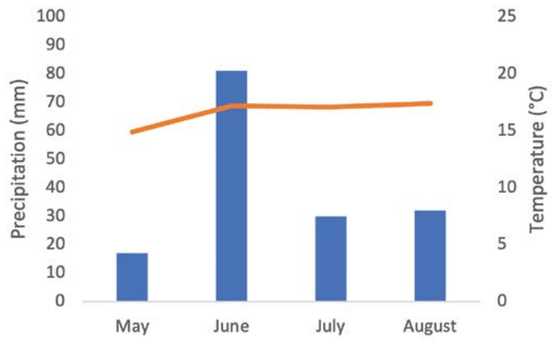
Envita® Application:

Date / Time	June 1 at mid-morning
Crop stage	3 leaf
Tank mix	No
Water volume	10 gal ac^{-1}
Weather conditions	Warm morning, hot afternoon

In-crop pesticide applications:

June 12	Velocity
June 30	Prosaro

Weather: *Scott CDA EC weather station*



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Normal N Check	4296 (71.6)	12.8	403	35.7
Normal N + Envita®	4109 (68.5)	13.3	403	36.1
Reduced N Check	4158 (69.3)	13.1	405	36.2
Reduced N + Envita®	4230 (70.5)	12.9	402	36.2
SE [2]	± 93 (1.5)	± 0.45	± 2.1	± 0.7
P-value (N rate) [3]	*0.89*	*0.79*	*0.60*	*0.70*
P-value (Envita®)	*0.36*	*0.71*	*0.39*	*0.81*
P-value (N x E) [4]	*0.06**	*0.47*	*0.19*	*0.82*

Summary:
There is a moderate probability that the yield response to Envita® application may have been influenced by N rate ($P<0.1$). The results suggest that under these trial conditions, Envita® application may have reduced yield at the normal N rate but did not affect yield at the reduced N rate. Grain quality was not affected by either N rate or Envita® application.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of
Sask Wheat DEVELOPMENT COMMISSION

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Davidson)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in wheat under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®
5. Low N rate – Untreated
6. Low N rate + Envita®

Replicates: Three

General Trial Information:

Variety	AAC Hodge VB	
Seeding date	May 2	
Previous crop	Canola	
Soil organic matter	3.0%	
Residual Nitrate-N (0-24")	40 lbs ac^{-1}	
Applied N	Granular side-band	77 lbs N ac^{-1} (Normal) 70 lbs N ac^{-1} (Reduced) 34 lbs N ac^{-1} (Low)
Plant density / Row spacing	23 plants ft^{-2} on 12" spacing	

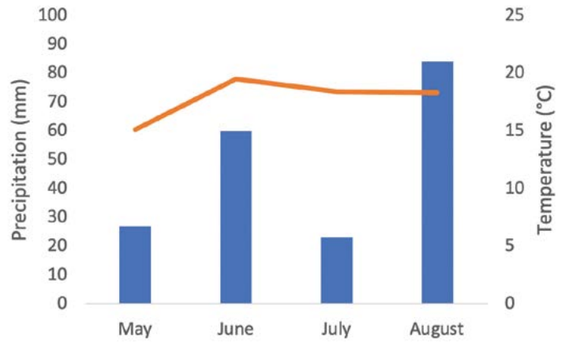
Envita® Application:

Date / Time	June 5
Crop stage	5-6 leaf, 2-3 tillers
Tank mix	No
Water volume	14.5 gal ac^{-1}
Weather conditions	Sunny, 25°C

In-crop pesticide applications:

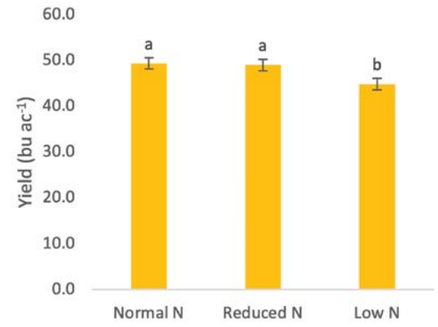
May 22	OnDeck + Horizon
June 7	2,4-D

Weather: *in-field weather station*



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Normal N Check	2930 (48.8)	14.1	399	33.5
Normal N + Envita®	2997 (50.0)	14.0	400	34.5
Reduced N Check	3040 (50.7)	14.0	400	34.1
Reduced N + Envita®	2847 (47.5)	13.9	399	34.0
Low N Check	2769 (46.1)	13.5	402	34.4
Low N + Envita®	2612 (43.5)	13.6	400	34.3
SE [2]	± 106 (1.8)	± 0.45	± 2.3	± 0.71
P-value (N rate) [3]	*0.04***	*0.44*	*0.68*	*0.87*
P-value (Envita®)	*0.30*	*0.96*	*0.71*	*0.63*
P-value (N x E) [4]	*0.44*	*0.97*	*0.66*	*0.66*



The effect of applied N rate on wheat yield at Davidson. Treatments labeled with the same letter are not significantly different.

Summary:
Yield was significantly lower with the low N rate compared to the normal and reduced N rates. We were unable to detect a difference in yield as a result of the application of Envita® foliar-applied N-fixing bacteria to spring wheat, regardless of N rate. Grain quality was not affected by either N rate or Envita® application.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of

WAgS
WARKENTIN AG SERVICES

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Delisle)

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

Treatments:
1. Untreated check
2. Envita® application

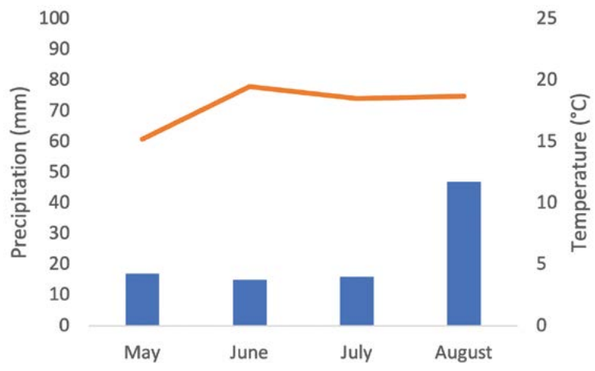
Replicates: Three

General Trial Information:	
Variety	AAC Starbuck VB
Seeding date	May 6
Previous crop	Lentil
Soil organic matter	3.4%
Residual Nitrate-N (0-24")	67 lbs N ac^{-1}
Applied N	105 lbs N ac^{-1} mid-row band urea in a granular blend
Plant density / Row spacing	24 plants ft^{-2} on 10" spacing

Envita® Application:	
Date / Time	June 6 at 6:20 p.m.
Crop stage	4 leaf, 2 tillers
Tank mix	Thumper + Axial
Water volume	10 gal ac^{-1}
Weather conditions	23°C

In-crop pesticide applications:	
June 6	Thumper + Axial

Weather: *Outlook EC station*



Results:				
Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Check	3005 (50.1)	15.1	377.0	28.3
Envita®	2969 (49.5)	14.8	376.5	29.0
SE [2]	± 155 (2.6)	± 0.21	± 2.4	± 0.60
P-value [3]	*0.69*	*0.36*	*0.54*	*0.40*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to spring wheat under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of

Sask Wheat DEVELOPMENT COMMISSION

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Hepburn)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in wheat under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®

Replicates: Three

General Trial Information:

Variety	AAC Starbuck VB	
Seeding date	May 13	
Previous crop	Canola	
Soil organic matter	5.1%	
Residual Nitrate-N (0-24”)	141 lbs ac^{-1}	
Applied N	70 Urea:30 ESN + granular blend	80 lbs N ac^{-1} (Normal) 74 lbs N ac^{-1} (Reduced)
Plant density / Row spacing	26 plants ft^{-2} on 12” spacing	

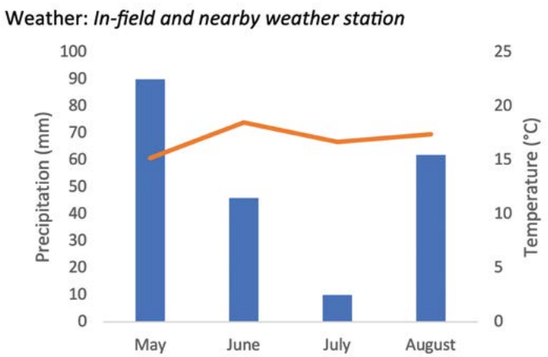
Envita® Application:

Date / Time	June 7
Crop stage	3 leaf
Tank mix	No
Water volume	20 gal ac^{-1}
Weather conditions	20-23°C, ~40% RH

In-crop pesticide applications:

June 6	Simplicity GoDri + Stellar

Weather: *In-field and nearby weather station*



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Normal N Check	4190 (69.8)	11.8	403	39.2
Normal N + Envita®	4177 (69.6)	12.0	405	40.3
Reduced N Check	3817 (63.6)	12.3	402	39.3
Reduced N + Envita®	4017 (66.9)	11.9	404	40.3
SE [2]	± 128 (2.1)	± 0.43	± 1.8	± 0.48
P-value (N rate) [3]	*0.07**	*0.63*	*0.51*	*0.96*
P-value (Envita®)	*0.49*	*0.80*	*0.25*	*0.09**
P-value (N x E) [4]	*0.43*	*0.49*	*0.90*	*0.90*

Summary:
There is a moderate probability that yield was lower with the reduced N rate compared to the normal N rate ($P<0.1$). There was no significant difference in yield as a result of the application of Envita® foliar-applied N-fixing bacteria to spring wheat, regardless of N rate. Grain quality was not affected by N rate. There was also a moderate probability that increased seed size was a result of Envita® application ($P<0.1$). Protein and test weight were not affected by Envita® application.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of
CO-OP LAKE COUNTRY

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Indian Head - IHARF)

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

Treatments:
1. Untreated check
2. Envita® application

Replicates: Four

General Trial Information:	
Variety	AAC Wheatland VB
Seeding date	May 14
Previous crop	Canola
Soil organic matter	5.2%
Residual Nitrate-N (0-24")	13 lbs ac^{-1}
Applied N	110 lbs. ac^{-1}
Plant density / Row spacing	25-30 plants ft^{-2} on 12" spacing

Envita® Application:	
Date / Time	June 19
Crop stage	5.5 leaf
Tank mix	Agral 90
Water volume	13 gal ac^{-1}
Weather conditions	Light rain overnight, Max 23°C, Daytime RH 43-68%

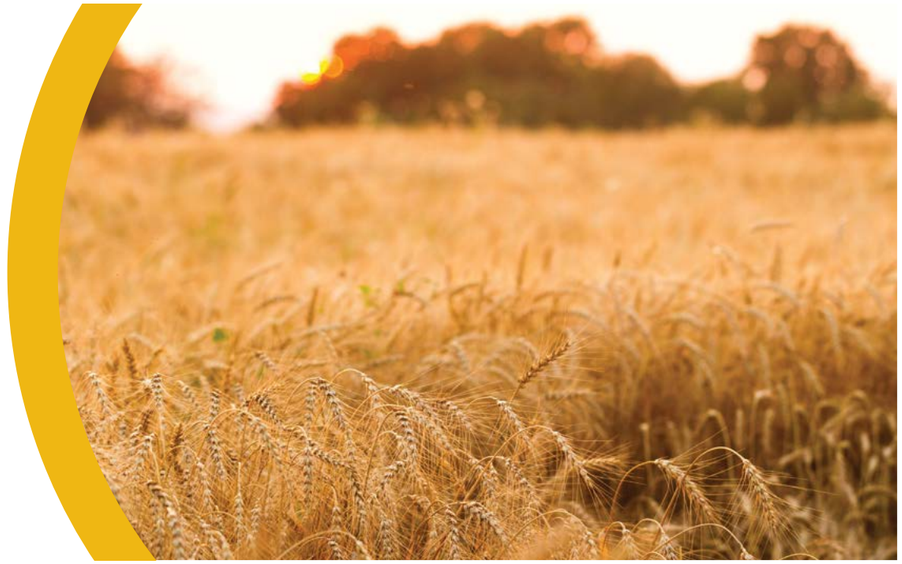
In-crop pesticide applications:	
June 10	Varro + OcTTain XL + Ammonium sulfate
July 5	Prosaro Pro

Weather: *In-field precip + Environment Canada Temps (Indian Head CDA)*

Results:				
Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Check	4258 (71.0)	11.9	398.6	35.3
Envita®	4195 (69.9)	11.9	398.5	35.1
SE [2]	± 54 (0.9)	± 0.1	± 0.8	± 0.2
P-value [3]	*0.19*	*0.75*	*0.87*	*0.64*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to spring wheat under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.



To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of IHARF Indian Head Agricultural Research Foundation **and AAFC Indian head**

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Indian Head)

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

Treatments:
1. Untreated check
2. Envita® application

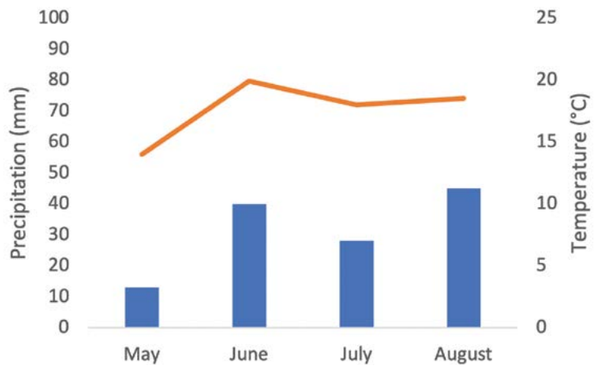
Replicates: Four

General Trial Information:	
Variety	AAC Elie
Seeding date	May 14
Previous crop	Lentil
Soil organic matter	3.0%
Residual Nitrate-N (0-24")	74 lbs N ac^{-1}
Applied N	121 lbs N ac^{-1} urea side-band
Plant density / Row spacing	28 plants ft^{-2} on 7" spacing

Envita® Application:	
Date / Time	June 15 at 8:00 a.m.
Crop stage	Tiller
Tank mix	Agral 90
Water volume	10 gal ac^{-1}
Weather conditions	High humidity, 16°C

In-crop pesticide applications:	
June 9	Varro + MCPA + Audible
July 5	Prosaro Pro (Aerial)

Weather: *In-field weather station*



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Check	4529 (75.5)	14.6	386.5	33.9
Envita®	4540 (75.7)	14.6	387.0	33.7
SE [2]	± 71 (1.2)	± 0.1	± 0.9	± 0.5
P-value [3]	*0.92*	*0.64*	*0.68*	*0.73*

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to spring wheat under these trial conditions.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of

IHARF
INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Kipling)

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

Treatments:
1. Untreated check
2. Envita® application

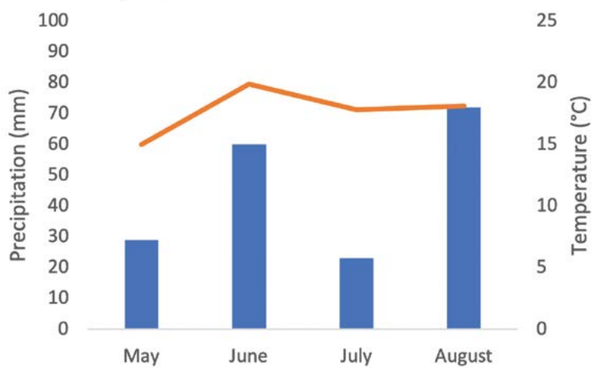
Replicates: Four

General Trial Information:	
Variety	SY Torach
Seeding date	May 27
Previous crop	Canola
Soil organic matter	3.3%
Residual Nitrate-N (0-24")	42 lbs N ac^{-1}
Applied N	90 lbs N ac^{-1} urea (granular blend) side-band
Plant density / Row spacing	25 plants ft^{-2} on 12" spacing

Envita® Application:	
Date / Time	June 27 at 8:00 a.m.
Crop stage	3 leaf
Tank mix	Velocity
Water volume	10 gal ac^{-1}
Weather conditions	Dry, warm

In-crop pesticide applications:	
June 27	Velocity

Weather: *Kipling EC station*



Results:				
Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Check	1682 (28.0)	13.3	380.0	31.6
Envita®	1684 (28.1)	13.0	381.3	32.1
SE [2]	± 129 (2.1)	± 0.2	± 2.1	± 0.2
P-value [3]	*0.99*	*0.05***	*0.30*	*0.11*

Summary:
We were unable to detect differences in yield as a result of the application of Envita® foliar-applied N-fixing bacteria to spring wheat under these trial conditions. Protein was significantly lower with Envita® application than in untreated wheat (P<0.05). Test weight and seed size were unaffected by Envita® application.

Economics:
There was no significant difference in yield between treatments. Therefore, the most economical treatment is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of **in Moosomin**

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Durum Wheat
(Milestone)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in wheat under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®

Replicates: Three

General Trial Information:

Variety	AAC Congress Durum	
Seeding date	May 21	
Previous crop	Canola	
Soil organic matter	4.9%	
Residual Nitrate-N (0-24")	61 lbs ac^{-1}	
Applied N	Urea mid-row band	119 lbs N ac^{-1} (Normal) 107 lbs N ac^{-1} (Reduced)
Plant density / Row spacing	22 plants ft^{-2} on 10" spacing	

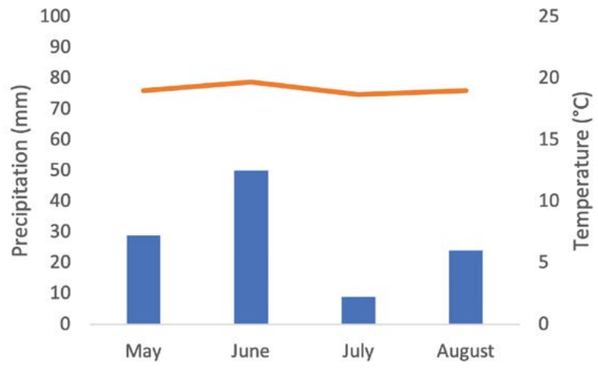
Envita® Application:

Date / Time	June 22, 5:30 a.m.
Crop stage	6 leaf, 2 tillers
Tank mix	No
Water volume	10 gal ac^{-1}
Weather conditions	12°C, Wind 11 km hr^{-1}, High humidity

In-crop pesticide applications:

June 9	Traxos + Stellar
July 15	Miravis Ace

Weather: *In-field weather station*



Results:

Treatment	Plant tissue (% N)[5]	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g $0.5L^{-1}$)	Seed size (g 1000 $seeds^{-1}$)
Normal N Check	4.86	4368 (72.8)	12.5	405	39.3
Normal N + Envita®	4.74	4316 (71.9)	11.2	405	39.8
Reduced N Check	4.70	4412 (73.5)	12.7	403	38.6
Reduced N + Envita®	4.66	4373 (72.9)	11.7	406	39.4
SE [2]	-	± 178 (3.0)	± 0.9	± 1.5	± 0.8
P-value (N rate) [3]	-	*0.72*	*0.72*	*0.83*	*0.42*
P-value (Envita®)	-	*0.75*	*0.20*	*0.17*	*0.37*
P-value (N x E) [4]	-	*0.96*	*0.85*	*0.26*	*0.82*

(5) Composite samples were submitted; statistical likelihood of treatment effect can not be determined.

Summary:
We were unable to detect differences in yield or grain quality as a result of the application of Envita® foliar-applied N-fixing bacteria to durum wheat, regardless of applied N rate, under these trial conditions.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of

KAV **Kessler Ag Ventures**

WHEAT WISE
Plotting the Future

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Plenty)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in wheat under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®

Replicates: Three

General Trial Information:

Variety	AAC Brandon	
Seeding date	May 10	
Previous crop	Flax	
Soil organic matter	3.7%	
Residual Nitrate-N (0-24")	134 lbs ac^{-1}	
Applied N	Variable Rate UAN	Average 42 lbs N ac^{-1} (Normal) Average 38 lbs N ac^{-1} (Reduced)
Plant density / Row spacing	34 plants ft^{-2} on 12" spacing	

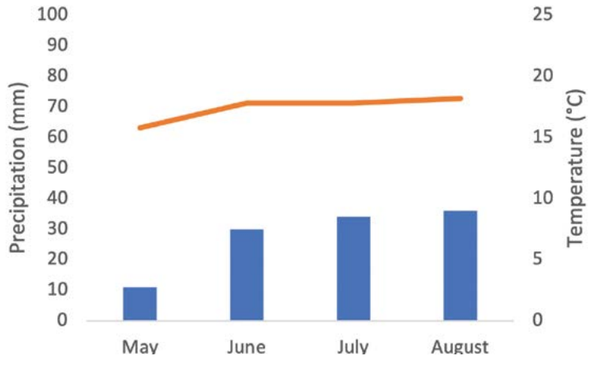
Envita® Application:

Date / Time	June 9 in the morning
Crop stage	4-5 leaf
Tank mix	Barricade + Simplicity
Water volume	10 gal ac^{-1}
Weather conditions	Low 10°C, High 25°C

In-crop pesticide applications:

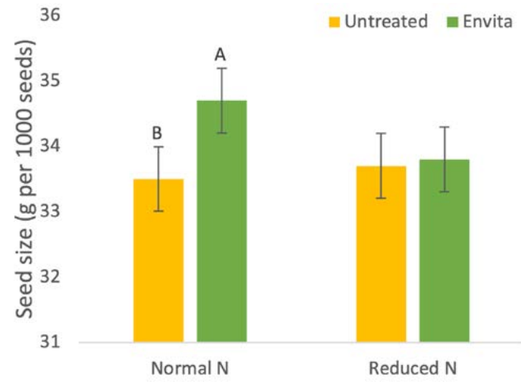
June 9	Barricade + Simplicity (on untreated)

Weather: *Local station (precip)*
+ Kindersley Airport EC station (temps)



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g 0.5L^{-1})	Seed size (g 1000 seeds^{-1})
Normal N Check	1857 (31.0)	15.5	395	33.5
Normal N + Envita®	1884 (31.4)	15.4	397	34.7
Reduced N Check	1969 (32.8)	15.3	397	33.7
Reduced N + Envita®	1785 (29.7)	15.5	397	33.8
SE [2]	± 53 (0.9)	± 0.2	± 2.7	± 0.5
P-value (N rate) [3]	*0.90*	*0.83*	*0.79*	*0.16*
P-value (Envita®)	*0.17*	*0.95*	*0.49*	*0.03***
P-value (N x E) [4]	*0.08**	*0.31*	*0.36*	*0.07**



The effect of Envita® on seed size of wheat at two different applied N rates at Plenty. Note the seed size axis has been abbreviated. Treatments labeled with the same letter are not significantly different.

Summary:
There was a moderate probability (P<0.1) that the effect of Envita® may have differed with applied N rate. We were unable to detect a difference in protein or test weight as a result of the application of Envita®, however there was a significant effect of Envita® on seed size (P<0.05). Seed size was significantly higher with Envita® application at the normal N rate, but seed size was not affected by Envita® application at the reduced N rate.

Economics:
There was no significant difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of

MAX AG CONSULTING Ltd.

Foliar-Applied Nitrogen-Fixing Biological Products In Spring Wheat
(Wynyard)

Objective: To determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product (Envita®) in wheat under varying rates of applied N fertilizer.

Treatments:
1. Normal N rate – Untreated
2. Normal N rate + Envita®
3. Reduced N rate – Untreated
4. Reduced N rate + Envita®
5. Low N rate – Untreated
6. Low N rate + Envita®

Replicates: Three

General Trial Information:

Variety	AAC Starbuck VB	
Seeding date	May 14	
Previous crop	Canola	
Soil organic matter	3.8%	
Residual Nitrate-N (0-24")	36 lbs ac^{-1}	
Applied N	Urea (31 lbs N ac^{-1} for all treatments) + N-lock treated urea (VR) to total:	82 lbs. N ac^{-1} (Normal) 74 lbs. N ac^{-1} (Reduced) 62 lbs. N ac^{-1} (Low)
Plant density / Row spacing	Moderate density 12" spacing	

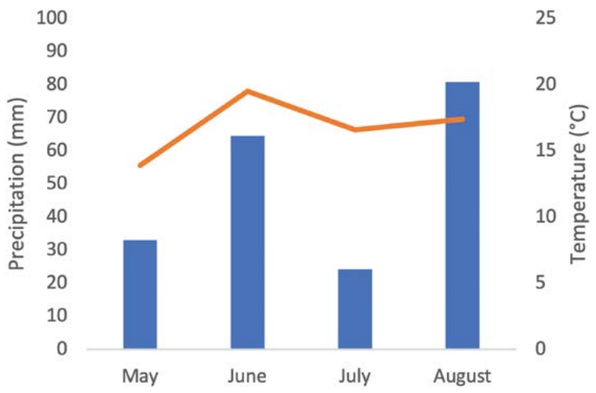
Envita® Application:

Date / Time	June 7 at 11:43 a.m.
Crop stage	Late herbicide timing (5-6 leaf)
Tank mix	Agral 90
Water volume	12 gal ac^{-1}
Weather conditions	26°C, RH 60%, wind 7 km hr^{-1}

In-crop pesticide applications:

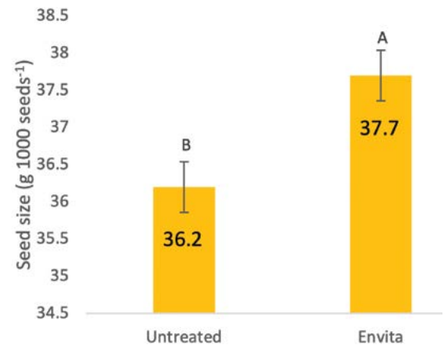
June 7	Rexade

Weather: *Environment Canada Station - Wynyard*



Results:

Treatment	Yield [1] (lbs ac^{-1} / bu ac^{-1})	Protein (%)	Test weight (g 0.5L^{-1})	Seed size (g 1000 seeds^{-1})
Normal N Check	3605 (60.1)	13.4	381	35.9
Normal N + Envita®	4081 (68.0)	12.9	382	36.8
Reduced N Check	3821 (63.7)	13.1	383	36.4
Reduced N + Envita®	3957 (65.9)	12.7	383	37.4
Low N Check	3851 (64.2)	12.9	380	36.2
Low N + Envita®	3952 (65.9)	12.3	374	39.0
SE [2]	± 107 (1.8)	± 0.3	± 5	± 0.7
P-value (N rate) [3]	*0.81*	*0.20*	*0.45*	*0.15*
P-value (Envita®)	*0.06**	*0.07**	*0.71*	*0.01***
P-value (N x E) [4]	*0.16*	*0.92*	*0.69*	*0.21*



The effect of Envita® application on harvested wheat seed size at Wynyard, averaged across N rates. Note the seed size axis has been abbreviated. Treatments labeled with the same letter are not significantly different.

Summary:
Wheat yield and quality were not significantly affected by N rate, regardless of Envita application, under these trial conditions. Averaged across N rates, Envita application significantly increased seed size ($P<0.01$), and may have increased yield ($P<0.1$) and decreased protein ($P<0.1$).

Economics:
There was no significant ($P<0.05$) difference in yield resulting from Envita® application, regardless of applied N rate. Therefore, the most economical treatment in regard to Envita® application is the check.

To review footnote references please refer to overall trial summary on page 103.

This trial was conducted with the agronomic support of

NOTES

NOTES