IHARF

INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

2024 Annual Report









IHARF

Box 156

Indian Head, SK

S0G 2K0

Ph: (306) 695-4200

www.iharf.ca

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Introduction

The Indian Head Agricultural Research Foundation (IHARF) is a non-profit, producer directed applied research organization which works closely with various levels of government, commodity groups, private industry and producers.

Founded in 1993, the mission of IHARF is to promote profitable and sustainable agriculture by facilitating research and technology transfer activities for the benefit of its members and the agricultural community at large.

IHARF Mandate

- Identify new research priorities required to meet the needs of agriculture now and in the future,
- Support public good research - research that has value to the public but is not tied to studying or promoting a specific product or service,
- Maintain strategic alliances with the agricultural community in order to strengthen the provincial research base,
- Play an active role in the technology transfer process and be involved in public education and awareness activities,
- Maintain a scientific research base at the Indian Head Research Farm.

IHARF Board of Directors

IHARF is led by a nine member Board of Directors consisting of producers and industry stakeholders who volunteer their time and provide guidance to the organization. Residing all across southeastern Saskatchewan, IHARF Directors are dedicated to the betterment of the agricultural community as a whole. The 2024 IHARF Directors included:

- Cameron Gibson - President *(Kendal)*
- Justin Ritco - Vice President *(Regina)*
- Jennifer Kreway - Secretary / Treasurer *(Regina)*
- Curtis Russell *(Indian Head)*
- Thom Weir *(Yorkton)*
- Bryce Thompson *(Regina)*
- Lisa Templeton *(Rouleau)*
- Danielle Stephens *(Regina)*
- Curtis Kuchinka *(Regina)*

Ex-Officio

IHARF receives additional guidance from an experienced team of Agriculture and Agri-Food Canada (AAFC) personnel at the Indian Head Research Farm and Ministry of Agriculture, Government of Saskatchewan, they include:

- Bill May - Research Scientist
- Chris Omoth - Research Assistant

IHARF Staff

The 2024 team of IHARF staff included:

- Danny Petty - Executive Manager
- Chris Holzapfel - Research Manager
- Chathuri Weerasekara – Sr. Research Technician
- Doug Stewart - Farm Technician
- Zak Woidyla - Research Technician

Dr. Guy Lafond Memorial Award



Guy had a passion for agricultural research and was dedicated to the advancement of the industry. He was instrumental in establishing the Indian Head Agricultural Research Foundation, and believed in IHARF's Mission, Mandate and the training of young agronomists.

The recipient of the Dr. Guy Lafond Memorial Award in 2024 was Aaron Brinkman. Aaron was pursuing his Master's degree in plant science at the University of Alberta, studying the interactions between the pathogen *Plasmodiophora brassicae* and canola. Specifically, his research examined how the implementation of cultivar mixtures of canola affects pathotype shifts of clubroot over time.

Extension Events

Indian Head Crop Management Field Day

On July 16, 2024, IHARF and AAFC hosted the annual Indian Head Crop Management Field Day. 145 producers and agronomists from across the prairies came for tours led by IHARF, AAFC researchers, and industry specialists.

AgriARM Research Update

IHARF, along with Agriculture Applied Research Management (AgriARM) sites from across the province, jointly hosted the virtual AgriARM Research Update on March 27, 2025. The event highlighted components of each organizations applied research and demonstration programs.

IHARF Soil and Crop Management Seminar

On February 5, 2025, IHARF hosted its annual winter seminar at Melville, SK. 100 producers and agronomists attended for the IHARF Soil & Crop Management Seminar. Presentations were delivered by:

- Bill May (AAFC Indian Head)
- Chris Holzapfel (IHARF)
- Ishita Patel (NARF)
- Meghan Rosso (Saskatchewan Ministry of Agriculture)
- Mike Hall (ECRF)
- Warren Ward (Canola Council of Canada)

Presentations from each speaker are available for download at www.iharf.ca.

2024 IHARF Partners

Every year, IHARF works with many organizations dedicated to advancing agriculture into the future. IHARF would like to thank all of our partners for their outstanding support of our efforts in 2024:

Platinum

- Agriculture & Agri-Food Canada - Indian Head Research Farm
- BASF
- Bayer CropScience
- Canada/Saskatchewan ADOPT Program
- Canola AgriScience Research Cluster
- Saskatchewan AgriARM Program
- Saskatchewan Barley Development Commission
- Saskatchewan Canola Development Commission
- Saskatchewan Pulse Growers
- Saskatchewan Strategic Field Program
- Saskatchewan Wheat Development Commission
- Syngenta

Gold

- Koch Agronomic Services
- Western Grains Research Foundation
- WinField United

Silver

- Anglo American
- BrettYoung
- Gowan
- Mazergroup
- Mosaic
- Mountain Valley MD
- Novozymes BioAg

Bronze

- CanMar Farms - Indian Head
- Delage Farms
- GrainShark.com
- LL Seeds
- Manitoba Crop Alliance
- Nutrien Ag Solutions
- Town of Indian Head
- University of Manitoba
- University of Saskatchewan

AgriARM

The Saskatchewan AgriARM (Agriculture Applied Research Management) program connects eight regional, applied research and demonstration organizations into a province wide network. Each location is organized as a non-profit organization, and is led by volunteer Boards of Directors, generally comprised of producers in their respective areas.

Each site receives base-funding from the Saskatchewan Ministry of Agriculture to assist with operating and infrastructure costs; with project-based funding sought after through various government funding programs, producer / commodity groups and industry stakeholders. AgriARM provides a forum where government, producers, researchers and industry can partner on provincial and regional projects.

The eight AgriARM organizations found throughout Saskatchewan include:

- Conservation Learning Centre (CLC), Prince Albert
- East Central Research Foundation (ECRF), Yorkton
- Indian Head Agricultural Research Foundation (IHARF), Indian Head
- Irrigation Crop Diversification Corporation (ICDC), Outlook
- Northeast Agriculture Research Foundation (NARF), Melfort
- South East Research Farm (SERF), Redvers
- Western Applied Research Corporation (WARC), Scott
- Wheatland Conservation Area (WCA), Swift Current

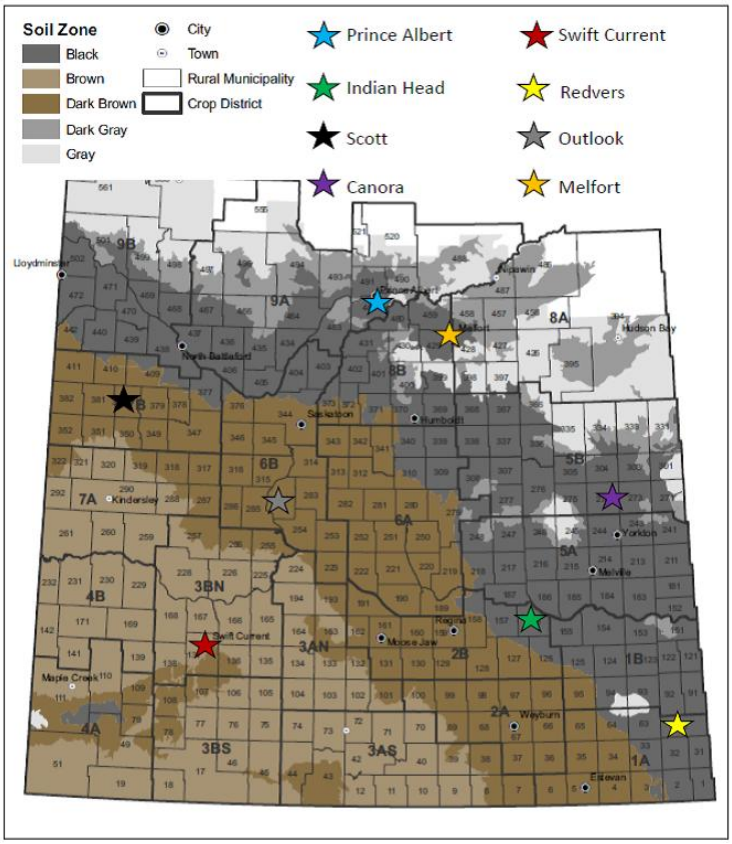


Figure 1. Locations of organizations comprising the Saskatchewan AgriARM Network.

Environmental Data

Weather data for Indian Head, Melfort, Scott, and Swift Current, Saskatchewan are provided, as many of the studies were conducted at these locations and the data were combined for analyses. Data were obtained from an Environment Canada weather station found at each site and accessed online [http://climate.weather.gc.ca/historical_data/search_historic_data_e.html].

Mean temperatures and total precipitation amounts for May through August are presented with the long-term averages for each location in Tables 1 and 2, respectively. In 2024, for all locations, temperatures were slightly below average or approximately average in May, well below-average in June, well above average in July, and slightly or (in the case of Swift Current) well-above in August. The precipitation patterns were such that cumulative rainfall in May and June were above average at all locations but well below average in July. August participation varied with conditions being below average at all locations except Indian Head where frequent August storms resulted in above average rainfall totals. Over the four-month period, all locations had close to average temperatures and precipitation totals except Scott, which reported a cumulative amount of 113% of average growing season rainfall.

Table 1. Mean monthly temperatures for the 2024 growing season and long-term normals (1981-2010).

		May	June	July	August	Average
				^0C		
Indian Head	2024	10.6	13.6	19.5	17.9	15.4
	Normal	10.8	15.8	18.2	17.4	15.6
Melfort	2024	10.1	13.2	19.4	17.4	15.0
	Normal	10.7	15.9	17.5	16.8	15.2
Scott	2024	9.8	13.3	18.9	17.4	14.9
	Normal	10.8	14.8	17.3	16.3	14.8
Swift Current	2024	10.6	14.3	21.3	19.4	16.4
	Normal	11.0	15.7	18.4	17.9	15.8

Table 2. Total monthly precipitation for the 2024 growing season and long-term normals (1981-2010).

		May	June	July	August	Total
				mm		
Indian Head	2024	63.7	74.9	37.4	71.2	248
	Normal	51.7	77.4	63.8	51.2	244
Melfort	2024	73.0	84.0	36.1	16.9	210
	Normal	42.9	54.3	76.7	52.4	226
Scott	2024	74.2	112.0	26.7	42.8	256
	Normal	38.9	69.7	69.4	48.7	227
Swift Current	2024	73.6	52.1	18.6	18.2	163
	Normal	42.1	66.1	44.0	35.4	188

Research

IHARF trials were situated at various locations in the Indian Head area, with the majority of projects located on NW28-18-12 W2 and NE27-18-12 W2. Each trial consisted of numerous plots, each representing a specific treatment being evaluated in that particular project (eg. rates, seed treatments, varieties, etc.). Apart from the specific treatments being evaluated, plots were generally cared for using best management practices and in a manner which was consistent with normal or typical practices in the Indian Head area. Deviations in agronomy and crop management have been specified where required as a result of the study objectives or treatments being evaluated and are indicated in the description of each trial. In general, plots were seeded as early as possible in mid-May to early June, with 8' x 35' plots and 12" row spacing using a SeedMaster air drill, or with 12' x 35' plots and 12" row spacing using a ConservaPak air drill. Cultivars and varieties were representative of those used by producers in the area, and recommended seeding practices (i.e. rate, depth) were typically used. Fertility and insect, weed and disease levels were normally kept non-limiting using commercial fertilizers and registered pesticide products so that yields would not be limited by anything other than the specific treatments being evaluated. Plots were desiccated or swathed when required, and harvested as closely as possible to the appropriate timing using a Wintersteiger plot combine, Kincaid-8 XP plot combine, or modified MF300 combine. Apart from the treatments being evaluated, all agronomy and crop management practices were consistent for every plot within a trial.

Statistical Analyses

The majority of trials were conducted using a randomized complete block design (RCBD), or a modified version of this experimental design, meaning each treatment is randomly assigned to plots within replicates (blocks). Split-plot designs were also frequently used. Treatments were replicated 4 times allowing for the statistical analyses of results to assess whether the observed differences in the responses (eg. plant density, height, seed yield) were an effect of the treatment being evaluated or due to natural variability or experimental error. If a difference between two treatments is significant, it should be repeatable and reasonably expected, under the conditions in which the trial was conducted. For agricultural research, a significance level of α=0.05 is generally used, which more specifically indicates a 95% probability that an observed effect was caused by the treatment and was not due to random variability or experimental error.

In this report, statistical differences between treatments are represented by letters of the alphabet next to the observed mean (average) for each treatment. Treatment means with the same letter do not significantly differ, while means with different letters are significantly different from one another (

Table 3). In the example below, there was no difference in plant density between the two treatments; however, Treatment 2 resulted in a significantly higher yield than Treatment 1.

Table 3. Example demonstrating how statistical results are presented in the report.

Treatment	Plant Density *(not significantly different)*	Yield *(significantly different)*
Treatment 1	87 a	32 b
Treatment 2	89 a	45 a

Units

Some data are reported in metric terms (i.e. yield responses shown in kilograms per hectare), particularly in cases where it was not practical to convert the values to bushels per acre (bu/ac), as in certain figures. For reference, yield values ranging from 1000-6000 kg/ha are shown with the corresponding values in bu/ac for each crop in Table 4. Alternatively, multiplying the kg/ha by 0.8921 will provide the lbs/ac, making for an easy conversion to bu/ac.

Table 4. Conversion of kg/ha to bu/ac for various crops.

		kg/ha										
		1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
Barley	bu/ac	18.6	27.9	37.2	46.5	55.8	65.1	74.3	83.6	92.9	102.2	111.5
Canola		17.8	26.8	35.7	44.6	53.5	62.5	71.4	80.3	89.2	98.1	107.1
Faba beans		14.9	22.3	29.7	37.2	44.6	52.0	59.5	66.9	74.3	81.8	89.2
Flaxseed		15.9	23.9	31.9	39.8	47.8	55.8	63.7	71.7	79.7	87.6	95.6
Oats		26.2	39.4	52.5	65.6	78.7	91.8	105.0	118.1	131.2	144.3	157.4
Peas		14.9	22.3	29.7	37.2	44.6	52.0	59.5	66.9	74.3	81.8	89.2
Soybeans		14.9	22.3	29.7	37.2	44.6	52.0	59.5	66.9	74.3	81.8	89.2
Wheat		14.9	22.3	29.7	37.2	44.6	52.0	59.5	66.9	74.3	81.8	89.2

Disclaimer

Disclosure of trade names does not imply any endorsement or disapproval of any specific product(s) and is only intended to differentiate treatments and allow producers to identify the specific technologies being demonstrated in the marketplace.

Demonstrating the Efficacy of New Foliar Fungicide Options in Flax

Holzapfel, C. (IHARF) and McInnes, B. (NARF)

Description

The objective of this project was to demonstrate and evaluate the efficacy of newer fungicides registered in flax with varying, and, in some cases, multiple modes of action compared to older options. Fungicides included in this project were Headline EC (older fungicide), Proline 480 SC (older fungicide), Acapela (newer), Dyax (newer), and Veltyma (newer fungicide). Small-plot trials with six treatments were conducted at Indian Head and Melfort, SK in 2024. At each site, the trial was set up as a RCBD with four replicates. The treatments are listed in Table 5. CDC Glas was grown at each location, and disease ratings were done pre- and post-fungicide product applications.

Table 5. List of treatments for the flax fungicide trial at Indian Head and Melfort, SK in 2024.

Treatment #	Treatment description
1	Untreated control - Unsprayed
2	Headline EC - applied at 161 ml/ac
3	Proline 480 SC - applied at 150 ml/ac with non-ionic surfactant, e.g. AgSurf or Agral 90 at 0.125% v/v
4	Acapela - applied at 355 ml/ac
5	Dyax - applied at 160 ml/ac
6	Veltyma - applied at 202 ml/ac

Results

The trials were established successfully at both sites, but hot and dry weather in July resulted in lack of disease and, hastened crop maturity. Consequently, there was no significant effect of fungicide applications or products on disease severity or control. A significant difference between days to maturity was seen at Melfort, where the application of Headline EC delayed flax maturity by two days compared to the unsprayed control and the application of Proline 480 SC. However, yield and test weight of harvested flaxseed were not affected by treatments of fungicides at either site.

Conclusions

Results suggest that fungicide choice is irrelevant in a year when weather conditions are not conducive to disease development. To perform a proper comparison of new vs. old fungicide products registered for use in flax, and in the interest of getting this information out to producers, it will be worthwhile to conduct this project when there is high disease pressure and weather conditions are favourable for disease development.

Acknowledgements

This project was funded by the Agricultural Demonstration of Practices and Technologies (ADOPT) program under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative and Saskatchewan Flax Development Commission (now Sask Oilseeds).

Canola Response to Enhanced Efficiency Nitrogen Fertilizer Products and Blends

Holzapfel, C. (IHARF), McInnes, B. (NARF), Patel, I. (NARF), Galbraith, Z. (CLC), Enns, J. (WARC), Nybo, B. (WCA), Wall, A. (WCA), and Hall, M. (ECRF)

Description

The overall project objective was to demonstrate the effects of side-banded nitrogen (N) enhanced efficiency fertilizer (EEF) products and blends, relative to untreated urea, on canola establishment, yield, and quality. In 2024, field trials were conducted at Indian Head, Melfort, Prince Albert, Yorkton, Scott, and Swift Current, SK. For each location, 14 nitrogen fertilizer treatments were arranged in a four replicate RCBD. The N fertilizer was always side-banded, and the targeted rates included both residual soil NO_3-N (0-60 cm) and any N provided by other fertilizer products (i.e., 11-52-0 or 21-0-0-24). The treatments are listed and described in greater detail in Table 6.

Table 6. Nitrogen treatments evaluated in canola side-banded N fertilizer formulation demonstration trials conducted at Indian Head, Melfort, Prince Albert, Scott, Swift Current, and Yorkton in 2024. All N fertilizer was side-banded, and the N rates include residual soil NO_3-N and any N provided by phosphorus or sulfur products.

#	Formulation	N Rate (soil + fertilizer)	Description
1	n/a	0 N	- only soil N and N from N & P products
2	Urea	75 kg N/ha	- low rate, untreated
3	Urea	125 kg N/ha	- medium rate, untreated
4	Urea	175 kg N/ha	- high rate, untreated
5	25% ESN®	125 kg N/ha	- medium rate, low percentage polymer coated
6	50% ESN®	125 kg N/ha	- medium rate, medium percentage polymer coated
7	75% ESN®	125 kg N/ha	- medium rate, high percentage polymer coated
8	100% ESN®	125 kg N/ha	- medium rate, pure polymer coated
9	25% SUPERU®	125 kg N/ha	- medium rate, low percentage dual inhibitor
10	50% SUPERU®	125 kg N/ha	- medium rate, medium percentage dual inhibitor
11	75% SUPERU®	125 kg N/ha	- medium rate, high percentage dual inhibitor
12	100% SUPERU®	125 kg N/ha	- medium rate, pure dual inhibitor
13	ANVOL®	125 kg N/ha	- medium rate, volatilization inhibitor
14	eNtrench™	125 kg N/ha	- medium rate, nitrification inhibitor

Results

Despite high residual N levels at multiple locations (i.e. Swift Current, Prince Albert, and Yorkton in particular), the project was considered successful overall; however, conditions were generally not conducive to either high yields or environmental N losses. To varying degrees, all locations in 2024 started out reasonably wet in May and June with high yield potential; however, hot dry weather in July caused this potential to decline substantially. With these environmental conditions in mind, the lack of yield benefits to EEF N products (relative to untreated urea), or indications in the seed quality data to suggest reduced N losses or enhanced crop uptake, was not unexpected. At Scott, we saw evidence of

seedling toxicity with side-banded N where plant densities declined linearly as the rate of untreated urea was increased. The losses were not large enough to have a negative impact on yield but were highly significant; however, there was strong evidence that polymer coated urea (ESN®) reduced these negative impacts. Polymer coated ESN® is known to improve seed safety and is commonly recommended to allow higher N rates to be applied with single shoot drills; therefore, this result was not unexpected.

Conclusions

This project will be repeated at all six locations in 2025, and our results and recommendations will be updated at that time.

Acknowledgements

Financial support for this demonstration was provided by the Saskatchewan Canola Development Commission (now Sask Oilseeds).

Establishing Nitrogen and Seeding Rate Recommendations for Composite Yellow Mustard Production in Saskatchewan

Wall, A. (WCA), Holzapfel, C. (IHARF), Shaw, L. (SERF), Jacob. C (Sask MOA), Chant, S. (Sask MOA), Marcino, S. (Sask MOA), and Mitzel, R. (Mustard 21)

Description

This project was initiated to define upper and lower limits of applied nitrogen fertilizer and an optimal seeding rate to maximize yield of composite yellow mustard (AAC Yellow 80) compared to an open pollinated variety (Andante). To evaluate this, small-plot research trials were established in 2023 in three different soil zones in Saskatchewan including Swift Current, Indian Head, and Redvers. The trials were repeated at the same locations in 2024. The project was comprised of two separate trials that included both AAC Yellow 80 and Andante yellow mustard. The first trial evaluated each variety at increasing nitrogen rates, and the second trial included each variety with balanced fertility at increasing seed rates. The two trials each arranged in a RCBD with four replicates. The treatments are listed and described in greater detail in Table 7.

Table 7. Nitrogen and seeding rates used in two yellow mustard trials conducted at Swift Current, Indian Head, and Redvers, SK in 2024.

Trial 1 Mustard Variety	Seed Rate*	Residual + Applied Nitrogen (lb N/ac)
AAC Yellow 80	194 seeds/m^2	Soil N^Z
AAC Yellow 80	194 seeds/m^2	60
AAC Yellow 80	194 seeds/m^2	80
AAC Yellow 80	194 seeds/m^2	100
AAC Yellow 80	194 seeds/m^2	120
AAC Yellow 80	194 seeds/m^2	140
AAC Yellow 80	194 seeds/m^2	160

Andante	194 seeds/m^2	Soil N[Z]
Andante	194 seeds/m^2	60
Andante	194 seeds/m^2	80
Andante	194 seeds/m^2	100
Andante	194 seeds/m^2	120
Andante	194 seeds/m^2	140
Andante	194 seeds/m^2	160
Trial 2		
Mustard Variety	Seed Rate	Residual + Applied Nitrogen (lb N/ac)[Y]
AAC Yellow 80	108 seeds/m^2	100
AAC Yellow 80	150 seeds/m^2	100
AAC Yellow 80	194 seeds/m^2	100
AAC Yellow 80	237 seeds/m^2	100
AAC Yellow 80	280 seeds/m^2	100
Andante	108 seeds/m^2	100
Andante	150 seeds/m^2	100
Andante	194 seeds/m^2	100
Andante	237 seeds/m^2	100
Andante	280 seeds/m^2	100

[Z] soil nitrogen varied at each site. [Y] varied according to location. *Seed rate (Trial 1) 237 seeds/m^2 (2023), 194 seeds/m^2 (2024).

Results

In the nitrogen trial, Andante yellow consistently resulted in a higher plant stand than AAC Yellow 80 at each site. In the seed rate trial, Andante generally resulted in higher plant stands compared to AAC Yellow 80 and plant stand increased with increasing seed rate at all sites. Both varieties increased in height with increasing nitrogen up to the moderate rates. Seed rate had no effect on mustard height in 2023. In 2024, height decreased with increasing seed rate at Indian Head and Swift Current by 5-10 cm. Nitrogen rates did not affect lodging at Swift Current, or Redvers in both years. At Indian Head (2023) Andante was more prone to lodging compared to Yellow 80 and slightly increased with nitrogen rates. In 2024 at Indian Head, lodging was quite severe due to wind damage and increased with increasing nitrogen rates. In 2023, seed rate had no significant effect on lodging. However, in 2024 at Indian Head, lodging was severe due to wind damage and increased with increasing seeding rates. Yield potential was negatively affected by limited moisture and above average temperatures across site years. Despite AAC Yellow 80 plant establishment being lower than Andante, average yields of AAC Yellow 80 were consistently and statistically higher compared to Andante for both the nitrogen and seed rate trials.

Conclusions

The field trial will be repeated for the third year at the three sites, and the project will be completed after the 2025 growing season. Preliminary results suggest the optimal seed rate could be lower than the treatments included in this study. Upper nitrogen limits were not clearly defined as environmental conditions varied, but results indicate applying a total of 120N-160N resulted in the highest yielding treatments for site years that received average amounts of precipitation.

Acknowledgements
This project was funded through the Ministry of Agriculture and the Canadian Agriculture Partnership Strategic Field Program (SFP).

Regional Adaptation of Quinoa and Response to Nitrogen and Phosphorus Fertilizer Applications

Holzapfel, C. (IHARF), McInnes, B. (NARF), Patel, I. (NARF), Singh, G. (ISask), Boot, B. (ISask), Nybo, B. (WCA), and Wall, A. (WCA)

Description
The main objectives of this project were to 1) gain experience with quinoa production and gather information on the overall productivity and adaptation of this crop across a range of Saskatchewan soil-climatic zones, 2) demonstrate quinoa response to nitrogen (N) fertilizer rates, and 3) demonstrate quinoa response to phosphorus fertilizer rates. Field trials with quinoa (*Chenopodium quinoa*) were established at Indian Head, Melfort, Outlook, and Swift Current in 2024. The treatments were nitrogen (N) rates ranging from 60-220 kg N/ha and phosphorus (P) rates ranging from 0-60 kg P_2O_5/ha. The N rates were tested with P non-limiting while P rates were tested with N non-limiting. The treatments were arranged in a four replicate RCBD and are summarized in Table 8.

Table 8. Nitrogen (N) and phosphorous (P) rate treatments for the 2024 quinoa fertility demonstrations.

#	N Rate [Z]	P Rate
1 [Y]	60 kg N/ha	40 kg P_2O_5/ha
2 [Y]	100 kg N/ha	40 kg P_2O_5/ha
3 [Y]	140 kg N/ha	40 kg P_2O_5/ha
4 [XY]	180 kg N/ha	40 kg P_2O_5/ha
5 [Y]	220 kg N/ha	40 kg P_2O_5/ha
6 [X]	180 kg N/ha	0 kg P_2O_5/ha
7 [X]	180 kg N/ha	20 kg P_2O_5/ha
8 [X]	180 kg N/ha	60 kg P_2O_5/ha

[Z] N rates include residual NO_3-N (0-60 cm), [Y] Treatment used to evaluate N rate response, [X] Treatment used to evaluate P rate response

Results
Although the season started cool and wet, heat and drought were the biggest limiting factors at most sites. We saw occasional, but minor, increases in seedling mortality and consistent height increases with N, while P effects on height were less consistent. Grain yields were relatively low and, perhaps, less responsive to N and P fertility under the growing conditions encountered. Yields at Indian Head were extremely low (343 kg/ha on average), presumably due to a combination of drought and heat stress during the reproductive growth stages. At Melfort, yields peaked at approximately 1000 kg/ha with N rates of 140-180 kg N/ha, including soil nitrate; however, there was no response to P fertilizer. Under irrigation at Outlook, yields were variable but relatively high and responsive to N, peaking at approximately 2200-2400 kg/ha at 140-180 kg total N/ha, but with a substantial decline at the highest

rate (Figure 2). There was no yield response to P fertilization at Outlook. At Swift Current, where the heat and drought stress were most severe, yields were essentially zero. Despite the low yields at Indian Head, we saw a classic protein response to N with values being similar for N rates of 60-100 kg total N/ha (13.5-13.7%) but increasing rapidly to as high as 16.8% with further increases in N rate (Figure 3). At Melfort, the protein response was weak and only marginally significant at best; however, there were indications of an N benefit with values ranging from as low as 13.4% to 14.3% at the highest N rate. This was similar to Outlook where the response was not as pronounced as at Indian Head but showed protein increasing from 14.2% at the lowest N rate to 15.6% at the highest rate. Phosphorus rates did not affect protein content in any cases.

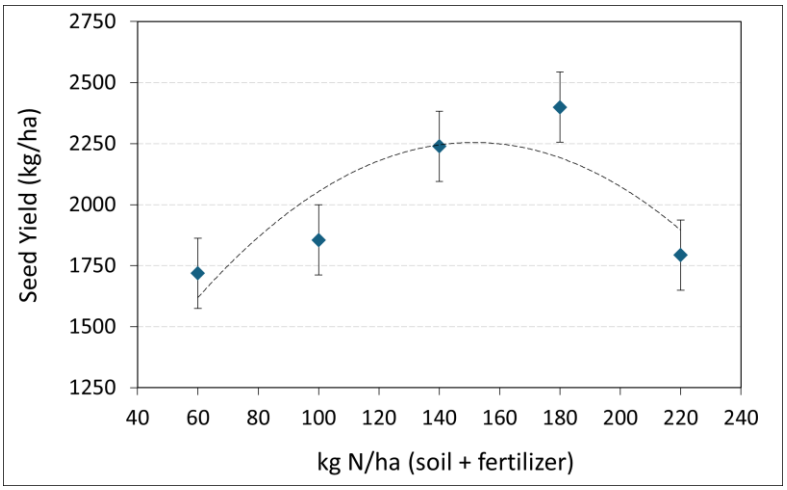


Figure 2. Nitrogen rate effects on quinoa grain yield at Outlook, 2024. The primary N source was side-banded urea. The overall F-test (P = 0.031) and quadratic orthogonal contrast (P = 0.005) results were significant.

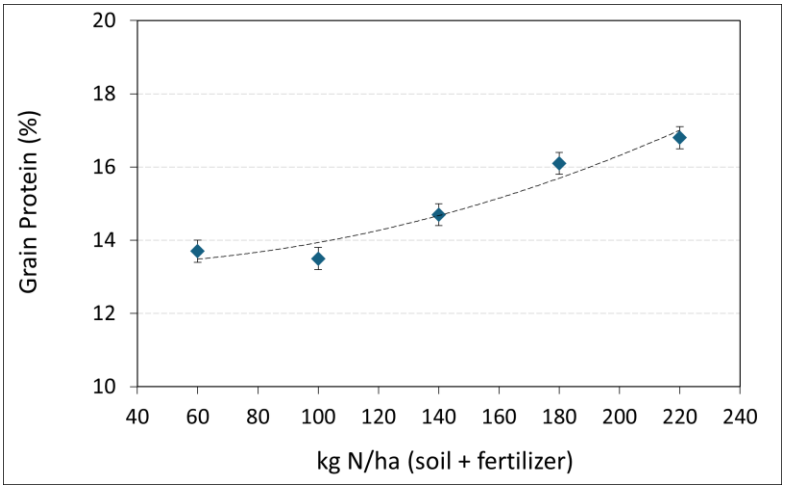


Figure 3. Nitrogen rate effects on quinoa grain protein at Indian Head, 2024. The primary N source was side-banded urea. The overall F-test (P < 0.001) and the linear orthogonal contrast (P < 0.001) were significant. The quadratic orthogonal contrast was marginally significant (P = 0.081).

Conclusions

To conclude, N rates of about 140 kg N/ha, including soil nitrate, and 20-40 kg P2O5/ha will be appropriate under most circumstances with the lower P rate often being sufficient unless yield potential is high or the goal is to increase soil fertility.

Acknowledgements

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Faba Bean Seeding Rates

Singh, G. (ISask), Risula, D. (Sask MOA), McInnes, B. (NARF), and Holzapfel, C. (IHARF)

Description

The main objective of this project was to provide accurate seeding rates of four low vicine/convicine (large and small seed size) faba bean varieties. Field trials were conducted at Outlook, Indian Head, and Melfort in 2024. Of the three trial sites, two were established under natural rainfall conditions (dryland), while the trial in Outlook was irrigated. Four faba bean varieties included, Fabelle (larger seed size), Allison (larger seed size), CDC 1142 (smaller seed size), and CDC 1089 (smaller seed size). Snowbird (smaller seed size) was used as a check variety in this trial as the agronomic information on this variety is known. The field trials included three seeding rate treatments: 45 seeds/m^2 (recommended rate), 30 seeds/m^2 (lower rate), and 60 seeds/m^2 (higher rate). All plots at all sites were seeded in early May on wheat stubble. The treatments were arranged in a RCBD with four replicates.

Results

At all sites, the seeding rate of 60 seeds/m^2 resulted in the highest plant density and the seeding rate of 30 seeds/m^2 resulted in the lowest plant density. Across all sites, the variety Fabelle had the best establishment while the plant density of CDC 1142 was the lowest. Overall, there was low disease pressure at all sites in 2024. Seeding rates of 45 and 60 seeds/m^2 resulted in taller plants compared to the seeding rate of 30 seeds/m^2. The varieties Fabelle and CDC 1143 were the two tallest, Snowbird and CDC 1809 were the shortest, and Allison was similar in height to the rest of the varieties. CDC 1089 also lodged severely in Melfort while other varieties had little to no lodging. Days to maturity were significantly affected by variety and seeding rate at all three sites. Generally, increasing seeding rate hastened maturity at all sites. CDC 1142 took significantly longer to mature at all sites compared to Snowbird, which was the earliest maturing. Average yield for the trial was highest at Outlook (5,774 kg/ha), followed by Melfort (4,312 kg/ha), and lowest at Indian Head (2,533 kg/ha). Generally, yield increased with increased seeding rate but there was no significant difference in yield for the seeding rates of 45 and 60 seeds/m^2 at any of the sites. However, at Melfort, all three seeding rates produced yields that were similar to each other. On average, CDC 1142 yielded the lowest at all sites and was not significantly different from CDC 1089. Fabelle and Allison were amongst the highest yielding at all sites.

Conclusions

The field trial will be repeated for the second year at the three sites in 2025 growing season. Considering all agronomic parameters measured during the first year (2024) of this project, Allison and Fabelle seeded at 45 seeds/m^2 appeared to be ideal for all locations.

Acknowledgements

This project was funded through the Ministry of Agriculture and the Canadian Agriculture Partnership Strategic Field Program (SFP) and Saskatchewan Pulse Growers.

Mitigating Yield Losses Due to Pea Leaf Weevil in Field Pea and Faba Bean

Holzapfel, C. (IHARF), McInnes, B. (NARF), Patel, I. (NARF), Enns, J. (WARC), and Hall, M. (ECRF)

Description

Field trials were established at four Saskatchewan locations in 2024 to demonstrate and investigate the relative effectiveness of chemical and cultural strategies to reduce the impact of pea leaf weevil (PLW; *Sitona lineatus*) on field pea and faba bean yield. The locations were Indian Head, Melfort, Scott, and Yorkton. Due to space limitations, only the field pea trial was conducted at Yorkton in 2024. The treatments were a factorial combination of two seeding dates (early vs delayed), two seed-applied insecticide treatments (fungicide only vs fungicide plus insecticide), and two fertility treatments (standard vs extra N). The treatments were arranged in a four-replicate split-plot design with seeding date as the main plot and seed-applied insecticide and fertility treatments as the sub-plots. The treatments are detailed in Table 9.

Table 9. Treatments evaluated in pea leaf weevil (PLW) management demonstrations conducted with field pea and faba bean at various Saskatchewan locations in 2024 and 2025.

Trt #	Seeding Date[Z] (main plot)	Seed Treatment	Nitrogen Treatment[W]
1	Early	Fungicide[Y] only	Standard Fertility
2	Early	Fungicide only	Standard Fertility + Nitrogen
3	Early	Fungicide + Insecticide[X]	Standard Fertility
4	Early	Fungicide + Insecticide	Standard Fertility + Nitrogen
5	Delayed	Fungicide only	Standard Fertility
6	Delayed	Fungicide only	Standard Fertility + Nitrogen
7	Delayed	Fungicide + Insecticide	Standard Fertility
8	Delayed	Fungicide + Insecticide	Standard Fertility + Nitrogen

[Z] Early seeding occurs as early as possible (late April / early May), target 10-14 days later for delayed seeding
[Y] Fungicide is Trilix EverGol (3.85 g penflufen, 3.85 g trifloxystrobin, and 5.1 g metalaxyl/100 kg seed
[X] Insecticide is Stress Shield 600 (62.4 g imidacloprid/100 kg for faba bean and 124.8 g imidacloprid/100 kg for field pea)
[W] Rates may vary across sites but recommend 77 kg MAP/ha in Trts 1,3,5,7 (8-40-0-0 kg/ha) and 77 kg MAP/ha + 221 kg urea/ha in Trts 2,4,6,8 (110-40-0-0). MAP should be side-banded while urea may be side- or mid-row banded

Results

Overall, seeding date effects on pea leaf weevil (PLW) feeding were inconsistent, with instances of higher damage when seeding was delayed in several cases and some where the opposite occurred. While measurable or statistically significant benefits did not always occur, seed treatments were generally quite effective for reducing PLW feeding and, in many cases, improving yields when the insect was present. For field peas, seed-applied insecticide significantly improved yields at Scott and there was a relative strong trend for such at Yorkton. For faba beans, seed-applied insecticide improved yields at Indian Head and Scott but had inconsistent effects at Melfort. Extra nitrogen fertilizer substantially increased yields at Indian Head, especially with field pea; however, with relatively low pressure, we cannot correlate this response specifically to PLW feeding with any confidence.

Conclusions

At this stage, field pea and faba bean growers who are concerned about PLW are strongly recommended to plan on using a registered, seed-applied insecticide to reduce the potential impacts of this pest. Based on these preliminary results, seeding early will generally produce the healthiest, highest yielding crop across a broad range of conditions. The field trial will be repeated for the second year at the four sites in 2025 growing season.

Acknowledgements

Financial support for this demonstration was provided by the Saskatchewan Pulse Growers.

When Should Rapidly Maturing Soybean Varieties be Planted in Saskatchewan?

Shaw, L. (SERF), Wall, A. (WCA), Husband, R. (ISask), Holzapfel, C. (IHARF), Hall, M. (ECRF), Patel, I. (NARF), Galbraith, Z. (CLC), and Enns, J. (WARC)

Description

Small plot trials were conducted at eight locations across Saskatchewan to evaluate the effect of seeding date on various early maturing cultivars of Soybean. These locations were located near Redvers, Swift Current, Scott, Indian Head, Yorkton, Melfort, Outlook and Prince Albert in 2024. The secondary objective was to evaluate the regional adaptation of soybeans with a range of maturity ratings in northern and southern locations in Saskatchewan. The trial was set up in a four-replicate split-plot design with seeding dates (Early: May 12-19, Normal: May 20-30) as the main plot factor and five soybean varieties belonging to different maturity groups (000.5, 000.7, 000.8, 000.9 and 00.2) as subplot factor. Data were collected for plant density, height, days to flowering, days to maturity, yield and protein. Unfortunately, the trial was cancelled at Swift Current which resulted in lack of data for all parameters except plant density.

Results

The early seeding date led to a relatively higher plant density compared to the late seeding date at the southern locations, specifically at Redvers and Swift Current. However, at all other sites, the opposite

trend was observed, with late seeding resulting in a higher plant density than early seeding. This variation in plant density suggests that environmental factors, such as temperature may have influenced seedling establishment differently across locations. The increased plant density at Redvers due to early seeding likely contributed to a higher soybean yield at this location compared to most other sites (Table 10). The only exception was Scott, where yield levels were comparable. Unfortunately, yield data for Swift Current was unavailable, preventing a complete assessment of early seeding effects at this location. Regarding protein content, a mixed interaction was observed, indicating that neither early nor late seeding had a consistent effect across all sites. This suggests that additional factors may have influenced protein levels in a more complex manner.

Table 10. Variety (maturity group) effect on soybean yield across seven Saskatchewan locations in 2024. Values within a column followed by the same letter do not significantly differ (P ≤ 0.05).

Variety (Maturity)	Redvers	Indian Head	Prince Albert	Yorkton	Melfort	Scott	Outlook
				Yield (kg/ha)			
Early Soy 1: (000.5)	3606.2 ^{A}	2584.8 ^{A}	3231.2	1800.5 ^{AB}	1975.9	1311.3 ^{A}	5532.9 ^{A}
Early Soy 2: (000.7)	3103.2 ^{B}	2370.9 ^{CD}	3122.6	1598.9 ^{B}	1933.2	1092.9 ^{AB}	5741.1 ^{A}
Early Soy 3: (000.8)	3202.4 ^{B}	2272.5 ^{D}	2775.2	2022.7 ^{A}	1999.3	1013.4 ^{B}	4700.9 ^{B}
Early Soy 4: (000.9)	3761.4 ^{A}	2551.9 ^{AB}	3206.2	1828.6 ^{AB}	2006.8	1133.7 ^{AB}	5778.8 ^{A}
Normal Soy: (00.2)	3125.7 ^{B}	2422.4 ^{BC}	2957.5	1919.2 ^{AB}	1888.5	1128.8 ^{AB}	5588.1 ^{A}
P- value	0.0	0.0	0.143	0.039	0.774	0.052	0.0

Conclusions

The collected data indicated that seeding dates have a clear impact on different maturity group's soybean varieties, particularly on key parameters such as days to flowering and days to maturity. The observed variations suggest that earlier or later planting times can significantly influence the crop's developmental timeline according to the location of the site, likely due to differences in temperature, daylight duration, and other environmental factors.

Acknowledgements

Financial support for this project was provided by the Saskatchewan Pulse Growers and Sustainable Canadian Agricultural Partnership.

Lentil Response to Soil Residual Nitrogen and Rhizobial Inoculation

Holzapfel, C. (IHARF), Slind, K. (WARC), Enns, J. (WARC), Nybo, B. (WCA), and Wall, A. (WCA)

Description

The project objective was to demonstrate, across a range of environments, the agronomic response of both small red and large green lentils to rhizobium inoculant and varying soil residual soil nitrogen levels. In the falls of 2022 and 2023, field trials with lentil were initiated near Indian Head, Scott, and Swift Current. The treatments were a factorial combination of three residual N levels (low, medium, and high), two rhizobium inoculant treatments (none vs label rate of granular inoculant), and two lentil classes (small red vs large green). Residual N treatments were established in each fall using the following

methods. First, a composite soil sample was collected for the entire trial area to verify initial residual nitrate (NO_3-N) levels to a depth of 60 cm. Next, granular urea was broadcast in the medium and high residual N treatments to bring the total N (residual soil NO_3-N + fall-applied fertilizer) up to 112 kg N/ha and 225 kg N/ha, respectively. The granular inoculant product was either Nodulator Duo SCG (BASF) at Indian Head and Scott or TagTeam BioniQ at Swift Current, applied in-furrow at label recommended rates. At all locations, the small red lentil variety was CDC Impulse CL, and the large green variety was CDC Lima CL. Each of the 12 treatments were replicated four times and arranged in a randomized complete block design (RCBD).

Results

Yield responses to residual N amongst individual sites were equally divided between negative (i.e., SC-24 and SW-24), positive (i.e., SW-23 and IH-24), and mostly neutral (i.e., IH-23 and SC-23) (Table 11). The same was true for residual N effects on protein; however, the protein responses were not consistently correlated with the observed yield responses. The sites that responded more negatively appeared to those where the initial residual N levels were highest (i.e., SC-24 and SW-24). One of the sites that responded positively (IH-24) had initially low residual N levels and challenges with root disease which may have inhibited N fixation to some extent. At IH-23, there was an interaction that appeared to be due to a slight yield increase at the highest residual N level for small red lentils, but not large green lentils. Notably, initial residual N levels at IH-23 were the lowest of all the sites but the entire season was dry, and root disease was not an issue at this site. There was some evidence of higher residual N increasing vegetive growth; however, this response was, at best, minor. Yield responses to granular inoculant application were never significant, regardless of residual N level.

Table 11. Main effect means on lentil seed yield for individual sites and averaged across sites. For each main effect, values within a column followed by the same letter do not significantly differ (Tukey, $P \leq 0.05$).

Main Effect	IH-23	IH-24	SC-23	SC-24	SW-23	SW-24	AVG
Residual N	---------- Seed Yield (kg/ha) ----------						
Low	3007 a	2328 b	3580 a	2730 ab	1000 b	976 a	2270 B
Medium	2951 a	2509 a	3650 a	2793 a	1171 a	958 a	2339 A
High	3034 a	2639 a	3692 a	2630 b	1178 a	774 b	2324 AB
S.E.M.	104.2	141.2	139.2	63.0	27.9	41.9	39.7
Pr > F (p-value)	0.338	<0.001	0.558	0.008	<0.001	<0.001	0.023
Inoculant	---------- Seed Yield (kg/ha) ----------						
No	3013 a	2504	3635 a	2718 a	1125 a	926 a	2320 A
Yes	2982 a	2479	3646 a	2718 a	1108 a	879 a	2302 A
S.E.M.	101.6	138.5	132.5	59.7	22.8	38.2	38.2
Pr > F (p-value)	0.509	0.652	0.891	0.990	0.587	0.190	0.399
Class	---------- Seed Yield (kg/ha) ----------						
Small Red	3196 a	2650 a	3797 a	2907 a	1273 a	926 a	2459 A
Large Green	2799 b	2333 b	3484 b	2529 b	959 b	877 a	2163 B
S.E.M.	101.6	138.5	132.5	59.7	22.8	38.2	38.2
Pr > F (p-value)	<0.001	<0.001	<0.001	<0.001	<0.001	0.143	<0.001

Conclusions

While no responses to granular inoculant were observed, we continue to recommend this input due to the importance of biological N fixation in lentil production. While lentils are not an ideal crop to take advantage of high residual soil N, this project suggested that any risks to doing so are low unless these levels are extremely high.

Acknowledgements

Financial support for this project was provided under the Sustainable Canadian Agricultural Partnership.

Lentil Response to Varying Rates and Combinations of Potassium and Sulfur Fertility

Holzapfel, C. (IHARF), Slind, K. (WARC), Enns, J. (WARC), Nybo, B. (WCA), and Wall, A. (WCA)

Description

The objectives of this project were to demonstrate, for a range of Saskatchewan environments, the yield and quality responses of small red lentils to varying rates and combinations of potassium (K) and sulfur (S) fertilizer. Field trials with small red lentils were conducted at Swift Current, Scott, and Indian Head in the 2023 and 2024 growing seasons. The treatments were factorial combination of three potassium (K) rates (0, 22, and 45 kg K_2O/ha) and three sulfur (S) rates (0, 11, and 22 kg S/ha) along with two additional control treatments to help explain responses and provide extra context. One of the control treatments was intended to test for a phosphorus (P) response and show the potential losses that might occur when no fertilizer is applied (Trt. #1). Since N was not balanced across treatments, the second control (Trt. #11) was to help ascertain whether responses to ammonium sulfate (AMS) were due to the S or the N that is provided by this product. The treatments are described in Table 12.

Table 12. Lentil fertility treatments in potassium (K_2O) and sulfur (S) demonstrations conducted at Indian Head, Scott, and Swift Current in 2023 and 2024.

Trt #	Nitrogen [Z] (kg N/ha)	Phosphorus (kg P_2O_5/ha)	Potassium (kg K_2O/ha)	Sulfur (kg S/ha)	Description
1	0	0	0	0	Unfertilized Control
2	10	45	0	0	Phosphorus Only
3	10	45	22	0	Low Potassium
4	10	45	45	0	High Potassium
5	18	45	0	10	Low Sulfur
6	27	45	0	20	High Sulfur
7	18	45	22	10	Low Potassium – Low Sulfur
8	18	45	45	10	High Potassium – Low Sulfur
9	27	45	22	20	Low Potassium – High Sulfur
10	27	45	45	20	High Potassium – High Sulfur
11	27	45	0	0	High Nitrogen Control

[Z] Except for treatment #11 which received supplemental urea, all N was provided by MAP and AMS

Results

Across treatments, plant densities ranged from a minimum of 135 plants/m^2 at SC-24 to 198 plants/m^2 at IH-24. Yields ranged from 1315-3773 kg/ha, consistently lowest at Swift Current (1315-1339 kg/ha), more intermediate at Indian Head (2699-2852 kg/ha), and highest, especially in 2023, at Scott (3137-3773 kg/ha). Test weights ranged from 370-404 g/0.5 l across sites. Seed weights ranged from approximately 38 g/1000 seeds at SW-24 (the driest site) to 50 g/1000 seeds at IH-23 and SC-23, with the values at IH-24, SC-24, and SW-23 being more intermediate (45-47 g/1000 seeds). Grain protein concentrations were lowest at IH-23 (23.6%), intermediate at SC-24 (24.2%), and highest at the remaining four sites (24.7-25%). The overall KCl effect was not significant for any response variables. The overall effect of AMS, or S rate, was significant for plant density (P = 0.037) and test weight (P = 0.029), and marginally significant for seed yield (P = 0.067). The overall average plant density response to S showed a slight drop in plants/m^2 at the highest rate of side-banded AMS; however, the reduction was only 3% relative to the control. Test weights also linearly declined (P = 0.008) with increasing S rate, albeit by a very small margin which was not considered agronomically important.

Conclusions

Despite the lack of responses in the current project, relatively small yield gains can be sufficient to cover the cost of small amounts of K and S fertilizer. Furthermore, regular applications of these nutrients at low rates could help to maintain soil fertility over the long-term and reduce the risk of deficiencies in future crops. As such, some growers may see value in including K and S in their lentil fertility program; however, the likelihood of yield loss or reduced profits if they refrain from doing so is low.

Acknowledgements

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Biological Enhancement in Pulses

Godebo, A. (ISask), McInnes, B. (NARF), Holzapfel, C. (IHARF), Nybo, B. (WCA), Wall, A. (WCA), Hall, M. (ECRF), Enns, J. (WARC), Lokken, R. (CLC), and Shaw, L. (SERF)

Description

The objectives of this project were to evaluate the granular formulations of biological enhancement products containing pulse inoculants and allow producers the opportunity to view the selected growth-enhancing product in side-by-side comparisons. The field trials were conducted at Outlook, Indian Head, Swift Current, Scott, Redvers, Yorkton, Prince Albert, Melfort in 2024. The treatments were arranged in a RCBD with four replicates. The biological enhancement products evaluated in this study are listed in the Table 13. Supplemental macronutrients, including phosphorus (P), potassium (K), and sulfur (S), were applied based on soil test recommendations to ensure optimal nutrient availability. Lentil was used as the test pulse crop at Outlook, Indian Head, Swift Current, and Scott. Pea was the tested pulse crop at Redvers, Yorkton, Prince Albert, and Melfort.

Table 13. List of treatments (products) evaluated for their effectiveness in improving agronomic performance in pulse crops.

Trt#	Product	Company	Active Microorganism	Technology
1	Control			
2	AgTIV® Thrive	Premier Tech (Taurus)	*R. leguminosarum + Glomus intraradices*	R + MF
3	Cell-Tech® Pea	Nexus BioAg	*R. leguminosarum*	R
4	AgTIV® Fuel G	AgTiv	*R. leguminosarum* (dual strains)	R
5	Nodulator® Duo SCG	BASF	*R. leguminosarum + Basillus subtilis*	R + GP
6	Primo GX2 Pulse	Verdisian	*R. leguminosarum + Azospirilium*	R + PGPR
7	Launcher	Brett Young	*R. leguminosarum*	R
8	TagTeam® BioniQ®	Novozymes	*R. leguminosarum + Penicillium bilaiae + Basillus amyloliquefaciens + Trichoderma virens + lipochitooligosaccharide*	R + P + PGPR + LCO
9	LALFIX Start	Lallemand Plant Care	*Rhizobium leguminosarum biovar viciae + Mezorhizobium cicero + Bacillus velezensis*	R + GP
10	BOS NutriAg	NutriAG	*Rhizobium leguminosarumbiovar viceae + Pseudomonas*	R + PGPR+ GP

*R = rhizobium for nitrogen fixation; GP = growth promotion; PGPR = plant growth promoting rhizobacteria; MF = mycorrhizae fungi; P = phosphate solubilizer; LCO = signal molecule

Results

Plant height data did not show any significant differences ($P > 0.05$) across all locations in both lentil and pea. Plant density showed a significant effect on lentils at Swift Current site, where treatments 9 (LALFIX Start) and 6 (Primo GX2 Pulse) resulted in the highest lentil plant density. Days to maturity showed significant treatment effects on lentils at Indian Head site ($P = 0.03$) where treatment 8 (TagTeam® BioniQ®) took significantly longer days to maturity. Yield was not significantly different at most locations ($P > 0.05$), except for lentil at Scott site ($P = 0.04$). The mean separation test indicated that treatments 2 (AgTIV® Thrive), 5 (Nodulator® Duo SCG), and 8 (TagTeam® BioniQ®) resulted in the highest seed yield, while treatment 3 (Cell-Tech® Pea) yielded the lowest compared to all other treatments. Pea protein content was significantly affected at Yorkton site ($P = 0.008$) where treatment 2 (AgTIV® Thrive) resulted in the highest protein content.

Conclusions

This inconsistent results across different sites suggest the importance of considering local environmental factors when choosing inoculants. For growers, this means inoculants may be beneficial in certain conditions but not universally effective, requiring site-specific testing for optimal results.

Acknowledgements

Financial support for this project was provided by the Saskatchewan Pulse Growers.

Fenugreek Response to Range of Nitrogen Fertilizer Rates

Holzapfel, C. (IHARF), Singh, G. (ISask), Boot, B. (ISask), Shaw, L. (SERF), Matharu, A. (SERF), Nybo, B. (WCA), and Wall, A. (WCA)

Description

The overall objective was to demonstrate the response of fenugreek to nitrogen (N) fertility and build upon past work exploring the overall adaption of this crop to a range of Saskatchewan environments. Fenugreek trials were established at Indian Head, Outlook (irrigated), Redvers, and Swift Current in 2024 growing season. The treatments were simply seven nitrogen (N) fertilizer rates, one of which was a control where no N beyond that provided by phosphorus (P) products was applied. All supplemental N was provided as side-banded urea and, in addition to the control, the rates evaluated were 50, 75, 100, 125, 150, and 175 kg N/ha (soil NO_3-N plus fertilizer). These seven N fertility treatments were arranged in a RCBD with four replicates.

Results

To varying degrees, the 2024 season started cool and wet but finished hot and dry. Averaging 2500-2600 kg/ha and peaking at 2800-3000 kg/ha, the highest yields were at Indian Head and Outlook. Despite being the wettest location, yields at Redvers were only 1300 kg/ha, presumably because factors other than N were most yield limiting. At Swift Current, the driest and hottest location, yields averaged only 550 kg/ha. Side-banded urea only affected emergence at Swift Current, where high rates slightly reduced plant populations. Delayed crop senescence with high N occurred at 2/3 sites where relative maturity was rated; however, any impacts were not agronomically important in the end. Yield responses to N rate varied widely. At Indian Head, the response was strong with yields increasing to the highest rate and, conservatively, the economically optimal rate being at least 125 kg N/ha (soil plus fertilizer). At Redvers and Swift Current the response was modest with yields peaking at 75-100 kg N/ha while, at Outlook, the response was not significant and trended slightly negative.

Conclusions

Overall, this project showed that fenugreek has potential to be quite well-adapted to Saskatchewan growing conditions; however, more data and experience is required to improve the potential for success on individual farms and better understand where this crop should specifically be grown. Higher N rates may be justifiable for growers who are confident in their ability to grow this crop and have seen substantial benefits to N fertilization in the past. Eventually, we need to better understand why responses occur in some environments but not others and it would be ideal to identify inoculant options to improve biological N_2 fixation, potentially reducing the need for supplemental urea to a large extent.

Acknowledgements

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Contrasting Fungicide Applications and Genetic Fusarium Head Blight Resistance for Enhanced Yield and Quality of Barley

Holzapfel, C. (IHARF), Turkington, K. (AAFC), Mohr, R. (AAFC), Hall, M. (ECRF), and McInnes, B. (NARF)

Description

This project was initiated in the winter of 2019-20 to investigate the potential for foliar fungicide applications combined with genetic fusarium head blight (FHB) resistance to enhance yields and/or end-use quality of barley. The first field trials were established at Indian Head, Yorkton, and Melfort in the spring of 2020, with the Brandon site postponed due to COVID-19 restrictions. For the 2021-23 growing seasons, trials were conducted at all four locations and, in 2024, trials were conducted at Brandon, Indian Head, and Melfort. The treatments were a factorial combination of three varieties and four fungicide treatments, arranged in a four replicate RCBD. The varieties were selected based on their genetic resistance to FHB and were CDC Bow (moderately susceptible; MS), AAC Synergy (intermediate; I), and AAC Connect (moderately resistant, MR). The seeding rates always targeted 300 live seeds/m^2. The fungicide treatments were an untreated control, a flag-leaf application targeting leaf disease, an application at 80-100% head emergence targeting FHB, and a dual application which received both the flag-leaf stage and heading fungicide applications. The treatments are listed in detail in Table 14.

Table 14. Treatments evaluated in barley FHB trial at various Saskatchewan locations from 2020-2024.

#	Variety	Fungicide [Y]
1	CDC Bow (MS)	1) Untreated (no foliar fungicide)
2	CDC Bow (MS)	2) Flag (0.4 l/ac Trivapro A + 0.12 l/ac Trivapro B)
3	CDC Bow (MS)	3) Head (0.325 l/ac Prosaro XTR)
4	CDC Bow (MS)	4) Dual (Trt 2 and 3 combined – plots receive both applications)
5	AAC Synergy (I)	1) Untreated (no foliar fungicide)
6	AAC Synergy (I)	2) Flag (0.4 l/ac Trivapro A + 0.12 l/ac Trivapro B)
7	AAC Synergy (I)	3) Head (0.325 l/ac Prosaro XTR)
8	AAC Synergy (I)	4) Dual (Trt 2 and 3 combined – plots receive both applications)
9	AAC Connect (MR)	1) Untreated (no foliar fungicide)
10	AAC Connect (MR)	2) Flag (0.4 l/ac Trivapro A + 0.12 l/ac Trivapro B)
11	AAC Connect (MR)	3) Head (0.325 l/ac Prosaro XTR)
12	AAC Connect (MR)	4) Dual (Trt 2 and 3 combined – plots receive both applications)

[Y] Fungicides should be applied in a minimum solution volume of 187 l/ha (~20 U.S. gal/ac) at either the flag-leaf stage (Trt 2, 4, 6, 8, 10, & 12) or between 80% head emergence and 3 days after heading is complete (Trt 3, 4, 7, 8, 11, & 12). If necessary, application dates may vary with variety.

Results

To date, field trials have been conducted at 18 location-years. At the time of the flag leaf fungicide applications (T1), there were only two instances where leaf disease levels differed between varieties (BR-24 and ME-24). Despite the significant effect, leaf disease was extremely low at ME-24 (< 1%); however, in both cases, leaf disease was lowest with Synergy and intermediate to highest with Bow and

Connect. Varietal differences were never detected at the remaining sites and were approximately 1% or lower (leaf area affected) at 14/16 sites, the exceptions being ME-20 and BR-23 where the overall mean values were still quite low at 2.3-2.4%. The final leaf disease collections were completed as late in the season as possible but before senescence; however, total disease levels at this time were still approximately 1% or less at 8/18 sites and were always less than 5%. Grain yields were affected by variety at 12/18 sites and fungicide at 2/18 sites. For 11/18 of the sites where variety differences existed, Bow was the lowest yielding variety. The sole sites where the overall fungicide effect was significant were BR-22 and IH-22, two of the wetter and higher yielding sites. At BR-22, the highest yields were achieved with the dual application, while yields for the single application treatments were intermediate and did not significantly differ from either the control or the dual fungicide treatments. At IH-22, all treatments that received a fungicide yielded similarly and significantly higher than the untreated control treatments. Test weights were affected by variety at 17/18 sites and fungicide treatment at 3/18 sites. Varietal effects on test weight appeared to vary with environment. Amongst the 17 sites where varietal differences in test weight were detected, Bow, Synergy, and Connect had amongst the highest test weights in 35%, 71%, and 59% of possible cases, respectively. For the three sites where fungicide affected test weight, the values for the untreated control were amongst the lowest. According to the overall tests of fixed effects, thousand kernel weight (TKW) was affected by variety at 14/18 sites and fungicide treatment at 4/18 sites. Variety effects, when significant, were somewhat inconsistent with Bow, Synergy, and Connect having amongst the highest TKW at 29%, 57%, and 79% of the 14 responsive sites. In the rare cases where fungicide effects occurred, they tended to show slightly higher thousand kernel weights when fungicide was applied post-heading, either alone or in combination with a flag-leaf application (i.e., BR-23, IH-22 and YK-22).

Conclusions

In 2024, yields were reasonably high but somewhat variable at locations. Despite low to moderate levels of leaf disease at Brandon and Melfort which were reduced by fungicide, no yield benefits to fungicide were observed in 2024.

Acknowledgements

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Preharvest Sprouting Ratings for Barley Varieties

Godebo, A. (ISask), Galbraith, Z. (CLC), Hall, M. (ECRF), Enns, J. (WARC), Nybo, B. (WCA), Shaw, L. (SERF), Matharu, A. (SERF), and Holzapfel, C. (IHARF)

Description

The objective of this study was to generate ratings for pre-harvest sprouting (PHS) resistance for popular and new barley varieties and, determine if there are interactions for PHS between genetics and environment. The study was conducted at Outlook (irrigated), Prince Albert, Yorkton, Scott, Swift Current, Redvers, and Indian Head in 2024. The treatments were arranged in a split-plot design with

three replicates. The main-plot factor was the harvest date (early vs late) and the sub-plot factor was the barley variety (33 varieties). The harvest dates at Indian Head were targeted as 1) when the latest varieties have attained 16% moisture (Early) and 2) after a minimum of 12 mm of rainfall and 10-25 days of the first harvest, but before snow fall (Late). The barley varieties tested in the trial are listed in Table 15. Variety performance was measured based on agronomic traits such as plant emergence, height, density, lodging, yield, grain moisture level and relative viscosity units.

Table 15. Barley varieties used in the preharvest sprouting ratings for barley varieties trial in 2024.

#	Variety	#	Variety	#	Variety
1	AAC Connect	12	AC Metcalfe	23	CDC Renegade
2	AAC Lariat	13	AB Advantage	24	Claymore
3	AAC Prairie	14	CDC Austenson	25	Esma
4	AAC Synergy	15	CDC Churchill	26	HB20351
5	AB Brewnet	16	CDC Clear	27	HB21355
6	AB Dram	17	CDC Copeland	28	KWS Kellie
7	AB Foothills	18	CDC Copper	29	Legacy
8	AB Hague	19	CDC Durango	30	RGT Planet
9	AB Prime	20	CDC Fraser	31	Sirish
10	AB Tofield	21	CDC Goldstar	32	SY Stanza
11	AB Wrangler	22	CDC Maverick	33	Torbellino

Results

At the Indian Head, plant emergence was high, with varieties scoring between 7 and 9, while at the Scott site, a broader range of emergence ratings (5 to 8) was observed, with CDC Austenson showing the lowest rating. Plant height data from Outlook revealed significant variation, ranging from 70 cm to 101 cm, with CDC Maverick and AB Advantage being the tallest varieties. Plant density was significantly influenced by variety across the Redvers, Yorkton, Swift Current, and Prince Albert sites, with CDC Austenson consistently showing the lowest density. Lodging rates varied significantly only at the Yorkton site, with rates ranging from 2 to 6, while the Prince Albert site had a narrower range (1 to 2). Yield differences were observed at Outlook, Redvers, Yorkton, and Scott sites, with early harvests generally yielding higher than late harvests, except at Outlook, where mid-harvest yields were higher but not statistically different from early harvests. At Redvers and Scott, AAC Connect produced the highest yields, while CDC Churchill excelled at Swift Current. AC Metcalfe showed the lowest yields at Scott and Yorkton. Harvest date significantly influenced moisture content at most locations, with variations in impact depending on the site. Moisture levels ranged from 8% to 13%, with harvest timing being a key factor, although variety only affected moisture at Outlook. Relative Viscosity Units (RVU) showed consistent responses to both harvest date and variety, with significant effects at most locations, particularly at Outlook and Indian Head. Interactions between harvest date and variety were significant for RVU in many locations. The number of varieties tested likely influenced the results at Outlook and Indian Head compared to the other sites with fewer varieties, with an increased number of varieties leading to more statistically significant differences.

Conclusions

Overall, variety was the primary factor influencing most traits, while the effect of harvesting date was more variable across locations. These findings highlight the importance of harvest timing and variety selection in determining barley quality.

Acknowledgements

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Enhanced Barley Variety Trials 2024-2025

Hall, M. (ECRF), Rajper, A. (ECRF), McInnes, B. (NARF), Holzapfel, C. (IHARF), Enns, J. (WARC), Slind, K. (WARC), Nybo, B. (WCA), and Wall, A. (WCA)

Description

The broad objective of this project was to determine if the malt varieties AAC Prairie, CDC Churchill and feed varieties CDC Durango and AB Wrangler differ in their response to N Fertility, PGR and fungicide. Trials were conducted at Yorkton, Melfort, Indian Head, Scott, and Swift Current in 2024. Table 16 lists the treatments established at each location in a split-plot design with 4 replications. The main-plot factor was “Barley Management” and the sub-plot factor was “Barley Variety”.

Table 16. Treatment list for barley management by barley variety trial.

Trt #	Barley Management	Barley Variety
1	Standard[1] N Fertility – No PGR – Fungicide[3]	AAC Prairie
2	Standard[1] N Fertility – No PGR – Fungicide[3]	CDC Churchill
3	Standard[1] N Fertility – No PGR – Fungicide[3]	CDC Durango
4	Standard[1] N Fertility – No PGR – Fungicide[3]	AB Wrangler
5	Enhanced[1] N Fertility – No PGR – Fungicide[3]	AAC Prairie
6	Enhanced[1] N Fertility – No PGR – Fungicide[3]	CDC Churchill
7	Enhanced[1] N Fertility – No PGR – Fungicide[3]	CDC Durango
8	Enhanced[1] N Fertility – No PGR – Fungicide[3]	AB Wrangler
9	Standard[1] N Fertility – PGR[2] - Fungicide	AAC Prairie
10	Standard[1] N Fertility – PGR[2] - Fungicide	CDC Churchill
11	Standard[1] N Fertility – PGR[2] - Fungicide	CDC Durango
12	Standard[1] N Fertility – PGR[2] - Fungicide	AB Wrangler
13	Standard[1] N Fertility – No PGR – No Fungicide	AAC Prairie
14	Standard[1] N Fertility – No PGR – No Fungicide	CDC Churchill
15	Standard[1] N Fertility – No PGR – No Fungicide	CDC Durango
16	Standard[1] N Fertility – No PGR – No Fungicide	AB Wrangler

[1]Standard and Enhanced rates of N Fertility [soil (0-24") + added N] varied between locations based on historic yield potentials obtained from SCIC data. Sites will fall into the following groupings:
- Group 1 = low yield potential: Swift Current: 100 vs 125 lb N/ac of soil + added N
- Group 2 = mid range yield potential: Indian Head, Scott: 120 vs 150 lb N/ac of soil + added N
- Group 3 = high yield potential: Yorkton, Melfort: 130 vs 162 lb N/ac of soil + added N
All sites were fertilized with P and K levels so as to be not limiting, even for the high N rate based on soil test recommendations.

[2]PGR applied was Moddus (trinexapac-ethyl) at GS30-32 (stem elongation).

[3]Fungicide applied was either Trivapro or Nexicor applied at flag leaf

Results

There was little evidence from this study to suggest that barley varieties should be managed differently. Application of PGR reduced crop height at all five locations, and reduced lodging at four sites. Yorkton was the only site where PGR increased yield (11.4%) and in turn decreased protein (0.94 percentage points). While CDC Durango had very good resistance to lodging without PGR compared to the other varieties at Yorkton, it still benefited from the use of PGR like the other varieties. Disease levels were not high in this study and fungicide did not significantly reduce leaf disease based on visual ratings. However, fungicide significantly increased yield at Yorkton by 14.8% and at Melfort by 4%. This resulted in a reduction in grain protein of 0.94 percentage points at Yorkton. The combination of PGR + Fungicide did not affect yield at any location except Yorkton, where yield increased 28% and protein decreased 1.9 percentage points. Enhancing N rate only significantly increased yield at Melfort but significantly increased grain protein at all locations except Swift Current where grain protein had plateaued due to drought. While significant effects of management on yield and grain protein were detected at some locations, there were no interactions to indicate responses differed between varieties.

Conclusions

While the yield of varieties significantly differed at all locations, their relative standing between sites was not consistent. However, CDC Durango tended to be the highest yielding and CDC Churchill the lowest yielding, except at Swift Current where the opposite was true under drought conditions.

Acknowledgements

Financial support for this project was provided by the Saskatchewan Barley Development Commission.

Evaluation of Nitrogen Stabilizer Products in Urea Ammonium Nitrate for Wheat and Oat

Shaw, L. (SERF), Holzapfel, C. (IHARF), Hall, M. (ECRF), Nybo, B. (WCA), Lokken, R. (CLC), Enns, J. (WARC), and McInnes, B. (NARF)

Description

The objective of this study was to demonstrate and evaluate products for their efficacy in improving nitrogen use efficiency of surface dribble-banded Urea Ammonium Nitrate (UAN) on wheat and oats. The field trials were conducted at Redvers, Indian Head, Yorkton, Swift Current, Prince Albert, Scott, and

Melfort in 2024. The demonstration included two randomized complete block trials: one in wheat and the other in oats. Each trial included 6 treatments, totaling 12 treatments across both crop trials, with four replications. Nitrogen treatments involved dribble-banded applications either in-furrow, with a sprayer, or with a custom liquid fertilizer applicator before crop emergence, depending on equipment availability at each site. Ammonium sulfate and monoammonium phosphate were side-banded, with total nitrogen application adjusted for the amounts of N provided by those fertilizers. The nitrogen rate was determined based on recommendations from soil tests at depths of 0-15 and 15-60 cm. The treatments are listed in the Table 17.

Table 17. Treatment list used for evaluation of nitrogen stabilizer products in urea ammonium nitrate for wheat and oat trials.

Trt #	Treatment Description	Additive	% of Recommended N
1	Untreated Control	None	70%
2	Volatilization (urease) Inhibitor	ARM-U	70%
3	Dual Inhibitor	ARM-U Advanced	70%
4	Volatilization (urease) Inhibitor + Humic	ARM-U + Humic	70%
5	Humic alone	Humic	70%
6	Control - No N	None	0%

Results

The results indicated significant differences in plant height at three wheat sites and five oat sites, with the control (No N) treatment showing reduced plant heights. Yield data followed a similar trend, showing significant yield improvements in wheat at four locations where all treatments outperformed the control (No N). In oats, all the treatments increased yield compared to control (No N) at Redvers, Indian Head, and Melfort. At Scott, treatments containing UAN + Volatilization (urease) Inhibitor, UAN + Dual Inhibitor, UAN + Volatilization Inhibitor + Humic, and UAN + Humic alone also resulted in significantly higher yields than untreated UAN and the control (No N). Plant density remained unaffected by all treatments across all locations. The impact of treatments on protein content was generally not significant, except Indian Head and Melfort, where protein content was significantly lower in the control (No N) treatment in both wheat and oats. Figure 4 illustrates the average yield and protein content across trial locations.

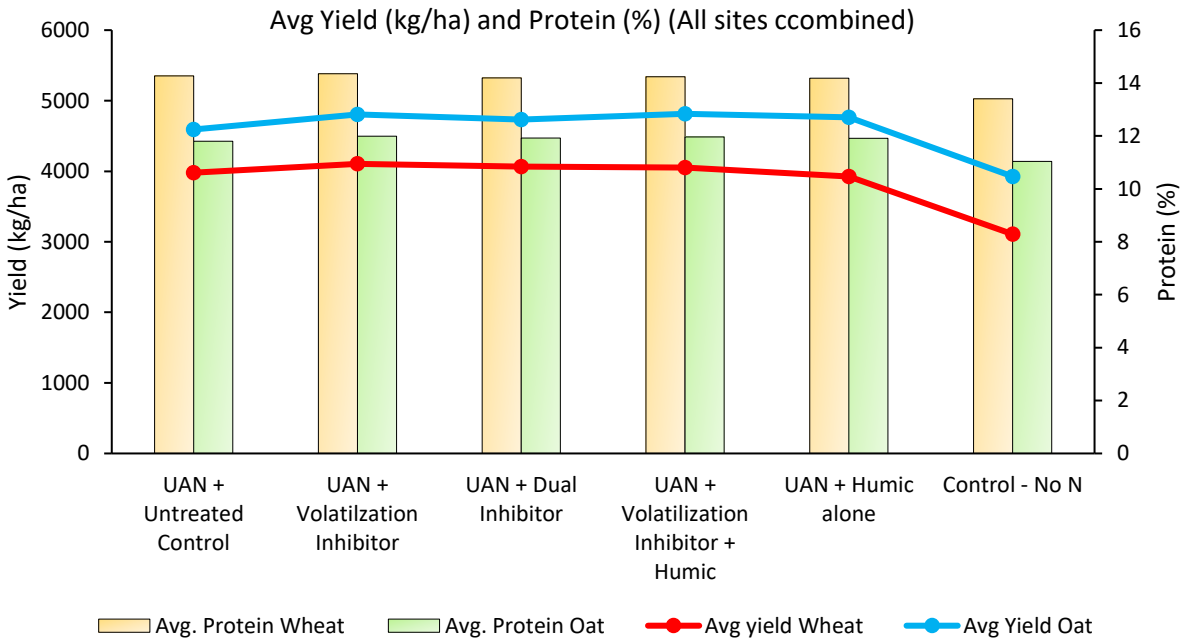


Figure 4. Average yield and protein content of wheat and oat across trial locations in Saskatchewan.

Conclusions

While the results demonstrated the potential of nitrogen stabilizer products including humic acid, there is a clear need for multiyear data to confirm these findings and draw more definitive conclusions. Variations in environmental conditions, soil properties, and cropping systems from year to year can influence the outcomes, emphasizing the importance of long-term studies.

Acknowledgements

Financial support for this demonstration was provided by the Agricultural Demonstration of Practices and Technologies (ADOPT) program under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

Evaluating the Fertility Package of Newly Available Oat Milling Varieties in Saskatchewan

Mathieson, S. (Sask Oats), McInnes, B. (NARF), Hall, M. (ECRF), Holzapfel, C. (IHARF), and Enns, J. (WARC)

Description

The objective of this project was to demonstrate the yield and quality response of new milling oat varieties to enhanced fertility as compared to a commonly grown and accepted variety. The demonstration was conducted in 2024 at Melfort, Indian Head, Yorkton, and Scott. The demonstration was set up as a factorial combination with treatments arranged in a randomized complete block design with four replications at all locations. The factorial combination consisted of two factors – oat variety (CS

Camden, CDC Anson, AAC Neville) and nitrogen rate (80, 100, 120, 140 and 160 kg N/ha soil + applied). Urea was side banded during seeding to meet the target N rates while adjusting for soil residual levels. Plant density, crop height, lodging, grain yield, and grain quality were evaluated.

Results

The N rates used in this demonstration were often higher (120 kg/ha+) than those used in past research; however, rates of 140 and 160 kg N/ha very rarely demonstrated significant N responses for the data collected as compared to 120 kg N/ha at all locations. As for variety, new varieties (Anson and Neville) were shorter and often less prone to lodging; however, grain yield was inconsistent, where Neville was higher yielding at Melfort and Indian Head, and Anson at Yorkton (Table 18). Neville had consistently higher test weights at all locations, and Anson only had higher test weights at 50% of the locations. Furthermore, oat milling quality was sometimes affected by variety or N rate, where increased N rates often increased % thins and % protein, while sometimes increasing β-glucan content. At Melfort and Yorkton, CS Camden tended to have lower protein at low N rates. At Melfort only, CS Camden also had lower β-glucan content with higher groat % in comparison to the other varieties.

Table 18**.** Results of the Analysis of Variance and treatment means for oat grain yield (kg/ha) at Melfort, Scott, Yorkton, and Indian Head in 2024. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Grain Yield (kg/ha)								
	Melfort		Scott		Yorkton		Indian Head	
Variety	<0.0001****		0.0005***		0.2065		0.0162*	
N Rate	<0.0001****		0.0235*		<0.0001***		0.6612	
Var*N	0.0312*		0.6575		0.1358		0.9309	
Variety								
Anson	6271	B	3841	B	5990	A	4772	B
Camden	6092	C	4227	A	5868	A	4799	B
Neville	6721	A	3797	B	5782	A	5158	A
N rate								
80kg	5657	D	3921	AB	5350	C	4804	A
100kg	6064	C	4088	AB	5646	BC	4893	A
120kg	6496	B	4150	A	6023	AB	5051	A
140kg	6749	AB	3927	AB	6175	A	4833	A
160kg	6840	A	3691	B	6206	A	4969	A

Conclusions

After one year of data collection, these results suggest that the newly available oat milling varieties were not more responsive to higher rates of N as compared to the current check variety, CS Camden.

Acknowledgements

Financial support for this demonstration was provided by the Agricultural Demonstration of Practices and Technologies (ADOPT) program under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative and the Saskatchewan Oat Development Commission.

Plant Growth Regulator Products and Mixes to Improve Crop Safety and Efficacy in Barley

Holzapfel, C. (IHARF), Japp, M. (Sask Barley), Singh, G. (ISask), Boot, B. (ISask), Galbraith, Z. (CLC), and Enns, J. (WARC)

Description

The overall project objective was to demonstrate the plant health, agronomic, yield and quality responses of three important malting varieties to the registered plant growth regulator (PGR) options, applied both alone and in combination. Field trials with malting barley were conducted at Indian Head, Outlook (irrigated), Prince Albert, and Scott in 2024. The treatments were a factorial combination of three malting varieties and seven plant growth regulator (PGR) treatments, for a total of 21 treatments. The varieties were AAC Synergy, CDC Fraser, and AAC Connect. The PGR treatments were rates and combinations of Manipulator® 620 (620 g chlormequat chloride/L) and Moddus® (120 g Trinexapac-ethyl/L), applied at Zadoks GS 30-32 (stem elongation up to two nodes detectible in stem). The minimum solution volume was 94 l/ha; however, higher volumes were permitted. Greater details on the PGR treatments are in Table 19.

Table 19. Plant Growth Regulator (PGR) treatments used in the 2024 Sask Barley-ADOPT project.

#	Name	Litres product/ha	Treatment Details
1	1x Moddus®	1030 ml Moddus/ha	124 g trinexapac-ethyl/ha
2	1x Manipulator®	2301 ml Manipulator/ha	1426 g chlormequat chloride/ha
3	0.5x Moddus®	514 ml Moddus/ha	62 g trinexapac-ethyl/ha
4	0.5x Manipulator®	1149 ml Manipulator/ha	713 g chlormequat chloride/ac
5	0.5x Moddus® + 0.5x Manipulator®	514 ml Moddus/ha + 1149 ml Manipulator/ha	62 g trinexapac-ethyl/ha + 713 g chlormequat/ha
6	1x Moddus® + 1x Manipulator®	1030 ml Moddus/ha + 2301 ml Manipulator/ha	124 g Trinexapac-ethyl/ha + 1426 g chlormequat/ha
7	UTC	Not applicable	No PGR applied

Results

Moddus® reduced plant height more consistently and to a greater extent than Manipulator®. The tank-mix also effectively reduced height, especially at the full rates. Both Moddus® and the mixes greatly reduced lodging, where applicable, while Manipulator® was ineffective. Yields were only consistently improved at Indian Head, where lodging occurred, by 10% on average with Moddus®. Without lodging, no PGR options increased yield and yields were reduced by the full rate mix. Moddus® was amongst the safest options for grain quality and the mixes frequently reduced test weight and plump kernels, especially at the full rates.

Conclusions

Overall, we recommend only applying PGR when moisture is not limiting and there is risk of lodging. Moddus® remains the preferred product and the potential benefits of mixing with Manipulator® appear to be insufficient to justify the elevated risk of undesirable effects.

Acknowledgements
Financial support for this demonstration was provided by the Agricultural Demonstration of Practices and Technologies (ADOPT) program under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative and Saskatchewan Barley Development Commission.

Demonstrating the Efficacy of Foliar-Applied Nitrogen Fixing Bacteria for Wheat

Holzapfel, C. (IHARF), McInnes, B. (NARF), Patel, I. (NARF), Singh, G. (Isask), Boot, B. (ISask), Lokken, R. (CLC), Galbraith, Z. (CLC), Shaw, L. (SERF), Matharu, A. (SERF), Slind, K. (WARC), Enns, J. (WARC), Nybo, B. (WCA), Wall, A. (WCA), and Hall, M. (ECRF)

Description
The project objective was to demonstrate the effects of commercially available, foliar-applied nitrogen (N) fixing bacteria/biostimulant products on CWRS wheat yield and protein, under a range of N fertility levels and contrasting environmental conditions. Field trials were conducted at eight Saskatchewan locations in 2023 and 2024, for a total of 16 individual sites. The locations were Indian Head, Melfort, Outlook (irrigated), Prince Albert, Redvers, Scott, Swift Current, and Yorkton. The treatments were a factorial combination of three N fertility levels (50, 100, or 150 kg N/ha) and three foliar treatments (untreated control, Envita®, or UtrishaTM-N). The N levels included residual soil nitrate, and the foliar treatments were applied at the 5-6 leaf stage and label recommended rates. The foliar treatments were applied in distilled water with a minimum solution volume of 110 l/ha and were never tank-mixed with any other pesticides. A non-ionic surfactant was added as required, for Envita® both years and UtrishaTM-N in 2024.

Results
To improve our ability to detect foliar treatment effects, several sites were excluded from the combined statistical analyses due to high residual N, other major yield-limiting factors, or inexplicably high variability. Nevertheless, these sites were still analyzed individually and reported on. The yield and grain protein responses to increasing N fertilizer rates were mostly consistent and as expected. For the sites included in the combined analyses, yields increased right up to the highest N rate 67% of the time and, for the remainder, were maximized with 100 kg total N/ha, or less. The 50 kg N/ha rate was always limiting to yield, and with only one exception, grain protein always increased right up to the highest N fertilizer rates. There were, however, no indications of improved N status associated with the foliar treatments for either grain yield or protein, regardless of N fertility or location. This was true for all sites, regardless of whether they were included in the combined analyses.

Conclusions
We recommend that farmers refrain from reducing their N fertilizer rates when using biostimulant products for improving N status in crop production and utilize check strips (preferably replicated, either treated or untreated) to assess whether they are realizing any measurable benefits on their own farms.

Acknowledgements
Financial support for this demonstration was provided by the Agricultural Demonstration of Practices and Technologies (ADOPT) program under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative and Saskatchewan Wheat Development Commission.

Standing Up With Your Own Stalk: Do the Plant Growth Regulators Available for Spring Wheat Improve the Productivity of Current CWRS Varieties?

Brianne, M. (NARF), Holzapfel, C. (IHARF), Enns, J. (WARC), Lokken, R. (CLC), Singh, G. (ISask), Boot, B. (ISask), Godebo, A. (ISask), and Hall, M. (ECRF)

Description
The main objective of this project was to demonstrate the response of current and common CWRS wheat varieties to the plant growth regulators (PGR) registered for use in spring wheat. The demonstration was conducted at six different locations in Saskatchewan over 2023 and 2024 growing seasons. The locations were Melfort, Prince Albert, Outlook, Indian Head, Yorkton, and Scott. The treatments were arranged as a split-plot design with four replicates. The main plot was the PGR, and the sub-plot was CWRS wheat varieties. The treatment factors of PGR and CWRS variety were combined to result in 12 treatments (Table 20). Both PGR products were applied at the recommended growth stage of BBCH 30-32 (early stem elongation) and at the recommended rate of 700 mL/ac for Manipulator and 340 mL/ac for Moddus.

Table 20. Treatments used in Standing up with your own stalk: Do the plant growth regulators available for spring wheat improve the productivity of current CWRS varieties? at all sites in 2023 and 2024.

Treatment #	PGR Product	Variety	Lodging Resistance*
1	No PGR	AAC Brandon	G
2		AAC Alida	VG
3		AAC Redberry	F
4		AAC Starbuck	F
5	Manipulator	AAC Brandon	G
6		AAC Alida	VG
7		AAC Redberry	F
8		AAC Starbuck	F
9	Moddus	AAC Brandon	G
10		AAC Alida	VG
11		AAC Redberry	F
12		AAC Starbuck	F

*Lodging resistance scale: VG-very good, G- good, F-fair

Results
In this two-year demonstration, applying a PGR often decreased crop height and reduced crop lodging, but rarely affected crop maturity, yield, or grain quality. PGR by variety interactions were rare for most

data collected, however, there were several significant interactions for crop height and crop lodging. Interactions for height varied by site, but a taller variety (AAC Redberry) did demonstrate a significant height reduction to both PGR products at 6 out of 6 significant site years, and a variety with moderate height (AAC Brandon) was more responsive to Manipulator than Moddus at 3 out of 6 significant site years. When there was a significant interaction for lodging, a tall variety with poor lodging resistance (AAC Redberry) tended to demonstrate greater lodging reductions with both PGR products compared to other varieties. A tall variety with good lodging resistance (AAC Alida) or a short variety with poor lodging resistance (AAC Starbuck) did not demonstrate a similar result. Furthermore, there were no instances where a PGR increased yield, as crop lodging tended to be low throughout the trial period. Test weight was sometimes reduced with an application of Manipulator, but this only occurred at 2/12 site years. Protein was also occasionally affected by PGR application but was only reduced with Manipulator at 3/12 site years and with Moddus at 1/12 site years.

Conclusions

Overall, the effect of PGRs in wheat in dry to normal conditions seems to be minimal, however, a PGR still reduced crop height and crop lodging, but rarely impacted yield or grain quality. Applying a PGR was economical 50% of the time in a year with near-normal to slightly above-average precipitation, while in a hot and dry year, when precipitation was reduced by 50-70%, applying a PGR was rarely economical at 8% of the time.

Acknowledgements

Financial support for this demonstration was provided by the Agricultural Demonstration of Practices and Technologies (ADOPT) program under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative and Saskatchewan Wheat Development Commission.

Demonstrating Optimum 4R Nitrogen Management Strategies for Winter Wheat

Holzapfel, C. (IHARF)

Description

A field trial with winter wheat was conducted near Indian Head to demonstrate crop responses to 4R Nitrogen (N) management strategies. Eleven treatments were arranged in a four replicate RCBD and consisted of nitrogen (N) management strategies where the fertilizer rates, application times, placement, and fertilizer formulations were varied, in addition to a control where no N was applied. The treatments included rates of side-banded urea, contrasting timing/placement options (sideband, spring broadcast, split), and N fertilizer formulations (urea versus enhanced efficiency fertilizer (EEF) products). The EEF products were tailored to the losses which were most likely to occur, with either a dual inhibitor or polymer coating utilized with fall side-banding and a urease inhibitor utilized with spring broadcasting. All the components of 4R nutrient management (rate, timing, placement, and formulation) were accounted for in the evaluated treatments. The treatments are listed and described in greater detail in Table 21.

Table 21. Nitrogen treatments evaluated in the winter wheat 4R nitrogen (N) management demonstration (ADOPT #20230418) conducted at Indian Head in 2024.

#	Total N Rate [X]	Fall Side-Banded N	Spring Broadcast N
1	0% (control)	Nil	Nil
2	50%	50 kg N/ha as Urea [W]	Nil
3	100%	100 kg N/ha as Urea	Nil
4	150%	150 kg N/ha as Urea	Nil
5	100%	100 kg N/ha as SUPERU [V]	Nil
6	100%	100 kg N/ha as ESN [U]	Nil
7	100%	Nil	100 kg N/ha as Urea
8	100%	Nil	100 kg N/ha as ANVOL [T]
9	100%	50 kg N/ha as Urea	50 kg N/ha as Urea
10	100%	50 kg N/ha as SUPERU	50 kg N/ha as ANVOL
11	100%	50 kg N/ha as ESN	50 kg N/ha as ANVOL

[Z] Side-banded fertilizer was placed approximately 38 mm beside and 19 mm below the seed row at the time of seeding

[Y] Spring broadcast N was distributed uniformly across the soil surface in the early spring without incorporation

[X] N rates do not include residual soil NO_3-N (0-60 cm) and no additional N was provided by P and/or S fertilizer products

[W] Untreated Urea (industry standard); [V] Dual urease / nitrification inhibitor; [U] Polymer coated / slow release; [T] Urease inhibitor

Results

Data collection included NDVI, grain yield, grain protein, and agronomic N use-efficiency (ANUE). Residual soil N was low, and the weather was such that wet spring soils created some potential for denitrification of fall-applied N while the risk of ammonia volatilization with spring broadcasting was low. There was a strong N response with yields (Figure 5) and protein (Figure 6) increasing to the highest rate; however, ANUE decreased with increasing N rate (Figure 7). Fall side-banding and split applications performed better than surface broadcasting the entire requirements in the spring. The EEF products, particularly the dual inhibitor, performed slightly better with fall side-banding. Both forms performed similarly with spring broadcasting.

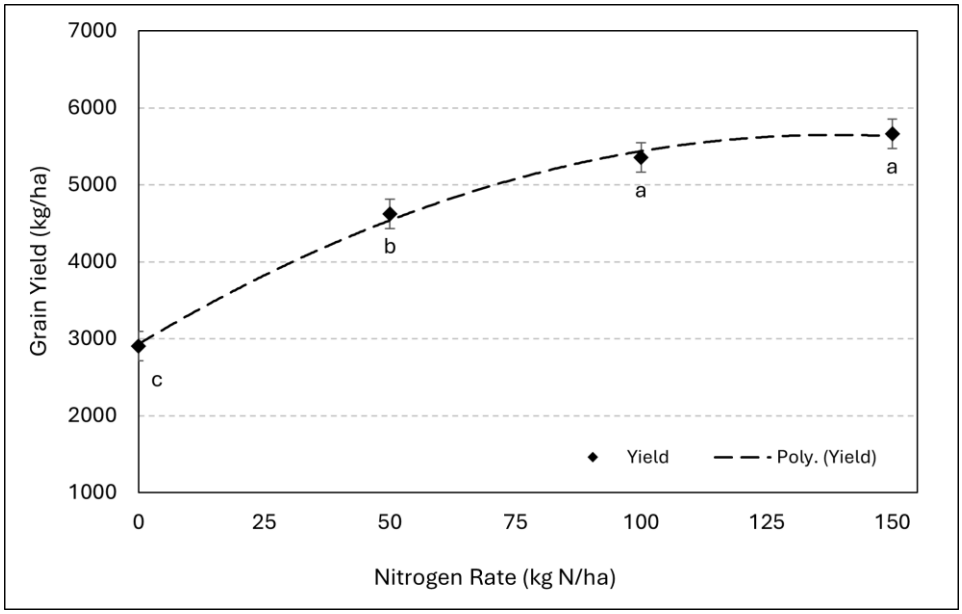


Figure 5. Side-banded nitrogen (N) rate effects on winter wheat grain yield at Indian Head, 2024. Error bars are standard error of the treatment means and values labelled with the same letter do not significantly differ (Fisher's protected LSD test; $P \leq 0.05$).

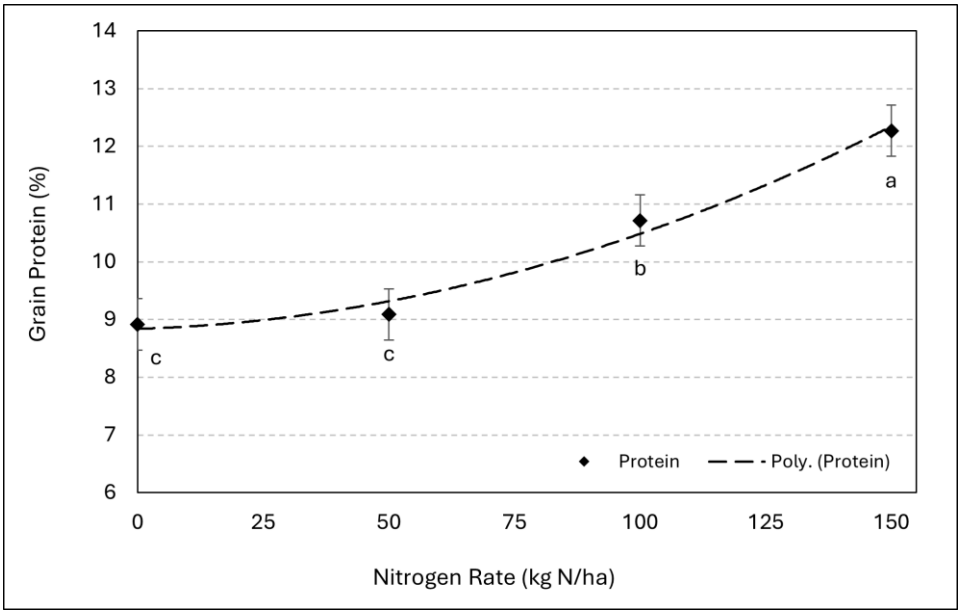


Figure 6. Side-banded nitrogen (N) rate effects on winter wheat grain protein at Indian Head, 2024. Error bars are standard error of the treatment means and values labelled with the same letter do not significantly differ (Fisher's protected LSD test; P ≤ 0.05).

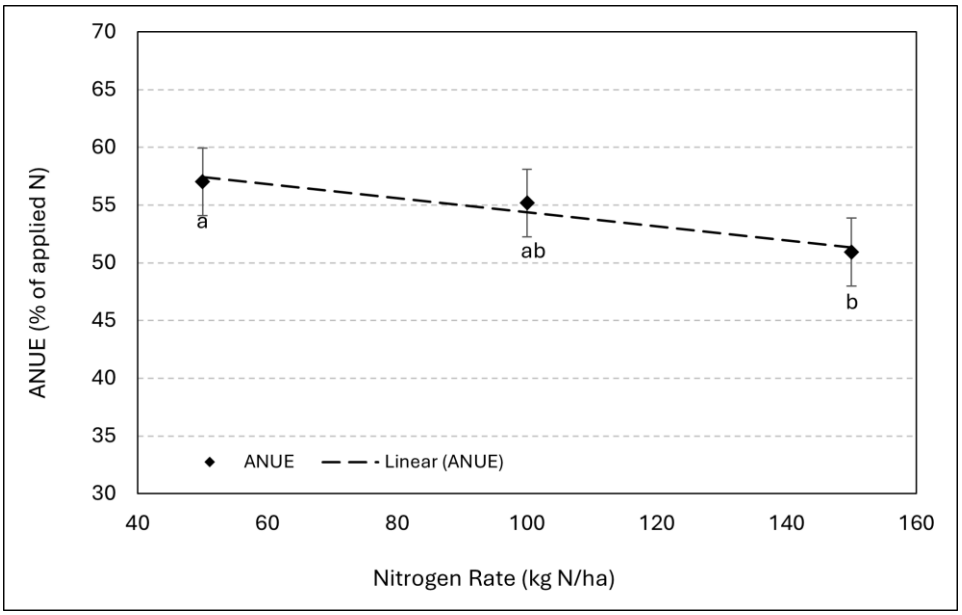


Figure 7. Side-banded nitrogen (N) rate effects on agronomic N use-efficiency (ANUE) in winter wheat at Indian Head, 2024. Error bars are standard error of the treatment means and values labelled with the same letter do not significantly differ (Fisher's protected LSD test; P ≤ 0.05).

Conclusions

Repeating this project would be beneficial to demonstrate the treatment performance under different environmental conditions and build upon these results in future years.

Acknowledgements

Financial support for this demonstration was provided by the Agricultural Demonstration of Practices and Technologies (ADOPT) program under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

Foliar-applied N-fixing Biological Product Applications in Wheat: Field-Scale

Description

The objective of this project was to determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in wheat under various management, soil and weather conditions in Saskatchewan. Cooperators implemented the field-scale trial in wheat field of their choice, using their own equipment and normal practices. Producers choose the foliar N-fixing bacteria product that they would like to use in the trial. The treatments compared crop treated with the foliar N-fixing bacteria product(s) to an untreated check:

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

The treatments were replicated four times and applied in randomized strips, for a total of 12 plots. All plots were managed the same agronomically including seeding date, variety, seeding depth, seed treatment, and pesticide application. The foliar N-fixing products were applied according to the label recommendation and was either tank-mixed at herbicide timing or applied as a separate pass.

Results

No differences in yield or grain quality were observed with the application of Envita® or Utrisha™ foliar-applied N-fixing bacteria at Indian Head location (Table 22).

Table 22. Effect of foliar-applied N-fixing bacteria product application on wheat yield and grain quality of a field-scale trial at Indian Head, 2024.

	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000 seeds)	Test Weight (TW) (kg/hL)
Untreated Check	73.3	13.8	33.3	79.7
Envita®	72.9	13.6	33.6	79.8
Utrisha™	72.4	13.6	33.7	79.8
SE	1.58	0.08	0.63	0.30
p-value	0.9089	0.2368	0.896	0.9474

Conclusions

Since there was no significant yield difference between treatments, the most cost-effective option is the untreated check.

Acknowledgements

Financial support for this project was provided by the Saskatchewan Wheat Development Commission under the Wheat Wise On-Farm Trial program.

Foliar-applied N-fixing Biological Product Applications in Canola: Field-Scale

Description

The objective of this project was to determine if there are agronomic and economic benefits of applying a commercially available, foliar-applied N-fixing bacteria product in canola under various management, soil and weather conditions in Saskatchewan. Cooperators implemented the field-scale trial in wheat field of their choice, using their own equipment and normal practices. Producers choose the foliar N-fixing bacteria product that they would like to use in the trial. The treatments compared crop treated with the foliar N-fixing bacteria product(s) to an untreated check:

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

The treatments were replicated four times and applied in randomized strips, for a total of 12 plots. All plots were managed the same agronomically including seeding date, variety, seeding depth, seed treatment, and pesticide application. The foliar N-fixing products were applied according to the label recommendation and was either tank-mixed at herbicide timing or applied as a separate pass.

Results

No differences in yield or grain quality were observed with the application of either foliar-applied N-fixing bacteria products at Indian Head location (Table 23).

Table 23. Effect of foliar-applied N-fixing bacteria product application on canola yield and grain quality of a field-scale trial at Indian Head, 2024.

	Yield (bu/ac)	Protein (%)	Thousand Kernel Weight (TKW) (g/1000 seeds)	Test Weight (TW) (kg/hL)	Oil (%)	Green Seed (%)
Untreated Check	48.4	24.8	3.7	66.1	47.2	0.0
Envita®	47.8	24.6	3.6	65.9	47.1	0.0
Utrisha™	48.0	24.9	3.7	65.9	47.0	0.0
SE	1.10	0.14	0.05	0.19	0.25	0
p-value	0.9056	0.2929	0.3793	0.7109	0.7457	0.1

Conclusions

Since there was no significant yield difference between treatments, the most cost effective option is the untreated check.

Acknowledgements

Financial support for this project was provided by the Saskatchewan Oilseeds under the Top Notch Farming Trials program.