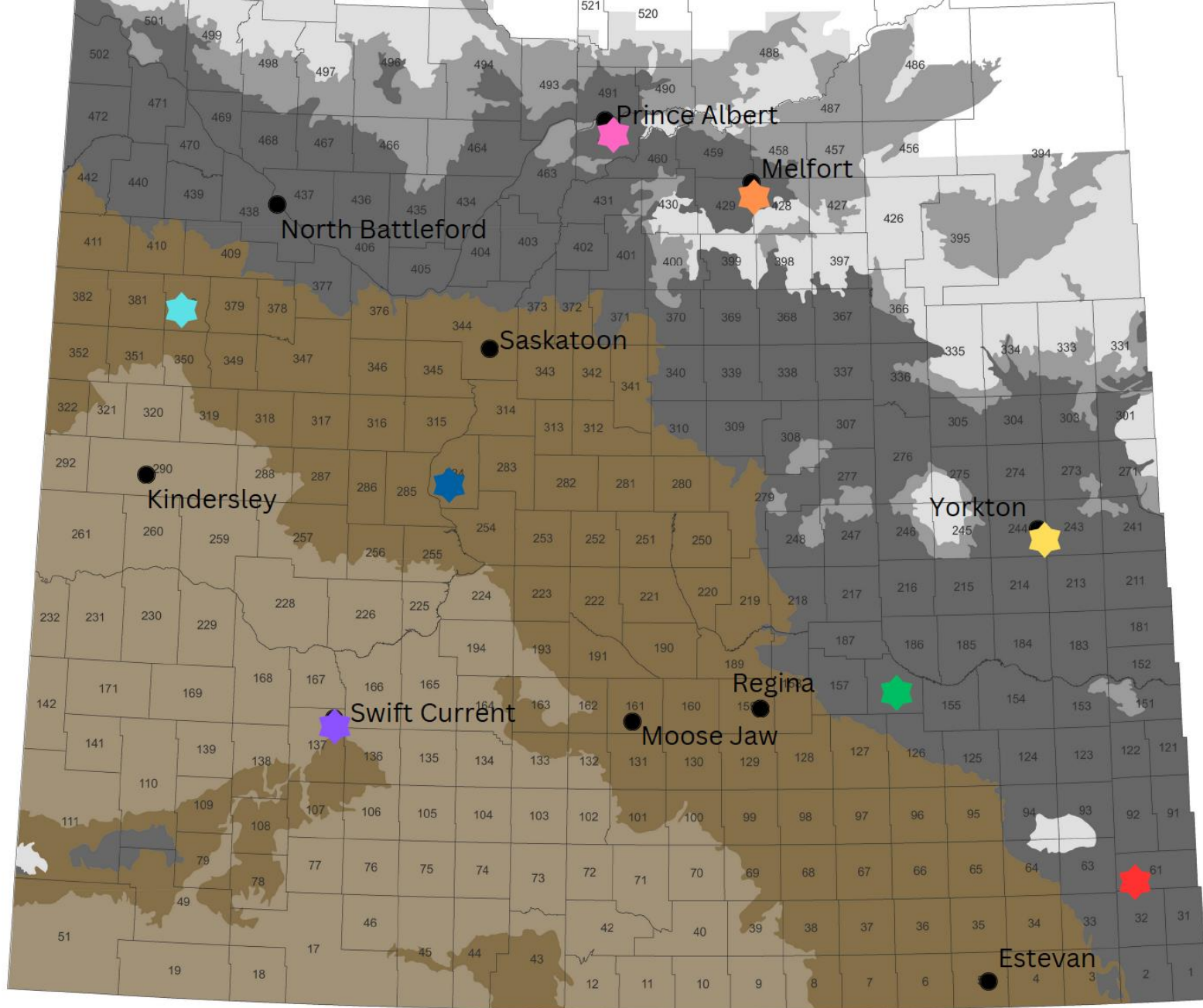




# Lentil Integrated Pest Management: Managing Aphanomyces with Soil Strategies

Amber Wall, Wheatland Conservation Area





## 2025 Annual Summer Tour

- Thursday, July 17, 2025






## Partners

- Government
- Industry Partners
- Commodity Groups
- AAFC
- Universities

# AgriARM Locations

Applied Research Management



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





# Integrated Pest Management (IPM) for Lentils in Aphanomyces Soil



## Locations:

1. Western Applied Research Corporation (WARC) in Scott, SK. RM #308
2. South East Research Farm (SERF), in Redvers, SK. RM #61
3. Irrigation Crop Diversification Corporation (ISask) in Outlook, SK. RM #284
4. Wheatland Conservation Area (WCA) in Swift Current, SK. RM #137

## Experimental design:

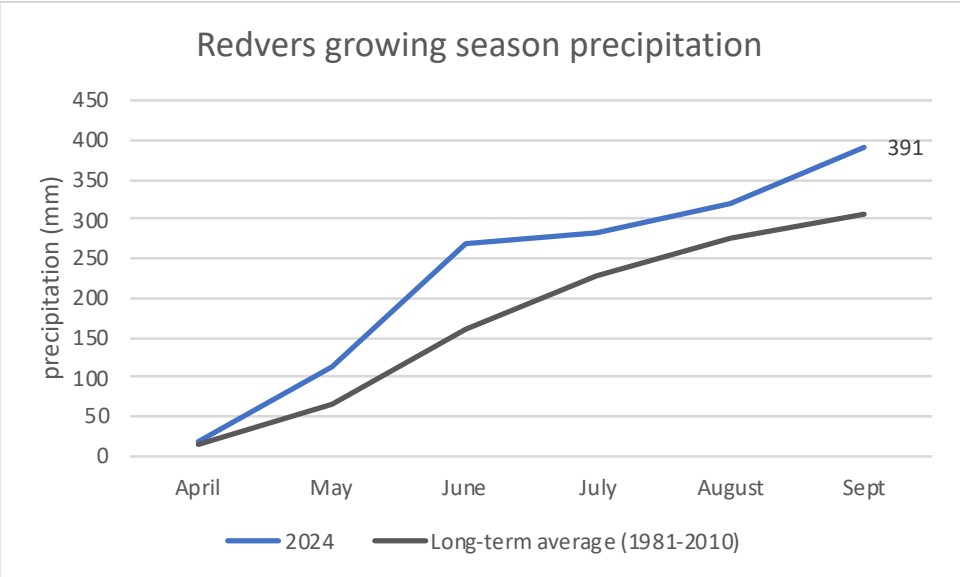
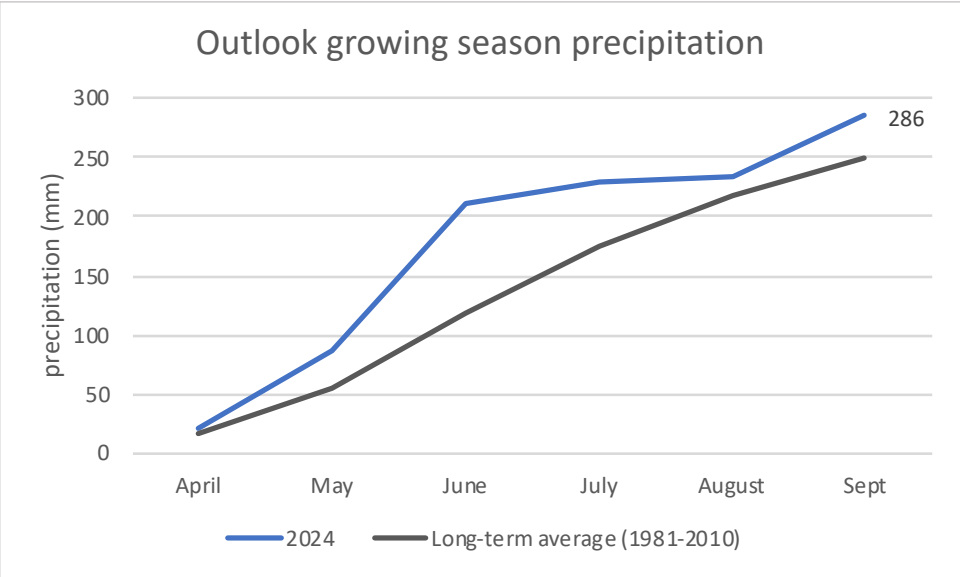
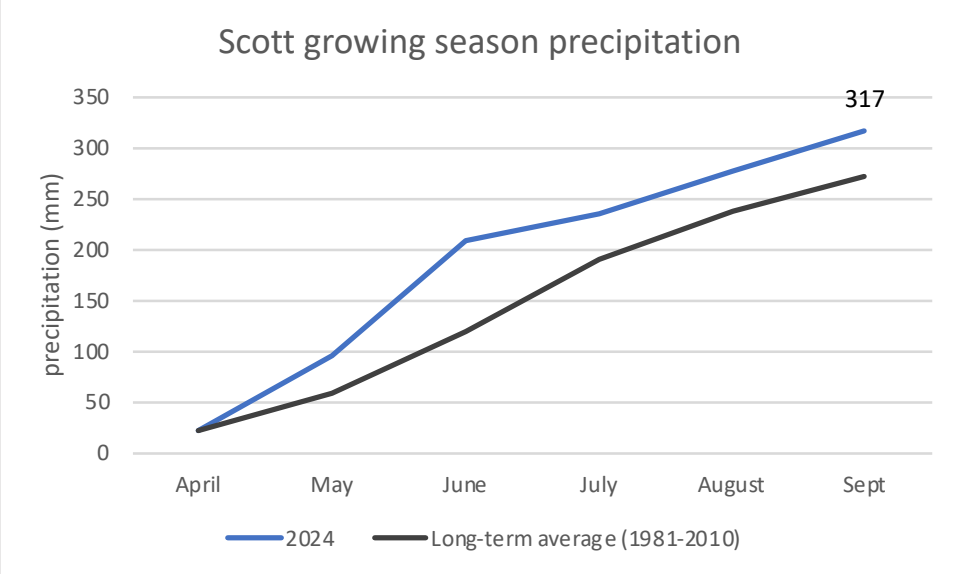
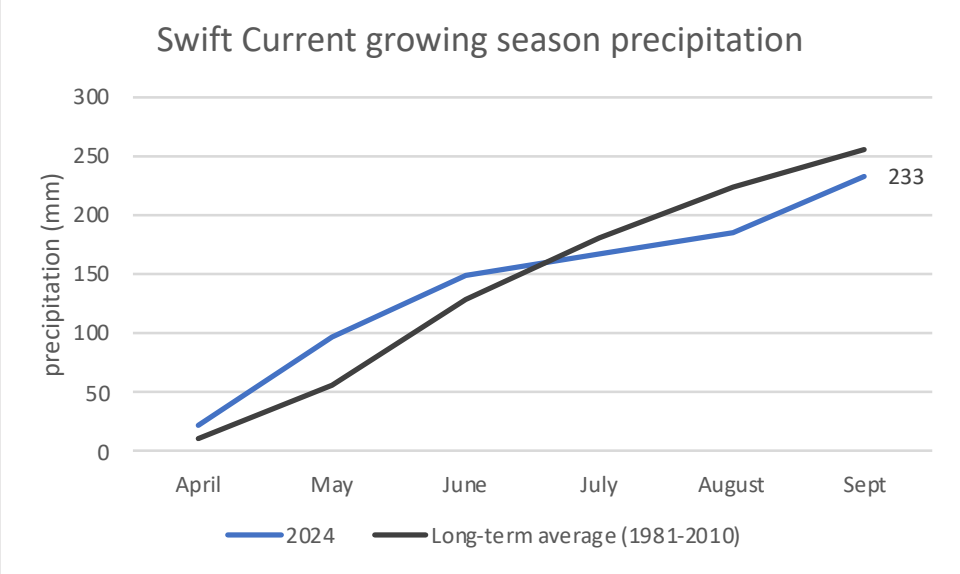
- RCBD
- 4 replicates

## Years:

- 2024-2026



# General weather conditions



# Treatments



#	N rate (lb/ac) *	Seed Treatment** (Y/N)	Seeding Date***
1	0	Y	Early
2	0	Y	Late
3	0	N	Early
4	0	N	Late
5	50	Y	Early
6	50	Y	Late
7	50	N	Early
8	50	N	Late
9	100	Y	Early
10	100	Y	Late
11	100	N	Early
12	100	N	Late

\*N Rate (applied as urea)

\*\*Treated with Rancona Trio @500ml/100kg seed

\*\*\*1<sup>st</sup> Seed Date: Early seeding date of Early May; Late seeding date of Mid-May



# Agronomics

- **Variety:** A common, high yielding variety common to each area, CDC Impulse
- **Seed Rate:** 190 seeds/m<sup>2</sup>
- **2 Seed Dates:** 2 weeks apart
- **Inoculant:** Granular rhizobial inoculant
- **Seed Treatment:** A seed treatment will be applied to the seed prior to sowing for specific treatments
- **Fertility:** N fertility will be side banded at seeding, (soil N not be taken into account), but an area with low residual N is recommended.
- PKS will be balanced using soil test recommendations
- **Pesticides:** best management practices



# Operations



June 6, 2024 at Swift Current. First seed date (left), second seed date (right)

Operation	Early Seed Date Treatments		Late Seed Date Treatments	
	Scott	Swift Current	Scott	Swift Current
Seed Date	05-May	29-Apr	22-May	13-May
Soil Temp at Seeding	5.2	9.5	8.0	15
Rolled	9-May-24	13-May	28-May	13-May
Emergence Date	20-May	18-May	03-Jun	27-May
Pre-seed herbicide	04-May	23-Apr	21-May	23-Apr
In-crop herbicide	02-Jun	20-Jun	19-Jun	20-Jun
Fungicide	11-Jul	none	11-Jul	none
Insecticide	none	23-Jul	none	23-Jul
Dessication	14-Aug	n/a	22-Aug	n/a
Harvest Date	20-Aug	31-Jul	27-Aug	06-Aug

# Data collection

- Soil test to confirm Aphanomyces

- Plant Density

- Heights

- Above ground disease ratings

- Root Assessments

- Nodule Assessments

- NDVI

- Protein

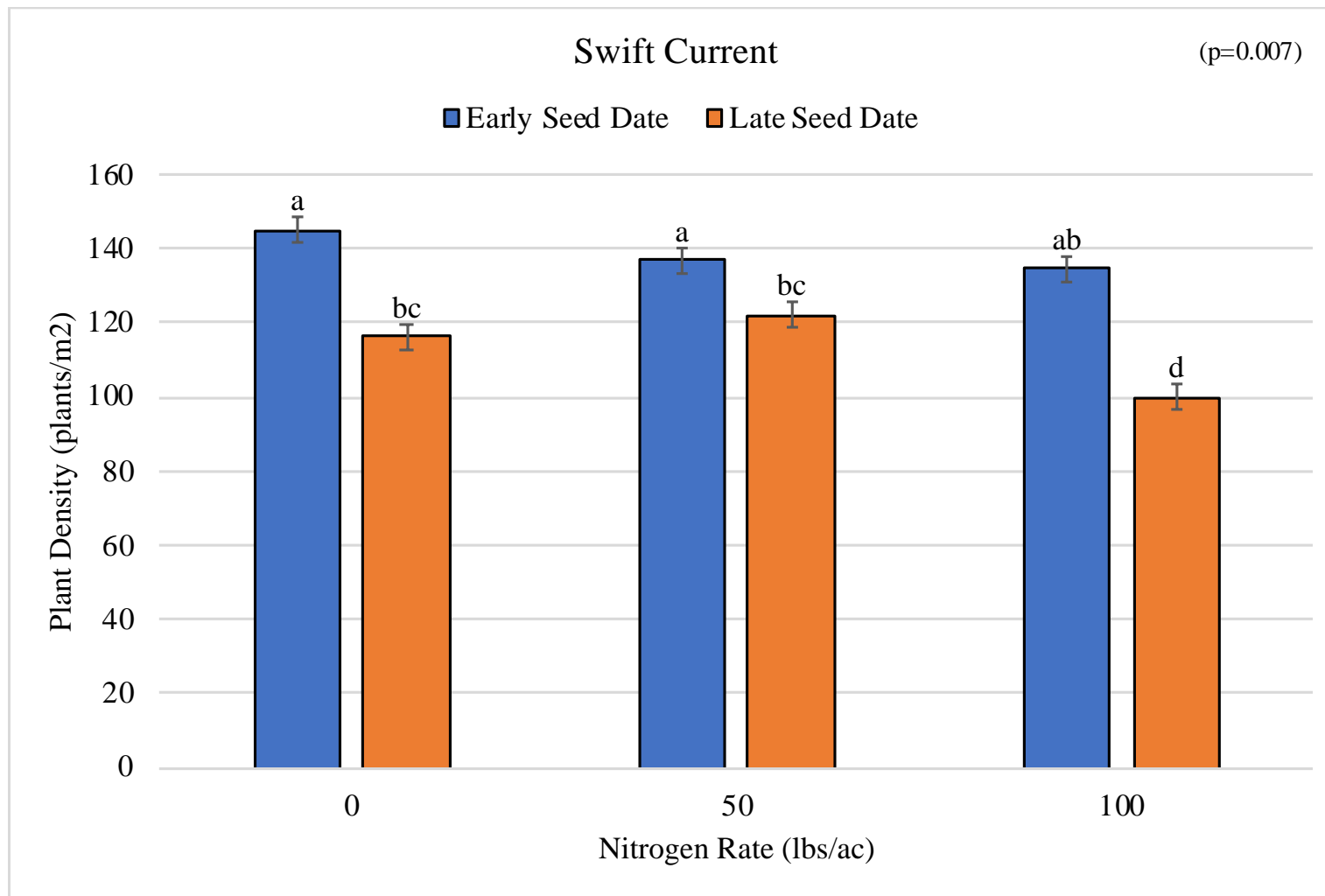
- Disease Seed Testing

- Seed Yield

- Economics

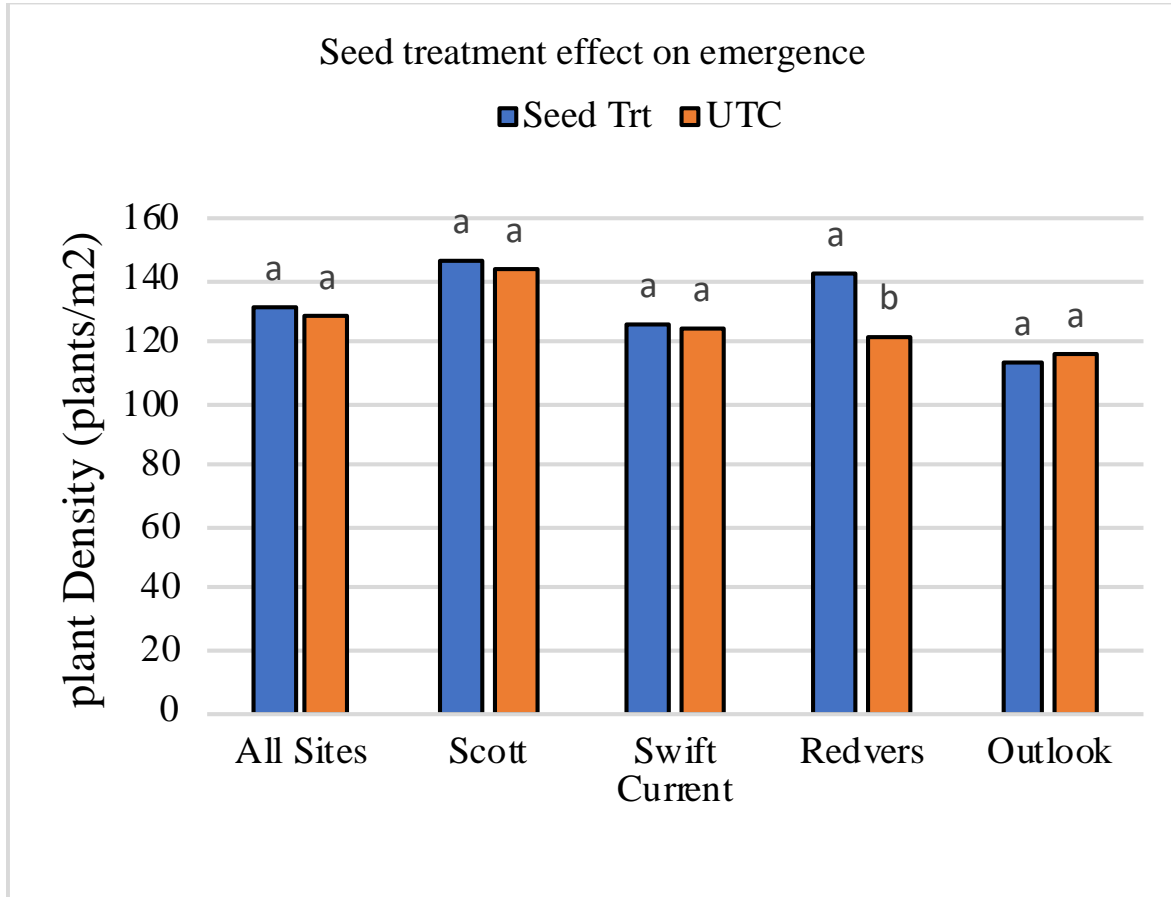
- Weather

# Plant Density (Swift Current 2024)

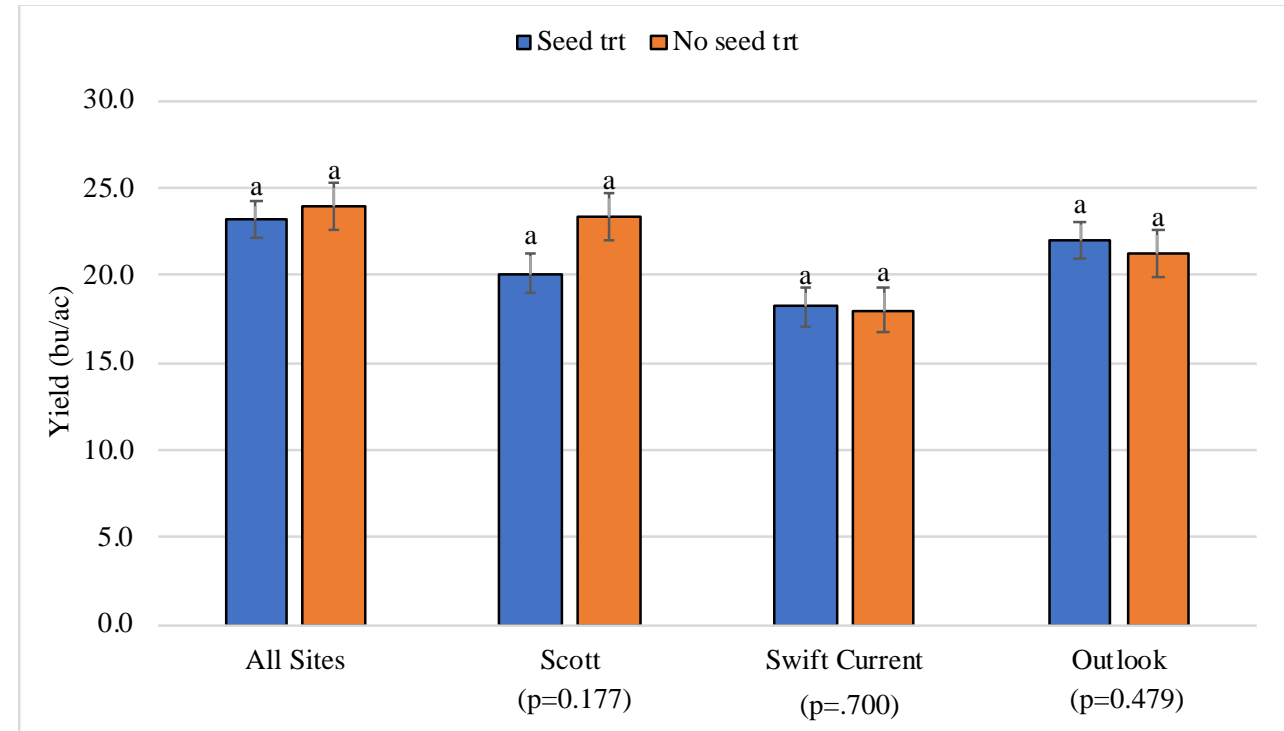


- No Nitrogen, or seed date effect on plant density at Redvers, Outlook, or Scott
- All sites had adequate emergence

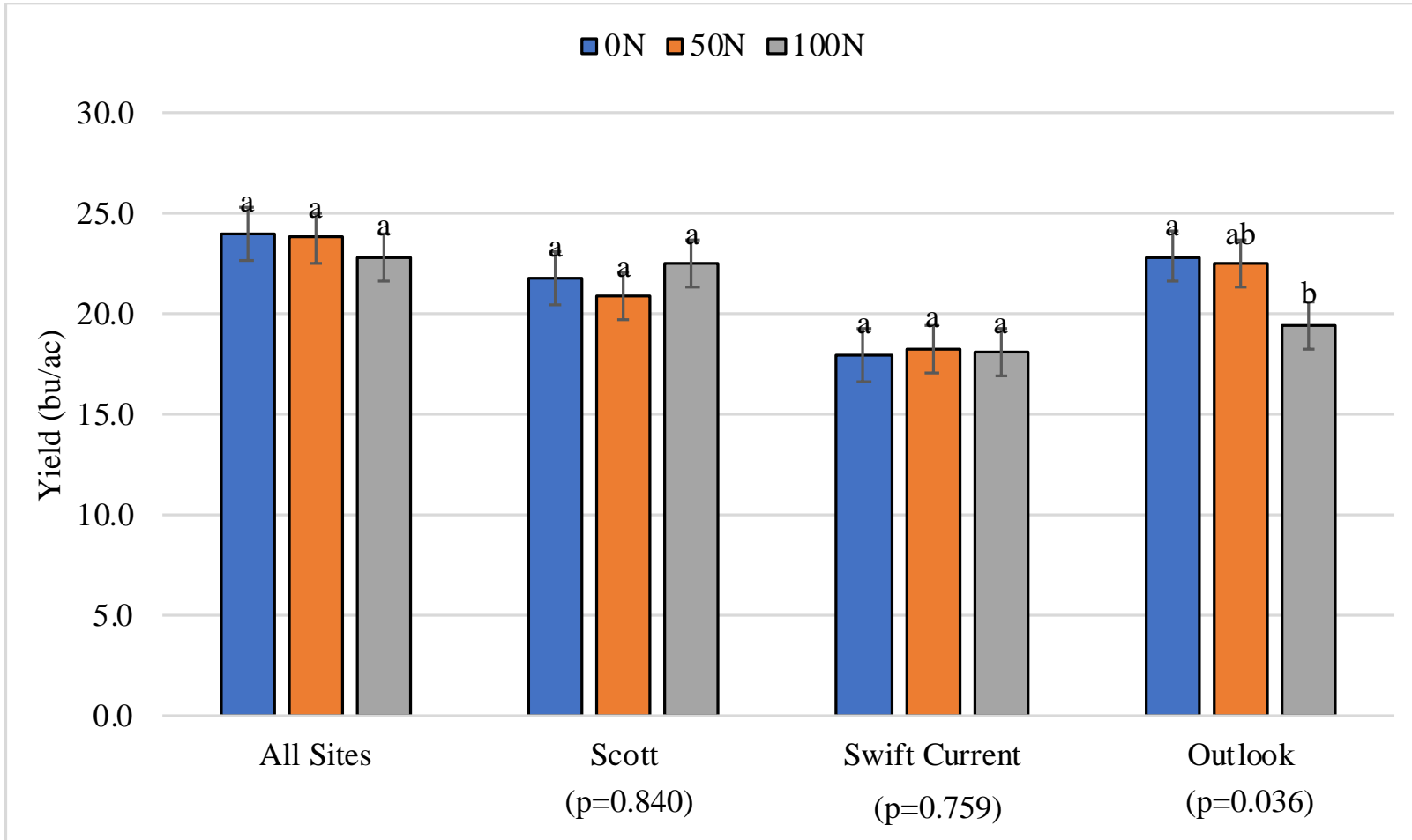
## Seed treatment x emergence



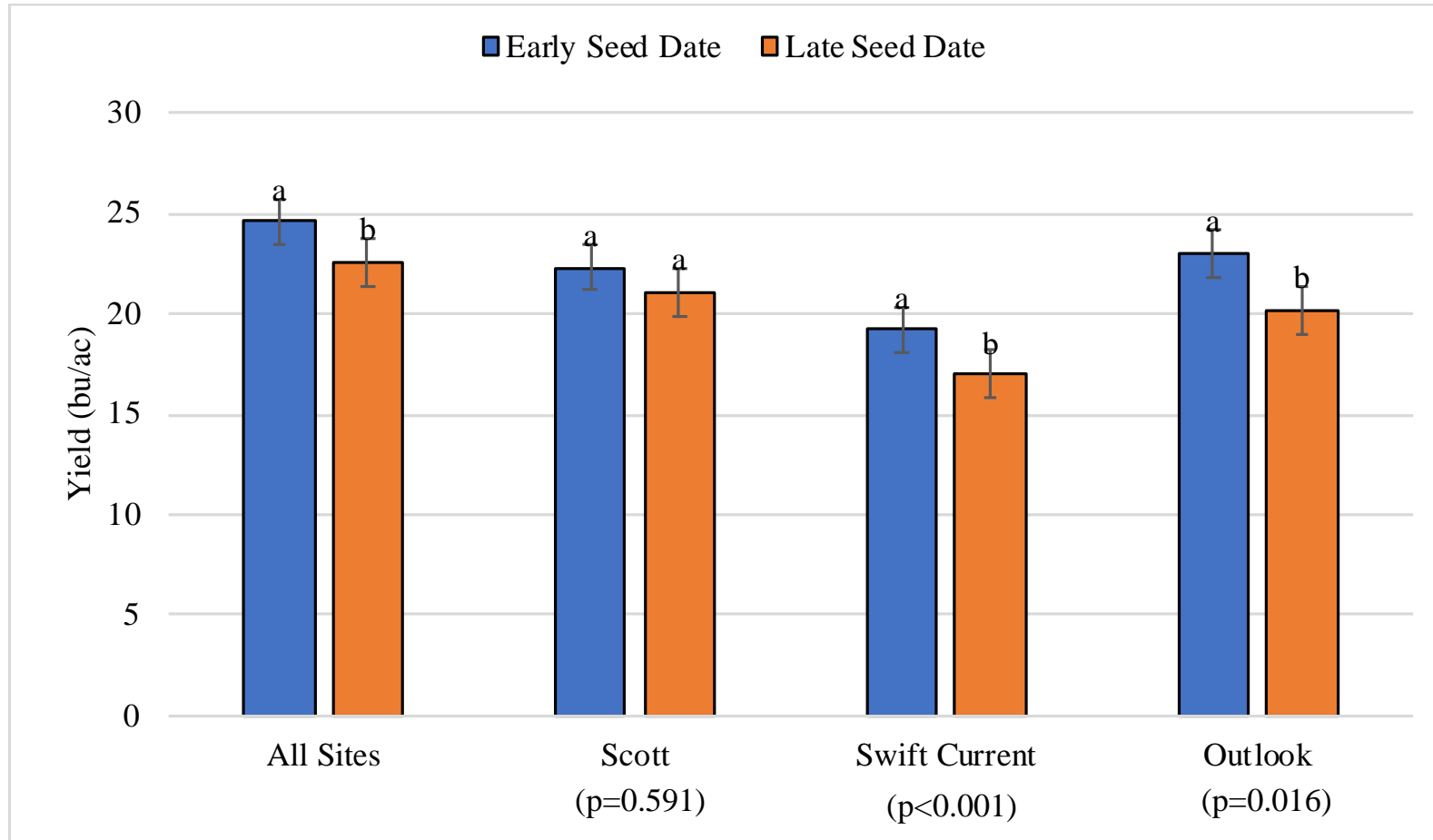
## Seed treatment x yield (bu/ac)



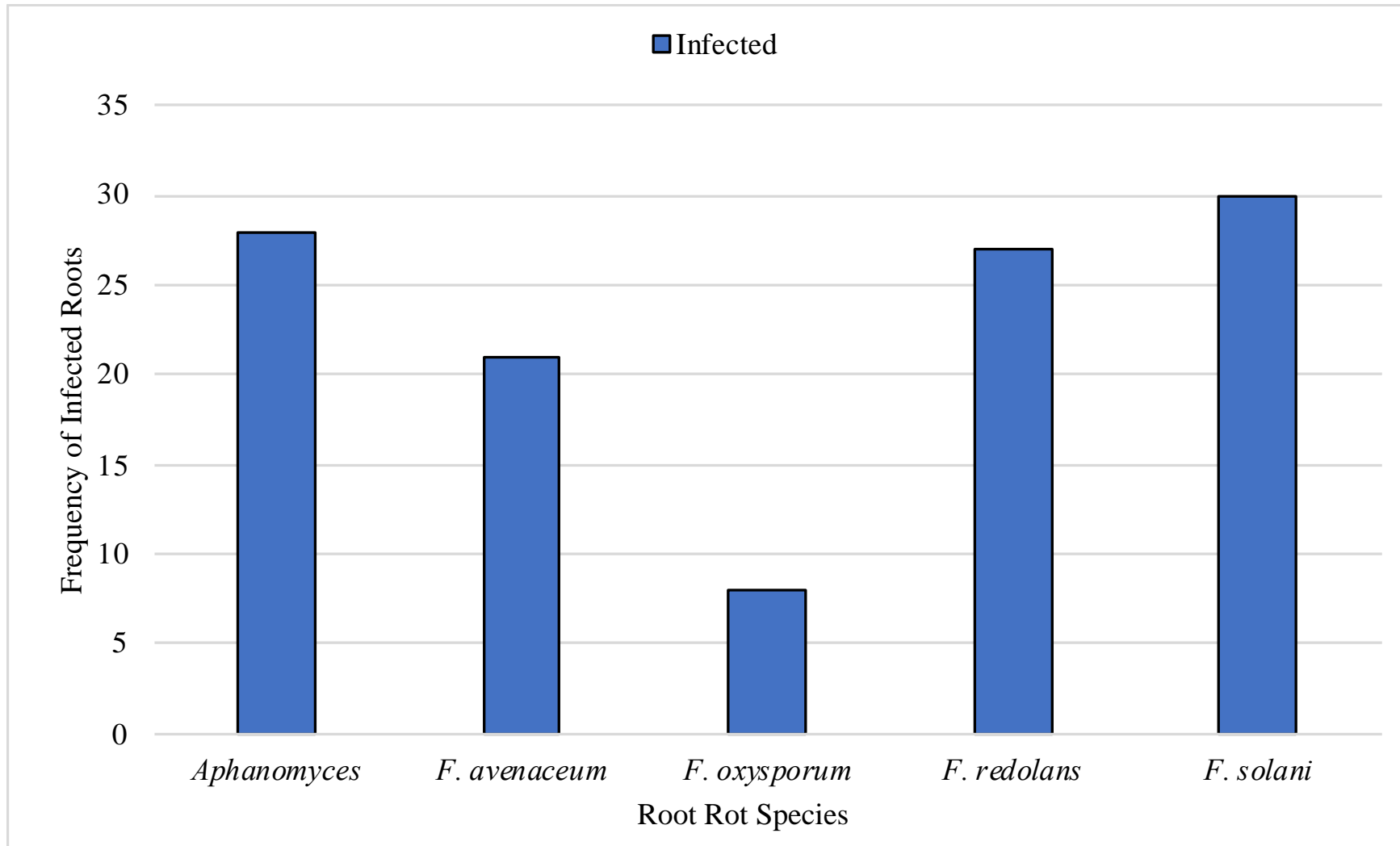
# Nitrogen rate x yield (bu/ac)



# Seed date x yield (bu/ac)



# Root disease quantification





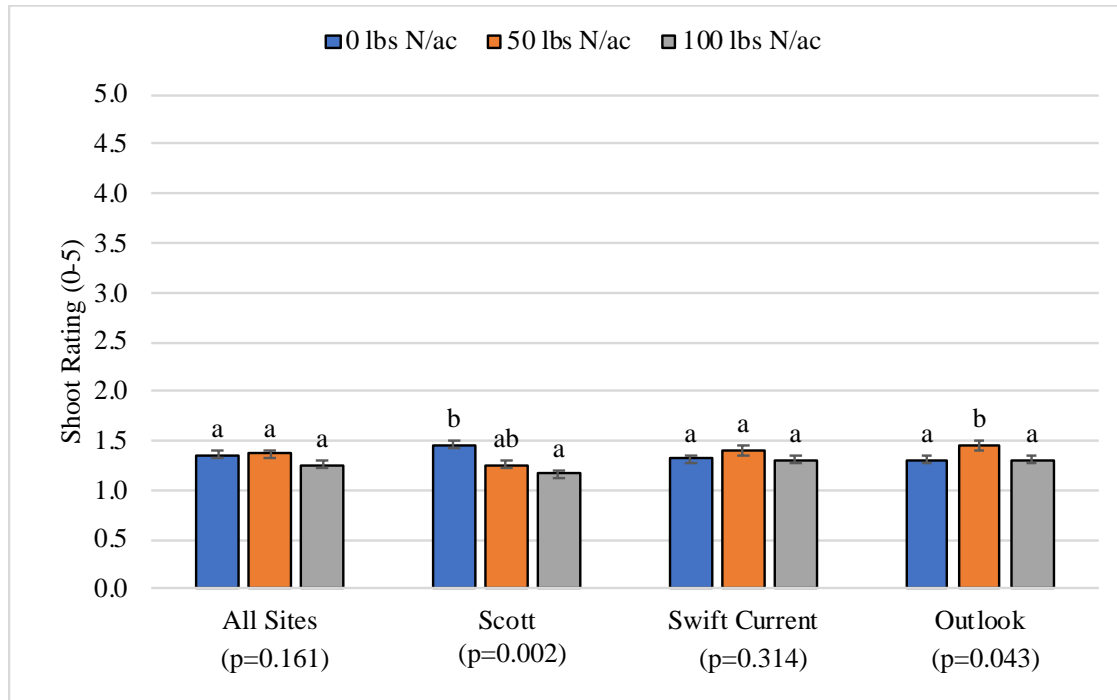
# Above ground disease ratings (Chatterton, 2023)

## Shoot symptoms rating scale:

1:	healthy plants
2:	Slight yellowing of lower leaves
3:	Yellowing of the lower leaves up to the 3rd or 4th node, some stunting
4:	Necrosis of at least half or more of the leaves with some stunting
5:	Plant dead or nearly so

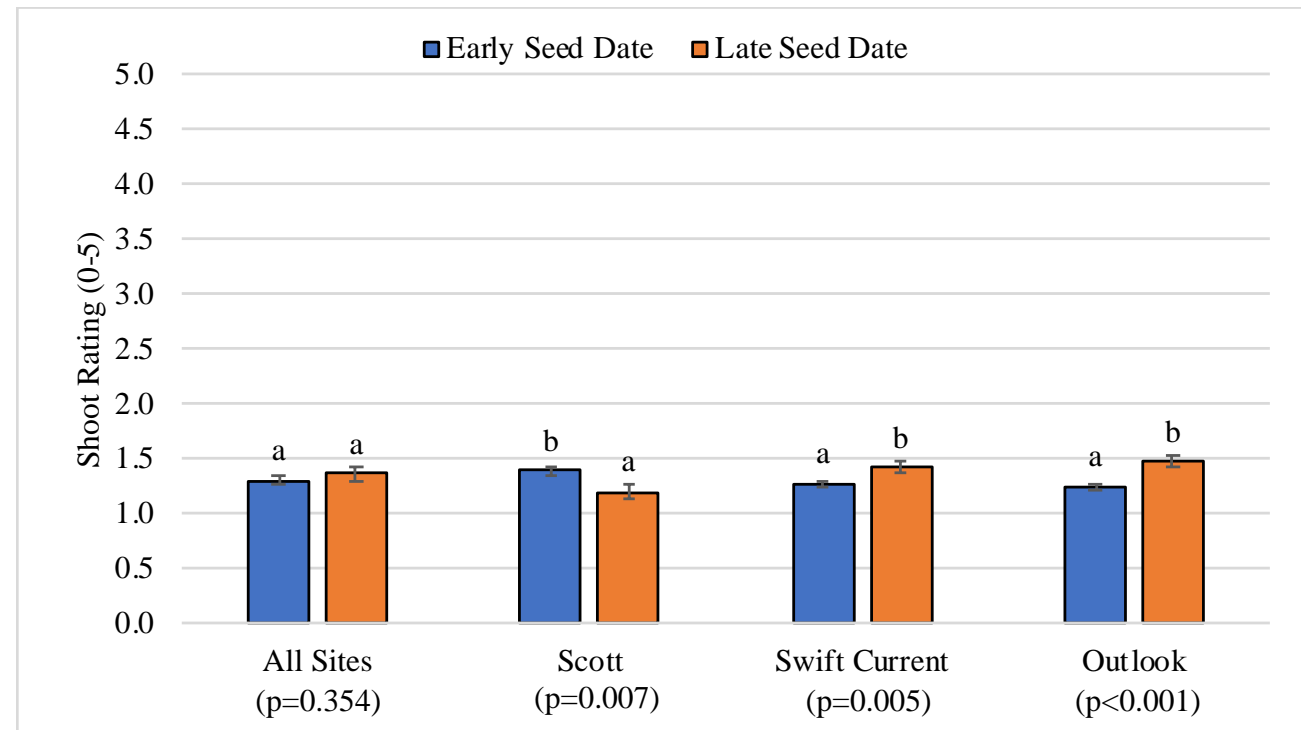


# Nitrogen rate x shoot health



- Seed treatment had no effect on visual shoot ratings

# Seed date x shoot health



# Root Rot Assessments (Chatterton, 2023)

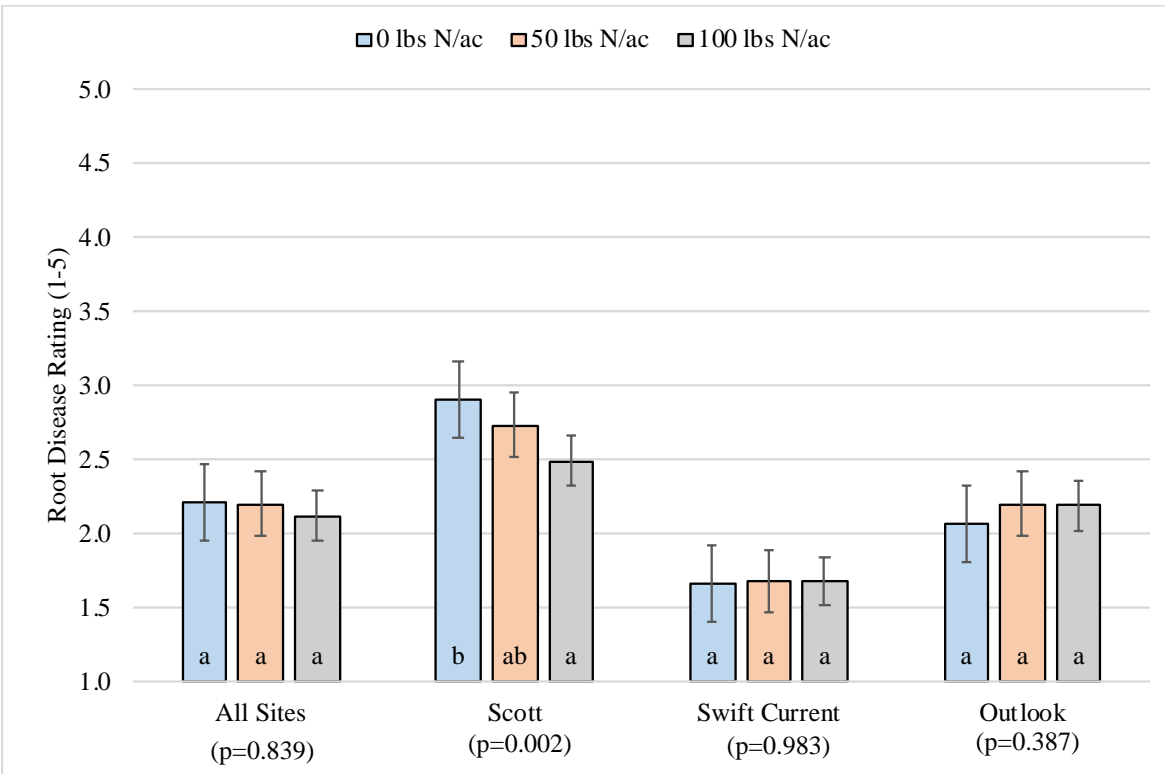
## Root rot rating scale for root rot:

- 0) No root discoloration
- 1) 1-25 % discoloration
- 2) 25-50 % discoloration
- 3) 50-75 % discoloration, epicotyl is still healthy
- 4) 75-100 % discoloration, honey-brown lesion extending from epicotyl to crown
- 5) Dead plant

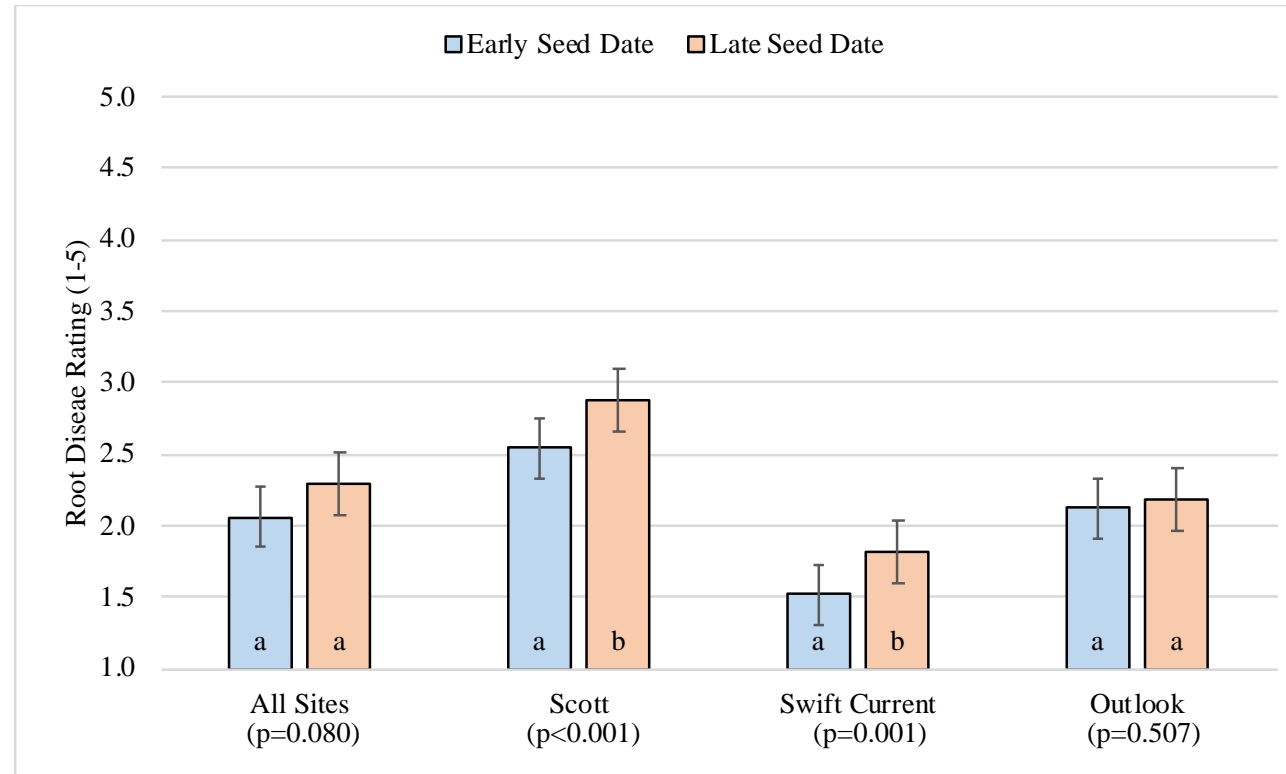


# Root Rot Ratings (0-5, 0=no discoloration)

## Nitrogen rate x root health



## Seed date x root health



- Seed treatment had no effect on visual root ratings



# Nodule Assessment

## TOTAL SCORE

11 – 13

**Effective nodulation.** Good nitrogen fixation potential.

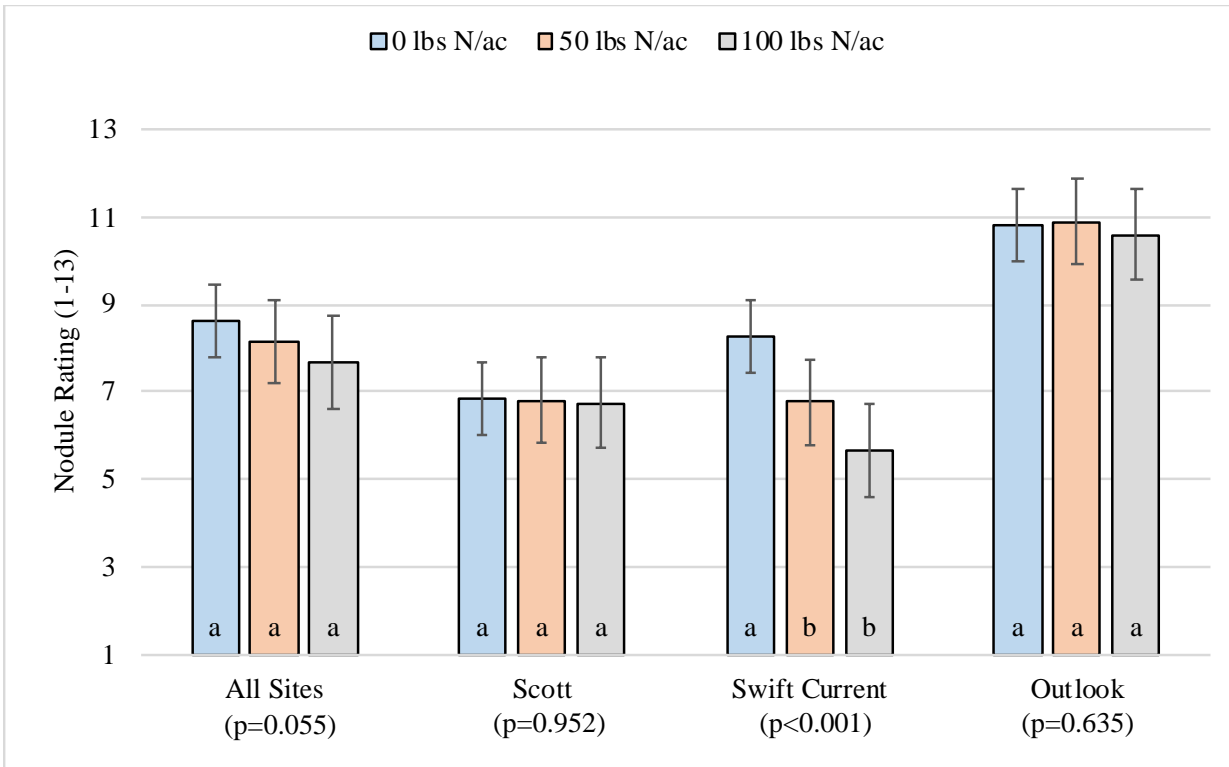
7 – 10

**Nodulation less effective.** Fixation potential reduced. Were inoculation or growing conditions less than optimum?

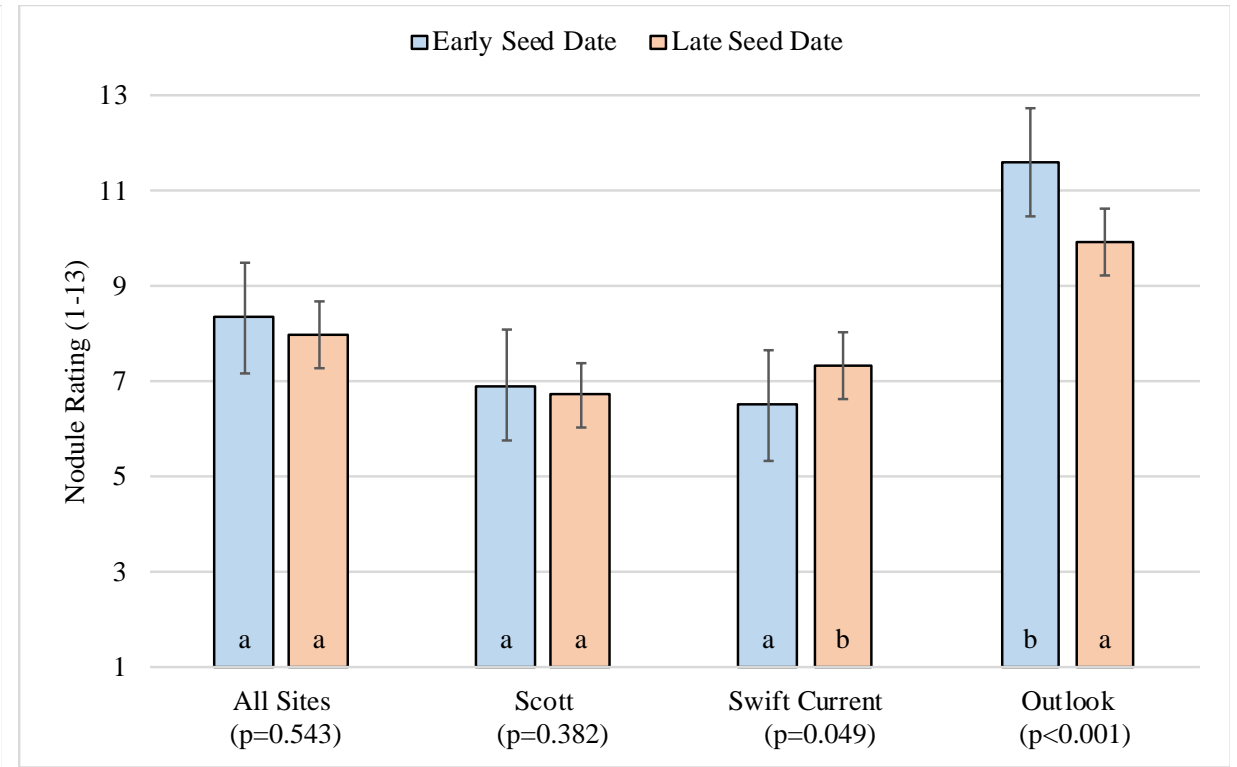
1 – 6

**Generally unsatisfactory nodulation.** Requires evaluation of inoculants used, inoculation methods and of growing conditions on site.

## Nitrogen rate x nodulation



## Seed date x nodulation



# Summary after 1 year...

- Overall response to seed treatment was unclear
- **Additional Nitrogen applications did not increase yields**
  - Nitrogen x Seed Date: lower emergence at Swift Current when additional nitrogen was applied at the later seed date
  - Additional nitrogen resulted in decreased yields at Outlook
  - Effect on root health and nodulation unclear at high moisture sites, but nodulation decreased with any addition of nitrogen at Swift Current
- **Seed DATE**
  - Early seed dates resulted in higher emergence at Swift Current
  - Early seed dates resulted in higher yields, although not significant at Scott
  - Early seed dates resulted in lower root disease ratings
  - Seed date effect on shoot/root health and nodulation unclear
- **Develop site-specific recommendations by testing root rot mitigation strategies under multiple soil conditions**

**Final report to be prepared by Alex at Western Applied Research Foundation**

# Lentil Response to Varying Rates of Potassium and Sulfur Fertilizer Applications



- Swift Current (Brown soil zone)
- Scott (Dark Brown soil zone)
- Indian Head (thin Black soil zone)
  
- 2023-2024
  
- Small Red Lentils



# Treatments

- Side-banded at seeding

#	Nitrogen <sup>z</sup> (kg N/ha)	Phosphorus (kg P <sub>2</sub> O <sub>5</sub> /ha)	Potassium (kg K <sub>2</sub> O/ha)	Sulphur (kg S/ha)	Description
1	0	0	0	0	No fertilizer applied
2	10	45	0	0	Phosphorus only
3	10	45	22	0	Low Potassium
4	10	45	45	0	High Potassium
5	19	45	0	11	Low Sulphur
6	29	45	0	22	High Sulphur
7	19	45	22	11	Low Potassium – Low Sulphur
8	19	45	45	11	High Potassium – Low Sulphur
9	29	45	22	22	Low Potassium – High Sulphur
10	29	45	45	22	High Potassium – High Sulphur
11	29	45	0	0	Extra Nitrogen Check

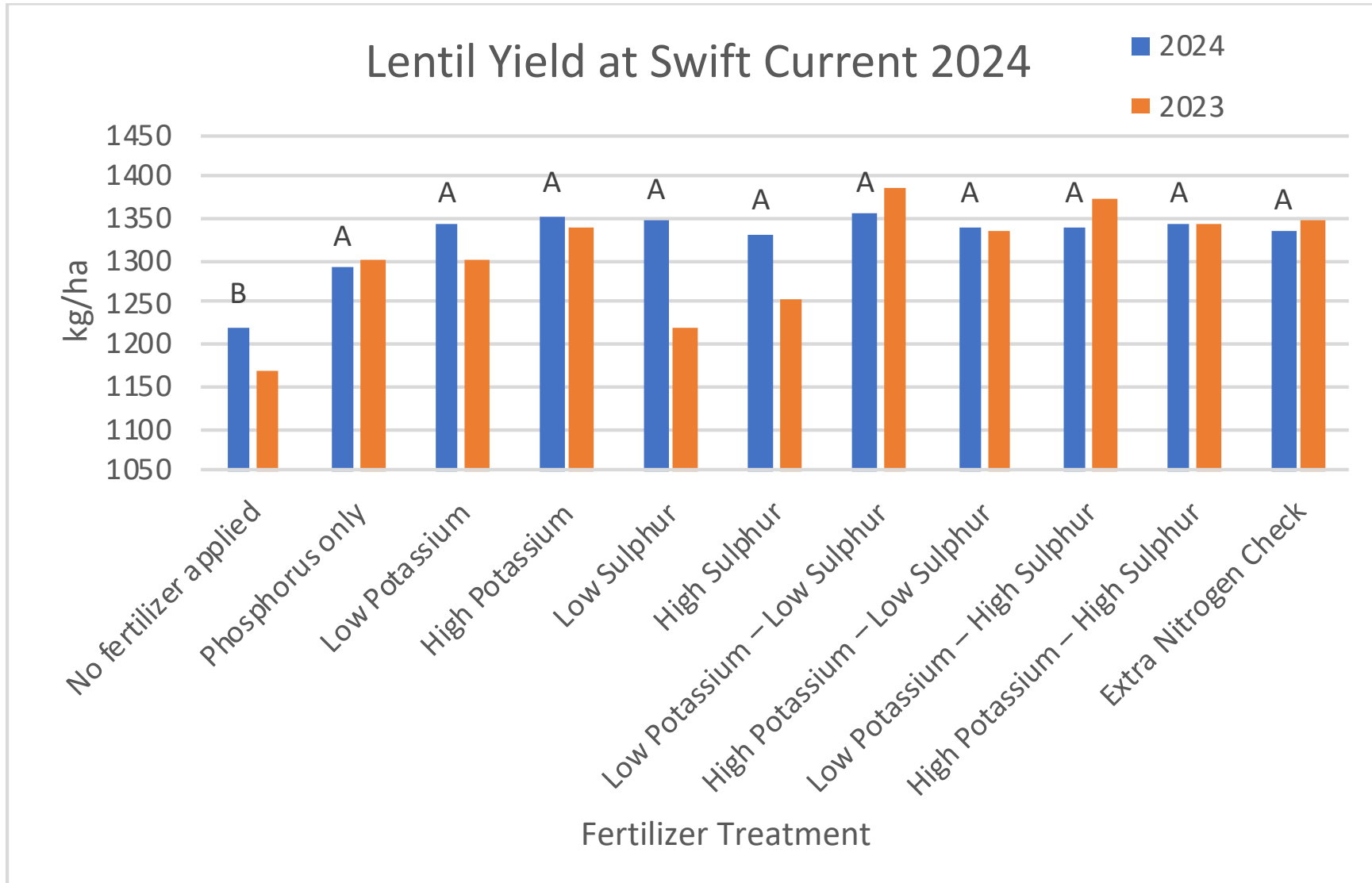
<sup>z</sup> Except for treatment #11 which received supplemental urea, all N was provided by MAP and AMS



# Data collection

- 1) Residual Soil Nutrients – A composite soil sample will be collected in the early spring. The composites should be representative of the entire trial area and consist of 12-16 individual soil cores. Sampling depths of 0-15 cm and 15-60 cm will be dried, ground and submitted to AgVise for complete analyses (Option F)
- 2) Emergence – Count plants in 2 x 1 m sections of crop row when emergence is complete (4-6 weeks after seeding)
- 3) Seed Yield – Yield corrected for dockage and to a uniform seed moisture content of 13%
- 4) Test Weight – Determined using standard CGC methods, use the average of two measurements per plot
- 5) Seed Size – Count and weigh 1000 seeds per plot and calculate g/1000 seeds
- 6) Grain Protein – Determined by IHARF using a FOSS NIR instrument

# Yield (kg/ha)



- soil tests did not indicate a high probability of response for either K or S
- modest amounts of K and S may be applied as part of longer-term or rotation wide nutrient management plan
- important nutrients to overall plant health

# Mean seed yields for individual lentil K and S fertility treatments at Indian Head, Scott, and Swift Current (2023).



#	N-P <sub>2</sub> O <sub>5</sub> -K <sub>2</sub> O-S (kg/ha)	Indian Head	Scott	Swift Current
		----- Seed Yield (kg/ha) -----		
1	0-0-0-0	2469 A	3849 A	1170 A
2	10-45-0-0	2679 A	4006 A	1300 A
3	10-45-22-0	2790 A	4049 A	1301 A
4	10-45-45-0	2715 A	3789 A	1338 A
5	19-45-0-11	2774 A	3514 A	1218 A
6	29-45-0-22	2581 A	3689 A	1252 A
7	19-45-22-0	2564 A	3644 A	1386 A
8	19-45-45-11	2705 A	3578 A	1335 A
9	29-45-22-22	2772 A	3738 A	1374 A
10	29-45-45-22	2715 A	3946 A	1344 A
11	29-45-0-0	2794 A	3689 A	1348 A
	S.E.M.	121.2	213.5	73.3

Lentil Response to Varying Rates and Combinations of Potassium and Sulfur Fertility (Project #AP-2317a). Interim Report 2023.

# Thank you!

**Michael Brown**, Agronomy Manager, Saskatchewan Pulse Growers

**Jessica Enns**, Research Manager, Western Applied Research Corporation

**Alex Waldner**, Research Tech, Western Applied Research Corporation

**Chris Holzapfel**, Research Manager, Indian Head Agricultural Research Foundation

**Lana Shaw**, Research Manager, South East Research Farm

**Gursahib Singh**, Former Research Manager, Irrigation Saskatchewan Agri-ARM site





**THANK YOU!**

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**Croportunities March 13, 2025**

**Annual field tour July 17, 2025**



[www.wheatlandconservation.ca](http://www.wheatlandconservation.ca)

X: @wheatlandsask

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