Pulse Replicated On-Farm Independent Trials

Pulse Phosphorus Rates Trial

Phosphorus (P) is a vital macronutrient for pulses, alongside nitrogen, potassium, and sulfur. In Saskatchewan, phosphorus plays a crucial role in pulse production by supporting key physiological and biochemical processes. It is particularly essential for the formation and functionality of root nodules, which facilitate efficient nitrogen fixation. Additionally, phosphorus supports energy transfer and root development, enabling effective water and nutrient absorption. It contributes to the production of healthy, protein-rich seeds while enhancing the plant's ability to withstand environmental stresses. Ultimately, phosphorus is a key factor in achieving higher yields and improved pulse quality.

Objective

The objective of this field-scale trial is to assess the impact of phosphorus (P) rates on peas and lentils and overall crop production. The cooperator will determine the product and rates.

Treatments

1.	75% P recommended
2.	100% P recommended (Check)
3.	125% P recommended

Phosphorus rates were determined in coordination with the producer, agronomist and spring soil tests. The primary focus was on P rates and overall fertility goals. Trials were set up as randomized strip trials, with a minimum of three replicates per treatment and a preferred four. All plots were managed the same agronomically, aside from treatments.

Data Collection

- Spring soil test
- Plant density
- Field history and management practices
- Yield by plot
- Harvest subsample per plot for grain analysis
- Economics
- General in-season observations
- Weather data (in-field or nearby weather station)

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

[1]SED is a measure of how much variability (same units as mean) you would expect in the difference between sample means if you repeated the experiment several times. The LSD is approximately two times the SED.

[2]A linear regression was used to assess the effects of fungicide on the response variables. The data were also analyzed using the Mixed Model procedure in JMP, with replicates treated as random and phosphorus rates as fixed effects. Treatment means were separated using the LSD test. All treatment effects and differences between means were considered significant at $p \leq 0.05$. However, p-values of 0.05–0.1 may also be acknowledged.

$P < 0.05$: There is a 95% probability (19 out of 20 times) that the observed difference is due to the treatment rather than random variation.
$P < 0.1$: There is a 90% probability (nine out of 10 times) that the difference is due to the treatment effect.
$P > 0.1$: There is a higher likelihood that the observed difference is due to random variability rather than the treatment.

2025 Results

Four locations conducted the phosphorus rates trial in 2025. One site used peas; the other three used lentils. The three lentil sites used different phosphorus rate structures, meaning the datasets are not directly comparable. Combining the results across locations would mask these differences and could lead to inaccurate or misleading conclusions. To ensure the effects of phosphorus rate are accurately represented, each site must be interpreted independently. The phosphorus rate showed minimal influence on most measured variables and locations. Plant density and thousand kernel weight (TKW) were unaffected by phosphorus rate at all three sites. Yield responded to phosphorus rate at only one site (Harris), where the reduced rate produced the highest yields. TW was influenced at two sites: the enhanced rate resulted in higher TW at Eston, whereas the reduced rate produced higher TW at Harris. TW is then both the standard and enhanced rates. Protein concentration was affected at Harris, with the reduced rate outperforming the enhanced rate. Moisture content also varied at Harris, where the improved rate produced higher moisture levels than the reduced rate.

Lentil Sites

	Plant Density (plants/ft^2)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Moisture (%)
	Eston					
Reduced Rate	15 a	65.03 a	36.33 a	85.20 a	10.90 a	13.90 a
Standard Rate	15 a	67.30 a	36.00 a	85.21 a	10.79 a	13.80 a
Enhanced Rate	15 a	66.89 a	36.83 a	85.39 a	10.80 a	13.95 a
SED[1]	1.42	2.92	1.67	0.074	0.089	0.350
p-value[2]	0.910	0.724	0.883	0.069	0.433	0.911
	Harris					
Reduced Rate	12 a	51.02 a	25.77 a	76.92 a	17.89 a	9.10 a
Standard Rate	13 a	48.30 b	25.63 a	75.93 b	17.83 a	9.48 a
Enhanced Rate	13 a	48.41 b	25.80 a	75.71 b	17.61 a	9.35 a
SED[1]	0.957	0.941	0.392	0.148	0.098	0.138
p-value[2]	0.593	0.046	0.905	0.029	0.069	0.085
	Plenty					
Reduced Rate	11 a	50.34 a	30.83 a	83.99 a	11.84 a	10.70 a
Standard Rate	11 a	48.6 a	29.75 a	84.13 a	11.88 a	10.44 a
Enhanced Rate	12 a	49.41 a	31.67 a	84.14 a	11.86 a	10.56 a
SED[1]	0.381	2.57	1.44	0.263	0.149	0.248
p-value[1]	0.160	0.796	0.459	0.822	0.968	0.598

Pulse Replicated On-Farm Independent Trials

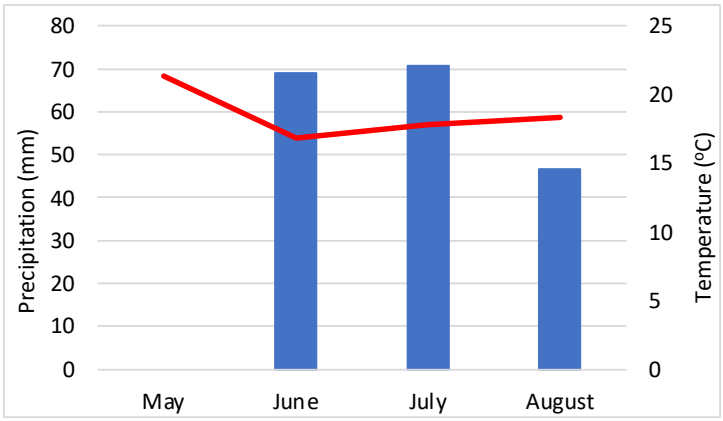
Pulse Phosphorus Rates
(Eston)

Objective: To assess the impact of phosphorus (P) rates on peas and lentils and its overall crop production. The cooperator will determine the product and rates

Trt #	Description	MAP (11-52) Rate (lb/ac)	Actual Nitrogen (lb/ac)	Actual Phosphorus (lb/ac)
1	Reduced (75%) Rate	93.3	10.3	48.5
2	Standard (100%) Rate	124.4	13.7	64.7
3	Enhanced (125%) Rate	155.5	17.1	80.9

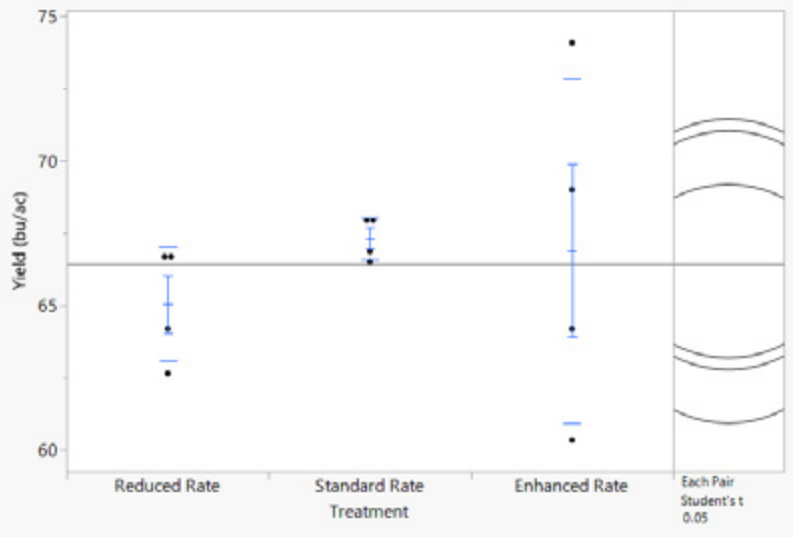
General Trial Information	
Variety	CDC Redmoon (small red lentil)
Thousand Kernel Weight (TKW)	35.9 g
Germ	99%
Seed Treatment	Vibrance® Maxx (metalaxyl, fludioxonil + sedaxane)
Inoculant	Lalfix® Spherical
Previous Crop	Durum
Soil Organic Matter	5.4%
Residual Nitrate-N	
- **0-6”**	9 lb/ac
- **6-24”**	18 lb/ac
Soil Texture	Fine
Seeding Date	April 28, 2025
Seeding Rate	61.7 lb/ac
Seeding Equipment	Bourgault 3320
Seeding Depth	1.5”
Seeding Speed	3.9 mph
Row Spacing	10”
Total Applied Fertilizer (lb/ac K-S)	0 – 7
Crop Protection	May 28 – Tricor® LQ (metribuzin) June 9 – Centurion® (clethodim) June 29 – Elatus® (azoxystrobin + benzovindiflupyr) July 7 – Coragen® (chlorantraniliprole) July 25 – Proline® (prothioconazole) August 19 – Reglone® (diquat)

Temperature and precipitation from a local weather station (May 30 – August 26)



Results

	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Moisture (%)
Reduced Rate	15.17 a	65.03 a	36.33 a	85.20 a	10.90 a	13.90 a
Standard Rate	14.66 a	67.30 a	36.00 a	85.21 a	10.79 a	13.80 a
Enhanced Rate	15.23 a	66.89 a	36.83 a	85.39 a	10.80 a	13.95 a
SED[1]	1.42	2.92	1.66	0.074	0.089	0.350
p-value[2]	0.910	0.724	0.883	0.069	0.433	0.911



Economics

	P Rate (lb/ac)	P Cost ($/ac)[y]	Yield (bu/ac)	Target Price ($/bu)[z]	Revenue ($/ac)	Net ($/ac)	Profit/Loss ($/ac)
Reduced Rate	48.5	$ 54.46	65.0	18.00	1170.00	1115.54	-23.20
Standard Rate	64.7	$ 72.66	67.3	18.00	1211.40	1138.74	0.00
Enhanced Rate	80.9	$ 90.85	66.9	18.00	1204.20	1113.35	-25.39

[y]2025 Red Lentils, 2025 Crop Planning Guide, Government of Saskatchewan (Phosphorus (P2O5) price $17.81/ac @ 20lb/ac)
[z]2024 Red Lentils, 2024 Crop Planning Guide, Government of Saskatchewan (target price $0.30/lb)

Summary

Phosphorus fertilizer rate had no significant effect on plant density, yield, or grain quality parameters. All treatments—reduced, standard, and enhanced rates—produced similar yields (65–67 bu/ac) and comparable kernel weights, protein, and moisture contents ($p > 0.05$). TW showed a slight, non-significant trend toward an increase at higher rates ($p = 0.069$).

To review footnote references please refer to overall trial summary on page 172.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

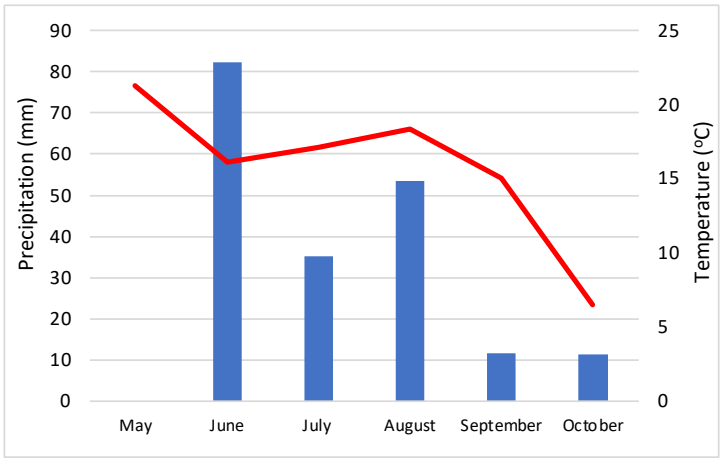
Pulse Phosphorus Rates
(Harris)

Objective: To assess the impact of phosphorus (P) rates on peas and lentils and its overall crop production. The cooperator will determine the product and rates

Trt #	Description	Actual Nitrogen (lb/ac)	Actual Phosphorus (lb/ac)
1	Reduced (75%) Rate	18.8	9.8
2	Standard (100%) Rate	25.0	13.0
3	Enhanced (125%) Rate	31.3	16.3

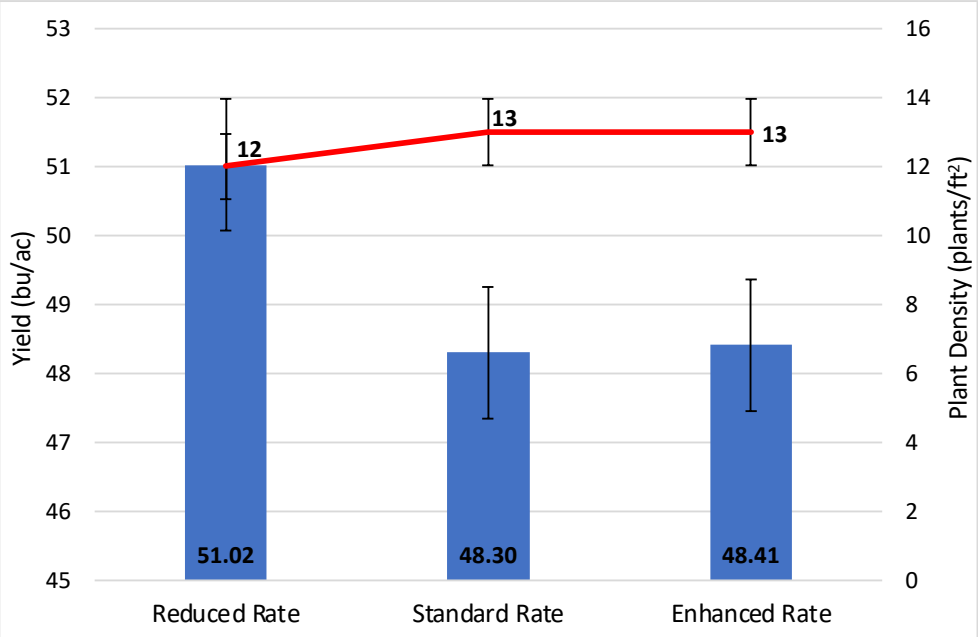
General Trial Information	
Variety	CDC Greenstar (large green lentil)
Thousand Kernel Weight (TKW)	65.42 g
Germ	95%
Seed Treatment	Trilex® EverGol (prothioconazole, penflufen + metalaxyl) + Intego® Solo (ethaboxam)
Inoculant	N-Charge®
Previous Crop	Durum
Soil Organic Matter	2.3%
Residual Nitrate-N - **0-6”** - **0-24”**	 8 lb/ac 28 lb/ac
Soil Texture	Medium
Seeding Date	May 13, 2025
Seeding Rate	98 lb/ac
Seeding Equipment	Bourgault 3335 + John Deere C650
Seeding Depth	1 ¼”
Seeding Speed	5.2 mph
Row Spacing	12”
Total Applied Fertilizer (lb/ac K-S)	0 – 0
Crop Protection	October 28: Edge® (ethalfluralin) + Fierce® (flumioxazin + pyroxasulfone) June 18: Centurion® (clethodim) July 3: Delaro® (prothioconazole + trifloxystrobin) July 24: Cotegra® (boscalid + pyraclostrobin)

Temperature and precipitation from a local weather station (May 29 – August 28)



Results

	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Moisture (%)
Reduced Rate	12 a	51.02 a	25.77 a	76.92 a	17.89 a	9.10 a
Standard Rate	13 a	48.30 b	25.63 a	75.93 b	17.83 a	9.48 a
Enhanced Rate	13 a	48.41 b	25.80 a	75.71 b	17.61 a	9.35 a
SED[1]	0.957	0.941	0.392	0.148	0.098	0.138
p-value[2]	0.593	0.046	0.905	0.029	0.069	0.085



Economics

	P Rate (lb/ac)	P Cost ($/ac)[y]	Yield (bu/ac)	Target Price ($/bu)[z]	Revenue ($/ac)	Net ($/ac)	Profit/Loss ($/ac)
Reduced Rate	9.8	11.00	51.0	28.20	1438.20	1427.20	79.74
Standard Rate	13.0	14.60	48.3	28.20	1362.06	1347.46	0.00
Enhanced Rate	16.3	18.30	48.4	28.20	1364.88	1346.58	-0.88

[y]2025 Large Green Lentils, 2025 Crop Planning Guide, Government of Saskatchewan (Phosphorus (P2O5) price $16.92/ac @ 19lb/ac)
[z]2025 Large Green Lentils, 2025 Crop Planning Guide, Government of Saskatchewan (target price $0.47/lb)

Summary

Plant density did not differ significantly among fertilizer rates, remaining around 12–13 plants per square foot. Yield was highest at the reduced rate (51.02 bu/ac) and significantly lower at the standard and enhanced rates. TW also showed a significant difference, being slightly higher at the reduced rate, while TKW, protein, and moisture were not significantly affected.

To review footnote references please refer to overall trial summary on page 172.

This trial was conducted with the agronomic support of

CrOptimize AG

Pulse Replicated On-Farm Independent Trials

Pulse Phosphorus Rates

(Marquis)

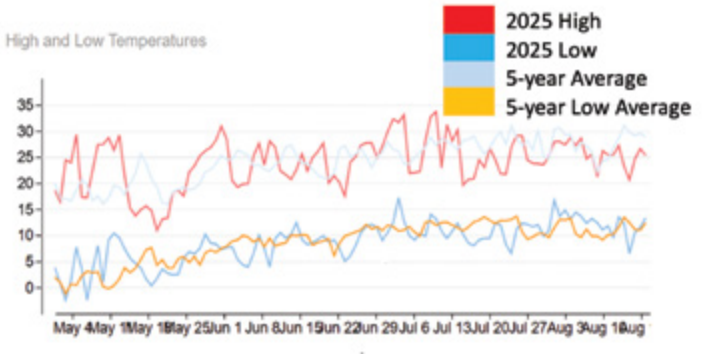
Objective: To assess the impact of phosphorus (P) rates on peas and lentils and its overall crop production. The cooperator will determine the product and rates

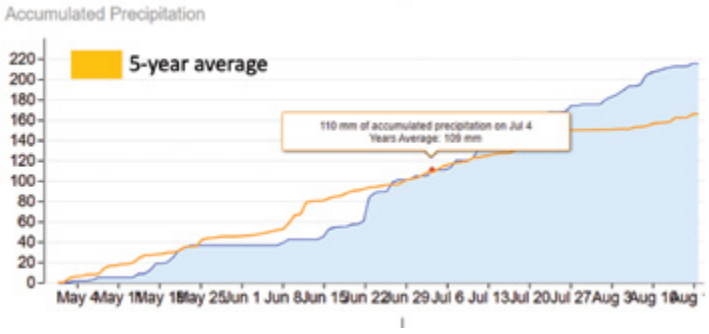
Trt #	Description	MESZ (11-40-0; 10% S & 1% Zn) Rate (lb/ac)	Actual Nitrogen (lb/ac)	Actual Phosphorus (lb/ac)
1	Reduced (75%) Rate	53	5.83	21.20
2	Standard (100%) Rate	70	7.70	28.00
3	Enhanced (125%) Rate	88	9.68	35.20

General Trial Information

Variety	CDC Forest (green pea)
Thousand Kernel Weight (TKW)	225 g
Germ	96%
Seed Treatment	Trilex® EverGol (penflufen, trifloxystrobin + metalaxyl)
Inoculant	CellTech®
Previous Crop	Wheat
Soil Organic Matter	4.1%
Residual Nitrate-N	
- **0-6”**	10 lb/ac
- **6-12”**	31 lb/ac
Soil Texture	Medium
Seeding Date	April 30, 2025
Seeding Rate	204 lb/ac
Seeding Equipment	Bourgault 710 AHD ¾” openers
Seeding Depth	1.5”
Seeding Speed	5.2 mph
Row Spacing	10”
Total Applied Fertilizer (lb/ac N-K-S)	8.4 – 0 – 7
Crop Protection	October 25: Fierce® EZ (flumioxazin + pyroxasulfone) April 28: Goldwing® (pyraflufen +MCPA ester) + glyphosate May 31: Ransack® (imazamox + bentazon) + UAN® August 8: Dessica® (diquat ion) + Cornerstone® (glyphosate)

Temperature and precipitation from a local weather station

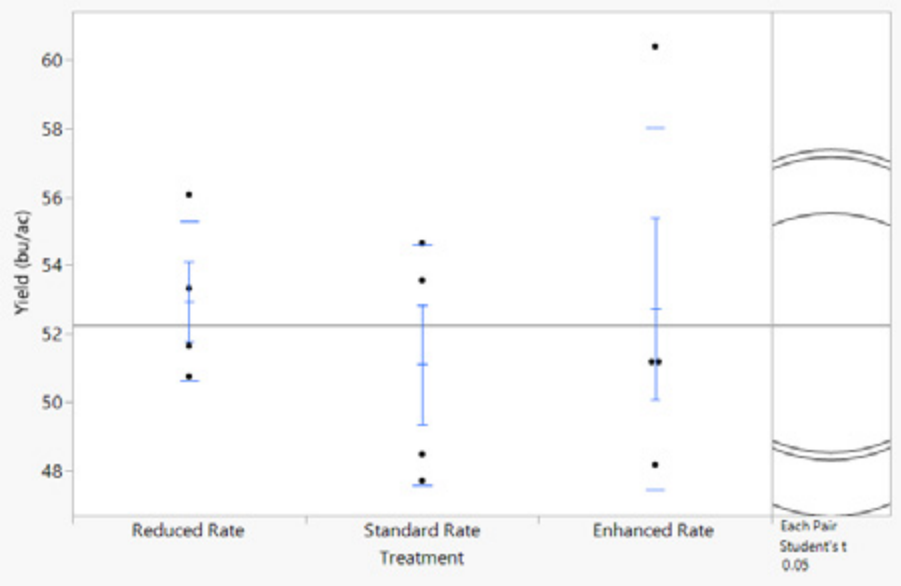




<u>Producer Comments:</u> For the pea phosphorus rate trial we performed this year, the process was pretty smooth to increase the rate to 125% P and decrease it to 75% P from our typical 70lb/acre applied rate of MESZ phosphorus fertilizer.
Our baseline normal rate was created based on soil samples, with our yield goal of 55 bu/ac. From emergence to flowering, there was little difference among the treatments, with normal, healthy growth observed across the board. On June 28th, plant stands were slightly higher in the higher-rate phosphorus treatments. All treatments seemed to have the same (minimal) disease presence, and a fungicide was not applied. All treatments matured at about the same rate, and all were desiccated and harvested simultaneously. Grain moisture did not appear to change from one trial to another. Harvestability was not affected by the treatments.

Results

	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Moisture (%)
Reduced Rate	13 a	53.0 a	272.92 a	81.85 a	22.65 a	14.60 a
Standard Rate	13 a	51.1 a	271.58 a	81.64 a	22.91 a	14.99 a
Enhanced Rate	13 a	52.74 a	276.08 a	81.52 a	22.80 a	15.20 a
SED[1]	0.656	1.96	2.18	0.295	0.257	0.225
p-value[2]	0.626	0.611	0.186	0.560	0.617	0.091



Economics

	P Rate (lb/ac)	P Cost ($/ac)[y]	Yield (bu/ac)	Target Price ($/bu)[z]	Revenue ($/ac)	Net Profit ($/ac)	Profit/Loss ($/ac)
Reduced Rate	21.2	23.80	53.0	15.50	821.50	797.70	37.09
Standard Rate	28.0	31.44	51.1	15.50	792.05	760.61	0.00
Enhanced Rate	35.2	39.52	52.7	15.50	816.85	777.33	16.72

[y]2025 Edible Green Pea, 2025 Crop Planning Guide, Government of Saskatchewan (Phosphorus (P2O5) price $30.28/ac @ 34lb/ac)
[z]2025 Edible Green Pea, 2025 Crop Planning Guide, Government of Saskatchewan (target price $15.50/bu)

Summary

Fertilizer rate had no significant effect on plant density, yield, or grain quality parameters. All treatments produced similar yields (51–53 bu/ac) with comparable kernel weight, TW, and protein content. Moisture content showed a slight, non-significant increase at the enhanced rate (p = 0.0913). Note that MESZ was the variable product, so the amounts of nitrogen, sulphur, and zinc also changed accordingly.

To review footnote references please refer to overall trial summary on page 172.

This trial was conducted with the agronomic support of

MNP AgINTELLECT

Pulse Replicated On-Farm Independent Trials

Pulse Phosphorus Rates

(Plenty)

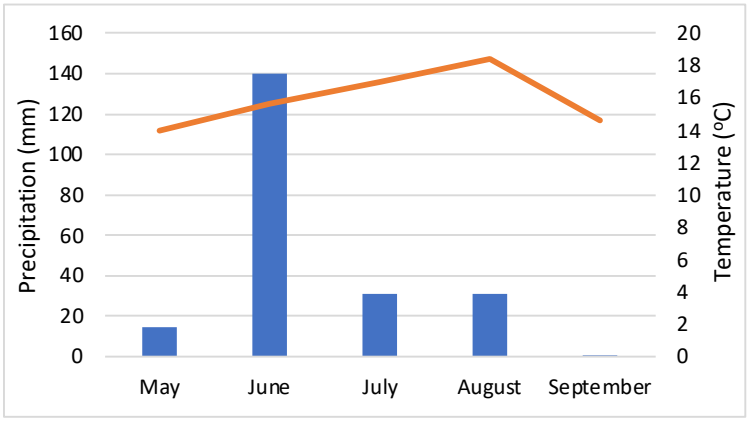
Objective: To assess the impact of phosphorus (P) rates on peas and lentils and its overall crop production. The cooperator will determine the product and rates

Trt #	Description	MAP (11-52) Rate (lb/ac)	Actual Nitrogen (lb/ac)	Actual Phosphorus (lb/ac)
1	Reduced (75%) Rate	44.75	4.92	23.27
2	Standard (100%) Rate	59.0	6.49	30.68
3	Enhanced (125%) Rate	73.5	8.11	38.35

General Trial Information

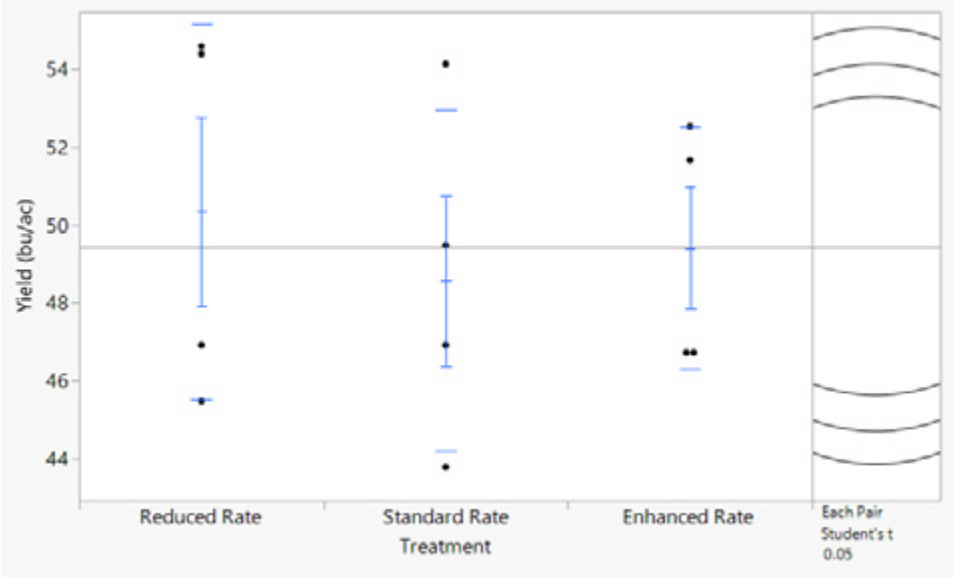
Variety	CDC Imvincible CL (small green lentil)
Thousand Kernel Weight (TKW)	25.98 g
Germ	98%
Seed Treatment	EverGol® Energy (penflufen, prothioconazole + metalaxyl)
Inoculant	N-Charge®
Previous Crop	Barley
Soil Organic Matter	3.9%
Residual Nitrate-N	
- **0-6”**	13 lb/ac
- **6-24”**	18 lb/ac
Soil Texture	Fine
Seeding Date	May 7, 2025
Seeding Rate	60.51 lb/ac
Seeding Equipment	Seed Hawk 8412
Seeding Depth	1 ½”
Seeding Speed	4.2 mph
Row Spacing	12”
Total Applied Fertilizer (lb/ac K-S)	0 – 0
Crop Protection	May 5: Stonewall® (glyphosate) + Heat® LQ (saflufenacil) June 17: Davai® (imazamox) + Centurion® (clethodim) July 3: Revy® Pro (mefentrifluconazole + prothioconazole) August 23: Reglone® Ion (diquat)

Temperature and precipitation from a local weather station (May 12 – September 9)



Results

	Plant Density (plants/ft²)	Yield (bu/ac)	Thousand Kernel Weight (TKW) (g/1000)	Test Weight (TW) (kg/hL)	Protein (%)	Moisture (%)
Reduced Rate	11 a	50.34 a	30.83 a	83.99 a	11.84 a	10.70 a
Standard Rate	11 a	48.6 a	29.75 a	84.13 a	11.88 a	10.44 a
Enhanced Rate	12 a	49.41 a	30.83 a	84.14 a	11.86 a	10.56 a
SED[1]	0.381	2.57	1.44	0.263	0.149	0.248
p-value[2]	0.160	0.796	0.459	0.822	0.968	0.598



Economics

	P Rate (lb/ac)	P Cost ($/ac)[y]	Yield (bu/ac)	Target Price ($/bu)[z]	Revenue ($/ac)	Net Profit ($/ac)	Profit/Loss ($/ac)
Reduced Rate	23.27	26.13	50.3	28.20	1418.46	1392.33	56.27
Standard Rate	30.69	34.46	48.6	28.20	1370.52	1336.06	0.00
Enhanced Rate	38.35	43.06	49.4	28.20	1393.08	1350.02	13.96

[y]2025 Large Green Lentils, 2025 Crop Planning Guide, Government of Saskatchewan (Phosphorus (P2O5) price $16.92/ac @ 19lb/ac)
[z]2025 Large Green Lentils, 2025 Crop Planning Guide, Government of Saskatchewan (target price $0.47/lb)

Summary

Phosphorus fertilizer rates had no significant impact on plant density, yield, or grain quality parameters. All treatments produced similar yields (48–50 bu/ac) and comparable kernel weight, TW, protein, and moisture levels. It is also important to note that Nitrogen was also variable. Overall, crop performance was consistent across reduced, standard, and enhanced fertilizer rates.

To review footnote references please refer to overall trial summary on page 172.