

Factsheet: Enhancing Canola Production with Improved P Fertilizer Management



Objective:

The objective of this study was to evaluate the impact of rate and placement (seed-placed versus side-band) of fertilizer phosphate, either alone or in combination with fertilizer S, on canola P-uptake and yield across a range of soil and climatic conditions in Saskatchewan.

Methodology:

The trial was established at three locations (Indian Head, Melfort, and Scott) over a three-year period (2016-2018). There were two factors evaluated. The first factor was five fertilizer rates of phosphorus at 0, 20, 40, 60, 80 kg/ha (0, 18, 36, 53, 71 lbs/ac). The second factor was placement which compared side-band, seed-placed, and seed-placed with fertilizer S (Table 1). Data collection consisted of plant density, biomass, phosphorus content, maturity, grain yield, green seed, and thousand kernel weight (TKW).

Table 1: Treatment List for Enhancing Canola Production with Improved P Fertilizer Management

Treatment Name	Phosphorus Rate (kg ha ⁻¹)	Fertilizer Placement
0P – SB	0 P ₂ O ₅	Side-band
20P – SB	20 P ₂ O ₅	Side-band
40P – SB	40 P ₂ O ₅	Side-band
60P – SB	60 P ₂ O ₅	Side-band
80P – SB	80 P ₂ O ₅	Side-band
0P – SP	0 P ₂ O ₅	Seed-placed
20P – SP	20 P ₂ O ₅	Seed-placed
40P – SP	40 P ₂ O ₅	Seed-placed
60P – SP	60 P ₂ O ₅	Seed-placed
80P – SP	80 P ₂ O ₅	Seed-placed
0P – SP+15AS	0 P ₂ O ₅	Seed-placed + 15 kg S/ha
20P – SP+15AS	20 P ₂ O ₅	Seed-placed + 15 kg S/ha
40P – SP+15AS	40 P ₂ O ₅	Seed-placed + 15 kg S/ha
60P – SP+15AS	60 P ₂ O ₅	Seed-placed + 15 kg S/ha
80P – SP+15AS	80 P ₂ O ₅	Seed-placed + 15 kg S/ha

Yield:

Phosphorus rate was significant at 5 site-years, while fertilizer placement did not have any significant effects on canola yield (Table 2). Furthermore, the rate by placement interaction was only significant at Scott 2016 and 2018.

The five site-years that responded to fertilizer P rates showed some similar responses, despite one being quadratic. At all the site-years where there was a linear response, 80 kg P₂O₅ ha⁻¹ produced the largest yields. This treatment resulted in yield increases between 120 and 850 kg ha⁻¹. At Melfort, yields increased with phosphorus application and were maximized at 72 kg P₂O₅ ha⁻¹, which resulted

The full report is available on www.warc.ca. This project was funded by the Saskatchewan Canola Development Commission.

in an 892 kg ha⁻¹ yield increase over the control. This site-year also had the highest yield gains from phosphorus application of the five significant site-years. In contrast, Indian Head had the lowest yield gains from phosphorus application at 116 kg ha⁻¹ between the control and 80 kg P₂O₅ ha⁻¹. At the remaining site-years, there was an average 243 kg ha⁻¹ yield increase between the lowest and highest phosphorus rates applied.

	Indian Head ^z			Melfort ^z			Scott ^z		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
Phosphorus Rate (R)	0.378 9	<0.000 1 ***	<0.000 1 ***	<0.000 1 ***	0.501 4	0.023 4 *	0.2821	<0.0001* **	0.181 9
Fertilizer Placement (P)	0.598 4	0.6393	0.9666	0.4342	0.097 5	0.457 3	0.1785	0.4609	0.805 8
R * P	0.953 5	0.7395	0.4056	0.8691	0.134 2	0.519 5	<0.0001** *	0.2243	0.016 3 *

Table 2: Phosphorus Rate, Placement, and Interaction Effects on Canola Grain Yield (kg ha⁻¹) from three Saskatchewan locations from 2016 to 2018.

^z p<0.05***; p<0.01**; p<0.0001***

Key Findings:

- Plant populations declined significantly as P rates increased with both seed-placed and SP + 15AS treatments, but not with the side-band placement.
- Side-banded fertilizer P can be as or more efficient than seed-placed P even at lower rates, for canola establishment.
- When significant, there is only a maximum of 40% decline in plant populations when fertilizer P was increased to 80 kg ha⁻¹.
- Yield was affected by phosphorus rate and in some cases, the interaction between rate and placement.
- On average, side-banded P resulted in yield increases of up to 263 kg ha⁻¹.
- Canola yields generally increased with increasing P rate and optimal yields were reached between 70 and 80 kg ha⁻¹ of fertilizer P.
- Therefore, if high rates of phosphorus are required, fertilizer P should be side-banded to minimize seed damage and maximize yields
- Quality parameters (TKW and Green Seed) were largely affected by fertilizer P rate alone, and very seldomly placement.
- Higher rates tended to increase % green seed and mean seed weight, particularly when seed-placed.
- This suggests that maturity delays are associated with reduced plant populations.

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