

Factsheet: Enhanced Fertilizer Management for Optimizing Yield and Protein in Field Pea

Objective:

The project objectives were to evaluate, across a range of Saskatchewan environments, the yield and protein response of yellow field pea to various rates and combinations of nitrogen (N), phosphorus (P) and sulfur (S) fertilizer.

Methodology:

The study was conducted in 2019 and 2020 at six locations; Swift Current, Outlook, Scott, Indian Head, Yorkton, and Melfort. The treatments were an assortment of fertilizer applications selected to test the yield and protein responses to varying P and S rates in addition to several N fertilization strategies. To represent both extremes we also included an unfertilized control and an ultra-high fertility treatment. The P and S sources were monoammonium phosphate (11-52-0) and ammonium sulphate (21-0-0-24), respectively. Treatments 10 and 11 included urea (46-0-0) as an N source, and treatments 12 and 13 included polymer coated urea (ESN; 44-0-0). All fertilizer was side-banded with the exception of the extra urea in Treatment 11 which was applied as a surface broadcast during the late vegetative crop stages.

Source / Treatment	Seed Yield	Seed Protein
<i>Overall F-test</i>	----- p-value -----	
Fertilizer Treatment (Fert)	<0.001	0.047
<i>kg N-P₂O₅-K₂O-S/ha</i>	----- kg/ha -----	----- % -----
1) 0-0-0-0 (no fertilizer)	4016 C	22.3 AB
2) 17-0-0-10 (0 P)	4155 BC	22.4 AB
3) 17-20-0-10 (20 P)	4303 AB	22.2 B
4) 17-40-0-10 (40 P / 10 S)	4468 A	22.6 AB
5) 21-60-0-10 (60 P)	4536 A	22.5 AB
6) 26-80-0-10 (80 P)	4456 A	22.6 AB
7) 17-40-0-0 (0 S)	4397 A	22.4 AB
8) 17-40-0-5 (5 S)	4310 AB	22.5 AB
9) 22-40-0-15 (15 S)	4405 A	22.5 AB
10) 40-40-0-10 (urea)	4367 AB	22.5 AB
11) 17-40-0-10 + 40 N in-crop	4431 A	22.7 A
12) 40-40-0-10 (ESN)	4382 AB	22.5 AB
13) 40-80-0-15 (ultra high fert)	4512 A	22.7 AB
S.E.M.	294.5	0.68
L.S.D. ^{0.05}	236.6	0.56

Table 1. Results for tests of fertilizer effects on field pea seed yield and protein concentrations along with individual treatment means when averaged over 12 locations-years in Saskatchewan. Means within a column followed by the same letter do not significantly differ from one another (Tukey-Kramer; $P \leq 0.05$).

Key Findings:

- Soil test P levels were considered low (≤ 12 ppm Olsen-P) for 11/12 location-years and there was evidence of a statistically significant ($P \leq 0.05$) response at 7/11 of the low P location-years (64%) and at least a marginally significant benefit ($P \leq 0.1$) at 8/11 low P sites (73%).
- When averaged across all twelve location-years, yields were increased by up to 13% with P fertilization and the optimal rate was approximately 40 kg P₂O₅/ha. Yield increases beyond the 20 kg P₂O₅/ha rate were rarely statistically significant and it is unlikely that rates exceeding approximately 40 kg P₂O₅/ha would be justified under most conditions. An exception could be when the objective of the producer is for long-term building of residual P and yields of more than 50 bu/ac are regularly achieved.

The full report is available at www.warc.ca. This project was funded by the Saskatchewan Pulse Growers Association.

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AP-2003a-IHARF



- Sulfur responses have been elusive in past research and this was also true in the current project. Consequently, if deficiencies have been observed in the past for either field peas or other crops, applying a small amount of S may be justified; however, it is unlikely that S deficiency has been much of a yield limiting factor for the majority of field pea producers in Saskatchewan.
- Our results did not show any benefits to N fertilization and, unless residual levels are extremely low or a nodulation failure is suspected, Saskatchewan field pea producers are advised to avoid applying any more N fertilizer than what is provided by the P and/or S fertilizer products being utilized.

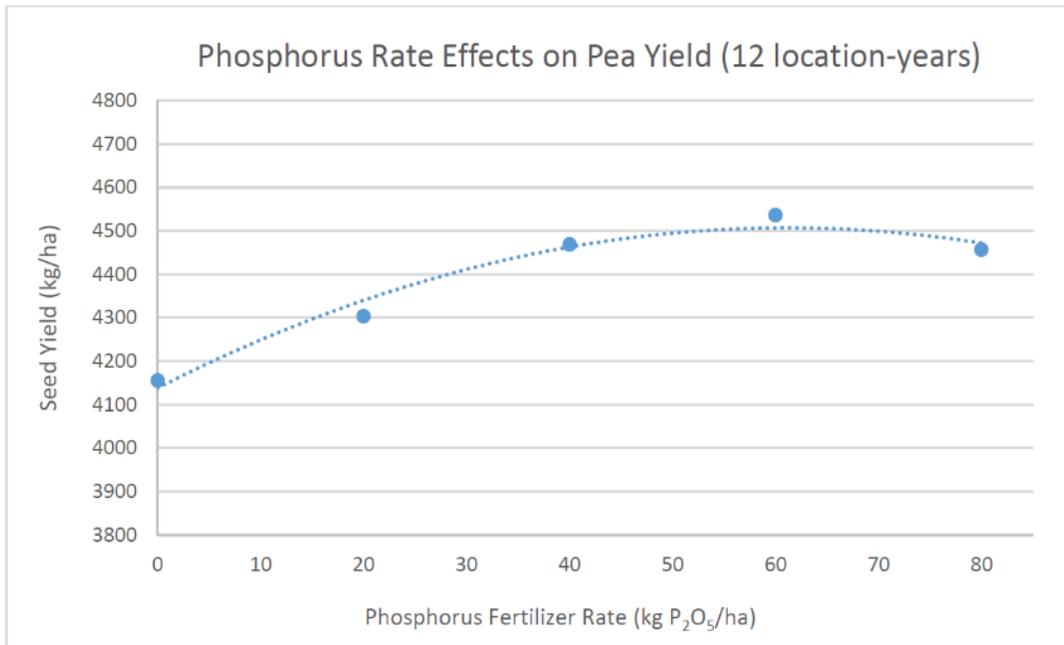


Figure 1. Field pea seed yield response to phosphorus fertilizer rate in Saskatchewan. The results are the overall average of 12 field trials comprised of six locations over a two-year period (2019-2020).

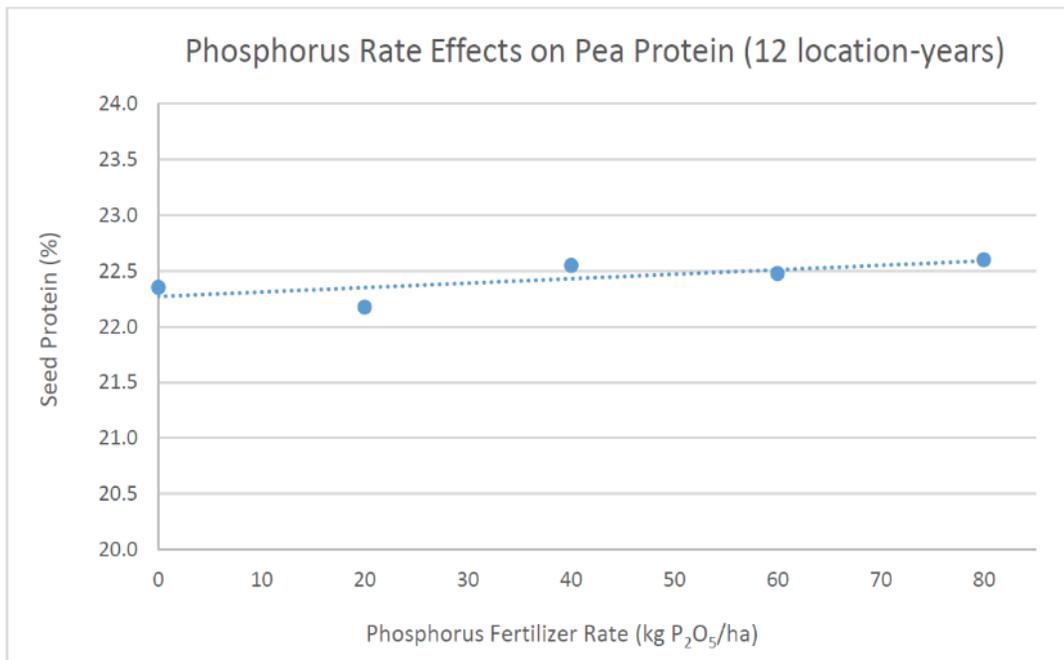


Figure 2. Field pea seed protein concentration response to phosphorus fertilizer rate in Saskatchewan. The results are the overall average of 12 field trials comprised of six locations over a two-year period (2019-2020).

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