

Pea Fertility Trial 2024 Ridgetown Campus

Evaluation prepared for the Ontario Processing Vegetable Growers

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Introduction:

Current phosphorous and potassium recommendation for Ontario vegetables are dated and a re-evaluation of crop response is warranted. Recent long term research in field crops by Dr. David Hooker and Horst Bohner compared crop yields on fields with low background phosphorous and potassium fertility levels ($P < 20$, $K < 120$ ppm) which had different levels of fertility applied; one of their questions was if fertilizing the crop to provide sufficient P and K as per crop recommendations was as good as building and maintaining moderate P and K levels in the soil. They found that regardless of the fertilizer treatment, plots in fields with low P and K did not yield as well as fields that had P and K maintained at moderate levels, suggesting a maintenance approach was better. Trials began in 2024 to evaluate this approach in pea production.

Experimental Design:

The trial took place at the University of Guelph's Ridgetown Campus Research Farm on a site that had relatively low phosphorous and potassium; the location had a soil pH of 6.9, $P = 18$ ppm and $K = 140$ ppm. The pea cultivar Reliance was used as the test variety.

The trial was set up as a randomized complete block design with four treatments which were replicated four times. The treatments included:

- 1) Untreated (control)
- 2) No P, with K using 100lbs/acre Potash
- 3) No K, with P using 100 lbs/acre Map
- 4) Mix: 100 lbs/acre Map and 100lbs/acre Potash

* Urea was added to treatment 2 to account for nitrogen from Map.

Each treatment plot was 8.0 m long and was established using a 12-row Wintersteiger cone seeder with row spacing of 18 cm. The statistical analysis program SAS was used to perform all analyses using the GLIMMIX procedure. The Shapiro-Wilk test was conducted to test normality, and the residual plots were utilized to test the assumptions of variance (ie. Random, homogenous, and independent). The means of the variables tested were separated using the

Tukey HSD test with a confidence interval of $\alpha=0.05$; means followed by the same letter are not different.

Data Collection:

- i) Days to harvest
- ii) Canopy Height (average of 2 standing heights)
- iii) Yield (lbs/acre)
- iv) Percent sieve distribution from 500g sample
- v) Peas/pod (average 10 plants/plot)
- vi) Pods/plant (average 10 pod/plot)
- vii) Soil samples taken before planting and fertilization of each plot.

Field Management:

On the advice of Dr. Dave Hooker, soil samples from each individual plot were taken for analysis of P and K; this was done because in his experience, soil P and K levels can vary significantly over short distances. These values were later used in the statistical analysis. Fertilizer treatments were applied by hand per plot to ensure accuracy and incorporated prior to planting. The trial was established on April 26th and a PRE herbicide of Dual II Magnum was applied April 29th. Unfortunately, soon after planting, plant stunting and bleaching in areas of the trial was noted, and assumed to be due to residual herbicides which we were assured would not present on this site. We assume the residues were of Lumax EZ. No POST herbicide application was applied due to this injury to the plants and there was little weed pressure. Every attempt was made to avoid collecting data in areas with obvious herbicide injury.

Tenderometer readings were taken from subsamples prior to harvest, in an attempt to harvest at a maturity of 110 psi. At harvest, a 2.0 m length of the center 8 rows from each plot were collected (2.88m²) and shelled with a stationary pea sheller. Every plot but one was able to have 2.0 m of peas harvested. From the selected harvest area, 2 readings of plant height were recorded. The sample weight of threshed peas was used to calculate yield, and a subsample of 500 g was sized using a set of steel pea sieves. Refer to Table 1 for sieve sizes. At harvest, 10 plants were collected per plot to assess pods/plant and peas/pod.

Table 1. Pea sieve sizes

SIEVE SIZE	DIAMETER OF CIRCULAR OPENING IN MM (INCHES)	
	Will not pass through	Will pass through
1	-	7.1 (18/64)
2	7.1 (18/64)	7.9 (20/64)
3	7.9 (20/64)	8.7 (22/64)
4	8.7 (22/64)	9.5 (24/64)
5	9.5 (24/64)	10.3 (26/64)
6	10.3 (26/64)	11.1 (28/64)

Results and Conclusions:

An analysis of variance was conducted using SAS software and the Tukey-Kramer test was utilized to separate the treatment means with significant differences. Since each individual plot was soil sampled, the corresponding yield was analyzed as a correlation to the original field P and K values by treatment. This resulted in a Pearson Coefficient for P and K compared to yield by treatment to see if there was any correlation. There were no strong correlations, which could be a result of the yields being negatively impacted due to the residual herbicide carryover.

There was no statistical difference between plant height among the treatments. As seen in Table 2 the untreated check (Treatment 1) resulted in higher pods/plant than all the other fertilizer treatments. Average peas per pod were statistically higher with the addition of K but not P (treatment 3; value of 5.7) when compared to the untreated control (Treatment 1) which had, on average 4.1 peas per pod. Yield was not statistically different among the treatments, however treatment 4 and 1 (untreated control and addition of both P and K) yielded lower than treatment 2 and 3 (the addition of P but not K and the addition of K but not P). This trend could mean that the 100 lbs/acre each of MAP and Potash was too much for the crop. As seen in Table 3 the percent sieve size distribution was mainly between sieve 4 and 3 (refer to corresponding size of pea in Table 1). Overall, the trend of yield was statistically not significant, and the yield was negatively impacted especially in the 4th replication due to the assumed herbicide residues.

Table 1. Percent sieve size distribution in response to pea P + K fertility treatments (cv = Reliance) University of Guelph, Ridgetown Campus (2024).

Treatment	sieve >6	sieve 6	sieve 5	sieve 4	sieve 3	sieve 2	sieve 1
Untreated check	0.00	0.11	4.26	32.27	40.36	15.91	7.09
No P, with K	0.00	0.22	4.13	28.91	45.04	16.40	5.30
No K, with P	0.00	0.44	5.38	28.70	43.92	16.10	5.46
Both P and K	0.00	0.06	3.67	25.42	45.31	18.59	6.96

Table 2. Pea plant height, tenderometer reading, pods/plant, peas/pod, plot sample weight, and yield response to pea P + K fertility treatments (cv = Reliance). University of Guelph, Ridgetown Campus (2024).

	Plant Height	Tenderometer	Pods/Plant	Peas/Pod	Plot Sample Weight	Yield
Main Effect	(cm)	(average)	(#)	(#)	(g)	(lbs/acre)
Fertilizer treatment	NS	-	*	*	NS	NS
Untreated check	35.9	108	4.5 a	4.3 b	750.1	3044.0
No P, with K	35.0	105	3.2 b	5.0 ab	791.1	3210.5
No K, with P	38.6	101	3.4 b	5.8 a	814.6	3305.9
Both P and K	36.1	104	3.2 b	4.9 ab	673.6	2733.5

^{a-b} Means within column followed by the same letter are not different according to Tukey's HSD at $\alpha=0.05$.

* Significant at $P<0.05$, respectively; NS, not significant at the $P=0.05$ level.

Refer to the treatment list under experimental design for more details on fertilization treatments.