Pea Population Trials 2023-24 Ridgetown Campus

Evaluation prepared for the Ontario Processing Vegetable Growers

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Experimental Design:

The pea population trials were set up as a randomized complete block design with four replications of all 4 treatments. In these studies four varieties were analyzed individually at four different seeding rates specific to the variety planted (Table 1).

Table 1. Variety of peas planted in trials with their seeding rate treatments.

Variety	Nitro	Reliance	Rihanna	Sherwood
Seeding rates	----------Seeds/acre----------			
1	620,000	475,000	620,000	550,000
2	720,000	550,000	720,000	650,000
3	820,000	625,000	820,000	750,000
4	920,000	700,000	920,000	850,000

Each treatment was planted in plots 8.0 m long using a 12-row Wintersteiger cone seeder; rows within plots were spaced at 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.

The following data was collected:

i) Days to harvest
ii) Canopy Height
iii) Yield (lbs/acre)
iv) Sieve distribution from 500g sample
v) Peas/pod
vi) Pods/plant

Field Management:

In both years the fields received a preplant weed burndown using the herbicide glyphosate and were cultivated before planting. The post planting herbicide program, as well as planting and harvest dates of trials can be found in Table 2. The cultivar Reliance was only used in these population trials in 2024.

Table 2. Planting/Harvest dates and herbicide program for pea population trials for 2 years.

Year	Planting Date	Harvest Dates	PRE Herbicide Application	POST Herbicide Application
2023	May 8th	*Sherwood*-June 30 *Nitro*- July 7 *Rihanna*-July 12	Dual II Magnum	Assure and Basagram
2024	April 26th	*Sherwood*- June 21 *Nitro*- June 27 *Rihanna*- June 30 Reliance- June 25	Dual II Magnum	N/A *

* A POST planting herbicide application was unable to be applied due to field being too wet for a field sprayer, hand weeding was implemented instead.

Tenderometer readings were taken from plant subsamples collected from the plots as the plants matured; the target harvest tenderometer value was 110 psi. At harvest, a sample of peas from 8 rows x 2.0 m long (2.88m^2) were harvested per plot and shelled using a stationary pea sheller. From the harvested 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 hand-sieved through a set of steel pea sieves to determine pea size distribution (refer to Table 3 for sieve sizes).

Table 3. 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:

A cumulative analysis of variance for the years 2023 and 2024 was conducted using SAS software and the Tukey-Kramer test was utilized to separate the treatment means with significant differences. However, the variety Reliance results are only from the 2024 field season.

Nitro (Tables 4 and 5)

The days till harvest in 2023 were 61 and in 2024 was 63 resulting in an average days till harvest of 62. Most of the percent sieve distribution for all treatments was for sieve size 2 being peas bigger than 7.14 mm; at 37% of whole subsample. Plant height, pods per plant and yield were statistically unsignificant. Differences in the number of peas per pod was significant as populations changed, with the number of peas per pod increasing as plant populations decreased. This can account for the yield of the lowest population being similar to the yield at the highest population. It appears Nitro is able to produce similar yields across the range of plant populations used in this study, as it is able to compensate by increasing the number of peas per pod.

Rihanna (Tables 6 and 7)

In 2023 and 2024 the days till harvest were the same at 66 days. When looking at percent sieve size distribution sieves 1 and 2 were comparable at 31% and 33% when averaged over all treatments. Pods per plant, peas per pod and yield were all statistically insignificant. Plant height was significant as the 2nd lowest population had a higher plant height than the highest population. Although not statistically significant the population at 720,000 seeds per acre had the greatest plant height as well as greatest number of pods per plant and yield. Rihanna at 720,000 seeds/acre produced 10 pods per plant, which was greater by 1 to 2 pods per plant when compared to the other rates. It also produced 4,364.1 lbs per acre over the 2 site years, which is greater by higher than 383.6 lbs per acre than the next highest yield found at a population of 920,000 seeds/acre.

Sherwood (Tables 8 and 9)

In 2023 the days to harvest was 54 and in 2024 it was 57, resulting in an average of 55.5 days. The majority of the pea distribution for the lower seeds/acre was between sieves 5 to 3, whereas the higher population were spread out between sieves 5 to 1. This resulted in the peas for Sherwood being larger in size at the lower populations, while the higher seeding rates had more variability in pea size. There were no significant differences for any of the ratings, however the higher populations resulted in higher yields, with the highest being 6,550 lbs/acre for the planting density of 750,000 seeds/acre.

Reliance (Tables 10 and 11)

The variety in 2024 took 61 days from planting to harvest. Sieves 4 and 3 had the highest percentage of pea distribution at 37 and 40% when averaged over all treatments. There were no statistically significant differences for any of the parameters taken. However, the highest yielding treatment was 625,000 seeds per acre at 4158.9 lbs/acre. This treatment was from the third highest seeding rate and was 884.7 lbs/acre higher than the next highest treatment, which was the highest population rate 700,000 seeds/acre.

Table 4. Nitro Population trial average days till harvest and percent sieve size distribution for two site years at the University of Guelph Ridgetown Campus (2023,2024).

Main Effect	Days to Harvest	Percent Sieve Size Distribution						
Seeds/acre	Average	<6	6	5	4	3	2	1
620,000	62	0.14	2.14	9.12	10.18	24.95	35.21	18.26
720,000	“”	0.65	2.76	7.19	9.98	27.40	36.81	15.20
820,000	“”	0.06	1.19	7.33	11.28	24.35	37.66	18.12
920,000	“”	0.27	2.27	8.89	9.58	20.84	38.37	19.77

Table 5. Nitro Population means for plant height, pods/plant, peas/pod and yield for two site years at the University of Guelph Ridgetown Campus (2023,2024).

	Plant Height	Tenderometer	Pods/Plant	Peas/Pod	Yield
Main Effect	(cm)	(average)	(#)	(#)	(lbs/acre)
Seeds/acre	NS	-	NS	*	NS
620,000	28.6	107	7.0	6.5 a	5331.0
720,000	29.9	110	6.3	6.1 ab	4846.3
820,000	29.9	105	6.5	5.8 ab	5020.1
920,000	26.9	104	6.2	5.6 b	5332.5

[a-b] Means within column followed by the same letter are not different according to Tukey’s HSD at α=0.05.

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

Table 6. Rihanna Population trial average days till harvest and sieve size distribution for two site years at the University of Guelph Ridgetown Campus (2023,2024).

Main Effect	Days to Harvest	Percent Sieve Size Distribution						
Seeds/acre	Average	<6	6	5	4	3	2	1
620,000	66	0.39	1.72	5.13	4.81	9.65	36.61	41.70
720,000	“”	0.43	4.12	13.72	13.98	15.00	27.20	25.55
820,000	“”	0.77	4.16	13.59	13.18	12.40	29.49	26.40
920,000	“”	0.14	1.24	4.09	6.97	19.68	37.58	30.30

Table 7. Rihanna Population means for plant height, pods/plant, peas/pod and yield for two site years at the University of Guelph Ridgetown Campus (2023,2024).

	Plant Height	Tenderometer	Pods/Plant	Peas/Pod	Yield
Main Effect	(cm)	(average)	(#)	(#)	(lbs/acre)
Seeds/acre	*	-	NS	NS	NS
620,000	49.9 ab	96	9.3	6.3	3490.9
720,000	50.5 a	97	10.0	6.6	4364.1
820,000	47.1 ab	98	8.7	6.5	3893.0
920,000	42.2 b	94	8.5	6.7	3980.5

[a-b] Means within column followed by the same letter are not different according to Tukey’s HSD at α=0.05.

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

Table 8. Sherwood Population trial average days till harvest and sieve size distribution for two site years at the University of Guelph Ridgetown Campus (2023,2024).

Main Effect	Days to Harvest	Percent Sieve Size Distribution						
Seeds/acre	Average	<6	6	5	4	3	2	1
550,000	55.5	0.12	2.51	29.34	40.16	20.61	5.39	1.88
650,000	“”	0.63	5.36	33.86	39.57	15.05	3.73	1.80
750,000	“”	0.11	1.46	14.52	23.52	20.97	23.61	15.82
850,000	“”	0.04	1.38	14.52	23.45	15.14	21.17	24.29

Table 9. Sherwood Population means for plant height, pods/plant, peas/pod and yield for two site years at the University of Guelph Ridgetown Campus (2023,2024).

	Plant Height	Tenderometer	Pods/Plant	Peas/Pod	Yield
Main Effect	(cm)	(average)	(#)	(#)	(lbs/acre)
Seeds/acre	NS	-	NS	NS	NS
550,000	27.8	101	4.1	5.2	5755.2
650,000	27.0	99	4.1	5.3	5918.9
750,000	27.3	98	4.5	5.0	6550.0
850,000	27.5	95	4.3	5.1	6338.8

[a-b] Means within column followed by the same letter are not different according to Tukey’s HSD at α=0.05.

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

Table 10. Reliance Population trial days till harvest and sieve size distribution for one site year at the University of Guelph Ridgetown Campus (2024).

Main Effect	Days to Harvest	Percent Sieve Size Distribution						
Seeds/acre	Average	<6	6	5	4	3	2	1
475,000	61	0.03	1.99	13.29	36.15	37.79	8.78	1.98
550,000	“”	0.00	1.85	11.33	37.75	39.07	7.99	2.01
625,000	“”	0.00	0.86	10.11	36.33	40.93	9.83	1.95
700,000	“”	0.03	1.03	9.89	36.66	40.66	9.85	1.88

Table 11. Reliance Population means for plant height, pods/plant, peas/pod and yield for one site years at the University of Guelph Ridgetown Campus (2024).

	Plant Height	Tenderometer	Pods/Plant	Peas/Pod	Yield
Main Effect	(cm)	(average)	(#)	(#)	(lbs/acre)
Seeds/acre	NS	-	NS	NS	NS
475,000	40.0	104	4.2	5.4	3159.2
550,000	40.5	103	4.7	6.4	3148.2
625,000	40.9	103	3.9	6.1	4158.9
700,000	41.5	105	3.8	6.1	3574.2

[a-b] Means within column followed by the same letter are not different according to Tukey’s HSD at α=0.05.

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