**Effectiveness of pea inoculant at different planting dates and nitrogen application.**

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**Methodology:**

A trial was established on the Ridgetown Campus Research Farm to assess the effectiveness of pea inoculants and the impact of planting date as well as addition of nitrogen fertilizer. Plots were established on a sandy loam soil (65.7% sand, 5.6% silt, 28.7% clay) which had not grown green peas within the past 5 years. Each plot was 8 m x 3 m, and contained 12 rows, 18 cm apart. The peas were planted using Wintersteiger double cone plot seeder. There were four factors, cultivar (Tyne and Nitro), inoculant (inoculant and non-inoculant), planting dates (early and late), and nitrogen rate (0 and 50 lb of actual N per ac). All these factors were applied in combination to the experimental units. The cultivar seeding rates were 550,000 seeds/acre for Tyne and 720,000 seeds/acre for Nitro. Weeds were controlled by an application of Dual II Magnum (pre-plant), followed by post-emergent application of Assure and Basagram herbicides.

Assessment of pea nodulation was conducted at the R1(flower bud) stage based on a method described in "Assessing Field Pea Nodulation" by the Manitoba Pulse & Soybean Growers (Table 1). Ten pea plants were randomly selected from each plot and scored according to the categories in Table 1. The maturity of plots was assessed by comparing the tendrometer reading of a subsample to the target tenderometer value of 110. When mature, 2.0 m x 8 rows (2.88 $m^2$) were harvested per plot and shelled in a stationary pea sheller. At harvest, plant biomass and height from the harvested area were recorded. The final yield of the pea was reported as well as yield adjusted to 110 tendrometer reading based on conversion factors based on "Midwest Maturity Studies". At harvest, a 500 g pea sample from each plot was hand-sieved though a set of steel pea sieves and the percentage distribution of pea seed was recorded (Table 2). The trial was established as a randomized complete block design with 4 replications. Analysis of variance for a randomized complete block design was conducted using SAS software. Tukey-Kramer test was used to separate the treatments with significant differences.

**Results and Discussion:** Any trends related to inoculated vs no inoculant, and additional nitrogen fertilizer vs no additional nitrogen fertilizer were not apparent. Early planted peas tended to be taller with greater biomass (Table 3). There were significant effects of the treatment combinations on plant biomass, adjusted pea yield, and plant height. However, there were no significant differences among the treatments on pods per plant and nodule rating. The highest (6982.9 lb/ac) adjusted pea yield was recorded with a treatment combination of early planted Nitro cultivar with no inoculant and 50 lb /ac of actual N application, whereas the lowest (2961.7 lb/ac) was recorded from late planted Tyne cultivar with no inoculant and 50 lb /ac of actual N application (Table 3).

**Table 1.** Assessing field pea nodulation

| Category | Description | Score |
|---|---|---|
| Plant Growth and Vigour | Plants green and vigorous | 5 |
| | Plants green and relatively small | 3 |
| | Plants slightly chlorotic (less green) | 2 |
| | Plants very chlorotic | 1 |
| Nodule Color and Number | Greater than five clusters of pink pigmented nodules | 5 |
| | Three to five clusters of predominantly pink nodules | 3 |
| | Less than three clusters of nodules, or whitish/greenish nodules | 1 |
| | No nodules, or white/green nodules | 0 |
| Nodule Position | Crown and lateral root nodulation | 3 |
| | Generally crown nodulation | 2 |
| | Generally lateral nodulation | 1 |

11-13 = Effective Nodulation 7-10 = Less Effective Nodulation 1-6 = Unsatisfactory

**Table 2.** Green 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) |

**Table 3.** Effect of pea inoculant, planting date and nitrogen application on plant biomass, height, number of pods per plant, and nodule rating crop parameters at Ridgetown, Ontario.

| Treatments (Cultivars - inoculant-N rates) | Planting time | Days to Harvest (#) | Plant biomass (kg) | Plant height (cm) | Pods per plant (#) | Nodule rating | Yield (lb/ac) | Tendrometer reading | Yield Adjustment factor | Adjusted yield (lb/ac) |
|---|---|---|---|---|---|---|---|---|---|---|
| Tyne-IN-0 | Early | 67 | 10.2 abc | 60.5 ab | 5.3 | 12.4 | 8183.2 | 135.3 | 0.89 | 6517.1 a |
| Tyne-IN-50 | Early | 67 | 10.7 ab | 66.3 a | 4.4 | 12.2 | 5698.8 | 123.5 | 0.91 | 4740.3 ab |
| Tyne-NO-0 | Early | 67 | 10.1 abc | 50.0 b | 5.1 | 12.8 | 8096.4 | 136.5 | 0.88 | 6379.0 ab |
| Tyne-NO-50 | Early | 67 | 11.2 a | 61.3 a | 5.5 | 11.3 | 6269.1 | 126.3 | 0.90 | 5097.3 ab |
| Nitro-IN-0 | Early | 61 | 8.0 abcd | 32.8 cd | 5.6 | 12.1 | 7230.9 | 105.8 | 1.06 | 6841.6 a |
| Nitro-IN-50 | Early | 61 | 7.8 bcd | 30.5 cde | 7.1 | 12.1 | 6632.0 | 109.0 | 1.01 | 6056.8 ab |
| Nitro-NO-0 | Early | 61 | 7.9 abcd | 30.0 cdef | 4.9 | 12.2 | 6898.4 | 109.3 | 1.02 | 6303.4 ab |
| Nitro-NO-50 | Early | 61 | 8.5 abcd | 29.5 cdef | 6.7 | 11.5 | 7399.7 | 108.5 | 1.02 | 6982.9 a |
| Tyne-IN-0 | Late | 67 | 7.0 cd | 34.0 c | 5.4 | 12.0 | 5099.8 | 107.3 | 1.05 | 4789.2 ab |
| Tyne-IN-50 | Late | 67 | 7.1 cd | 35.0 c | 5.5 | 10.5 | 5070.3 | 107.0 | 1.03 | 4690.4 ab |
| Tyne-NO-0 | Late | 67 | 6.5 d | 30.0 cdef | 4.3 | 11.8 | 5189.2 | 111.8 | 0.99 | 4632.4 ab |
| Tyne-NO-50 | Late | 67 | 7.1 cd | 28.0 cdef | 5.0 | 10.1 | 5052.1 | 108.8 | 1.01 | 2961.7 b |
| Nitro-IN-0 | Late | 60 | 6.7 d | 19.5 f | 6.6 | 12.9 | 6051.3 | 117.0 | 0.99 | 5371.8 ab |
| Nitro-IN-50 | Late | 60 | 7.5 bcd | 22.5 def | 6.8 | 12.8 | 6008.7 | 120.3 | 1.01 | 5393.5 ab |
| Nitro-NO-0 | Late | 60 | 6.5 d | 20.0 ef | 5.8 | 12.7 | 5709.2 | 118.8 | 0.97 | 4965.8 ab |
| Nitro-NO-50 | Late | 60 | 6.8 cd | 21.3 ef | 6.3 | 10.9 | 5177.1 | 113.0 | 1.01 | 4690.5 ab |
| Effects | | | | | | | | | | |
| Treatments | | | <0.0001 | <0.0001 | NS | NS | NS | | | 0.0122 |
| **[z]SE** | | | **0.6531** | **2.049** | **0.6446** | **0.6853** | **830.01** | | | **721.00** |

[z]SE indicates standard error of means.

[a-f]In each column and for each effect, means followed by a different letter indicate statistically significant effect at $P<0.05$ per Tukey-Kramer adjustment.

The presented plant biomass in the table is from the randomly harvested area pf 2.88m$^2$.

Note: Early planting was done on May 6$^{th}$ and late planting of the pea trial was done on June 2$^{nd}$, 2023.

**Table 4.** Percent size distribution of peas from different treatment combination at Ridgetown, Ontario.

| Treatments | | Sieve Size (size in mm which the pea will not pass through) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (Cultivars - inoculant-N rates) | | **>6** | **6 (10.31)** | **5 (9.52)** | **4 (8.72)** | **3 (7.93)** | **2 (7.14)** | **1 -** |
| Tyne-IN-0 | Early | 1.5 | 10.0 | 43.4 | 33.6 | 8.1 | 1.5 | 0.9 |
| Tyne-IN-50 | Early | 3.2 | 11.5 | 38.1 | 31.8 | 9.7 | 2.8 | 1.9 |
| Tyne-NO-0 | Early | 1.7 | 9.5 | 46.0 | 31.2 | 8.0 | 1.5 | 1.0 |
| Tyne-NO-50 | Early | 1.9 | 11.2 | 41.5 | 31.6 | 9.3 | 2.2 | 1.0 |
| Nitro-IN-0 | Early | 0.0 | 0.0 | 0.1 | 3.4 | 37.9 | 43.7 | 14.2 |
| Nitro-IN-50 | Early | 0.0 | 0.0 | 0.2 | 5.2 | 39.9 | 39.5 | 14.2 |
| Nitro-NO-0 | Early | 0.0 | 0.0 | 0.1 | 4.9 | 41.0 | 40.7 | 13.5 |
| Nitro-NO-50 | Early | 0.0 | 0.0 | 0.0 | 4.0 | 36.2 | 43.7 | 15.3 |
| Tyne-IN-0 | Late | 0.9 | 7.6 | 34.0 | 36.6 | 14.2 | 3.7 | 2.1 |
| Tyne-IN-50 | Late | 1.1 | 9.0 | 34.2 | 35.5 | 13.7 | 3.6 | 1.9 |
| Tyne-NO-0 | Late | 0.4 | 7.9 | 39.2 | 35.4 | 12.9 | 2.1 | 1.1 |
| Tyne-NO-50 | Late | 1.5 | 9.0 | 36.2 | 34.3 | 12.6 | 3.5 | 1.8 |
| Nitro-IN-0 | Late | 0.0 | 0.1 | 2.2 | 12.2 | 39.9 | 32.6 | 11.9 |
| Nitro-IN-50 | Late | 0.0 | 0.1 | 2.0 | 12.7 | 38.6 | 32.7 | 12.4 |
| Nitro-NO-0 | Late | 0.0 | 0.0 | 1.7 | 11.1 | 38.0 | 36.4 | 11.6 |
| Nitro-NO-50 | Late | 0.0 | 0.1 | 1.9 | 12.1 | 41.0 | 32.2 | 11.4 |