

## Side Banding vs. Mid Row Fertilizer Placement



**Project Location(s):**

- Scott Saskatchewan, R.M. #380 Legal land description: NE 17-39-20 W3

**Project start and end dates (month & year):** May 2019 and completed January 2020

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### **Methodology:**

The demonstration was arranged as a randomized complete block design (RCBD) with four replicates and seven treatments at Scott, SK 2019. The trial was sown on wheat stubble using an R-tech drill with 10-inch row spacing. Further details regarding treatment applications can be found in Appendix A1. Nitrogen and sulphur rates were targeted to achieve 120lb N /ac and 45 lb S /ac to result in a 49-0-0-51 blend applied at 367 lb/ac in the mid-row or sideband (dependent on treatment). Phosphorus was applied seed placed for all treatments.

### **Treatment List:**

Table 1. Phosphorus and nitrogen rates and placement treatment list for Scott, SK

| Treatment # | 11-52-0 lb/ac Rate | Phosphorus Rate                  | N Fertilizer Placement |
|-------------|--------------------|----------------------------------|------------------------|
| 1           | 0                  | 0                                | 0                      |
| 2           | 0                  | 0 P <sub>2</sub> O <sub>5</sub>  | Sideband               |
| 3           | 19                 | 10 P <sub>2</sub> O <sub>5</sub> | Sideband               |
| 4           | 96                 | 50 P <sub>2</sub> O <sub>5</sub> | Sideband               |
| 5           | 0                  | 0 P <sub>2</sub> O <sub>5</sub>  | Midrow                 |
| 6           | 19                 | 10 P <sub>2</sub> O <sub>5</sub> | Midrow                 |
| 7           | 96                 | 50 P <sub>2</sub> O <sub>5</sub> | Midrow                 |

### **Data Collection:**

Plant densities were determined by counting numbers of emerged plants on 2 x 1 meter row lengths per plot approximately three weeks after crop emergence. Days to maturity was determined by recording the date each plot matured to 60% seed colour change (SCC). NDVI ratings were taken using a hand held Greenseeker and were conducted 3 weeks after emergence. Plant densities after harvest were determined by counting the stubble on 2 x 1meter row lengths per plot after harvest. Yields were determined from cleaned harvested grain samples and corrected to the required moisture content. Greenseed was also collected as an additional seed quality indicator. Weather data was collected from Environment Canada.

**Weather:**

Table 2. Mean monthly temperature, precipitation and growing degree day accumulated from April to October 2019 at Scott, SK

| Year                                 | April | May   | June  | July  | August | Sept. | Average |
|--------------------------------------|-------|-------|-------|-------|--------|-------|---------|
| <i>-----Temperature (°C)-----</i>    |       |       |       |       |        |       |         |
| 2019                                 | 4.2   | 9.1   | 14.9  | 16.1  | 14.4   | 11.3  | 11.7    |
| Long-term <sup>z</sup>               | 3.8   | 10.8  | 14.8  | 17.3  | 16.3   | 11.2  | 12.4    |
| <i>-----Precipitation (mm)-----</i>  |       |       |       |       |        |       |         |
| 2019                                 | 6.1   | 12.7  | 97.7  | 107.8 | 18     | 41.8  | 284.1   |
| Long-term <sup>z</sup>               | 24.4  | 38.9  | 69.7  | 69.4  | 48.7   | 26.5  | 277.6   |
| <i>-----Growing Degree Days-----</i> |       |       |       |       |        |       |         |
| 2019                                 | 35.2  | 185.3 | 295.4 | 333.3 | 291.1  | 202.6 | 1342.9  |
| Long-term <sup>z</sup>               | 44    | 170.6 | 294.5 | 380.7 | 350.3  | 192.3 | 1432.4  |

<sup>z</sup>Long-term average (1985 - 2014)

## Results & Discussion

### Plant Density

Plant densities were significantly influenced by both fertilizer placement ( $P = <0.0001$ ) and phosphorus fertilizer rate ( $P = 0.0003$ ). Plant densities dropped from 7 to 5 plants/ft<sup>2</sup> (25%) when seed placed phosphorus exceeded 10 lb/ac of P<sub>2</sub>O<sub>5</sub>. Plant densities were similar between the unfertilized check and mid-row banded treatments (7 plants/ft<sup>2</sup>) and were significantly higher than when fertilizer was side-banded (4 plants/m<sup>2</sup>) (Figure 1 and 3).

### NDVI

NDVI (healthiest vegetation) was greatest when nitrogen and sulphur were midrow banded ( $10 > 0 > 50$  P<sub>2</sub>O<sub>5</sub>). NDVI was lowest when 50 P<sub>2</sub>O<sub>5</sub> was seed placed combined with N/S side banded (Figure 1).

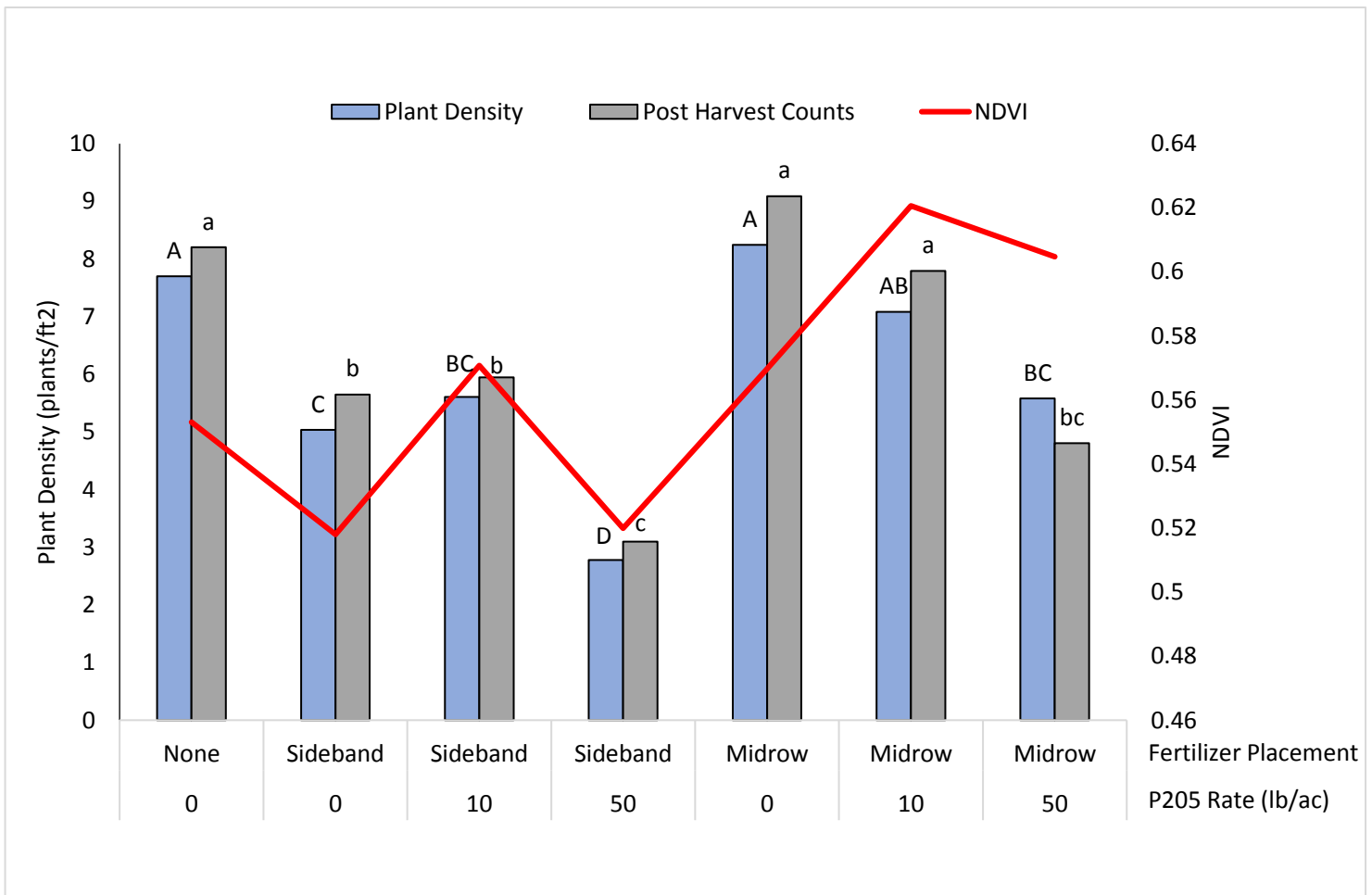


Figure 1. Response of P fertilizer placement and rate on plant densities, post harvest counts and NDVI

**Days to Maturity**

Days to maturity ranged from 111 to 107 days, with shorter days in maturity resulting from higher rates of phosphorus mid row banded. When no phosphorus was applied sidebanded it resulted in the highest number of days to maturity.

**Yield**

Yield was significantly influenced by both rate ( $P=0.0037$ ) and placement ( $<0.0001$ ). The application of  $P_2O_5$ , regardless of rate, resulted in a 12 bu/ ac gain compared to the untreated check. Side banded and mid row banded fertilizer resulted in similar yields and resulted in a 25.5 bu/ac gain compared to the unfertilized check. Although fertilizer placement (sideband vs. mid row) was similar, the greatest gains were achieved when 10  $P_2O_5$  was seed placed and N/S was mid rowed. Side banded and mid rowed treatments where P was applied resulted in a 4.5 bu/ac yield gain compared to when P was not applied (Figure 2 and 3).

**Greenseed**

Green seed was marginally influenced by fertilizer rate and placement. When P was applied, % green seed increased slightly. Unfertilized check resulted in highest green seed (1.45%) compared to side banded and mid rowed treatments (Figure 2).

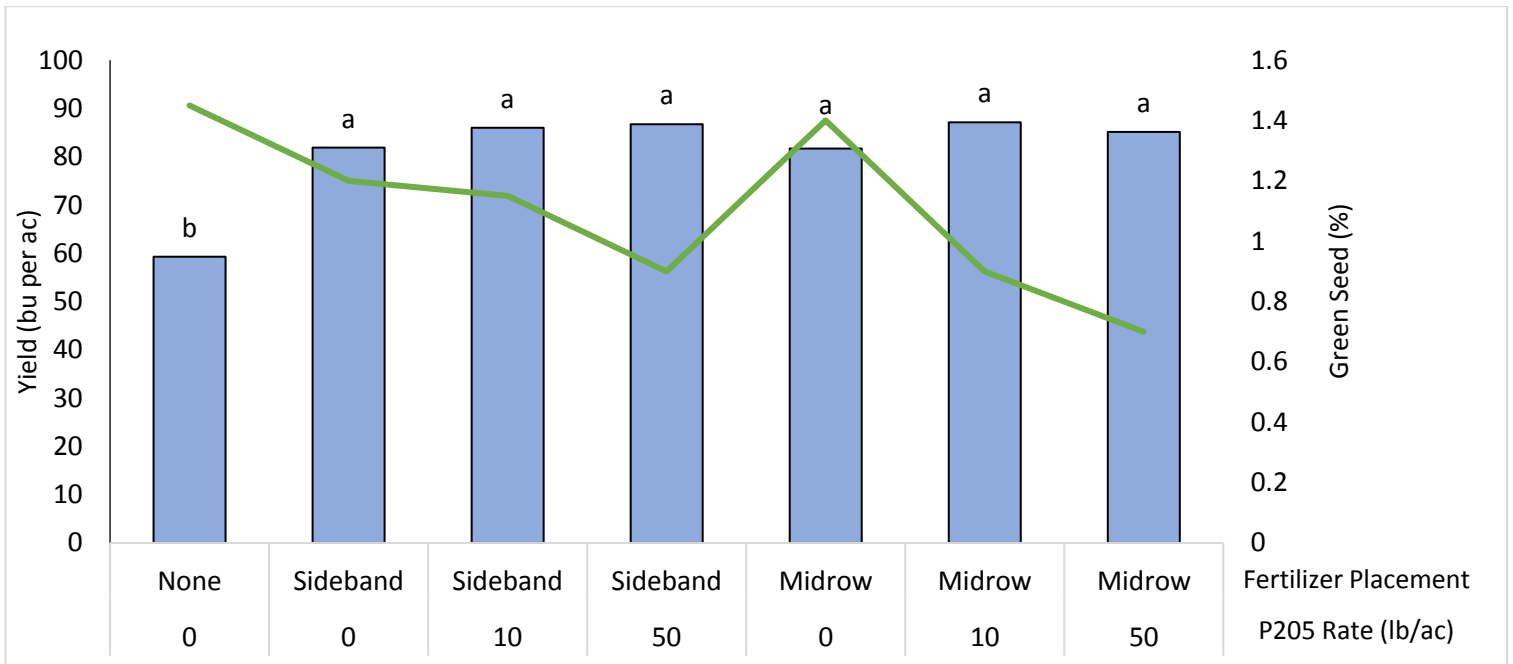


Figure 2. Yield and Greenseed (%) response to P fertilizer placement and rate, Scott 2019.

### Post-Harvest Counts

Post-harvest stubble densities were significantly influenced by both fertilizer placement ( $P=0.0073$ ) and phosphorus fertilizer rate ( $P=0.0004$ ). Overall, post-harvest counts were slightly higher than spring plant densities excluding mid row banding at 50 lb/ac, which saw a decline from 6 plants/ft<sup>2</sup> to 5 plants/ft<sup>2</sup> (Figure 1 and 3).

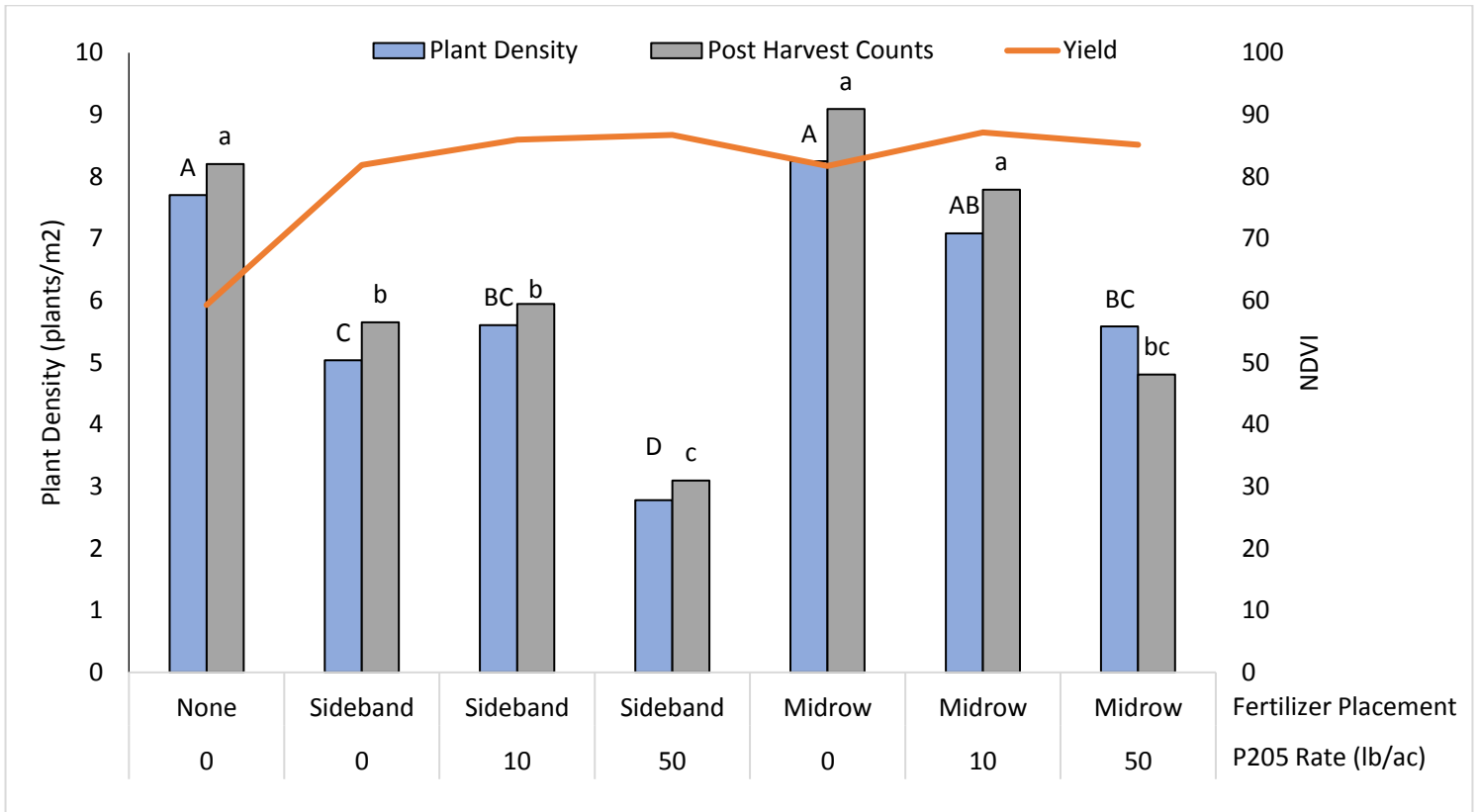


Figure 3. Comparing plant density, post-harvest counts, yield and NDVI responses to P fertilizer placement and rate

### Conclusions and Recommendations

Overall, yield was significantly influenced by both fertilizer rate and placement. The application of P<sub>2</sub>O<sub>5</sub> at 10 and 50 lb/ ac resulted in a 12 bu/ ac gain compared to the untreated check. The placement of fertilizer overall resulted in a 25.5 bu/ac compared to the untreated check. There were no significant differences between side banded and mid rowed overall. However, the general trend indicated that the greatest gains were achieved when 10 P<sub>2</sub>O<sub>5</sub> was seed placed and N/S was mid row banded. Yield differences between side banded and mid row banded treatments were expected, as plant densities dropped below recommended minimum of 5 plants/ft<sup>2</sup>, particularly under 50 lb/ac P<sub>2</sub>O<sub>5</sub> with side banded N/S.

The NDVI indexes indicated that mid row banded treatments typically resulted in greater early season vigor compared to the sidebanded treatments. However this did not correlate into a yield gain. Based on these results, side banding high rates (50 lb/ac) with high N/S is not recommended as plant densities were severely reduced and there is a high probability that yield loss would occur under these conditions.

## Appendices

### Appendix A

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**Table A1.** Agronomic and treatment application information during the growing season at Scott, 2019.

|                            | <b>Product</b>                                     | <b>Rate</b>                          | <b>Date</b>                |
|----------------------------|--|--------------------------------------|----------------------------|
| <b>Fertilizer</b>          | blend of 49-0-0-51<br><i>as per protocol for P</i> | 367 lb/ac                            | May 22 <sup>nd</sup>       |
| <b>Variety</b>             | L255PC   | 115 seeds/ m <sup>2</sup>            | May 22 <sup>nd</sup>       |
| <b>Pre-Plant Herbicide</b> | Glyphosate 540<br>AIM EC                           | 1 L/ac<br>35 mL/ac                   | May 19 <sup>th</sup>       |
| <b>In-Crop Herbicide</b>   | Amigo<br>Liberty<br>Centurion                      | 0.5 L/100 L<br>1.62 L/ac<br>75 mL/ac | June 26 <sup>th</sup>      |
| <b>Fungicide</b>           | Priaxor  | 180 ml/ ac                           | July 15 <sup>th</sup>      |
| <b>Desiccation</b>         | Reglone Ion  | 0.83 L/ac                            | September 18 <sup>th</sup> |

## Finances

|                               |  |                |
|-------------------------------|--|----------------|
| <b>Name of Trial</b>          | <b><i>Side-banding vs. Midrow Banding Fertilizer Placement</i></b>       |                |
| <b>Description</b>            | Randomized Complete Block Design   |                |
|                               | 7 Treatments x 4 replicates  |                |
|                               | Data Collection:   |                |
|                               | * Germination Counts 3 WAE   |                |
|                               | * Days to Flowering  |                |
|                               | * Days to Maturity   |                |
|                               | *Yield   |                |
|                               | *Plant density after harvest   |                |
| <b>Reporting Requirements</b> | Data sheet to be submitted in a timely manner upon completion of harvest |                |
| <b>WARC Trial Expenses</b>    | <b>Treatments</b>  | 7              |
|                               | <b>Cost per Treatment</b>  | \$150          |
|                               | <b>Trial Subtotal</b>  | <b>\$1,050</b> |
|                               | Administration Costs (15%)   | \$157.5        |
|                               | GST (5%)   | \$52.5         |
|                               | <b>Project Total</b>   | <b>\$1,260</b> |