

Phosphorus Response in Wheat Production

(Interim Report)

Purpose:

Wheat is known as a crop that has an extremely high demand for phosphorus in the early growth stages. A healthy wheat crop takes up 15 lbs/ac of phosphorus (P_2O_5 equivalent) in the first 30 days of growth, compared with soybeans that require only 1 lb/ac of phosphorus in the first 40 days of growth.

Phosphorus is less available in cool soils than in warm soils, with soil available phosphorus 5 times greater in 25° C soil than in 5° C. Cool soils result in less root growth, which further limits phosphorus uptake. Wheat is planted when this combination of factors is most likely to occur - under cool soil conditions in the fall, when soil temperatures are cool and getting colder. Thus the potential for response to phosphorus should be very high with the wheat crop.

It's estimated that up to 95% of the wheat crop is now planted using no-tillage. The "corn row" syndrome is a development that has been concurrent with the uptake of no-till. Wheat plants respond dramatically to the band of starter phosphorus applied with the corn crop, even two years after the corn was planted and the fertilizer applied. The corn row syndrome appears as strips of healthy wheat every 30 inches, corresponding with the old corn row, and much poorer wheat in between. This response is a further indication that wheat should respond to applied phosphorus.

The objective of this study was to determine the response of wheat to different rates and sources of phosphorus.

Methods:

Eight sites were planted in the fall of 2002, to evaluate phosphorus response. Five rates and sources of phosphorus were applied, in two replication field scale trials. The treatments included: Zero, 5 gal/ac Alpine 6-24-6 liquid, 50 lbs/ac 11-52-0 dry seed placed, 100 lbs/ac 11-52-0 dry seed placed, 200 lbs/ac 11-52-0 broadcast. Soils were tested for phosphorus levels to investigate the impact of phosphorus soil test with crop response.

Results:

Table 1 shows the yield results of these trials. In 7 out of 8 trials a significant response to starter phosphorus was found. A greater response was observed with 200 pounds of dry 11-52-0 broadcast than with 50 lbs of seed placed 11-52-0 in all seven locations that had this comparison. In 4 of the 8 trials (50%), response continued beyond the 50 lb seed placed rate, with higher yields from the 100 lb/ac seed placed rate.

Table 1 - Phosphorus Trials - Zero vs 50 MAP vs 100 MAP

| Co-operators | P Rates (lbs/ac) | | |
|----------------|------------------|-------------|-------------|
| | 0 | 50 | 100 |
| | Yield (bu/ac) | | |
| Ryan | 77.3 | 88.1 | 86.7 |
| Jeramel Farms | 97.5 | 103.9 | 112.9 |
| Johnston | 89.6 | 87.1 | 86.1 |
| Bloomfield | 81.5 | 106.7 | 100.3 |
| Willemse | 94.3 | 107.5 | 110.3 |
| Devries | 91.8 | 92.3 | 95.1 |
| Sutherland | 62.3 | 68.8 | 73.5 |
| McCallum | 69.0 | 81.4 | 75.1 |
| Average | 82.9 | 92.0 | 92.5 |

Summary:

The yields reported in Table #1 above appear to show a classic response curve. The broadcast rate appears less effective, despite the higher level of applied phosphorus, due to the less efficient application method. This data supports the use of seed placed starter fertilizer with wheat seed as a profitable way to increase wheat yields.

Next Steps:

Further field trials will be conducted to validate this initial study.

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Project Contacts:

Peter Johnson, OMAFRA, Stratford, peter.johnson@ontario.ca . To be involved in similar trials in the future please contact Peter.