Enhancing Canola Production with Improved Phosphorus Fertilizer Management

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Canola has a relatively high phosphate requirement compared to cereals, and with high yielding canola hybrids, the safe rates for seed-row placement are typically insufficient for yield optimization. Researchers conducted a three-year project to determine how to best apply these high rates and the best recommendations for high yielding canola production. Overall, the study demonstrated that the optimal phosphorus management practices have changed for growing canola in Saskatchewan, and that the current phosphorus fertilizer recommendations should be reconsidered for the high yielding cultivars currently used. All or most of the phosphorus fertilizer applied should be side-banded, especially when higher rates are needed, to minimize seed damage and maximize yields.

Most soils in Saskatchewan are deficient in available phosphate (P_2O_5), a macronutrient typically limiting crop growth and yield. Canola has a relatively high phosphate requirement compared to cereals, and with high yielding canola hybrids, the safe rates for seed-row placement are typically insufficient for yield optimization. As well, safe rates with seed-row placement are not sufficient to offset crop removal, further depleting soil P reserves. Therefore, producers question how to best apply these high rates and what the best recommendations are for high yielding canola production.

Researchers in Saskatchewan initiated a three-year project in 2016 at three locations, including Scott, Indian Head and Melfort, to answer these questions and to provide the basis for updating the fertilizer P rate and placement recommendations for canola production. The objective of the study was to evaluate the impact of rate and placement (seed-placed versus side-band) of fertilizer phosphate, either alone or in combination with fertilizer Sulphur, on canola P-uptake and yield across a range of soil and climatic conditions in Saskatchewan.

The study compared five fertilizer P_2O_5 rates ranging from 0, 20, 40, 60, and 80 kg/ha and various placement methods, including side-band, seed-placed, and seed-placed with fertilizer S, for a total of 15 individual treatments at each location. At all nine site-years, plots were established on cereal stubble and seeded with L140P (Liberty Link tolerant) canola and under typical agronomic management practices. Data collection consisted of plant density, biomass, phosphorus content, maturity, grain yield, green seed, and thousand kernel weight (TKW).

Overall, researchers found responses to high rates of side-banded P were always equal to or greater than seed-placed, and no evidence of better responses associated with seed-placed P over side-band P, even at low rates. The study results demonstrate the high level of crop safety associated with side-band placement of fertilizer when it is banded away from the seed. However, there was a high degree of risk associated with seed-placed fertilizer when soil and climatic conditions are conducive to high levels of fertilizer damage. No rate of seed-placed P was found to be safe, as damage occurred at very low rates. It is also very difficult to predict the degree of damage from seed-placed P fertilizer due to soil characteristics and spring moisture and is likely to change across the landscape.

Generally, plant populations declined significantly as P rates increased with both seed-placed and SP + 15AS treatments, but not with the side-band placement. Yield was affected by phosphorus rate and in some cases, the interaction between rate and placement. The results showed that canola yields generally increased with increasing P rate and optimal yields were reached between 70 and 80 kg/ha of fertilizer P. Therefore, if high rates of phosphorus are required, fertilizer P should be side-banded to minimize seed damage and maximize yields as it was the most consistent and beneficial application method.

At all site-years with very low to moderate levels of soil available P, the results showed a yield benefit from side-banded P including treatments with fertilizer P rates above soil test recommendations. In addition, there were no negative consequences to added fertilizer P at site-years that were high in soil available P, suggesting that this practice can be used as a method to build or maintain soil P reserves. The results also showed that applying even a small amount of ammonium sulphate to the seed-row is detrimental to crop establishment and can have a negative additive effect to seed-placed P. Therefore, if logistics allow, P and S fertilizer should all be side-banded to maintain plant populations and yield potential.

Overall, the study demonstrates that optimal phosphorus management practices have changed for growing canola in Saskatchewan, and the current phosphorus fertilizer recommendations should be reconsidered for the high yielding cultivars currently used. As well, all or most of the phosphorus fertilizer applied should be side-banded, especially when higher rates are needed, to minimize seed damage and maximize yields.