AgriARM Applied Research Management

Canola Response to Novel Phosphorus Sources

Canola is a large user of phosphorus (P) and relatively responsive to fertilizer applications in relative to many crops. It is well documented that high rates of seed-placed P fertilizer can reduce seedling survival and establishment in sensitive crops such as canola; however, many farmers prefer to place at least a portion of their P in the seed row to ensure it is not limited early in the season. This project was initiated to demonstrate canola response to increasing rates of seed-placed P fertilizer for various formulations.

The project was conducted at 14 sites which were comprised of Indian Head (2020, 2021, 2022), Scott (2020, 2021, 2022), Swift Current (2020, 2021, 2022), Melfort (2021, 2022), Outlook (2021), Redvers (2021), and Yorkton (2021). The formulations were monoammonium phosphate (MAP), MicroEssentials® S15, CrystalGreen® (CG), and a 50:50 blend of MAP and CG. This blend resulted in actual P_2O_5 proportions of 35:65 from CG and MAP. In addition to a control, the rates were 25, 45, and 65 kg P_2O_5/ha. All sites were reasonably low in residual soil P, with less than 15 ppm 93% of the time and less than or equal to 10 ppm 71% of the time.

Treatment effects on establishment occurred at approximately 50% of the sites. While the lack of response could sometimes be reasonably explained by soil properties and/or moisture, that was not always the case and confirmed the unpredictable nature of seedling injury with in-furrow P fertilizer placement. Where they did occur and when averaged across sites, stand reductions were usually most severe with S15 followed closely by MAP, were less severe with the MAP:CG blend, and were essentially non-existent with 100% CG (Table 1). Across forms and sites, seed yield increased up to the highest P rate and the responses were similar for all forms except CG applied on its own, which performed slightly poorer (Table 1). For individual sites, yield responses to P were at least marginally significant 64% of the time. The non-responsive sites could usually, but not always, be explained as a combination of low yields (due to drought) and moderately high residual soil P levels. When considering the poor uptake-efficiency in the year of application, P fertilization is also important in the long-term. From an economic perspective, all forms performed reasonably well except 100% GC, due to its higher cost and weaker yield response. On average, the rates required to maintain P fertility over the long-term (i.e. approximately 45 kg P_2O_5/ha) were also profitable.

In conclusion, MAP generally performed well or better than the options to which it was compared; however, other forms may be advantageous from a logistic perspective (i.e. S15) or with regard to seed safety (i.e. MAP:CG blends) and, as such, will still commonly be a good fit for individual operations.

Table 1. Main effect means for seed-placed phosphorus (P) fertilizer formulation and rate effects on canola emergence, final plant densities, and seed yield when averaged across 14 location-years in Saskatchewan. Means followed by the same letter do not significantly differ (Tukey-Kramer, $P < 0.05$) and the 0 P control treatment was excluded from the factorial analyses.

Main Effect	Spring Plant Density	Final Plant Density	Seed Yield
	---------- plants/m^2 ----------	---------- stems/m^2 ----------	---------- kg/ha ----------
Control (0 P)	71.9	72.2	2200
P Form			
MAP	63.5 C	63.9 C	2397 A
S15	60.7 D	58.5 D	2429 A
CG	75.1 A	75.4 A	2324 B
MAP:CG	70.4 B	69.9 B	2400 A
kg P_2O_5/ha			
25	70.3 A	70.7 A	2315 C
45	68.0 B	66.9 B	2395 B
65	63.9 C	63.2 C	2452 A

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