Flax Response to Nitrogen & Phosphorous Fertilizer

Many growers in Saskatchewan are interested in flax as a rotational alternative to canola and potentially profitable crop; however, flax yields have been variable and have not increased over time to the same extent as other crops like wheat and canola. Flax often responds well to nitrogen (N) fertilizer application and, depending on residual N and soil moisture, rates of 35-80 kg N/ha are commonly applied. Relative to N, flax response to phosphorus (P) fertilizer can be less consistent and often is not as pronounced as for crops like spring wheat or canola. This project aimed to evaluate the flax yield response to applications of varying rates of side-banded N and P fertilizer under a broad range of environmental conditions and to investigate potential interactions amongst these nutrients. The trials were conducted over a three-year period (2016, 2017, 2018) at six locations in Saskatchewan (Indian Head, Melfort, Redvers, Scott, Swift Current, and Yorkton), one in Alberta (Vegreville) and one in Manitoba (Brandon). The treatments were a factorial combination of four N rates (13, 50, 100 and 150 kg N/ha) and four P rates (0, 20, 40 and 60 kg P_2O_5/ha).

Flax emergence was somewhat sensitive to side-banded urea with stand reductions associated with increasing N rate observed at 74% of the sites. At affected sites, the response was linear with a 28% reduction in plant densities when the N rate was increased from 13 kg N/ha to 150 kg N/ha. Side-banded MAP did not affect plant density, regardless of rate. Increasing N rate delayed maturity 71% of the time averaging 2.4 days amongst the affected sites. Phosphorus rate did not have a noticeable effect on flax maturity. Flax yields increased with both N and P fertilizer as shown in Figure 1. There was a site by N rate interaction with a relatively strong response at 83% of the sites, increasing yields by 39% on average with maximum yields achieved at approximately 100 kg N/ha. At the remaining sites, the response was weak with an 11% yield increase on average and optimal rates closer to 50 kg N/ha. For phosphorus, although there was variation, no site by phosphorus interaction was detected. The average response was linear but relatively shallow (7%); therefore, more modest rates of 20-40 kg P_2O_5/ha are likely to be optimal. At 50% of the sites, the maximum yield increase with P was 5-10% while the response was below 5% at 28% of the sites and greater than 10% at 22% of the sites. Test weight was not affected by P fertilizer rate but there was a very slight linear increase at 41% of the sites.

In conclusion, these results show that adequate N and P fertility are both important for achieving higher flax yields. However, the responses were modest with respect to both magnitude of the yield increase and the rates at which maximum yield was achieved. Site-to-site variability was much higher than the variability within sites due to N and P fertilizer rate. This potentially suggests that fertility is not likely the most limiting factor for majority of western Canadian flax acres; however, this will vary on a farm-to-farm basis.

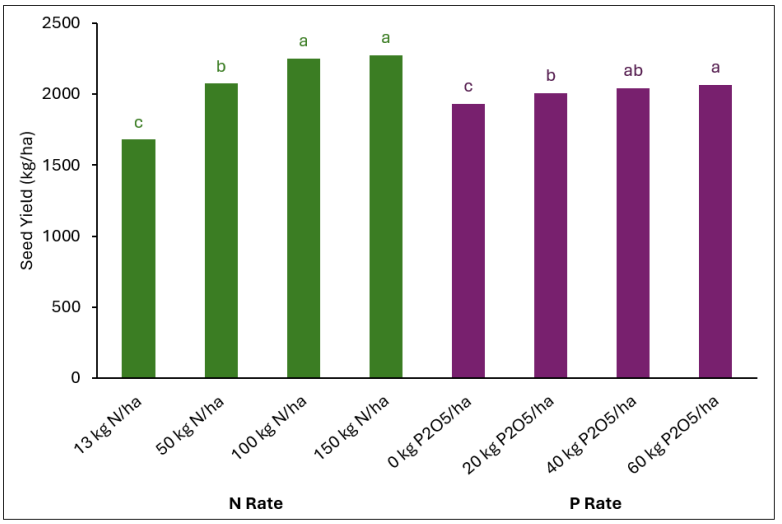

Figure 1. Main effect (N and P rates) means for flax seed yield when averaged across all sites. Main effect means within each rate followed by the same letter do not significantly differ.

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