Factsheet: Flax Response to a Wide Range of Nitrogen & Phosphorus Fertilizer Rates in Western Canada

Objective:

1. to evaluate the yield response of flax to various rates and combinations of nitrogen (N) and phosphorus (P) fertilizer
2. to evaluate the potential yield response to higher N and P rates than are typically recommended or utilized for flax

Methodology:

Field trials were conducted over a 3-year period (2016-2018) at six locations in Saskatchewan (Indian Head, Melfort, Redvers, Scott, Swift Current and Yorkton), one in Alberta (Vegreville), and one in Manitoba (Brandon). All fertilizer was side-banded, and the treatments were a factorial combination of four N fertilizer rates (13, 50, 100, and 150 kg N/ha) and four P fertilizer rates (0, 20, 40, and 60 kg P_2O_5/ha).

Key Findings:

- Flax emergence was somewhat sensitive to side-banded urea whereby stand reductions associated with increasing N rate were observed at 74% of the sites. Among the affected sites, there was a 28% reduction in plant densities when the N rate was increased from 13 kg N/ha to 150 kg N/ha. Side-banded monoammonium phosphate did not affect plant density, regardless of rate.
- Increasing N rate delayed maturity by 2.4 days 71% of the time. Phosphorus rate did not have a noticeable effect on flax maturity.
- Flax yields were increased with both N and P fertilizer. Response to N was relatively strong at 83% of the sites, increasing yields by 39% on average with maximum yields achieved at 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.
- Yield response to P was relatively shallow (7%); therefore, more modest rates of 20-40 kg P_2O_5/ha are likely to be most economical and enough to maintain soil fertility under most circumstances. At 50% of the sites, the maximum yield increase with P was 5-10%.
- Test weight increased slightly with increased rates of N, but was generally not affected by P fertilizer rate.
- 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.

The full report is available on www.warc.ca. This project was jointly funded through the Canada-Saskatchewan ADF program (administered by the Saskatchewan Ministry of Agriculture), Saskatchewan Flax Development Commission, and Western Grains Research Foundation.

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Table 1. Individual treatment means for the N rate by P rate (not statistically significant) interaction averaged across all sites (n=18) for flax seed yield. Means followed by the same letter do not significantly differ (L.S.D. = 89.0).

	Phosphorus Rate				Orthogonal Contrasts	
Nitrogen Rate	0 kg P_2O_5/ha	20 kg P_2O_5/ha	40 kg P_2O_5/ha	60 kg P_2O_5/ha	PR – linear	PR – quadratic
	---------- kg/ha ----------				---------- p-values ----------	
13 kg N/ha	1627 g	1697 g	1686 g	1707 g	0.103	0.438
50 kg N/ha	1993 f	2113 de	2063 ef	2122 de	0.017	0.329
100 kg N/ha	2129 de	2235 bc	2325 a	2317 ab	<0.001	0.068
150 kg N/ha	2188 cd	2219 c	2326 a	2352 a	<0.001	0.946
Orthogonal Contrasts	---------- p-values ----------				–	–
NR – linear	<0.001	<0.001	<0.001	<0.001	–	–
NR - quadratic	<0.001	<0.001	<0.001	<0.001	–	–

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