Factsheet: Flax Response to Non-Traditional Nitrogen Fertilizer Management Strategies

Objective:

The project objective was to demonstrate, across a variety of Saskatchewan locations, the yield response to a range of nitrogen fertilizers, the seed safety and potential yield benefits of using a polymer coated urea (ESN) in a high-rate side-banded, and the potential merits of a split application to reduce the likelihood of seedling injury and lodging.

Methodology:

The study was conducted in 2021 at six locations; Indian Head, Melfort, Redvers, Swift Current, Yorkton, and Scott. The treatments were a range of N fertilizer rates from 17-130 kg N/ha, treatments of urea versus 75% ESN were tested at the higher rates. The split application had the post emergent treatment added during the vegetative or early reproductive stage with and without a volatilization inhibitor (NBPT; Agrotain). P, K and S were non limiting and were side-banded. To ensure enough N was available in the early season the ESN we used was a 75% blend with 25% untreated urea.

Table 1. Treatments evaluated in ADOPT nitrogen management demonstration in flax (2021).

#	Name	kg N-P_2O_5-K_2O-S/ha	Comments
1	Check	17-40-0-11	- N from 77 kg/ha MAP and 42 kg/ha AS
2	Low N – urea	55-40-0-11	- all N side-banded as either untreated urea or a blend of 75% ESN:25% untreated urea
3	Medium N – urea	80-40-0-11	
4	High N – urea	105-40-0-11	
5	High N – 75% ESN	105-40-0-11	
6	Ultra N – urea	130-40-0-11	
7	Ultra N – 75% ESN	130-40-0-11	
8	Split – early in-crop urea	105-40-0-11	- 55 kg N/ha side-banded and 50 kg N/ha broadcast as untreated urea or Agrotain when the flax is 4-10 cm tall
9	Split – early in-crop Agrotain	105-40-0-11	
10	Split – late in-crop urea	105-40-0-11	- 55 kg N/ha side-banded and 50 kg N/ha broadcast as untreated urea or Agrotain when the flax is budding to starting to flower
11	Split – late in-crop Agrotain	105-40-0-11	

The full report is available at www.warc.ca. This project was funded through Sask Flax, and the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canadian Agricultural Partnership bi-lateral agreement between the federal government and the Saskatchewan Ministry of Agriculture
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Key Findings:

- The 2021 growing season was dry at all locations. The mean temperature over the four-month growing season was well above normal at all locations. With a substantial amount of the precipitation in the latter half of august.
- Establishment found that the rate of emergence declined as the rate of side-banded urea was increased. The plant densities ranged from 34-107 plants/m^2. Losses were reduced or eliminated by using untreated urea in a 75:25 ESN blend or a split application.
- Dry conditions led to low yields. Yield did increase with increased N at Indian Head, Melfort and Redvers, but not at Swift Current, Scott, or Yorkton. Yield response increased with an application of 55 kg of N/ha to 105 kg of N/ha. There was no benefit found going up to 130 kg N/ha. There was no lodging observed in any trials from an increased N application.
- Even though establishment benefited from ESN and a split-application, results showed there was no yield benefit by using either treatment. Yields were similar regardless of application time. At Swift Current, there did appear to be a benefit to using untreated urea with Agrotain treated urea even though there was not a response to being side-banded.

Table 2. Mean flax seed yield as affected by nitrogen (N) treatment at six Saskatchewan locations (Indian Head, Melfort, Redvers, Swift Current, Yorkton, and Scott) in 2021. Means within a column followed by the same letter do not significantly differ (Tukey-Kramer, P ≤ 0.05).

Source / Nitrogen Treatment	Indian Head	Melfort	Redvers	Swift Current	Yorkton	Scott
	---------- Pr > *F* (p-values) ----------					
Entry	<0.001	<0.001	0.002	0.599	0.264	0.807
	---------- Seed Yield (kg/ha) ----------					
1. Check	793 b	1438 b	903 b	807 a	761 a	1116 a
2. Low N – urea	1075 a	1654 a	1300 a	840 a	891 a	1198 a
3. Med N – urea	1130 a	1780 a	1208 ab	839 a	864 a	1145 a
4. High N – urea	1328 a	1715 a	1276 ab	832 a	653 a	1213 a
5. High N – 75% ESN®	1243 a	1731 a	1278 a	883 a	864 a	1190 a
6. Ultra N – urea	1239 a	1831 a	1148 ab	830 a	761 a	1150 a
7. Ultra N – 75% ESN®	1233 a	1794 a	1355 a	834 a	845 a	1071 a
8. Split – early urea	1209 a	1749 a	1336 a	783 a	894 a	1062 a
9. Split – early Agrotain®	1194 a	1705 a	1234 ab	939 a	937 a	1031 a
10. Split – late urea	1226 a	1712 a	1397 a	802 a	874 a	–
11. Split – late Agrotain®	1213 a	1658 a	1338 a	945 a	1062 a	–
S.E.M.	107.6	44.9	145.5	94.2	114.4	91.8

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