



Seedrow starter fertilizer for pulses

CATEGORY [soils and fertility](#) | December 12, 2019

Sensitivity of pulse crops to seedrow placed nitrogen, phosphorus and sulfur fertilizer products was lentil > pea ~ chickpea > soybean ~ black bean > faba bean. Overall and under good moisture conditions, a maximum of 10 kg N/ha rate as starter in the seedrow was suitable for the most sensitive and least responsive crops of lentil, pea, and chickpea. A 20 kg N/ha rate was safe for faba bean, soybean, and black bean.

Research at the University of Saskatchewan's Soil Science department looked at several aspects of seedrow starter nitrogen (N), phosphorus (P), and sulphur (S) fertilizer products. Crop safety and the response of pulse crops to starter N, P and S fertilizer were assessed.

2017 greenhouse study evaluated seedrow safety

Soil was collected from a loamy textured Brown Chernozem field in southern Saskatchewan. Soybean, green pea, faba bean, black bean, small red lentil and desi chickpea were seeded into the soil with a simulated 15% seedbed utilization (1.5 inch opener on 10 inch row spacing) and grown for 30 days under greenhouse conditions.

Fertilizer product application rates were based on four "starter" N rates of 0, 10, 20 and 30 kg N/ha that was applied for seven different fertilizer blends/products. The amount of nutrients applied

varied by product/blend. For example, a 10 kg/ha N rate applied as MAP (11-52-0) resulted in 47.3 kg P₂O₅/ha also being applied with the seed. Conversely, the same 10 kg N rate in a blend of urea and MAP (28-26-0) resulted in only 9.3 kg P₂O₅/ha applied.

Rates of seedrow placed fertilizer products P₂O₅, P and S at three different N rates

Fertilizer	Analysis	10 kg N ha ⁻¹				20 kg N ha ⁻¹				30 kg N ha ⁻¹			
		kg product ha ⁻¹	kg P ₂ O ₅ ha ⁻¹	kg P ha ⁻¹	kg S ha ⁻¹	kg product ha ⁻¹	kg P ₂ O ₅ ha ⁻¹	kg P ha ⁻¹	kg S ha ⁻¹	kg product ha ⁻¹	kg P ₂ O ₅ ha ⁻¹	kg P ha ⁻¹	kg S ha ⁻¹
MAP	11-52-0	90.9	47.3	20.3	0	181.8	94.5	40.7	0	272.7	141.8	61.0	0
MAP + Urea	28-26-0	35.7	9.3	4.0	0	71.4	18.6	8.0	0	107.1	27.8	12.0	0
MAP + AS	16-26-0-12	62.5	16.3	7.0	7.5	125.0	32.5	14.0	15.0	187.5	48.8	21.0	22.5
MES-15	13-33-0-15	76.9	25.4	10.9	11.5	153.8	50.8	21.8	23.1	230.7	76.1	32.7	34.6
APS 1	12-45-0-5	83.3	37.5	16.1	4.2	166.6	75.0	32.2	8.3	249.9	112.5	48.4	12.5
APS 2	16-20-0-13	62.5	12.5	5.4	8.1	125.0	25.0	10.8	16.3	187.5	37.5	16.1	24.4
APS 3	16-20-0-12	62.5	12.5	5.4	7.5	125.0	25.0	10.8	15.0	187.5	37.5	16.1	22.5
Control	NA	0	0	0	0	0	0	0	0	0	0	0	0

Source: Dona, U of S, 2018

Overall, the six legume crops showed the following relative sensitivities (injury potential) from starter fertilizer placed in the seedrow: lentil > pea > chickpea > soybean > black bean > faba bean.

Lentil, pea and chickpea could generally only tolerate the 10 kg N/ha rates while soybean and black bean could tolerate 10 to 20 kg N/ha.

Faba bean emergence appeared relatively unaffected by all three rates of N (10, 20 and 30 kg N/ha) and showed least sensitivity to seedrow placed fertilizer. In a separate trial, a zero tannin faba bean variety had some sensitivity to the 20 and 30 kg N/ha rates of fertilizer application with reduced emergence compared to greater tolerance of higher rates of N in a tannin faba bean variety.

Overall, the ammonium phosphate sulfate fertilizer products tended to have less injury potential than the equivalent analysis blends when applied at a given N rate.

Soybean and black bean were most responsive to starter fertilizer with increased 30-day biomass production and nutrient uptake. Pea, faba bean, lentil and chickpea biomass and nutrient uptake did not respond greatly to the starter fertilizer applications, and there would be no benefit realized from going above 10 kg N/ha on this soil from any of the fertilizer products or blends.

Paired row soybean field trial

To complement the controlled environment trials, a field scale soybean experiment was conducted in a field near where the soil was collected for the controlled environment study. A paired row side band configuration was used to limit the potential injury to the soybean from the higher rates of N fertilizer.

A 75:25 blend of urea and monoammonium phosphate fertilizer (37-13-0) was applied at a blended product rate of 0, 40, 80 and 120 lbs./ac. This provided rates of 0, 17, 34 and 51 kg N/ha and 0, 6, 12 and 18 kg P₂O₅/ha.

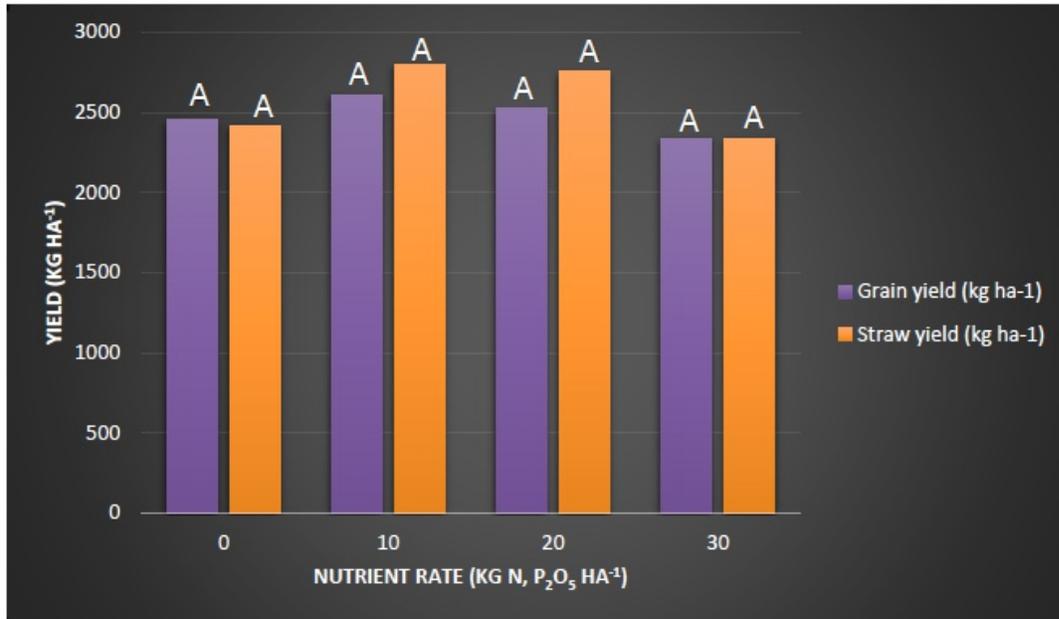
The highest rate of N (54 kg N/ha) placed in paired row side band configuration had the highest grain yield. This was despite lower initial plant counts observed at the high rate. The researchers observed poor nodulation throughout the growing season due to drought conditions, and would explain the yield response to applied N fertilizer.

2018 soybean and lentil field trial

Rates of fertilizer applied in the seedrow were based on four rates of starter N: 0, 10, 20 and 30 kg N/ha using a blend of urea (46-0-0) and MAP (11-52-0) analysis of 28-26-0. This blend also supplied approximately 0, 10, 20 and 30 kg P₂O₅/ha. Fertilizer was placed in the seedrow with the lentil and soybean under approximately 15% seedbed utilization.

Similar to the controlled environment study, a rate of 10 kg N and P₂O₅/ha as seedrow placed urea-MAP blend (28-26-0) appeared to be the rate that did not significantly reduce emergence, stand count or biological nitrogen fixation, and was sufficient to maximize yield, N fixation and P uptake.

Lentil straw and grain yield



Source: Galpottage Dona et al. 2019

Based on results of this study, pulse crops that begin N fixation early and fix large amounts of N such as faba bean and pea should require the least amount of starter N. A 10 kg N/ha rate of the urea/MAP blend as starter placed in the seedrow appeared to be sufficient to maximize faba bean, pea, lentil and chickpea early season growth. Higher rates of 20 to 30 kg N/ha may be desirable for black bean and soybean, especially under very low fertility and good moisture conditions.

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H. Galpottage Dona, T. King and J. Schoenau. 2019. Tolerance and Response of Pulse Crops to Seed Placed N, P, S Fertilizer.

H. Galpottage Dona. 2019. Assessing the Tolerance and Response of Pulse Crops to Seed Row Placed Fertilizer Blends and Composite Products Containing Nitrogen, Phosphorus and Sulfur. MSc Thesis, Department of Soil Science, University of Saskatchewan College of Graduate and Post Doctoral Studies, Spring 2019.