

Factsheet: Nitrogen Benefits of adapted grain legumes to succeeding crops in NW SK



Objective:

The objective of this experiment was to determine the contribution of legume crops to soil nitrogen and succeeding crop yield.

Methodology:

This demonstration was conducted at the AAFC Scott Research Farm in 2016 and 2017 growing season, where wheat was seeded on the 2016 legumes and flax stubble. There were six treatments (five legume crops and a non-legume crop). Fertilizer was applied to the non-legume (flax) and all the legumes were inoculated with their respective registered inoculants at recommended rates at seeding in the 2016 growing season. Pesticides were also applied as and when they were required in both years. Plots were harvested at separate dates based on their maturity in 2016 but in 2017 growing season, all the wheat plots were harvested at the same time after desiccation. Soil analyses were done prior to seeding and after harvest to determine the residual soil nitrogen (N) when the soil temperature was not rife for further mineralization.

Table 1: Demonstration treatment list for 2016 and 2017 growing seasons

Treatment	2016 Crop type	2017 Crop type
1	Non-legume (flax)	Wheat on flax stubble
2	Faba bean	Wheat on faba bean stubble
3	Peas	Wheat on peas stubble
4	Chickpea	Wheat on chickpea stubble
5	Lentils	Wheat on lentils stubble
6	Soybean	Wheat on soybean stubble

Key Findings:

- Nitrogen is recycled primarily through the decomposition of crop residues that are returned to the soil.
- Although this study did not result in the anticipated N benefits associated with legumes, there are several advantages associated with a legume based crop rotation that producers could utilize.
- Legume roots can also acidify root zone and solubilize calcium phosphates common in prairie soils, this explains why pulses/legumes are sometimes not highly responsive to P fertilization.

- The non-N benefits may also include the interruption of disease cycles, reduced weed populations, and increased availability of other nutrients, improved soil structure, and release of growth substances from legume residue.
- Even though there was not a statistically significant difference for wheat yield, a trend towards a higher yield was observed after seeding peas, lentils and faba beans.
- We recommend including pulses in the crop rotation, as lentils, peas and faba beans were able to provide a slight residual N benefit. Furthermore, both crops are a viable pulse option as they are adapted to the conditions of Northwestern Saskatchewan.

Table 3. Plant density, yield, seed quality (thousand kernel weight and bushel weights), protein, and N contents (grain N, grain N yield and N credit) of wheat seeded in different legume stubble types at Scott, SK in 2017. Values represent means (n = 4).

Stubble Type	Plant density (plants/m²)	Yield (bu/ac)	TKW (g)	BW (kg/hL)	Protein (%)	Grain N content (%)	Grain N yield (kg/ha)	N credit (kg/ha)
Flax	158.7	52.3	35.1	16.6	10.3	1.95	6930	0
Faba bean	156.7	53.9	36.6	16.7	10.2	1.97	7150	0.2
Pea	163.1	60.7	36.4	16.7	10.1	1.95	7991	1.1
Chickpea	155.0	50.8	35.5	16.7	10.2	2.0	6821	-0.1
Lentil	162.2	55.8	35.5	16.7	10.2	1.99	7486	0.6
Soybean	158.2	50.8	36.4	16.7	10.2	2.01	6855	-0.1