

Nitrogen-fixing legume crops offer many rotational benefits in a cereal dominated crop rotation, and annual grain legumes have the potential to offer additional benefits related to their N-fixing capabilities. Thus, benefits of grain legumes in annual crop rotations include soil nitrogen (N) contributions plus non-N rotational benefits. Production of grain legumes has increased in western Canada in recent years and there is a recent need to add faba bean in rotations around NW SK. Other than peas and lentils, most legume crops are low in acres; therefore, there is a need to demonstrate their contribution to the N budget of subsequent crops. Legumes that were included in this study were faba bean, chickpea, soybean, lentils, and peas for which their rotational benefits have not been evaluated for NW SK. In order to focus on the apparent N benefits of the annual grain legumes, flax was chosen as the non-legume reference crop in this study.

The intent of the study was to compare the rotational benefits of five annual grain legumes and an annual non-legume reference crop on a subsequent wheat crop in NW SK. Information on N benefits from legume stubble under NW Saskatchewan conditions is necessary to develop a more accurate fertilizer recommendation for crops that will be grown on the legume stubble in rotation.

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. A randomized complete block design with four replications was used in both growing seasons. 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

Stubble Type	Yield (bu/ac)	Grain N content (%)	Grain N yield (kg/ha)	N credit (kg/ha)
Flax	52.3	1.95	6930	0
Faba bean	53.9	1.97	7150	0.2
Pea	60.7	1.95	7991	1.1
Chickpea	50.8	2.0	6821	-0.1
Lentil	55.8	1.99	7486	0.6
Soybean	50.8	2.01	6855	-0.1

Table 1. Yield 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).

No yield or quality benefits were observed for wheat seeded on various legume stubble types. Although a trend towards an increased yield and quality were observed when wheat was seeded on pea, lentil and faba bean stubble. A small N credit was detected for peas, lentils and faba beans. Faba beans, lentils and peas are already adapted to the conditions of northwestern Saskatchewan makes them a viable alternative for crop rotations.

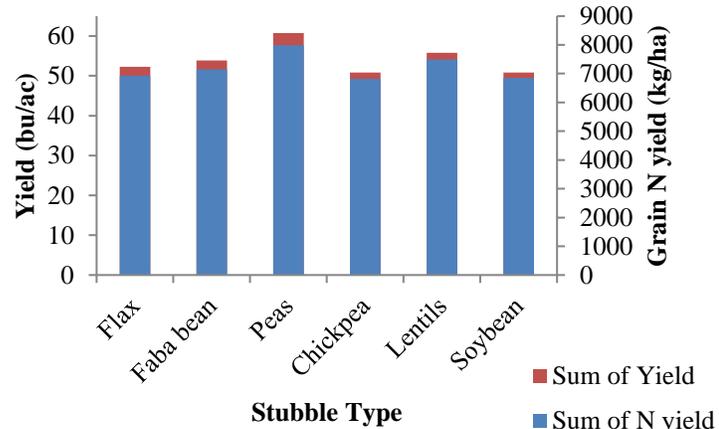


Figure 1. Total yield and grain N yield of wheat seeded on flax and five legume stubble types at Scott, SK in 2017.

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.

Full report at:

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