Introduction
Grain legumes are a group of crops grown worldwide primarily for their protein-rich seeds that are used as human food, animal feeds, or in industrial products. They also play a significant role in nitrogen cycling by fixing atmospheric N₂ through biological nitrogen fixation (BNF). BNF efficiency is reported to vary among pulse species and cultivars but information is scarce in the Canadian prairie growth environment.

Materials & methods
A 3-year field study was conducted at the Agriculture and Agri-Food Canada (AAFC) Research farm, Swift Current, Saskatchewan (50°25’N, 107°44’W) in 2008, 2009 and 2010 to quantify the BNF ability and related traits, and the effect of BNF on crop yield in chickpea (Cicer arietinum L.), dry bean (Phaseolus vulgaris L.), faba bean (Vicia faba L.), field pea (Pisum sativum L.) and lentil (Lens culinaris Medik.). In each plot, the number of nodules per plant was counted at the early- and later-flowering stages.

Results & discussion
- BNF varied according to growing season, and pulses had a higher BNF in the wetter 2010 than the drier 2009 (Table 1).
- In 2010, faba bean and chickpea had the highest BNF at 106 kg N ha⁻¹, followed by lentil, field pea, and dry bean at 87, 69, and 12 kg N ha⁻¹, respectively (Table 1).
- Across years, field pea had the most stable BNF ability and seed yield. There are large differences in BNF and yield among cultivars within a species and the magnitude of the difference varied with years (Fig. 2).
- Most pulse crops had a higher number of nodules at the early flowering stage, but the nodule weight was higher at late flowering stage (Table 1).
- At the late flowering stage, chickpea had the highest number of nodules in 2008 (36.7 plant⁻¹) (Table 1).

Conclusions
Large genetic variability in BNF, N accumulation and yield suggest the possibility that pulse cultivars with a higher N₂-fixing ability and seed yield can be developed through selection of the N₂-fixing traits.

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