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The Effects of Soil Depth and Soil Phosphorus Levels on Nitrogen Fixation and Protein of Field Pea

Pea production in Montana has increased more than 5 fold in the past decade yet essentially no research has been conducted on variables that affect key properties of pea plants. For example, little is known about what affects pea protein and the amount of nitrogen fixation, which is the conversion of nitrogen gas to plant available nitrogen that occurs on pea roots. This study is currently investigating the effects of soil depth and soil phosphorus availability on nitrogen fixation and pea protein. Nitrogen is typically the limiting nutrient in agriculture and phosphorus is one of the most limiting nutrients in Montana. Two fields located in central Montana were used to collect soil, weed, and pea tissue samples. The pea grain, pea chaff, and weed tissue were processed and analyzed for 15N in order to calculate the amount of nitrogen fixed by the peas. The soil samples collected will be analyzed for plant available phosphorus using a sodium bicarbonate extraction. After sample analysis, a multiple linear regression with depth to gravel and plant available phosphorus as fixed independent variables and nitrogen fixed in grain and protein in grain as dependent variables, will be analyzed. It is expected that soil depth and phosphorus will control nitrogen fixation and pea grain protein. Ideally, a “critical” phosphorus level for nitrogen fixation (meaning minimum P concentration that maximizes N fixation) will be developed from this research so pea producers will have a value to target when fertilizing to optimize the vitality of their crop. Although depth to gravel cannot be controlled, learning its influence on protein and N fixation can allow producers to select fields that optimize N fixation and pea protein.