Nutrient management for pulses production

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Fixation of Nitrogen

Pulse crops have the ability to obtain much of their nitrogen requirement from the air within the soil surrounding their roots. This is done when the plant forms a mutually beneficial relationship with soil bacteria called *Rhizobium*.

Specific pulse crops require specific *Rhizobium* species for nodulation.

R*hizobium* species required for legume crops

pea, lentil, faba bean, chickling vetch	*Rhizobium leguminosarum*
chickpea	*Rhizobium ciceri*
dry bean	*Rhizobium phaseoli*
soybean	*Bradyrhizobium japonicum*
alfalfa, sweet clover	*Rhizobium meliloti*
clover	*Rhizobium trifolii*

Nitrogen fertiliser and inoculation

A soil test is the best tool to provide guidelines for crop fertility needs.

Pulse crop seedlings use nitrogen from the top 15-30 cm of the soil until nitrogen fixation starts.

Nitrogen below this depth will not be available to small seedlings.

Nitrogen fixation may take three to four weeks to become well established.

Nitrogen fertiliser and inoculation

Poor N fixation if:

- Improper inoculant , low temps, drought or excess moisture, > 40 Kg total available N/ ha

- Low availability of other nutrients including phosphorus, potassium, sulfur, and iron

Nitrogen fertilisation

- Nitrogen is necessary for high pulse crop yields
- Although nitrogen fixation generally is sufficient to meet crop needs, providing supplemental nitrogen to the pulse crops prior to the onset of nitrogen fixation by applying low rates of starter nitrogen is recommended
- Generally, dry beans are poor fixers of nitrogen in comparison to pea, lentil, faba bean, and chickpea.

Nitrogen fertilisation

- In soils with available nitrogen levels less 11 kg/ha, early plant growth may be slow and seedlings may appear yellow due to nitrogen deficiency. This early nitrogen deficiency can be corrected by providing low levels of starter nitrogen at seeding.

- When the combined levels of available soil and fertilizer nitrogen reach approximately 40 kg/ha , any additional nitrogen will reduce nodulation and fixation.

- Combined levels of soil and fertilizer nitrogen greater than 55 kg/ha can dramatically delay nodulation and reduce or eliminate fixation.

- Application at sawing and during vegetation period

Nitrogen Fertiliser rates (kg/ha)
Yield level : 4 t/ha peas 3 t/ha beans
RO: Long time trials
UK: Fertiliser Manual
CND: Fertiliser GuidelinesSaskatchewan

	Very low	Low	Moderate	High	Very High
Nitrogen ($Kg\ ha^{-1}$)					
RO	60	50	40	30	0
UK	0	0	0	0	0
CND	55	40	20	20	0

Fertilisation with phosphorus

- Pulse crops must have phosphorus for plant development, nodule formation, and nitrogen fixation.
- A soil test will provide a guideline for phosphorus requirements.
- Pulses are sensitive to seed-placed phosphate (P2O5) fertilizer. Sensitivity is greater for pea, followed by chickpea, lentil, dry bean, and faba bean.
- Application at seedbed preparation
- Some pulse crop growers apply extra P2O5 to the previous year's cereal crop to increase available phosphorus for the pulse crop and avoid the risk of seedling injury.

Phosphate Fertiliser rates (kg/ha)
Yield level : 4 t/ha peas 3 t/ha beans
RO: Long time trials
UK: Fertiliser Manual

	Very low	Low	Moderate	High	Very High
Phosphate (P_2O_5) Kg ha^{-1}					
RO	130	110	90	80	70
UK	100	90	70	40	0

Fertilisation with Potassium

- Peas have a high demand for potassium. For other pulses is needed more research
- Seed-placing potassium may cause seedling damage.
- Application at seedbed preparation

Potassium Fertiliser rates (kg/ha K_2O)
Yield level : 4 t/ha peas 3 t/ha beans
RO: Long time trials
UK: Fertiliser Manual

	Very low	Low	Moderate	High	Very High
Potash (K_2O)					
RO	75	60	45	20	20
UK	100	70	40	0	0

Fertiliser with micronutrients

- Peas may suffer from sulphur deficiency on sensitive soil types. Where deficiency is possible, apply 25 kg SO_3 ha^{-1}

- Pulse crops respond well to application of micronutrients like Zn, B, magnesium, molybdenum and iron under deficient conditions

Potential benefits of pulse crops in rotations

- Reduce the need for N fertilizer
- Increase subsequent wheat protein
- Improve soil health
- Provide higher economic return