



Micronutrients

A boost up dose for Pulses Production and Nutritional Security

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Micronutrient

The elements which are required by the plant less than 1ppm are called micronutrients.

- Micronutrient have been called minor or tracer element that their concentration in plant tissue is minor or in trace amount relative to the macronutrient.
- Deficiency of micronutrient drastically affects the growth,metabolism and reproductive phase of plants.
- Pulses play a prominent role in the national food and nutritional

security, as they share about 9-10 per cent of total food grains.

- Pulses play a crucial role in addressing food insecurity and achieving healthy and balanced diet.
- Pulses are nutritional power houses among all the protein sources as they have zero cholesterol, high content of iron, gluten-free, rich in minerals and vitamins, low fat content and an important source of dietary source of fibre.

Criteria of Essentiality

The term essential mineral element (or mineral nutrient) was proposed by **Arnon and Stout (1939)**.

Three Criteria for Essentiality of Nutrients:

- Plant cannot complete its life cycle without the element.

- No other element can perform the function of the element.
- Element is directly involved in plant nutrition.

Pulses for soil health

- BNF by crop legumes is estimated at 20-22 million metric ton N/year
- 70-210 kg/ha N Fixed

Pulse crop	BNF (kg/ha)
Lentil	30-120
Chickpea	20-100
Dry Bean	5-70
Faba Bean	80-160

- Residue of pulse has a lower C:N ratio (17) compared with 41 for oilseed and 32 for wheat.
- Negative carbon food print.
- Thus,pulse in the rotation can impact soil health.

Role of micronutrient in crop development

Zinc

- Aids plant growth hormones and enzyme system.
- Necessary for chlorophyll production.
- Necessary for carbohydrate and starch formation.

- Aids in seed formation.
- Zinc stabilizes Ribosomal fraction.

Copper

- Catalyses several plants process.
- Increase sugar content.
- Intensifies color.

- Improves flavor of fruits and vegetables.
- Copper indirectly affects nodule formation.
- Enhance fertility of male flower.

Manganese

- Aids in chlorophyll synthesis.

- Involved in N metabolism and assimilation.
- Mn plays a role in maintenance of chloro-plastic membrane structure.
- Being a constituent of nitrite reductase and hydroxylamine reductase enzymes Mn is linked with nitrogen assimilation in plants.

MICRONUTRIENT FERTILIZERS

Zinc

- Zinc sulfate (monohydrate)
- Zinc chloride
- Zinc oxide

Fe

- Ferrous sulphate
- Ferric sulphate
- Iron chelates

B

- Boric acid
- Borax

Mn

- Manganese sulfate
- Manganese chloride
- Manganese oxide

Cu

- Copper sulphate
- Copper chloride
- Cuprous oxide
- Cupric oxide

Mo

- Ammonium molybdate
- Sodium molybdate
- Molybdic acid

Boron

- Essential for germination of pollen grain and growth of pollen tubes.
- Essential for seed and cell wall formation.
- Promotes maturity.
- Necessary for sugar translocation.
- Boron regulates carbohydrate metabolism.

- It plays a role in pollen germination and pollen tube growth.

Iron

- Iron is a constituent of two group of proteins
(A) Hema proteins containing fe porphyrin complex as a prosthetic group

(B) Fe-S proteins in which Fe is coordinated to the thiol group of cysteine or to inorganic S.

- It plays an essential role in the nucleic acid metabolism.
- It is necessary for synthesis and maintenance of chlorophyll in plants.
- Acts as an oxygen carrier.

Molybdenum

- Required to form the “nitrate reductase” which reduce nitrate to ammonium in plants

- Aids in the formation of legume nodules.
- phosphates to organic forms in the plants.

Chlorine

- Activator of enzymes.
- Enhances maturity of small grains.
- It is essential for photosynthesis.
- It acts as a co-factor in Manganese (Mn) - containing water splitting enzyme of photosystem II.

Critical level of nutrients in soil and plants

Element	Critical level in soil	Critical level in plants
Zinc	0.6 mg/kg	<15-20 ppm
Manganese	2mg/kg	<20 ppm
copper	0.2 mg/kg	<4 ppm
Iron	2.5-4.5 mg/kg	<500 ppm
Boron	0.5 mg/kg	<20ppm
Molybdenum	0.2 mg/kg	<0.1 ppm
Nickel	0.2 mg/kg	<0.1 ppm

Source-method manual soil testing in India, ministry of agriculture GOI 2011

Conclusion

- Application of micronutrient Zn (1.5 kg/ha) and B(1.5 kg/ha) resulted in the growth attributes & better uptake and translocation of better nutrients.
- Micronutrient application with urea + zinc (2%+0.3%) significant effect on grain and straw yield, nutrient uptake, and protein content of pulse.
- Spraying of 500 ppm thiourea + 0.2% zinc sulphate at vegetative and reproductive stage increased the yield of chickpea.
- Application of zinc sulphate (ZnSO₄) up to 15 kg/ha favourably increased zinc, iron and magnesium content in mung bean.

- Application of 15 kg/ha of boric acid or borax increased the yield of crop appreciably and it also improved the formation of pods in plants.
- Application of boric acid increased the plant height, relative growth rate, net assimilation rate and leaf area index in pigeon pea.
- Availability of nutrients especially the micronutrients at optimum level has direct impact on chlorophyll content, root growth, plant vigour and protein content which result in higher grain and straw production.

