



Role of Macro and Micronutrients in Plants and their Deficiencies Symptoms

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Macro and micronutrients in plants are certain elements that plants require for their growth and metabolism. Some of these elements are required in larger quantities. They are known as macronutrients. In contrast, elements needed in a minimal amount for the plant's optimal growth are called micronutrients. The prefixes 'macro' and 'micro' refer to the quantity of the minerals. Micronutrients are generally found in plant tissue at parts per million concentrations. The 17 essential minerals needed for the optimal growth of plants are as follows:

Macronutrients

- Carbon
- Hydrogen
- Oxygen
- Nitrogen
- Phosphorus
- Potassium
- Calcium
- Sulphur
- Magnesium

Micronutrients

- Iron
- Chlorine
- Manganese
- Boron
- Zinc
- Copper
- Nickle
- Molybdenum

Nitrogen (N)-Nitrogen is a part of all living cells and is a necessary part of all proteins, enzymes and metabolic processes involved in the synthesis and transfer of energy. Nitrogen is a part of chlorophyll, the green pigment of the plant that is responsible for photosynthesis. Helps plants with rapid growth, increasing seed and fruit production and improving the quality of leaf and forage crops.

If Deficient

- Lack of nitrogen causes stems to develop anthocyanin coloration, completely stop flowering and fruiting,
- Slow growth
- Leaves are smaller and yellowish



Potassium (K) - Potassium aids in regulating turgor pressure (i.e., the ability of a plant to keep its structure) and a variety of other critical enzymatic reactions. Potassium is absorbed by plants in larger amounts than any other mineral element except nitrogen and, in some cases, calcium. Helps in the building of protein, photosynthesis, fruit quality and reduction of diseases.

If Deficient

- Potassium deficiency leads to scorched and brown leaf tips, chlorosis in interveinal regions, shorter internodes, and loss of apical dominance.
- Small fruits, susceptible to disease



Phosphorus - Photosynthesis and growth are both dependent on phosphorus for plant health. It's also involved in cell membrane development and the closing and opening of stomata. Through aiding in the transfer of carbohydrates, phosphorus promotes proper root growth and fruit ripening

If Deficient

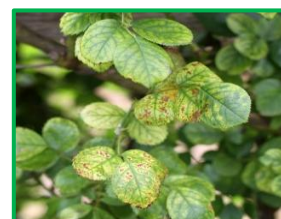
- Poorly developed root system
- Leaf tips look burnt older leaves may turn dark green or redish



Magnesium (Mg)- Important part of chlorophyll in all green plants and essential for photosynthesis. Activates many plant enzymes needed for growth. They play a crucial role in the binding of ribosomal particles, which are necessary for protein synthesis. Additionally, they are a component of numerous respiration enzymes.

If Deficient

- Poor quality crop
- Older leaves turn yellow at the edges creating a green arrow shape in the center.
- Magnesium deficiency causes chlorosis, a yellowing of leaves and veins, and drooping foliage.



Calcium (Ca)- This mineral is necessary for the proper functioning of the cell membrane as well as cell division. Provides for normal transport and retention of other elements. Provides strength in the plant.

If Deficient

- Weak plant
- New leaves are often distorted or irregularly shaped.
- Calcium deficiency can cause stunted or aberrant growth, black patches on leaves, and chlorotic leaf veins.



Sulfur (S)- Essential plant food for production of proteins. Promotes activity and development of enzymes and vitamins. Helps in chlorophyll formation. Improves root growth and seed production Helps with vigorous plant growth and resistance to cold, and encourages nodulation in legumes

If Deficient

- Leaves become yellowish green and exhibit a slow stunted growth
- Stems are woody and small in diameter



Zinc (Zn)- Zinc is required for enzyme production and a variety of enzymatic processes. In addition, it is necessary for hormonal activity, protein synthesis, and carbohydrate consumption which regulate plant growth.

If Deficient

- Plants fail to develop normally
- Yellowing occurs between the veins of new leaves
- Signs of zinc deficiency are chlorotic and spotted leaves.



Iron(Fe)- Chlorophyll is formed with the help of iron, which works as a catalyst. It is one of the essential micronutrients that play a significant role in various enzymatic processes.

If Deficient

- Stunted growth and leaves may drop easily
- Yellowing occurs between the veins of young leaves



Manganese (Mn)- Manganese is required for photosynthesis, respiration, and nitrogen absorption. Black, grey or brown spots on leaf veins are also possible.

If Deficient

- Reduced plant size and decreased fruit production
- Chlorosis can result from a manganese deficiency, with leaves gradually turning white and dropping off.



Copper (Cu)- Copper is required for nitrogen metabolism. Hence it's common to find it near root systems. It's also a necessary part of several enzymes and enzymatic activity. Necessary for the respiration process.

If Deficient

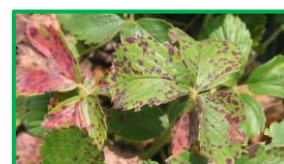
- Plant is stunted
- Copper deficiency leads to brown speckled leaves and shrinking of shoot tips.
- Probable loss in grain yield
- Probable loss in straw yield



Boron (B)- Boron is crucial for controlling plant hormone levels and fostering healthy growth. Boron enhance the growth and retention of flowers, the lengthening and germination of pollen tubes, and the development of seeds and fruits.

If Deficient

- Small fruit that are brown in colour
- Terminal buds may die



Molybdenum (Mo)

Helps in nitrogen metabolism and synthesis of proteins.

If Deficient

- Pale leaves that may be scorched, cupped or rolled

