

Role of Macronutrients in Plant Growth

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SUMMARY

Soil nutrient content plays a pivotal role in crop production to meet the demand of increasing population. According to need of particular element they are classified as Macronutrients, Secondary Nutrients and Micronutrients. Total 18 macronutrients are essential to complete a life cycle of the plant. Macronutrients are taken up in larger quantities that provide the energy needed to maintain a plant body function. Generally application of macronutrients increases plant growth, yield and quality of crops. Deficiency may leads to appearance of specific symptoms and diseases in plants.

INTRODUCTION

All essential elements perform several functions like they maintain the osmotic concentration of the cell sap, have buffering action, show enzymatic activity and act as a major constituent of macromolecules and coenzymes. Amongst 18 essential plant nutrients six are used by plants in large quantities. These are nitrogen, phosphorous, potassium, calcium, magnesium and Sulphur. Nitrogen, Phosphorous and Potassium are also called as major nutrients whereas Calcium, Magnesium and Sulphur as secondary nutrients. In the absence of the nutrients plant is unable to complete a normal life cycle or that the element is part of some essential plant constituent or metabolite.

Functions of Macronutrients and their deficiency symptoms

Nitrogen

Generally nitrogen requires by plants in large amounts. It is taken in the form of ions from the soil. It is required for the division of cells. It is the major constituent of proteins, vitamins, hormones. Imparts dark green colour to plants. Promotes leaf stem and other vegetative growth but remains small in root system. Produces rapid early growth. Improves quality, succulence of leafy vegetables and fodder crops. Increases protein content of food and fodder crops.

Deficiency-

- Yellowing and drying of lower leaves
- Older leaves shows 'V' shape chlorosis

Disease-

- Buttoning in cauliflower
- Starvation disease

Phosphorus:

Phosphorus is essential constituent for nucleic acid and Phytin, Phosphorus is also an essential constituent of majority of enzymes which are of great importance in the transformation of energy, in carbohydrate metabolism, fat metabolism and also respiration in plants. It is closely related to cell division and development. It Gives rapid and vigorous start to plants, strengthens straw and decreases lodging tendency. Improves the quality of food grains and other crops.

Deficiency-

- Imparts dark green colour in leaves
- Older leaves shows Bronzing appearance

Disease

- Sick leaf disease

Potassium –

It helps in formation of proteins and chlorophyll. Imparts winter hardiness to legumes and other crops. Acts as an accelerator for enzyme action, increases plumpness of grains and seeds. Essential in the formation and transfer of starches and sugars. Thus potassium is required in large quantities for potato, sweet potato, turnip and banana.

Deficiency-

- Bottom leaves margins appears like scorching and burning symptoms
- Dead tissues at tips

Disease

- Rosette/ die back disease

Calcium:

It is a constituent of the cell wall. Promotes early root development and growth. Provides a base for neutralization of organic acids, commonly termed as poisons produced in the plant. Essential to activate growing points, especially root tips. Improves intake of other plant nutrients, specially nitrogen and trace elements such as iron, boron, zinc, copper and manganese by correcting soil p^H. Encourages seed production. Calcium is immobile in plants and deficiency symptoms appear un meristem tip.

Deficiency-

- Terminal bud die

Disease

- Blossom end rot of tomato
- Popping in groundnut

Magnesium:

Since it is a constituent of chlorophyll, it is essential for all green plants. It helps in maintaining the dark green colour in leaves. It takes part in the production of carbohydrates, proteins, fats and Vitamins and in certain catalytic reaction in the enzyme system. Helps the translocation of starches. Regulates the uptake of other nutrients and base economy of plants.

Deficiency-

- Chlorosis between veins.

Disease

- Sand drown disease of tobacco

Sulfur:

Sulphur is required for synthesis of S-Containing amino acids (Cystine, Cysteine and methionine) which are essential components of plant protein that comprises about 90% of Sulphur in plants. Though sulfur is not a constituent of chlorophyll it helps in chlorophyll formation and encourages vegetative plant growth. Increases root growth. Stimulates seed formation. Promotes nodule formation on roots of legumes.

Disease

- Akiuchi disease of rice due to excess of H₂S
- Tea yellow disease in tea.

CONCLUSION

Macronutrients are very important in relation to plant growth because, it plays a vital role in plant metabolism. Without this essential nutrients plant can not be completed its life cycle. Deficiency of macronutrient leads to particular symptoms and also cause of diseases.

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