

SUBJECT: AGRICULTURAL SCIENCE

TERM: SECOND TERM

CLASS: SS2

WEEK 8th week

NUTRIENTS

Macro and Micro-nutrients

Nutrients are chemical substances that are required for the proper functioning of cells, tissues and different organs in all living organisms. Our body requires an adequate amount of nutrients which are mainly required for various functions of the body, including growth, repair, and protection against disease-causing microbes. Since our body cannot synthesize these nutrients on its own, these need to be supplied through external sources such as food.

There are two different types of nutrients essential for the body:

1. Macro-nutrients.
 2. Micro-nutrients.
- **Macro-nutrients**

The plant-based nutrients which are essential in large quantities as our body cannot produce by its self. These macro-nutrients providing energy and supports the different metabolic system, growth, and development of the body. Macro-nutrients include fats, proteins, carbohydrates, vitamins and minerals. They are mineral elements or nutrients required by plants in large quantities for healthy growth and development. These are nitrogen, phosphorus, hydrogen, oxygen, carbon, sulphur, calcium and iron.

- **Micro-nutrients**

The plant-based nutrients which are required in very small quantities and are mainly responsible for repairing damaged cell and tissues, prevention of infectious diseases by fighting against the disease-causing pathogens including bacteria, virus, fungi, etc. Micro-nutrients include calcium, iron, vitamins, iron, minerals and vitamin C. These nutrients that are required in small quantity by plants for proper growth and development.

Notes: The nutrients that are essential for the plants and other living organism in lesser amounts are known as micro-nutrients, whereas the nutrients that are required by the plants and other living organism in greater amounts are known as macro-nutrients.

Difference between Micronutrients and Macro-nutrients

Following are the important difference between macronutrients and micronutrients:

Micro-nutrients	Macronutrients
Requirements	
Required in very minute quantities.	Required in larger quantities.
Functions	
Prevents diseases.	Provides energy.
Consequences of Deficiency	
Deficiency results in Anemia, Goiter, Scurvy, etc.	Deficiency results in Kwashiorkor, Marasmus, Malnutrition, etc.
Consequences of Overconsumption	
Overconsumption of Vitamins leads to liver and nerve damage.	Overconsumption of macro-nutrients results in cardiovascular diseases, diabetes, obesity, etc.
Concentration	
Available in a minute concentration in the body, less than 1 mg/gm.	Available in high concentration in the body, equal to 1 mg or 1000 microgram.
Composition	
Also called trace elements.	Also known as major elements.
Types	
Vitamins, minerals and trace elements.	Carbohydrate, protein and fats.
Examples	
Antioxidants, Minerals, and Vitamins are examples of macro-nutrients.	Proteins, fibre, carbohydrates, and fats are examples of micro-nutrients.
Sources	
Are found in fruits, vegetables, eggs, fermented foods, green leafy vegetables, etc.	Are found abundantly in cereals, fish, legumes, meat, nuts, oilseeds, potatoes, yam, etc.
Advantages	
Micro-nutrients contribute to body growth and disease prevention.	Provides energy required for the metabolic system.

ROLES AND SYMPTOMS OF DEFICIENCY

Macro nutrients	Roles	Symptoms deficiency
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Nitrogen	<ul style="list-style-type: none"> • Nitrogen is essential for Amino acid formation. • Necessary for cell division and for plant growth. • Necessary part in Photosynthesis formation. • Essential for formation and uses of carbohydrates. • Affects the anabolic and catabolic reactions in plants. 	<ul style="list-style-type: none"> • Lower leaves show chlorosis (lack of chlorophyll). • Necrosis in older leaves. □ Reduction in quality. • Crop mature early but of poor quality. • Yellow discoloration of leaf tips.
Phosphorus	<ul style="list-style-type: none"> • Essential in seed formation. • Generate early root 	<ul style="list-style-type: none"> • Mostly occurs in young plants. • Plants leaf and stem turns
	<ul style="list-style-type: none"> • formation and growth of plant. • Enhance the fruit quality. • Provide tolerance to plant to survive in harsh winter conditions. • Use for formation and transfer of energy to plants. • Use in cell division and cell enlargement. 	<ul style="list-style-type: none"> • dark green. • Older leaves show purplish discoloration. • Colour changes due to sugar accumulation. • Leaf tip become brown and die.

Potassium	<ul style="list-style-type: none"> • Important in carbohydrates metabolism. Enhance the translocation of starch. Use for water use efficiency. • Important in enzyme activity and control the reaction rate. • Enhance the seed and fruit quality. • Improve the disease resistance. • Essential in protein synthesis • • 	<ul style="list-style-type: none"> • Not give quick response to plants. • Reduction in growth rate. • Burn leaf tips of the plant. • Reduced straw and stalk in plants. <p>Show low protein level.</p>
Calcium	<ul style="list-style-type: none"> • It is part in nitrogen metabolism. • Decrease plant respiration. Enhance fruit set percentage. • May use for formation and division of cell. • May start microorganisms activity. Enhance nut development in some • • 	<ul style="list-style-type: none"> • Stem become weak and may die. • Leaf tip become dry and wilt. • Leaves become abnormally dark green. • Cause low transpiration rate. • Cause formation of pits in fruits. • Cause brown spots in fruits.
	fruits.	

Magnesium	<ul style="list-style-type: none"> • Essential in chlorophyll formation. • Enhance the utilization and phosphorus mobility. • Constituent of many enzyme activities. • Improves the utilization of iron in plants. • Cause earliness and maturity of plants 	<ul style="list-style-type: none"> • Cause inter venial necrosis. • Leaf margins changes to reddish purple. • Reduced photosynthetic activity. • Reduction in enzyme activity. • Cause ageing of leaves.
Sulphur	<ul style="list-style-type: none"> • Essential element of Amino acid. • Help in formation of enzymes and vitamins. • Essential foe seed formation. • Play important role in chlorophyll formation. • Formation and permotes nodules. 	<ul style="list-style-type: none"> • Reduction in protein and chlorophyll synthesis. • Young leaves become yellow from green colour. • Stem become spindly and short. • If not protected all plant become pale green. <p>Stunted growth of plant.</p>
Iron	<ul style="list-style-type: none"> • Used as carrier of oxygen. • Enhance cell division and growth of plants. • Enhance formation of chlorophyll. • Essential for respiratory reactions. • Essential for photosynthesis activity. 	<ul style="list-style-type: none"> • Reduction in production of chlorophyll. • Interveinal chlorosis may occur. • Leaf become whitish yellow. • Stunted plant growth. • Field show irregularly yellow shaped area.
Micro nutrients	Roles	Symptoms of deficiency.

<p>Boron</p>	<ul style="list-style-type: none"> • Enhance the pollen germinations. • Formation of pollen tube. • Important for cell wall and seed formation. • Increases the maturity. • Affects carbohydrates and nitrogen. Essential for translocation of sugars. 	<ul style="list-style-type: none"> • Leaves develop dark brown colour. • Irregular lesion on leaves. • Whitish yellow leaves spots on the base of plants. • Stem become brittle and distorted. <p>Flower bud fails in flower formation.</p>
<p>Calcium</p>	<ul style="list-style-type: none"> • Give good result with combination of p. • Increase soil productivity. Role in stomatal activity. • Major constituent of photosynthesis. Role in osmotic adjustment. 	<ul style="list-style-type: none"> • Leaves margin become wilted. • Highly branched root system. • Spots on leaves. • Having stubby tips. • Leaflet tip blade wilting.
<p>Copper</p>	<ul style="list-style-type: none"> • Catalyse many plant process. Major role in photosynthesis. • Important role in reproductive stages. • Enhance sugar level of plants. • Minor constituent in chlorophyll formation. • Improves fruit colour and flavours. 	<ul style="list-style-type: none"> • Chlorosis in young leaves. • Stunted growth of plants. • Cause delay in maturity of fruits. • Irregular patches on leaves. • Cause problem in reproductive stages.

Maganese	<ul style="list-style-type: none"> • Catalyse enzyme activity. • Help in chlorophyll 	<ul style="list-style-type: none"> • Cause interveinal chlorosis. • Sunken spots between the
	<ul style="list-style-type: none"> • synthesis. Enhance the availability of Ca and P. • Help in pollen germinations. Help in root cell elongation. Causes resistant against root disease. 	<ul style="list-style-type: none"> • veins. • Reduced and stunted growth of plant. • Deficiency occur when too much iron is applied.
Molybdenum	<ul style="list-style-type: none"> • Essential for conversion of inorganic phosphorus to organic. • Essential for formation of enzymes. Help in nodule formations. • Regulate enzyme activity. 	<ul style="list-style-type: none"> • Stunted growth of plants. • Chlorosis in some legumes. • Leaves become scorched and cupped. • Leaves become thick and brittle.
Zinc	<ul style="list-style-type: none"> □ Helps in enzymes system productions. • Increase plant growth. • Essential for chlorophyll formations. Helps in seed production. • Essential for starch formation. 	<ul style="list-style-type: none"> • Cause interveinal chlorosis. • Leaves turn grey-white. • Damage area become pale yellow or may be of white colour. • Seed and flower setting is delayed

Conclusion

The excessive consumption or the deficiency of both the macro and micro-nutrients have a negative impact on the health. Therefore, it is important to have a [balanced diet](#) which includes an equal and required quantity of both macro-nutrients and micro-nutrients.