

# JOB ROLE – FLORICULTURIST (OPEN CULTIVATION)

Sector – Agriculture

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PPT's for Class XI



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# **UNIT 5: PLANT NUTRITION AND IRRIGATION**

## **Session 1: Plant Nutrients**

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# Session Objectives

The student will be able to :

- Describe role of nutrients in plants.
- Identify manures and fertilisers.

# Introduction

The elements necessary for normal metabolic activities in the body of an organism are known as nutrients. The process of nutrient supply and their intake is known as 'nutrition'. It has been observed that at least 17 plant food elements are necessary for the growth of plants. These nutrients are called 'essential elements'. In the absence of any one of these, a plant fails to complete its normal life cycle, though the disorder caused can be corrected by adding that element.

These 17 elements are carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), Phosphorus (P), Potassium (K), Sulphur (S), Calcium (Ca), Magnesium (Mg), Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), Molybdenum (Mb), Boron (B), Chlorine (Cl) and Nickle (Ni).

# Role of Nutrients in Plants

Plant nutrients can be classified according to their function or importance in plant life development and production. This classification includes structural nutrients; accessory nutrients; regulators and carriers; and catalyst and activators.

## **Structural nutrients**

These are of vital importance and required in large quantities and mostly available naturally. These nutrients include Carbon (C), hydrogen (H) and oxygen (O<sub>2</sub>).

# Role of Nutrients in Plants

## **Accessory structural elements**

These are essential for the growth and production of plants and formation of proteins. These are nitrogen, phosphorus and sulphur. These are also called 'macro-elements', which can be supplied through manures and fertilisers.

## **Regulators and carriers**

These elements are potassium (K), calcium (Ca) and magnesium (Mg), which regulate plant growth and build resistance against crop pests.

# Role of Nutrients in Plants

## Catalysts and activators

Although these are required in very small quantities, they are equally important. These activate various chemical changes within the cell. These are iron (Fe), boron (B), manganese (Mn), molybdenum (Mo), zinc (Zn), chlorine (Cl) and copper (Cu).

# Manures

## Manures

Manures are decomposed organic matter derived from plants and animals. Besides providing supplement of plant nutrients, manures are beneficial in many ways. They enhance biological activities in the soil, and also improve structure, colour, aeration and water-holding capacity of the soil.

# Manures

## Classification of organic manures

Manures can be classified in three groups as manures of plant origin, animal origin and composite derived from both plants and animals.

### 1. Manures of plant origin

**a. Oil cake:** The solid platy residue left after the extraction of oil from seeds is known as 'oil cake'.

Coarse residues obtained after oil is removed from oilseeds. These are applied to the soil at the time of land preparation and can be used along with fertilisers. These cakes add nutrients to the soil as well as improve the soil structure.



# Manures

## 1. Manures of plant origin

### a. Oil cake:

**Edible oil cakes:** Groundnut cake, linseed cake, rapeseed cake, sesamum cake, etc.

**Non-edible oil cakes:** *Karanj* cake, neem cake, castor cake, etc.

**b. Plant residues:** Straw, husks, stalks, saw dust and wood ash also add nutrients to the soil.

# Manures

## 1. Manures of plant origin

### c. Green manures:

Green manure crop is raised and turned into the soil for decomposition. Green manures improve the physical structure of the soil, as well as, soil fertility. Crops, like *dhaincha* and sunnhemp are used as green manure.



**Green manure crop  
(sunnhemp)**

# Manures

## 2. Manures of animal origin

This includes animal's settled sludge, dried blood, night soil and sludge manure, fish manure bone meal, cattle dung and urine mixed, sheep dung and urine mixed, pig manure, poultry manure, etc.

# Manures

## 3. Composite manures

Manures are composed of material from both plant and animal origin.

### **Farm Yard Manure (FYM)**

FYM is a decomposed mixture of dung and urine of farm animals, along with litter and leftover material from fodder or roughages fed to animals. FYM contains 0.5% N, 0.2% P and 0.5% K.



# Manures

## 3. Composite manures

### Compost

Compost is an organic manure produced by the decomposition of organic wastes. It is made of cattle wastes, urine soaked earth, cow dung, leaves and branches of plants.



# Manures

## Vermicompost

Vermicompost is developed using earthworms. Earthworms consume organic matter and excrete it as cast. This cast is used as vermicompost. It is rich in plant nutrients and beneficial bacteria and vesicular arbuscular micorrhiza (VAM) fungi.

**Vermiwash** is drained out extract of vermicompost. To prepare vermiwash, a vermicomposting unit is arranged with water trickling arrangement. This is used as a vermiwash for crop production. It contains more nutrients than vermicompost and finds favour for use as liquid manure.

# Manures

## Nutrients supplied by manures (%)

Manure	N (%)	P <sub>2</sub> O <sub>5</sub> (%)	K <sub>2</sub> O (%)
<b>Manures of animal origin</b>			
a. Dried blood	0.5 - 1.5	0.4- 0.8	0.5 - 1.9
b. Fish manure	1.2 - 2.0	1.0	1.5
c. Bone meal	0.- 0.7	0.1 -0.2	0.8- 1.6
d. Settled sludge (dry)	3.9- 4.0	1.8- 1.9	1.6 - 1.7
e. Night soil	3.9 - 4.0	0.9 - 1.0	1.3 -1.4
f. Cattle dung & urine mixed	5.2- 5.3	1.0- 1.1	1.4 - 1.5
<b>Manures of plant origin</b>			
a. Cotton seed cake	3.9- 4.0	1.8- 1.9	1.6 - 1.7
b. Karanj cake	3.9 - 4.0	0.9 - 1.0	1.3 -1.4
c. Neem cake	5.2- 5.3	1.0- 1.1	1.4 - 1.5
d. Linseed cake	5.5- 5.6	1.4 -1.5	1.2- 1.3
e. Green manure	10.0-12.0	1.0 - 1.5	0.6 - 0.8

# Manures

## Nutrients supplied by manures (%)

Manure	N (%)	P <sub>2</sub> O <sub>5</sub> (%)	K <sub>2</sub> O (%)
<b>Manures of plant origin</b>			
<b>Wood ashes</b>			
a. Ash coal	0.73	0.45	0.53
b. Ash babul	0.1 – 0.2	2.5-3.0	3.5-4.5
<b>Plant residue</b>			
Groundnut husk	1.6-1.8	0.3-0.5	1.3 -1.7
<b>Composite manures</b>			
a. Farmyard manure (FYM)	0.5 -0.7	0.4 - 0.8	0.5-1.9
b. Compost (urban)	1.0- 2.0	10-1.2	1.2-1.5
c. Compost (rural)	0.4 - 0.8	0.3-0.6	0.7- 1.0

# Fertilisers

They are plant nutrients manufactured commercially from inorganic chemicals. They are ready-to-use nutrients in concentrated forms and contain much higher amount of nutrients than manure and are, therefore, used in small quantities. These chemicals get washed off through irrigation or rainwater and become unavailable at many instances.

# Fertilisers

## Advantages

- Easily available anywhere
- Calculated amount of nutrients can be applied
- Required nutrient can be specifically applied
- Fertilisers can be carried easily because of packing
- Easy to apply in different ways

## Disadvantages

- Leaches out or infiltrated with rains or irrigation water
- More than the required quantity is applied harmful
- Responsible for air and water pollution
- Sometimes, may have adverse effect on soil properties

# Fertilisers

## Type of fertilisers

**Sole fertilisers :** Chemical fertilisers being the source of a single nutrient is called a 'sole fertiliser'.

**Nitrogenous fertilisers:** These are prepared and applied as a source of nitrogen to the crop. Commonly available nitrogenous fertilisers are urea, ammonium sulphate, calcium ammonium nitrate, etc.

**Phosphorus or phosphatic fertilisers:** These fertilisers are the main source of phosphorus only. Some commercially available phosphatic fertilisers are single superphosphate, triple super phosphate, dicalcium phosphate.

# Fertilisers

## Sole fertilisers :

**Potassic fertilisers:** These are applied as a source of potassium. Commonly used potassic fertilisers are muriate of potash and potassium sulphate.

**Mixed fertilisers (complex fertilisers):** Fertiliser with a source of more than one macro-nutrient for the plant is known as mixed fertiliser. Commonly used mixed fertilisers are di-ammonium phosphate (18:46:0), nitro-phosphate (20:20:0), NPK (19:19:19, 20:20:20) etc.

# Fertilisers

## Fertiliser containing micronutrients

Chemical compounds used as a source of micronutrients are of two types, viz.

1. Chelates chemical compounds in the form of heterocyclic ring having a metal ion attached by coordinate bonds to at least two non-metal ions, such as EDTA, common chelated micronutrients being Zn-EDTA and Fe-EDTA.
2. Inorganic salts, such as zinc sulphate ( $\text{ZnSO}_4$ ), copper sulphate ( $\text{CuSO}_4$ ), manganese sulphate ( $\text{MnSO}_4$ ), etc., All these are soluble in water and can be used as soil application or foliar spray.

# Summary

In this session you have learnt about the role of nutrients in plants and types of manures and fertilisers.

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