Practical-10

Identification of Organic Manures and Chemical Fertilizers

Exercise 10.1: Identification of organic manures and chemical fertilizers

OBJECTIVE:

- To impart knowledge to identify organic manures, biofertilizers and chemical fertilizers used in vegetable production.

Delivery schedule: 01 session.

Student expectations/learning objective:

- To know about characteristic features of organic manures and chemical fertilizers for their easy identification.

Pre-learning required: Importance of manures and fertilizers in vegetable crops.

Handouts/material/equipments & tools required: Paper sheet and pen to note down the instructions, samples of different manures and fertilizers, petri-dishes *etc.*

Introduction

Organic manures

These are the waste products of plants and animals used as nutrients after decomposition. Manures are the complex compounds from plants, animals and human residues that are used by plants as source of nutrient. Manures are low in nutrient content and have long residual effects. Nutrients from manures are released only after decomposition of manure by micro organisms. Organic manures and leguminous green manures are most valuable from crop nutrition point of view. Besides, organic manures recycle the crop residues after decomposition. Organic resources reduce the mining of soil nutrients and improve physical property of the soil by improving soil tilth, aeration, water-holding capacity and activity of the microorganisms. Manures are classified into two groups depending upon nutrient content they contain *e.g.*

1. **Bulky manures:** Farmyard manure, compost, vermicompost, sewage and sludges.
2. **Concentrated manures:** Oil cakes, blood meal, meat meal and fish meal.

Farmyard manure

1. **Farmyard manure (FYM):** It is blackish brown in colour, moist and sticky. It has foul smell. The decomposed mixture of dung and urine of farm animals along with litter and left over materials from roughages or fodder fed to cattle is farmyard manure.
2. **Compost** is mass of rotten organic matter made from farm waste. Composting is a process in which both aerobic and anaerobic micro-organisms decompose organic matter under medium to high temperature and low carbon-nitrogen ratio.
3. **Vermicompost:** It is granular, non-sticky and blackish brown in colour. It does not carry any smell. The compost is prepared with the help of earthworms. It is a rich mixture of major and minor plant nutrients. It also increases total microbial population on the root system and improves soil fertility.

Farmyard manure

Vermicompost

Sources of manures: The sources of manures are as under:

1. Cattle shed wastes that include dung, urine and slurry from biogas plants
2. Human habitation wastes *e.g.* night soil, human urine, town refuse, sewage, sludge and silage
3. Poultry litter, droppings of sheep and goat
4. Slaughterhouse wastes such as bone meal, meat meal, blood meal, horn and hoof meal, fish wastes *etc.*
5. Byproducts of agro industries like oil cakes, biogases and press mud, fruit and vegetable processing wastes *etc.*
6. Crop wastes namely, sugarcane trash, stubbles and other related material.
7. Green manure crops.

Bio-fertilizers

Biofertilizers are the micro-organisms containing inputs which are capable of mobilizing nutrients from non-usable form to usable form through biological processes. They are less expensive, eco-friendly and sustainable. They improve plant growth and development by producing plant hormones. Some of the beneficial microorganisms are capable of fixing atmospheric nitrogen are *Rhizobium, Azotobacter, Azospirillum etc.* On the other hand, some can increase the availability of phosphorus such as *Pseudomonas, Bacillus, Aspergillus etc.*

Dhaincha
(www.lalajacky.blogspot.com)

Green manures: Green manures are the fast growing legume crops that are grown in the field prior to the cultivation of a vegetable crop and is ploughed under to incorporate it into the soil for the purpose of restoring or increasing the organic matter content in the soil *e.g.* Dhaincha *(Sesbania canabina),* sunhemp *(Crotolaria juncea),* cowpea *(Vigna unguiculata),* horse gram *(Macrotyloma uniflorum),* barseem *(Trifolium alexandrium),* cluster bean *(Cyamopsis tetragonolaba),* Lentil *(Lens culinaris) etc.*

Sunhemp
(www.commons.wikimedia.org)

Chemical fertilizers

Any natural or manufactured material, dry or liquid which is added to the soil in order to supply one or more plant nutrients other than lime or gypsum is known as chemical fertilizer. These are industrially manufactured chemicals containing higher nutrient contents in comparison to organic manures and are soluble in form. In India five types of fertilizers are generally used in crop production.

1. Nitrogenous fertilizers
2. Phosphatic fertilizers
3. Potassic fertilizers
4. Complex fertilizers
5. Mixed fertilizers

Table 2: Characteristic features of important synthetic fertilizers used in vegetable production

Fertilizer	Nutrient composition	Characteristic features
Nitrogenous fertilizers: They supply nitrogen.		
Calcium Ammonium Nitrate (CAN)	25% N	It is available in granular form and brown or light grey or white in colour
Urea	46% N	It is white, crystalline organic chemical and soluble in water.
Ammonium sulphate	20.6 % N	It is white to yellowish grey in colour
Calcium nitrate	15% N	It is in prilled form
Phosphatic fertilizers: They contain phosphorus in absorbable form		

Single superphosphate	16% P_2O_5	Ash coloured powder like material or granular grey coloured material
Potassic fertilizers: They supply potassium to the plants.		
Muriate of Potash	60% K_2O	Reddish or dirty white crystalline material
Potassium sulphate	48% K_2O	Dirty white powdery material
Compound fertilizers		
Ammonium phosphate	20: 20	Granulated fertilizer
Mixed fertilizers		
NPK (12:32:16) *etc.*		Granular in form and brown or ash coloured

Urea

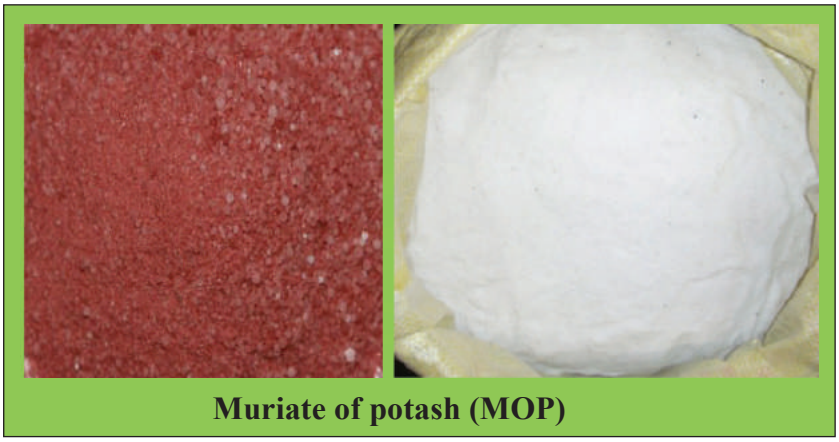
Calcium ammonium nitrate (CAN)

Ammonium nitrate

Urea, single super phosphate and muriate of potash are important chemical fertilizers used in vegetable production. Nutrients are lost from the soil through leaching, runoff, volatilization, fixation by soil or consumption by weeds *etc.*

Magnesium potassium sulphate

Single super phosphate (SSP)



Muriate of potash (MOP)

Exercise 10.1: Identify the given sample of chemical fertilizers and record your observations in the data sheet.

Handouts/material required/equipments & tools: Data sheet and pen to note down the observations, samples of organic manures and chemical fertilizers, petri dishes and beaker.

Procedure/methodology:

1. Spread the fertilizer sample on a piece of paper or in a petri dish. Note its colour. The colour may range from snow white to dark grey.
2. Note the texture of the fertilizer which may vary from powder to globular granules. Some fertilizers have crystalline texture.
3. Observe the hygroscopicity of fertilizer material. Hygroscopicity refers to the absorbance of water vapours from the atmosphere. The hygroscopic fertilizers usually form small to big lumps while non-hygroscopic fertilizers maintain their original texture and do not form any lumps.
4. Test the material for its solubility in water. Put a pinch of fertilizer in a beaker containing water. Stir it and carefully observe whether the fertilizer forms a solution or suspension over a time span of 5-15 minutes. Hygroscopic fertilizers quickly dissolve in water while others take a long time. Some may not dissolve at all and remain suspended in water.

PRECAUTIONS

- Identify each sample separately to avoid confusion.
- Never taste the samples while identification.
- Handle the fertilisers carefully or wear gloves while handling these fertilizers.

DATA SHEET

Sample number	Name of fertilizer	Type of fertilizer	Nutrient contents	Characteristic feature		
				Texture (granular/ crystalline/ powder)	Colour	Remarks
1						
2						
3						
4						
5						
6						
7						

Exercise 10.2: Identify different organic manures and record your observation in the data sheet

i) Bulky organic manure

a. Farmyard manure

b. Vermicompost

c. Green manure *etc.*

ii) Concentrated organic manures

a. Oil cakes

b. Fish meal

c. Bone meal

d. Blood meal *etc.*

DATA SHEET

Sample number	Name of organic manure	Origin	Specific identifying feature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			