Assignment No. 1

Q.1 Define essential elements & classify the essential elements with example.

→ Essential elements:
Elements needed by plant without which it will not able to survive are called essential nutrient.

◉ Classification of elements:

① Basic Nutrients:
Carbon (C)
Hydrogen (H)
Oxygen (O)

② Macro Nutrients:
Such elements are required in larger amount.

Nitrogen (N)
Phosphorus (P)
Potassium (K)
} Primary / major Nutrients

Calcium (Ca)
Magnesium (Mg)
Sulphur (S)
} Secondary Nutrients

③ MicroNutrient:
Copper (Cu)
Molybdenum (Mo)
Boron (B)
Chlorine (Cl)
Iron (Fe)
zinc (Zn)
Nickel (Ni)
Sodium (Na)

Q.2 Define elements. Give the source & available (absorb) form of element.

→

Element: Elements are the fundamental component of soil mineral & Nutrients required for plant growth.

Sr No.	Element	Source	Available form.
①	Carbon (C)	From air	CO_2 through leaves
②	Oxygen (O)	From air	CO_2, O_2, OH
	Hydrogen (H)	From water & rest of soil Solid	
④	Nitrogen (N)	From soil added by rainfall & Non Symbiotic N fixing BGA . Azolla	NH^{+4} (ammonium) & NO_3^- (Nitrate)
⑤	Phosphorus (P)	Apatite, rock phosphate	$H_2PO_4^-$ & HPO_4^{-2} (orthophosphate)
6.	Potassium	Feldspar, Mica, Iron Pyrite	K^+
7.	Sulfur (S)	Iron pyrite, Gypsum	SO_4^{-2} (Sulfate)
8.	Calcium	Limestone, Calcite, Dolomite.	Ca^{+2}
9.	Magnesium	Dolomite	Mg^{+2}
10.	Iron (Fe)	Iron pyrite, hematide, limonite	Fe^{+2} (ferrous) & Fe^{+3} (ferric)
11.	zinc (Zn)	zicron	Zn^{+2}
12.	Mangnease (Mn)	Pyrolusite	Mn^{+2}
13.	Molybdenum (Mo)	Molybdate, Crystal lattice, Primary & secondary minerals	MoO_4^{-2} (molybdate)
14.	Copper (Cu)	Copper pyrite	Cu^{+2}
15.	Boron (B)	Borosilicate, Tourmaline	H_3BO_3 (boric acid) H_3BO_3 (borat
16			
16	Chlorin (Cl)	Halides, salt of chlorine water,	Cl^-
17.	Cobalt	From soil	Co^{2+}
18	Sodium (Na)	from soil	$Si(OH)_4$
19	Silicon (Si)	from soil	
20.	Vanadium	from soil	

Q3 Give the criteria of essentiality.

→ Arnon & Stout 1939 proposed criteria of essentiality which was refined by Arnon (1954)

A. The deficiency of the element make it impossible to complete the vegatative or reproductive stages of its life cycle.

b. The deficiency is specific to element in quition & such can be prevented by corrected only by supplying that particular nutrient to the plant.

c. The element must have specific rule they cannot replace one another.

Classification of Nutrients.

Nutrient..

- Primary: required in large quantity C, H, O, N, P, K
- Secondary required in small quantity after primary nutrient. Ca, Mg, S.
- Tertiary Nutrient required in small quantities is called as micro nutrients. Zn, Cu, B, Mo, Fe, Cl, Ni.

Q.1 Define beneficial elements with example.

→ Beneficial elements:

Beneficial Elements are the mineral element which stimulate plant growth, but are not essential. or which are essential only for certain plant species. or under specific condition.

E.g: Sodium, aluminium, cobalt, selenium & Vanadium.

Q.2 Give the functions of (role) of essential elements in plant growth.

→

Nitrogen (N): Primary Nutrient.

Protein, Amino Acids, impart in vegetative growth nitrogen governs the above earth growth. In healthy plant range ben 1 to 5.

② Phosphorus (P)

Nucleic acid, ATP increase in root growth, is Energy storage & transformation in plant root is called key of life. in healthy plants range beth 0.1 to 0.47%.

③ Potassium (k)

Catalyst in transport formation of plant sugar regulates osmo-regulation & stomatal movement. It act as traffic policemen root booster stalk sheing strengthner food farmer, protein builder, breathing regulator but it is not effective withat countrients such N & P in

N & P in healthy plants range betn 0.1 to 0.5%

Calcium : Secondary element/nutrient:
Enzyme activation, Energy regulation, Translocation of sugar increase resistance to disease, heat moisture stress, Constituent of cell wall, require for cell elongation & cell division increase uptake of of NO_3N. Cell wall component in healthy plants ranges betn 0.1 to 0.2%

Magnesium (Mg)
Part of chlorophyll, Helps in transport of P with the formation of seed of high quality of oil content promotes formation of oil & fats, Translocation of starches, catalytic action in healthy plants. ranges betn 0.1 to 0.4 %

Sulfur (S) :
Amino acid, increase oil content, chlorophyll Synthesis, Creates Fragrance & smell. promotes Nodules formation in healthy plants ranges betn 0.1 to 0.4 %

Iron (Fe) Micronutrient
chlorophyll Synthesis, Activation of enzymes present in leghemoglobin, Act as oxygen carrier, ib content is 100 to 500 mg/kg dry matter.

Copper (Cu):
Component of enzymes, imp. in photosynthesis Carbohydrates metabolism, Role in lignification

fertilization & seed set it content is 5 to 20 mg/kg dry matter.

Mangnease (Mn):
Activates enzymes imp in photosynthesis, Nitrogen metabolism development of chloroplast & role in respiration it content is 25 to 50 mg/kg dry matter.

zinc (Zn):
Activates enzymes promotes growth harmone. It content is 20 to 150 mg.

Boron (B):
New cell development, Pollination & pollen germination of fruit seed. Act as regulator of K/Ca ratio. Help in carbohydrates metabolism. it content is 10 to 200 mg/kg dry matter.

Molybdenum (Mo)
Involved in N fixatation, iron Absorption & translocatation in plant. It content is 0.2 to 1 mg/kg dry matter.

Chloride (Cl)
Photosynthesis reaction cell enlargation, stomata Opening, it content is 100 to 500 mg/kg dry matter.

Assignment No. 3

Q. Give the differance betⁿ chlorosis & necrosis

→

Chlorosis	Necrosis.
chlorosis is a yellowing of leaves due to loss of chlorophyll.	Necrosis is a death of plant tissue.
chlorosis cause by nutrient deficiency like N, Fe, Mg.	Necrosis cause by severe deficiency, diseases or injury.
It's apperance is leaves turn pale/ yellow	It's apperance is Brown/ Black dead spots

Q. Give the deficiency & toxicity symptoms of essential element

→

Nitrogen (N):

Deficiency: Light green to yellow apperance of leaves, especially older leaves, stunted growth poor fruit development. Cereals show characteristic 'V' shaped yellowing at the tip of lower leaves

Toxicity:

Dark green foliage which may be suspectible to lodging, drought, disease & invansion. Fru and seed crops may fail to yield.

Phosphorous (P):

Deficiency:

Leaves may develop purple colouration, stunted plant growth & delay in plant development.

Toxicity:

Excess phosphorus may cause micronutrient deficiencies, especially iron or zinc.

Potassium (K)

Deficiency:

Older leaves turn yellow initially around marg & die, irregular fruit development, scratching Potato shows abnormal dark green colour.

Toxicity:

Excess potassium may cause deficiencies i magnesium & possibly calcium.

Calcium (Ca):

Deficiency:
Reduced growth or death of growing tips; blosson-end rot of tomato; poor fruit devlopment & apperance.

Toxicity:
Excess Calcium may cause deficiency in either Magnesium or potassium.

Magnesium (Mg):
Deficiency:
Initial yellowing of older leaves between leaf veins spreading to younger leaves; poor fruit devlopment & production.

Toxicity:
High Concentration tolerated plants; however, imbalance with Calcium & potassium may reduce growth.

Sulfur (S)
Deficiency:
Initial yellowing of young leaves spreading to whole plant; Similar symptoms to nitrogen deficiency but occurs on new growth

Toxicity:
If Excess of sulfur may Cause premature dropping of leaves.

Iron (Fe):
Deficiency: Initial distinct yellow or white areas between veins of young leaves leading to spots of dead leaf tissue. chlorosis. leaves turn white & blached.

Toxicity:
Possible bronzing of leaves with tiny brown spots. Reduction in growth. Browning of roots. leaf blades.

Molybdenum (Mo):
Deficiency:
Translucent spots irregular shape in betwee to veins of leaves, these spots are light green colour, yellow or brown, chloric motlin between veins of middle leaves. whiptail in Cauliflower, yellow spots in citrus.

Toxicity:
Brilliant tintsl golden yellow or blue.

Copper (Cu):
Deficiency:
chlorosis, Distoration of younger leaves, possi Necrosis of the apical meristem, Young leav becomes bleached & defoliation & dieback of twings.

Toxicity:
Depressed Fe conc. in leaves causing chlorosi

Boron (B):
Deficiency:
Wilted & curled leaves, Thickend condition of ster & petiole. Necrosis of soft tissues. Hollo stem of Cauliflower, Internal corke of apple, gumm deposite in citrus. Death of growing points & deformation of leaves with areas of discol ration.

Toxicity:
Leaf tips ~~bet~~ become followed by necrosis. leaves get a scorhead appearance. & later fall of. Reddish brown area which turns to dry & papery. chloric patals in bud.

Mangnease (Mn):
Deficiency:
Interveniel yellowing or molting of young leaves first ~~Fruit~~ small chloric paches further chlorotic area become necrotic & turns brown.
Toxicity:
older leaves have brown spots surrounded by a chlorotic circle or zone.

zinc (zn):
Deficiency:
Interveniel yellowing on young leaves; stems length reduced. Rosstening of leaves; Mottling, stripping, bronzing reddish brown colouration of foliage. reduced leaf size.
Toxicity:
Interveniel chlorosis of young leaves, reddish brown colouration. Dry & pappy leaves. Roots brown & necritic.

Chlorine (Cl)
Deficiency:
chlorosis of younger leaves & whilted of plant. Deficiency seldom occurs because of rainwater

Q. Define Indicator plant with example:
→ An indicator plant is defined as plant which shows the deficiency & toxicity of element is called as indicator plant.

Element	Indicator plant
Nitrogen	Cauliflower, Cabbage
Phosphorus	Rapeseed
Potassium &	Potato
magnesium	
Calcium	Cauliflower, Cabbage
Iron	Cauliflower, Cabbage
Sodium	Sugarbeet
Mangnease	Sugarbeet.

Q. Give the critical level of essential elem of plant analysis.
→

Soil

	Limit	Range.
Nitrogen	Below 250 kg/ha	low
	250 - 500 kg/ha	medium
	above 500 kg/ha	High
Phosphorus	Below 10 kg/ha	low
	10-20 kg/ha	medium
	above 20 kg/ha	High
Potassium	Below 100 kg/ha	low
	100-250 kg/ha	medium
	above 250 kg/ha	High.

Sulfur	Below 10 ppm	Hot water Soluble
Calcium	Below 50% of CEC (Ammo Acetate method)	Ammonium acetate
Magnesium	Below 4% of CEC (Ammo acetate method	Ammonium acetate Extractable
zinc	Below 0-6 ppm (0.5-1.2 ppm)	DTPA extractable
Iron	2.5 - 4.5 ppm	DTPA extractable AMIM Acetate Extractable
Mangnease	Below 2 ppm	DTPA extractable
Copper	Below 0.2 ppm	DTPA extractable
Boron	Below 0.5 ppm	Hot water soluble
Molybdenum	Below 0.2 ppm	Ammonium oxalate extractant
Chlorin	Below 2 ppm	water soluble.

Q. ⇒

Assignment No. 4

Give history of soil fertility & plant nutrition

① Jan Bapista van Helmont (1577-1644)
- Father of A physician / chemist, concluded from five year willow tree experiment that increased dry matter (169 lbs. & about 3 oz) production came primarily from water supplied since soil lost no weight.

② Francis Bacon (1591-1624)
Principal nourishment of plants was water & the main purpose of the soil was to keep plants erect & to protect from heat & cold"

③ Jan Bapista van Helmont (1577-1644)
Reported that water was sole nutrient of plants.

④ Robert Boyle (1627-1691
England scientist confirmed that findings of van helmont. & proved that plants synthesis salts, spirills & oil etc. from H_2O.

⑤ S. N. Winogradsky
- Discover the autotraphic mode of life among bacteria & established the microbiological transformation of nitrogen & sulphur.
- Isolated for the first time nitrifying bacteria & demonstrated that free living role of these bacteria in nitrification (189
- Demonstrated that free living clastridium pasteurianum could fix atmospheric nitrogen

(1893). Therfore, he is considered as "Father of soil Microbiology"

⑥ Lowes & Gilbert
- Rothamastead agriculture equipment stain at england.
- They conducted field experiment. For 12 yrs.
- Cereal crops took up nitrogen from the soil, Contary to the ideas of justus von liebig who held that it was obtained only from the air.

⑦ Robert Warrington:
- Nitrification process explained.
- He demonstrated that the relation was two step phenomenon.
- First NH_3 being converted to nitrites & the nitrites to the nitrates.

⑧ Justus Von Liebig.
- Most of the Carbon in plants comes from the CO_2 of atmosphere.
- Hydrogen & O_2 comes from H_2O
- Alkaline metals are needed for neutrilization of acids formed by plants as a result of their metabolic activities.
- Phosphorus is necessary for seed form^n.
- Plant absorb everything from the soil but excreate from their roots those materials that are not essential.

⑨ Priesty (1800)
Priesty (1800) established the essentialy of O_2 for the plant growth.

⑩ B. Boussingault (1802-1882)
- French chemist conducted field experiment & maintain balance sheet.
- He showed how much quality of minerals comes from rain, air & soil.
- He was first scientist to conduct field experiment.
- He is considered as father of field experiment.

Anthur Young (1741-1820)
- English agriculturist conducted pot experiment using barley as a test crop under sand culture condition. He added charcoal, train oil, poultry dung, spirits of wine, oyster shells & numerous other materials & he Conducted that some of the materials were produced higher plant growth.

Q. Define following terms:

① Soil fertility:
It refers to the inherent capacity of soil to supply all the essential nutrients to plant in suitable quantity & in right proportion.

② Soil productivity: Soil productivity is the ability of soil for producing a specified plant or sequences of plants under specific system of managment.

Q. Give the difference betn Soil fertility & productivity:

→

Soil fertility	Soil Productivity
Soil's ability to provide essential nutrients to plants for their growth & development.	Soil's Capacity to support plant growth is relation to external factor.
It encompass the soils nutrient content, organic matter, microbial activity & other factors that contribute to plant nutrition.	It reflects overall efficiency with which a given soil can convert inputs into plant yield.
It is used to indicate the soil nutrient index.	It is used to indicate crop yields.
It depends on process that help contribute to plant nutrition.	It depends on the inte raction of external factor such as climate, land managment practices & crop selection.
Can be analyzed in the lab.	Assessed in field Condition.
~~It is used to indicate~~ It is an inherant property of soil	It's not an inherant property of the soil.
All fertile soils are not productive.	All productive soils are fertile.

Assignment No. 5

Date 25 | 3 | 26 | 20

Q.1 Define Manure & Give the classification of organic manure.

→ Manure: Manure are organic in nature, plant or animal origin & contain organic matter in large proportion & plant nutrients in small quantities & used to improve soil productivity by correcting soil physical, chemical & biological properties.

Classification of Organic Manure.

Bulky organic Manure

Mainly derived from animal, plant & other organic waste & green plant tissue.

- well Decomposed animal plant & other organic residue.
  - Farmyard manure (FYM)
  - Composts from farm & town refuses etc.
- Green plant tissue (undecomposed)
  - Green manure
- Edible Cake
  - mustard, groundnut, oil, Cake.
- Non-edible Cake.
  - Mahua, neem oil Cakes, etc.

Concentrated Organic Manure.

- Oil Cake
- Blood meal
- Meat meal
- other etc.

Q.2 Give the Difference between organic manures & chemical fertilizer.

→

Manures	Fertilizer
Organic in nature	Inorganic in nature
Slow acting, quick acting	Slow acting, quick acting
Improvment physical properties of soils	Don't improve physical properties of soil.
Supply almost all major, minor & micronutrient.	Supply one or very few plant nutrients.
Obtained from plant, anim al & human resources	Mixed or manufactured.
Having no definit chemical composition.	Having definit chemical composition.
Bulky in nature.	Non-Bulky in nature
Improve soil fertility as well as productivity	Improves soil fertility
Required in large quantity bulky & costly.	Required in less quantity & cheaper.
Nutrient slowly available upon decomposition.	Nutrient are readily available

Assignment No. 5

DATE 25 | 3 | 26 | 20

Q.1 Define Manure & Give the classification of organic manure.

→ Manure: Manure are organic in nature, plant or animal origin & contain organic matter in large proportion & plant nutrients in small quantities & used to improve soil productivity by correcting soil physical, chemical & biological properties.

Classification of Organic Manure.

- **Bulky organic Manure**
  - mainly derived from animal, plant & other organic waste & green plant tissue.
    - well Decomposed animal plant & other organic residue.
      - Farm yard manure (FYM)
      - Composts from farm & town refuses etc.
    - Green plant tissue (undecomposed)
      - Green manure
- **Concentrated Organic Manure.**
  - Oil Cake
    - Edible Cake
      - mustard, groundnut, oil cake.
    - Non-edible Cake.
      - Mahua, neem oil cakes, etc.
  - Blood meal
  - Meat meal
  - other etc.

Q.2 Give the Difference between organic manures & chemical fertilizer.

Manures	Fertilizer
Organic in nature	Inorganic in nature
Slow acting, quick acting	Slow acting, quick acting
Improvment physical properties of soils	Don't improve physical properties of soil.
Supply almost all major, minor & micronutrient.	Supply one or very few plant nutrients.
obtained from plant, animal & human resources	Mixed or manufactured.
Having no definit chemical composition.	Having definit chemical composition.
Bulky in nature.	Non-Bulky in nature
Improve soil fertility as well as productivity	Improves soil fertility
Required in large quantity bulky & costly.	Required in less quantity & cheaper.
Nutrient slowly available upon decomposition.	Nutrient are readily available

long lasting effect on soil & crop.	very less residual effect.
No adverse effect.	Adverse effect are observed when not applied in time & in proper proportion.

Q.3 Give the importance of organic manure/ organic matters.

→

(A) Improvement of soil physical properties:
1. Improvement of soil structures.
2. Improvement of water holding capacity
3. Improvement of soil aeration.
4. Reduction of soil loss through erosion

(B) Improvement of chemical properties:
1. Supply of essential plant nutrients in balanced ratio.
2. Slow release of nutrients.
3. High residual value.

(C) Improvement of biological activity:
Stimulation of soil fauna & flora.

Assignment No. 6

13 25 23

Q.1 Give the differance between bulky organic manure & conc. organic manure.

→

Bulky Organic manure	Concentrated Organic manure.
- Bulky organic manure are those organic in nature & supply essential nutrients in small Concentration.	Concentrated organic manure are those whi supply plant nutrient in high concentratio
- Bulky in nature.	- Used in small amount
- Not use as feed for cattle	- Edible oil cake are use as feed for cattle.
- They provide plant nutrient in less quantity.	- They provide plan nutrien in large quantity.
- Bulky organic manure Contain wider C:N ratio	No Concentrated organic manure has narrow C:N rati
- It ~~to~~ Contain lower Conc. of plant nutrient	It Contain ~~power~~ Higher concentration of plant nutrients.
Ex: FYM, Compost, Slurry, Green manure, Vermicompost.	Ex: Oil cakes, Blood meal, bone meal.

Q.2 Define bulky organic manure & Give the characteristics of bulky organic manure.

→ Bulky Organic Manure:

Bulky organic manure are those that are plant or animal origin supply all major plant nutrients in small concentration.

⓪ characteristics of bulky organic manure:

① Organic materials are relatively poorer in concentration of plant nutrient.

② These material possesses wider C:N ratio & C:S ratios and supply energies needed for micro organism.

③ The mineral nutrient that available in the organic materials become available to plants after mineralization.

④ Judicious combination of organic & inorganic manure is quite essential to maintain fertility status.

Example: FYM, Compost, Green Manure, Biogas slurry, Sewage or sludge. Molases & vermicompost.

Q.3 Define Conc. Organic manure & Give the characteristics of Conc. Organic manure.

→ Concentrated Organic Manure:

Concentrated Organic Manure are these are Organic in nature & contain higher percentage of major essential plant nutrients as compared to bulky Organic manure.

⓪ characteristics of conc. Organic manure

① Quick acting organic manure as C:N ratio is usually narrow (5-15)

② Oil prevents rapid conversion of N.

③ Nearly 50-80% of its N is made available in 2-3 months & rate of availability varies with the type of cake & nature of soil.

④ Castor Cake Contain Ricin, Mahua Cake Contains Saponin & Neem Cake contains nimbidin which are responsible for slow nitrification of their ~~of~~ N due to effects of alkaloids on soil micro-organism.

⑤ Castor Cake has also good vermicida effect against white ants.

⑥ Groundnut Cake has the highest nitrification rate.

⑦ Mahua cake is very poor in N & take a long time to nitrify. when used as manure it has got to be applied to the soil two or three months before sowing/planting of crop.

Q. what is o importance / of significone / Advantages of bulky organic manure

→ ① Since these manure contain plant nutrient they have direct effect on plant growth like any other commercial fertilizer. Bulky organic manures contain nutrients in small quantities, therefore large quantities of these are needed. Besides the major nutrients, they also contai traces of micro-nutrients.

(ii) Bulky organic manures increases organic matter content & hence improve the physical properties of soil. This effect is very important in case of most of our arable land. Such manures increase the humus content of soil & consequently water holding capacity of sandy soils also increased & the drainage of clayey soils is improved.

(iii) Bulky organic manures provide food for soil micro organisms. This increases the activity of microbes. which in turn help to convert unavailable plant nutrients into available form. Organic manure have been that traditional means of improving soil fertility. The organic matter that is applied through organic manures has very complex process effect on soil & on plant growth.

Example: FYM, Compost, Green Mannure.

Q. ~~Defined the Concentrated Organic~~ what is importance/ significane/ Advantages of Concentrated organic Mannure.

→ (i) Concentrated organic manure derived from raw materials of either animal or plant origin such as oil cake, bone meal, blood meal etc.

(ii) Oil Cake containing higher amount of oil. non edible cake like castor, neem, mahua, karanj Cake are recomended for use in conjunction with chemical fertilizers.

(iii) Bones & bone meals are good source for supply lime, phosphate & Nitrogen. Bone meal is slow acting manure It is essentially a phosphatic fertilizer.

(iv) Dried blood or blood meal is a very quick acting manure effective on all types of soils. Also meat meal is quick acting & effective to all crops.

(v) Edible oil cakes like groundnut, Sunflower mustard Coconut in seed are also used as a cattle feed.

Assignment No. 7.

DATE 13/4/25

Q.1 Define FYM & Give different methods/classification / classification of FYM

→ Farm Yard Mannure:

Farm yard mannure is a decomposed mixture of Cattle dung & urine with straw & litter used as bedding material & residues from the fodder fed to the Cattle.

Methods Of Composting:

1. Trench method
2. Gobar Gas Method
3. Enriched method
4. NADEP Method.
5. Heap Method
6. Trench Method.

(1) Pit Method:

1. This method is mostly adopted by farmers.
2. Pit of 8* 2* 1m dimension are prepared.
3. Then fill it with dung & urine & litter up to 50 cm above ground level.
4. Pit is covered by soil & plastered by mud paste.
5. The manure become ready after about 150 to 180 days of plastering.
6. usually 10-12 tons of FYM obtain/pit.
7. Every animal gives out about 5 to 6 tones of FYM/year.

(2) Trench Method:

- The manure preparation should be carried out in trenches of suitable size i.e. 6.09 - 7.62 m long, 1.5 - 1.8 m broad & 0.91 - 1.06 m deep. All availa ble dry matter from the farm & house should be heaped ~~for~~ up near the cattle shed & poor on of litter, mixed with soil should be spared in the shed in evening at the rate of 2.26 kg per animal for the absorpti on of urine. The litter should be kept in areas where urine generally drops & soak into ground.

Each morning, the urine soaked litter dung should be well mixed & taken to the manu re trenches. Likewise fill up the trench by daily collected urine soaked litter about 46-61 cm above ground level. The top of the heap is made dome shaped & plaster over it with cowdung soil slurry. After three months the mannure will be completly decomposed & can be utilized for application in soil.

Heap Method:

1. Every day cowdung & litter can be are collected & heaped at any fixed place.
2. After about 6 to 9 months the rotten mannure is ready to use.
3. In that about 30 to 35% abo 30 to 35% N, 20 To 25% P, & 4 to 6% K are lost during preparation of manure due to leachin g, washing & volatization.

Q. Define vermicompost & Give the procedure for preparation of vermicompost and vermiwash

→ Vermicompost:

Vermicompost is a method of making compost with the use of earthworms, which is generally live in soil eat biomass & excrete it in digested form. This compost is generally called vermicompost or wormicompost.

① Selection of earth worms:

Use exotic species e.g: Eudrilus eugenial, Eisenia fotedia

② Size of Pit:

Any convinient dimension such 2M1X1M1X1M may be prepared. This can hold 10-40 thousand worms.

③ Preparation of vermibed:

A layer of 15-20 cm thick of good loamy soil above a thin layer (5cm) of broken and sand should made.

④ Inoculation of earth worms:

About 2000 earthworms are introduced as an optimum density into a compost pit of 2m x 2m x 1m.

⑤ Organic layering:

It is done on the vermibed with fresh cattle dung. The compost pit is then layered to about 5cm with shredded organic litter of dry leaves or hay. moisture level is maintained by addition of water.

⑥ Wet organic layering:

It is done after four weeks with moist green organic waste & can be spread over it to thickness of 5cm. Practise is repeated every 3-4 days till compost is nearly full.

⑦ Harvesting:

At maturation moisture content is brough down. This ensures draying of compost and migration of worms into vermibed. Manure compost is removed, sieved dried and packed.

Rate of application:

Vermicompost is recomanded at 5T/ha.

Q. Give the advantages of vermicompost.

→ ① There will be no immobilization in compost because of narrow C:N ratio.

② Application is easy, because of the compost is humified & have a structure of crumb & granular.

③ It is hygienic, pathogens & weed seeds are destroyed.

④ No loss of nutrients.

⑤ It improves physical properties better than compost on soil application.

Q. Give the Advantages & Dis-disadvantages of FYM.

→ Advantages of FYM:

- FYM is rich in nutrients.
- A small amount of N is directly available to the plants where a larger portion is made available as and when the FYM decomposes. when cow dung & Urine are mixed a balanced nutrition is made available to the plants.
- Application of FYM improves soil fertility
- It has spectacular beneficial effect on physical, chemical & biological properties of soil.

Disadvantages of FYM:

- It introduced weed problem in field.
- It's decomposition releases harmful gases which polluted atmosphere.
- Reduced availability of certain micronutrients.
- Needs more cost/ unit weight of nutrients during handling storage & application as compared.

Q. Give the Difference between aerobic and non-aerobic methods of FYM.

→

Assignment No. 8

Q. Define INM & Give the components of INM.

→ Integrated Nutrient Managment:
INM refers to the maintanance of soil fertility & plant nutrients supply at optimum level for sustaining the desire productivity through optimising the profits from all possible organic inorganic & biological component in an integrated method.

Components:

① Mineral Fertilizers:
Super granules, coated urea, direct use of locally available rock PO_4 in acid soils, single super phosphate (SSP), MOP & micronutrient fertilizers.

② Organic Source:
By products of farming & allied industries. FYM, droppings, crop waste, residue, sewage sludge, industrial waste.

③ Biological Sources:
Microbial inoculants substitute 15-40 kg N/ha.

④ Legumes:
Leguminous inoculants substitute 15-40 kg N/ha.

Q.2 → Give the principles & objectives of INM.

Principles:

① Nutrients removed by crops must be refunde to the soil.
② Soil physical and chemical conditions should be maintained and upgraded.
③ The build up of abiotic cause stress should be minimal.
④ Organic carbon levels of soils should be maintained & improved.
⑤ ~~To~~ Deprivation of land occuring due to so erosion must be controlled.
⑥ Soil quality concerning soil acidity, salinity, sodicity or toxic elements build up mus be minimized.

Objective of INM:

- To guarantee productivity & sustainable agriculture.
- To lesson useon expenses of bought inputs by utilizing excrement, harvest build up & so farth.
- To make use of plant potential advantage of bio-fertilizers, leguminous crops & green mannure.
- To avoid degradation of environment.
- To meet the social & economic aspirations of the farmers without harming the nature
- To encourage of judicious use of chemical fertilizers, organic mannure & green mannure.
- To recycle & use organic waste.

- To maximise nutrient use efficiency.
- To avoid over expoliation of natural resources
- To protect soil health for future generation.
- To create of positive nutrient balance in the soil.

2. Give the importance of INM?

→ ① Improve crop productivity and quality.

ⓐ Balanced Nutrition:
INM ensures a comphrensive spectrum of nutrients, preventing deficiencies & imbalance that could impede crop growth & compromise quality.

ⓑ Efficient nutrient Use:
The approach optimizes the utilization of nutrients from various sources, minimizing wastage & maximizing overall benefits.

ⓒ Enhanced soil health:
Incorporating organic matter from composts & manures enhance soil structure, aeration & water retention. This, in turn, promotes better root development & nutrient uptake.

② Economic Benefits for farmers:

ⓐ Reduced Cost:
INM can assist in lowering the dependency on expensive chemical fertilizer, particularly benefiting resource - constrained farmers.

ⓑ Improve income:
Increased crop yield & enhanced quality to can lead to better market prices, resulting in higher income of farmers.

ⓒ Resiliance to challenging climate:
INM practices such as mulching & crop cover & cropping improve soil moisture retention & drought tolerance, making farms more resilient to the impact of climate change.

Assingment No. 9

Q.1 Give the methods of soil fertility evolution with their approach.

- Methods of soil fertility evolution:

① Sampling:
Soil sampling is perheps the most vital step for any analysis. Since a very small fraction of huge soil mass of a field is used for analysis; it becomes extremely important to get a truly representative soil sample from it.

② Preparation of sample:
Drying, Grinding & sieving according to the need of analytical procedure.

③ Analytical procedure:
A suitable method is one which satisfies the following criteria.
(i) It should be fairly rapid so that just the test results can be obtained in reasonably short period.

(ii) It should give accurate & reproductive results of a given samples with least interferance during estimation.

(iii) It should have predictability i.e. a significant relationship of test values with crop performance.

Q.2 Give different nutrient diagnostick technique & Give its importance.

→ Techniques of Nutrient Diagnostic:
① Soil Testing
② Plant tissue analysis
③ Visual Deficiency symptom
④ Biological Tests.

① Plant Testing:
(i) Analysis of tissue from plant growing on the soil:
- Plant analysis is a narrow sense is the determination of the concentration of an element or extractable fraction of an element in a sample taken from a particular part of a crop at certain time or stage of morphological development.
- Diagnosis of nutrient deficiencies, toxicities or imbalance.
- Estimating overall nutritional status of the region or soil types.

(ii) Collection & Preparation of sample:
- The recentaly matured fully expanded leaves just before the onset of the reproductive stages are collected & put in perforated paper bags.
- Sample contaminated with dust, dirt & residue of the sprays etc. need to be wash with water. rinsing with Dil. HCl (0.001N)
- Washed sample dried in hot air oven at 60°c ± 5°c for period of 48 hours

& ground in stainless steel mill to pass through sieve of 40/60 mesh.

(iii) Oxidation of plant material:
Main objective of dry de oxidation is to destroy organic components in the plant material release from their combination.

(a) Dry ashing:
Powdered plant materials in iron from silica crucibles are ashed at 500°C in a muffle furnace for 3-4 hours.

(b) Wet Digestion:
The powdered plant samples can also dissolved by digestion by digesting in acids. Usually HNO_3, $HClO_4$ & H_2SO_4. These acids are used either singly or in combination of two or three acids.
e.g: HNO_3 & $HClO_4$ (in 4:1 ratio)
HNO_3, $HClO_4$ & H_2SO_4 (10:4:1 ratio)

(iv) Interpretation of results:
The basis for plant analysis as a diagnostic technique is the relationship between nutrient concentration in the plant & growth & production response.
- Interpretation shows Deficient, Adequate & excess nutrients concentration in plant.

Biological methods:
The biological method consisting of raising crop in microbe culture is a form of soil & estimating its fertility.

(a) Field tests:
The field plot technique essentially means the crop response to variables. Field experiments are essential in establishing the equ used to provide fertilizer recommendation.

(b) Pot culture tests:
The pot culture utilize small quantities of soil to quantify the nutrient supplying power of soil. Selected treatments are applied to the soils.

(c) Laboratory tests:
(i) Neubauer seedling method:
This technique based on uptake of nutrients by growing a large number of plants in small amount of soil.

(ii) Microbial methods:
In absence of nutrients, certain microorganisms exhibit striking behavioural traits of higher plants.
Ex: Growth of azotobacter or Aspergillus niger reflects nutrient deficiency in soil.

③ Nutrient Deficiency symptom of plant:
When a plant body needs a certain element it shows deficiency symptoms. It is good tool to detect deficiency of nutrients. It have limitations.
- visual symptoms are caused by more than one nutrient.
- It is difficult to distinguish symptoms are deficiency, insect damage etc.

Plant	Nutrient deficiency / toxicity:
Oat	: Mg, Mn & Cu deficiencies.
Wheat & barley	: Mg, Cu, & some time Mn deficiency
Sugar beet	: B & Mn deficiencies.
Maize	: N, P, K, Mg, Fe, Mn & Zn deficiencies.
Potatoes	: K, Mg & Mn defeciencies.
Brassica species	: K & Mg Deficiencies
Celery & Sunflower	: B deficiency.
Cauliflower	: B & Mo deficiencies.
Barley	: B, Mn & Al toxicities
Cucumber	: N & P excess.

Q.3 Give the critical levels of nutrients in the soil.

→

Sr No.	Nutrients	Category		
		Low	Medium	High
1.	Alkaline $KMnO_4$-N (kg/ha)	<250	250-500	>500
2.	Olsens-P_2O_5 (kg/ha)	<28	28-56	>56
3.	Neutral N NH_4OAc-K_2O	<140	140-280	>280
4.	0.15% $CaCl_2$-S (mg/kg)	<10	10-20	>20
5.	DTPA extractable Fe (mg/kg)	<10	10-20	>20
6.	DTPA extractable Mn (mg/kg)	<5	5-10	>10
7.	DTPA extractable Zn (mg/kg)	<0.5	0.5-1.0	>1.0
8.	DTPA extractable Cu (mg/kg)	<0.2	0.2-0.4	>0.4
9.	Hot water soluble B (mg/kg)	<0.1	0.1-0.5	>0.5
10.	Hot water soluble Mo (mg/kg)			

Q.4 Write short Note on:
DRIS Method:
→
- Recentaly diagnosis recomendation Integration System (DRIS) is suggested for fertilizer recomendation. In
- In this approach, plant sample are analyzed for nutrient content & they are expressed as rations of nutrients with other.
- Suitable ratios of nutrients are established for higher yields from experiment & plant samples collected from farmer's fields.
- The nutrients whose ratios are not optimum for high yields are suspended by top dressing.
- This approach is generally suitable for long duration crops. but it is being tested for short duration crops like Soybean, wheat etc.