Unit - IV
Chapter-15 Mineral Nutrition
IMPORTANT POINTS

The absorption, distribution and metabolism of various mineral elements by plants is called mineral nutrition. All organisms need nutrition. We know that in plants, nutrition is autotrophic. Mineral elements occur mainly in their inorganic ionic forms in the soil. Plants absorb them from the soil through their root systems. The study of mineral nutrition is concerned with the absorption of essential mineral nutrients, their important role in the plant life and the effects of their imbalanced availability cause specific symptoms.

Some methods to determine the requirement of minerals by plants are as Hydroponics, Aeroponics, and Organoponic. Criteria for Essentiality of Elements are

(1) A plant must be unable to complete its life cycle in the absence of the mineral element.

(2) The function of the element must not be replaceable by another mineral element.

(3) The element must be directly involved in plant metabolism.

The nutrients or elements which are essential for the healthy growth of the plant are called essential nutrients or essential elements. About 112 elements have been discovered until now. Only twenty kinds of mineral elements are considered as essential for the plants. Most of the mineral elements present in soil are absorbed by roots of the plant. All minerals which are absorbed by plants are not 'essential minerals.' Most of the **mineral nutrients**, which come from the soil, are dissolved in water and absorbed through a plant's roots.

Macronutrients include - Carbon, Hydrogen, Oxygen, Nitrogen, Potassium Phosphorus, Sulphur, Calcium, and Magnesium. Micronutrients include - Manganese, Copper, Molybdenum, Boron, Zinc, Iron, Chlorine and Nickel. Sodium, Cobalt, Silicon and Vanadium are also seem to be important - 'trace elements'. C, H, O and N are Non mineral elements.

The absence or deficiency (not present in the required amount) of any of the essential elements shows to deficiency symptoms or effects in plant. The requirement of micronutrients is always low while there moderate decrease causes the deficiency symptoms and a moderate increases causes toxicity.

1. Due to which type of bacteria atmospheric N_2 is maintained ?
   (a) Nitrosomonas (b) Rhizobium (c) Nitrobacter (d) Pseudomonas
2. Which method of hydroponics is used for providing nutrients to plants or seedlings in environment saturated with fine droplets of nutrients ?
   (a) Aeroponics (b) Continous flow of cultured solution
   (c) Static cultured solution (d) Suspension culture
3. Yellowing of leaves is called -
   (a) Tylosis (b) Chlorosis (c) Necrosis (d) Florosis

4. Standards for mineral elements essentially was suggested by which scientist ?
(a) Julious Vonsachs (b) Cornelius Von (c) Arnon and Stout (d) Jhon Ingen house

5. What is concentration of micronutrients in the dry mass of plants per gram ?
(a) 1 to 10 mg (b) 0.1 mg
(c) 0.1 mg or less than that (d)10 mg or more than that

6. Which group is included in Macronutrients?
(a) H, Mn, S (b) S, P, Ca, Mg (c) Mn, Cu, N (d) Na, Cl,

7. Which group is included in micronutrients ?
(a) Mn, Cu, Mo (b) Cl, Ni, Co, Mg (c) C, H, O, N (d) Cl, S, Ni, Fe

8. Out of the following, what is the function of Potasium ?
(a) ion balance (b) stabilizes ribosomes
(c) Required for iron absorption (d) In active site of many redox enzymes

9. Which element is necessary to stabilize ribosomes ?
(a) Mn (b) Mg (c) Mo (d) Ni

10. In which form Phosphorous is absorbed from soil ?
(a) $H_3PO_4^-$ (b)HPO_4^- (c) $H_2PO_4^-$ (d) $H_4P_2O_7^-$

11. Which elements play significant role in structure and synthesis of chlorophyll ?
(a) Fe, Ca (b) Fe, Mg (c) Cu, Fe (d) Mg, Fe

12. Deficiency of which element kills terminal buds leaving a rosette effect on the plant ?
(a) Mo (b) B (c) Cu (d) None

13. Deficiency of which element shows stunted growth ?
(a) Mo, Ca, S, N (b) Cl, N, Cu, Zn (c) P, S, Mn, Ca (d) K, N, Fe, Ca

14. State importance of iron ?
(a) Required for activation of Carboxyalase enzyme.
(b) Required for the structure of Ferodoxin.
(c) Required for the photolysis of H_2O during photosynthesis.
(d) Required for the absorption and metabolism of Ca.

15. Which element is required for absorption and utilization of calcium ?
(a) Fe (b) Cu (c) B (d) K

16. State deficiency of Cl.
(a) Wilting of stubby roots (b) brown spoted fruits
(c) accumalation of purple pigment (d) premature leaf fall

17. Due to which element deficiency bark of tree becomes rough and gets split and exudes gum-like secretion ?
(a) Zn (b) K (c) P (d) Cu

18. Which element deficiency shows bronzing leaves ?
(a) K (b) N (c) Ca (d) S

19. Donnan equillibrium is achieved at which surface ?
(a) Cell wall (b) Nuclear membrance
(c) plasma membrance (d) Vascular membrace

20 What is the function of Zn ?
(a) Synthesis of Carboxyalase enzyme
(b) Formation of Indol Acetic acid (IAA)
(c) required for absprption and utilization of Ca.
(d) required for maintenance of ribosomal constituent.

21. One plant is given Urea fertilizer, but it has deficiency of phosphorous, this plant will show which symptom ?
(a) Cambium activity reduces (b) fruit size deminishes
(c) Grey spots on leaves (d) seed dormancy increases.

22. State deficiency symptoms of Mo.
(a) fruit yeild decreases (b) fall of fruit
(c) N - deficiency appears. (d) death of root-apex and shoot-apex.

23. State importance of Ca.
(a) Structural component of plasma membrance (b) For the synthesis if IAA.
(c) Formation of bipolar centriole during cell-division (d) Formation of nuclear membrance

24. Deficiency of which mineral causes shortening of internodes and reduction in cambium activity ?
(a) K (b) Fe (c) Cu (d) B

25 In the first phase of absorption of mineral ions from soil to root, element passes through which plant ?
(a) Cell wall (b) Nuclear membrance (c) tonoplast (d) plasma membrance

26. By which principle, indirect storage of stable and non-diffusible ions is explained ?
(a) ion exchange (b) principle of mass flow
(c) Donnan equillibrium (d) principle of Diffusion

27. According to mass flow principle what is responsible for absorption of water ?
(a) Transpiration (b) Turgidity (c) Osmotic pressure (d) Turgor pressure

28. Formation of FAD during N_2 fixation occurs during which processes ?
(a) growth and development (b) cell division and differentiation
(c) photosynthesis and transpiration (d) Respiration and photosynthesis

29. Which amino acid is formed when α keto - glutaric acid reacts with NH_3 during transmmination ?
(a) Glutanic acid (b) Aspartic acid (c) Oxalo-acetic acid (d) None of these

30. What is the function of leg haemoglobin ?
(a) To protect Nif gene from the side effect of O_2
(b) To proctect nitrogenase from the side effect of O_2
(c) To provide atmosheric N_2 to Rhizobium bzcteria
(d) To synthesis reduction inducing unit FAD.

31 Toxicity of Mn inhibits function of which other elements ?

(a) Fe, Mg, S (b) Ca, Fe, Mg

(c) Mg, K, Fe (d) Ca, P, S

32. Which substances of soil water are degraded gradually by, atmosphere and microorganisms ?

(a) Organic material (b) inorganic material

(c) elements (d) positive ions

33. Which inorganic substance is obtained by N_2 - fraction ?

(a) Ammonium

(b) amino acid

(c) Ammonia

(d) Ammonium Hydroxide

34 Formation of NO_2 and NO_3 from NH_3 is indentified by which name ?

(a) Nitration (b) Denitrification

(c) Nitrogenation (d) Nitrification

35. The process which release NA_3 from Nitrogenous excretory waste is known as

(a) Ammonification (b) Denitrification

(c) Nitrification (d) Demonification

36. $ZNO_3 \rightarrow ZNO_2 \rightarrow ZNO \rightarrow N_2O \rightarrow N_2$ is which process ?

(a) Reductive Amination (b) Ammonification

(c) Denitrification (d) Nitrification

37. Due to natural lightening ...

(a) Nitrate is converted into Nitride

(b) N_2 is converted into nitrate

(c) Modify from ZNO_3 to N_2

(d) to increase activity of Reductive Amination

38. A : Leguminous plant are grown between crops to increase yeild.

R : Rizobium bacteria are present in the root - nodules of Leguminous plant.

(a) Both A and R are true, & R gives correct explanation of A.

(b) Both A and R are true, but R is not correct explanation of A.

(c) A is true, but R is wrong.

(d) A is wrong, but R is true.

39. Which element is required for photolysis of water during photosynthesis ?

(a) Mo (b) Co

(c) Cu (d) Cl

40. Which element is necessary for meristmatic tissue and differentiating tissues ?

(a) Fe (b) N

(c) Ca (d) B

41. Which one is correct option of given Column I and Column II

Column I	**Column II**
1 Copper	P. Maintenance of ribosomal constitution.
2 Molybdenum	Q. Carbohydrate transport
3 Zinc	R. Nitrogen fixation
4 Magnesium	S. Activity of enzymes in respiration
5 Boron	T. Auxin synthesis

(a) 1 - S, 2 - R, 3 - P, 4 - Q, 5 - T (b) 1 - S, 2 - R, 3 - T, 4 - P, 5 - Q

(c) 1 - R, 2 - P, 3 - S, 4 - T, 5 - Q (d) 1 - T, 2 - S, 3 - Q, 4 - R, 5 - P

42. Which one is correct option for Column I and Column II

Column I		Column II
1 Diffusion	(i)	Suction pressure
2 Ion exchange	(ii)	expenditure of metabollic energy
3 Donnan Equillibrium	(iii)	Cell wall
4 Principle of Mass flow	(iv)	ion channels
5 Active absorption	(v)	plasma membrace

(a) 1 - iv, 2 - iii, 3 - v, 4 - i, 5 - ii (b) 1 - ii, 2 - iii, 3 - iv, 4 - v, 5 - i

(c) 1 - iv, 2 - iii, 3 - v, 4 - ii, 5 - i (d) 1 - v, 2 - i, 3 - ii, 4 - iii, 5 - iv

43 The absorption, distribution and metabolism of various mineral elements is called .....

(a) dispersal of mineral (b) Absorption of mineral salts

(c) mineral metabolism (d) mineral nutrition

44 Elements and its deficiency symptoms are given in Column I and Column II

	Column I	Column II
1	P	a. Accumulation of purple pigments.
2	Cl	b. discolored tubers and roots.
3	Mo	c. Wilting of stubby roots.
4	B	d. Pale green leaves with rolled margins.
5	S	e. purple blots occur on leaf surface.

(A) 1- a, 2 - d, 3 - b, 4 - c, 5 - e (B) 1- d, 2 - c, 3 - a, 4 - b, 5 - e

(C) 1- e, 2 - c, 3 - d, 4 - b, 5 - a (D) 1- e, 2 - c, 3 - b, 4 - d, 5 - a

45. Which are criteria for Essentiality of Elements.

Choose the correct sentences from given sentences.

(i) A plant must be unable to complete its life cylce in the absence of the mineral element.

(ii) The function of the element must not be replaceable by another mineral element.

(iii) All minerals which are absorbed by plants are not essential minerals.

(a) i and ii (b) iii and i

(c) ii and iii (d) only ii

46. In the following statements which option is correct for toxicity levels of elements.
Statements :
(A) Toxicity levels for any elements may inhibit the uptake of another element.
(B) Low concentration of Mn may cause deficiencies of Mg and Ca.
(C) A moderate increase toxicity are difficult to identify.
(a) A (b) A and C (c) all (d) B and C

47. Which is the correct path of transport of mineral nutrients from roots ?
(a) Root epidernal layer → endodermis → cortex → Pericycle → xylem tissue
(b) Root epidernal layer → cortex → endodermis → xylem tissue → Pericycle
(c) Root epidernal layer → cortex → endodermis → Pericycle → xylem tissue
(d) Root epidernal layer → Pericycle → cortex → endodermis → xylem tissue

48. From the given statements for transport of mineral elements which are correct one ?
(i) Transport of mineral ions takes place by symplastic and Apoplastic path.
(ii) Mineral ions absorbed by roots first enters in the cortex then through pericycle and endoder mis enters into xylem units.
(iii) Water and mineral ion transpotation are interlinked with each other.
(iv) Transport of mineral elements in xylem takes place with water only.
(a) i, ii and iii (b) i, iii and iv (c) ii, iii and iv (d) i and ii

49. Match proper pair

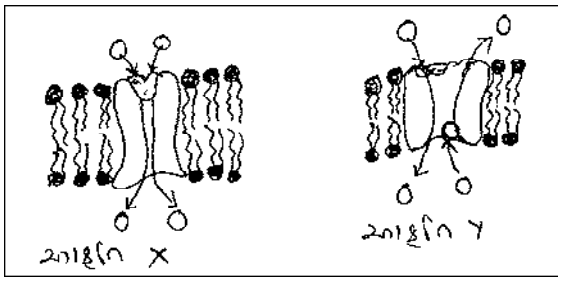
Column I	Column II
1 Silt particle	a. large
2 Sand particle	b. Colloids
3 Clay particle	c. medium
4. very small clay particle	d. small

(A) 1 - a, 2 - d, 3 - c, 4 - b (B) 1 - b, 2 - c, 3 - a, 4 - d
(C) 1 - c, 2 - b, 3 - d, 4 - a (D) 1 - c, 2 - a, 3 - d, 4 - b

50 Write an example of bacteria and the process which is responsible for reducing nitrates to gaseous nitrogen ?
(a) Agrobacterium and Nitrification
(b) Pseudomonas and Agrobacterium
(c) Nitrosomonas and Denitrification
(d) Agrobacterium and Denitrification

51. The method of hydroponic in which with the use of NFT, automatically, nutrient rich solution is given, is called .....
(a) Continous flowing solution culture
(b) Tissue culture method
(c) Gas culture method
(d) Balanced - culture solution method

52. Which type of transport of mineral elements is shown in the given diagram ?



(a) Fig x Sympart Fig y Unipart
(b) Fig x Unipart Fig y Antipart
(c) Fig x Sympart Fig y Antipart
(d) Fig x Antipart Fig y sympart

53. Which is the correct sequence of enzymes for protein synthesis during N_2 fixation ?
(a) Nitrogenase $\rightarrow$ Transaminase $\rightarrow$ Glutamate dehydrogenase
(b) Glutamate dehydrogenase $\rightarrow$ Transaminase $\rightarrow$ Nitrogenase
(c) Hydrogenase $\rightarrow$ Glutamate dehydrogenase $\rightarrow$ Transaminase
(d) Transaminase $\rightarrow$ Nitrogenase $\rightarrow$ Glutamate dehydrogenase

54. Which amino acid acts as a main donor of amino group in transamination ?
(a) Glutamic acid (b) Glutamine
(c) Glutamate dehydrogenase (d) Glycine

55. The region within the plasma membrance and within the vacuole is called ?
(a) nucleus membrane region (b) passive transport region
(c) Cellular region (d) Active transport region

56. What is responsible for N_2 fixation in Rhizobium ?
(a) nif - gene (b) leghemoglobin (c) Nitrogenase (d) ATP

57. Which of the following is not related with intra cellular fluid ?
(a) Mn (b) Mg (c) Mo (d) Na

58. Which method of hydroponics used for raising plants in solution filled containers such as a glass, jars, buckets, tubs and water tanks ?
(a) static solution culture (b) nutrient film technique
(c) Aeroponics (d) tissue culture

59. Which is improper pair of the following ?
(a) Ionic balance in plants - Na (b) Cell wall component - B
(c) Activation of Nitrogenase - Cu (d) Required for iron absorption - Ni

60. Which is proper pair of ions and its deficiency symtoms ?
(a) Nitrogen - Induction of dormancy (b) Potassium - Scorched look to leaves
(c) Phosphorous - Chlorosis (d) Zinc - Brown spoted of fruit

61. Which is correct for absorption of mineral ions, from the given statement ? select proper option.
(i) Elements absorbed by root cells first enters region between cell wall and plasma membrance.
(ii) It also enters in the inter cellular space of root cells.
(iii) This process occurs rapidly through transportation and requires energy obtained from ATP.
(iv) Later on mineral ions enters inside plasma membrance and vacuolar sap.
(a) i, ii and iii (b) i and ii
(c) iii and iv (d) i, ii and iv

62. Find out the correct option from the given statements for ion exchange.
(i) Anion and cations are located on the surface of cell wall through their absorption.
(ii) The soil solutions also contains ions.
(iii) Carrier molecules are involved in ion exchange & energy is consumed from ATP.
(iv) Such ionic exchange occurs even against their concentration - gradient.
(a) iii and iv (b) i, ii and iii (c) i, ii and iv (d) ii, iii and iv

63. Which statement is correct option from the given statements for plasma membrance ?
(i) The inner region of plasma membrane is the region within the vacuole.
(ii) For ionic absorption various ionic channels are located in the plasma membrance.
(iii) In Donnan equillibrium, only positive ions occurs on the inner surface of plasma membrance
(a) only ii (b) i and ii
(c) ii and iii (d) i, ii and iii

64. Which one is the correct statement from the given statements for Nitrogen cycle ?
(i) Amonification is the transforming process of complex organic matters into the simple organic matters.
(ii) Nostoc converting the gaseous N_2 in to NO_2^-
(iii) Agrobacterium converted directly from NO_3 to N_2.
(iv) Psuedomonas converts NO_3 into gaseous N_2.
(a) i and ii (b) only iv
(c) i, ii and iii (d) ii and iv

65. Select improper pair for the N_2 fixation to the formation of Amino acid process.
(a) FAD - Reduction inducing unit
(b) Essential enzymes - Hydrogenase, Nitrogenase
(c) ATP - the introduction of H_2 units in a diatomic N_2 unit.
(d) Reductive Amination - Nitrogenase.

66. Choose in correct pair.
(a) Pulses - Nostoc
(b) Nitrogenase - iron & molybdenum containing protein.
(c) leghemoglobin - Oxygen carries protein.
(d) FAD - Floride Adenine Dinucleotide.

67. Amonification is the release of NH_3 after the death of plants and animals and their degradation. Find the mistake in the given statement.

(a) Conversion of NH_3 into NO_2^- and NO_3^- is not mentioned.

(b) Excretory substances of dead bodies is not mentioned.

(c) Microbes responsible for degradation in the process are not mentioned.

(d) Release of NH_3 from N_2 containing substances (denitrification) is not mentioned.

68. Which is correct statement for Active transport ?

(a) It occurs in the concentration gradient so ATP is not required.

(b) It occurs in the concentration gradient so ATP is required.

(c) It occurs against the concentration gradient so ATP is not required.

(d) It occurs against the concentration gradient so ATP is required.

69 Which is the true statement for the vanadium element ?

(a) deficiency do not regulate the size of stomata.

(b) It is united in the formation of bipolar spindle during cell division.

(c) plant do not get ammonia from the soil, due to its deficiency.

(d) It plays role as structural component of vitamin Biotin and thiamin.

71. Of the following, S is essential for best production of which crop ?

(a) oily seeds (b) leguminosae (c) grains (d) Fibres

72. By which nitrite is converted into nitrate ?

(a) Nitro bacter (b) Nitro somonas (c) Agro bacterium (d) Psuedomonas

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Questionbank Biology

ANSWER KEY

1	d	26	c	51	a
2	a	27	c	52	c
3	b	28	d	53	c
4	c	29	d	54	a
5	c	30	b	55	c
6	d	31	b	56	a
7	a	32	a	57	b
8	a	33	c	58	a
9	b	34	d	59	c
10	c	35	a	60	b
11	d	36	c	61	d
12	d	37	b	62	c
13	a	38	a	63	c
14	b	39	d	64	b
15	c	40	c	65	d
16	a	41	b	66	c
17	d	42	a	67	c
18	a	43	d	68	d
19	d	44	c	69	c
20	b	45	d	70	a
21	d	46	a	71	b
22	c	47	c	72	a
23	c	48	b		
24	a	49	d		
25	a	50	d		

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