

ELE PATH-243

BIOFERTILIZERS, BIOPESTICIDES, BIOCONTROL AGENTS

1. Which of the following statements is correct?

- a. Atmosphere is the major reservoir for plants
- b. Nitrogen is the most abundant nutrient for plants
- c. Nitrogen cycle is a sedimentary cycle
- d. All

2. Nitrogen is absorbed by the plants in the form of

- a. Ammonium
- b. Nitrites
- c. Nitrates
- d. All

3. Nitrogen fixation is the conversion of

- a. N_2 to N
- b. N_2 to NH_3
- c. N_2 to NO_3^-
- d. N_2 to urea

4. Important enzymes involved in nitrogen fixation are

- a. Nitrogenase and hydrogenase
- b. Nitrogenase and hexokinase
- c. Nitrogenase and peptidase
- d. Nitrogenase and hydrolyase

5. Symbiotic nitrogen-fixing cyanobacteria are not present in

- a. *Azolla*
- b. *Gnetum*
- c. *Anthoceros*
- d. *Cycas*

6. How many molecules of ATP are required to fix one molecule of nitrogen?

- a. 12
- b. 20
- c. 6
- d. 16

7. Ammonification is the formation of

- a. Ammonia from nitrates by decomposers
- b. Ammonia from nitrogen
- c. Ammonia from amino acids
- d. Ammonia from nitrates by nitrogen fixers

8. Conversion of nitrates to nitrogen is called

- a. Ammonification
- b. Nitrification
- c. Nitrogen fixation
- d. Denitrification

9. Conversion of nitrites to nitrates is called

- a. *Nitrosococcus*
- b. *Clostridium*
- c. *Nitrobacter*
- d. *Nitrosomonas*

10. Conversion of ammonia to nitrite and then to nitrates is called

- a. Ammonification
- b. Denitrification
- c. Assimilation
- d. Nitrification

11. The conversion of nitrogen to ammonia or nitrogenous compounds is called as

- a) Nitrogen assimilation b) Nitrogen fixation
- c) Denitrification d) Nitrification

12. Plants absorb N₂ in the form of

- a) nitrites (NO₂⁻) b) nitrates (NO₃⁻)
- c) ammonium (NH₄⁺) d) all of the above

13. Plants cannot absorb molecular N₂ in the atmosphere because

- a) N₂ has double bonds making it highly stable
- b) Abundance in the atmosphere inhibits absorption
- c) N₂ has triple bonds making it highly stable
- d) None of these

14. Symbiotic N₂fixing cyanobacteria are present in all except

- a) Anthoceros

- b) Azolla
- c) Cycas

d) Gnetum

15. All the following are free living N₂fixers except

a) Rhizobium b) Azotobacter

c) Rhodospirillum d) Clostridium

16. Which of the following N₂fixer is involved in symbiotic association with legumes forming root nodules?

a) Rhizobium b) Azotobacter

c) Rhodospirillum d) Clostridium

17. Anabaena, a N₂ fixer is present in the root pockets of

a) Marselia b) Salvinia c) Pistia d) Azolla

18. Splitting of dinitrogen molecule into free nitrogen atom in biological N₂ fixation is carried out by

a) hydrogenase b) nitrogenase

c) dinitrogenase d) nitrate reductase

19. The conversion of amino acids to ammonium by soil decomposers is called

a) ammonification b) mineralization

c) deamination d) Both a and b

20. Industrial fixation is accomplished by

a) Helmonts process

b) Haber process

d) Friedel-Crafts reaction

d) Reimer Tiemann Reaction

21. N and P are nutrients substances required by the microorganism to survive. N is a limiting factor and depletion due to?

a) Microbial denitification, soil erosion and chemical volatilization

b) Chemical volatilization and Chemical development

c) Soil erosion and suspension

d) Microbial denitrification and microbial nitrification

22. In nitrogen fixation, what is/are the important requirement to complete this mechanism?

- a) It requires oxygen and tremendous energy
- b) It requires oxygen to initiate the process
- c) It requires nitrogenase and tremendous energy
- d) It requires less energy at the beginning and high energy at the end of the process

23. Nitrogenase is an enzyme that very sensitive to oxygen. What are the proteins that use to compose this enzyme?

- a) Fe and Zn protein
- b) MoFe and Fe protein
- c) MoFe and Mn protein
- d) All above are incorrect

24. Frankia produced nitrogen by fixing nodule on

- [A] lentils
- [B] garden pea
- [C] alnus
- [D] broad bean

25. Leg-hemoglobin means

- [A] low grade hemoglobin
- [B] luminous hemoglobin
- [C] leguminous hemoglobin
- [D] low level haemoglobin

26. Sequential stage for principal stages of nodule formation are

- (1) Rhizobia multiply and colonies the surrounding roots.
- (2) Rhizobia attached to epidermal and root hair cells.
- (3) Root hair curl and bacterial invade root hair.
- (4) Initiation of nodule formation in cortex.
- (5) Infection thread is produced carrying bacteria to cortex.
- (6) Bacteria released from thread into cells and causes their differentiation in specialized nitrogen fixing cells
- (7) Nodule formed establish, a direct vascular connection with the host for exchange of nutrient,

- [A] I->VII->II->VI ->III->V->IV
- [B] II->III-> IV->I-> VII-> V-> VI
- [C] VII->VI-> IV-> I ->III -> V-> II

[D] I-> II-> III-> V-> IV-> VI->VII

27. Root nodule of leguminous plant contains

- [A] Nitrogenase
- [B] leg hemoglobin
- [C] both
- [D] none

28. Enzyme nitrogenase is

- [A] Mo-Fe protein
- [B] Mo-Mn protein
- [C] Mn-Fe protein
- [D] Cu-Fe protein

29. Nitrogenase require _____ condition for its activity,

- [A] aerobic
- [B] anaerobic
- [C] ozonised environment
- [D] CO₂

30. Which of the following is incorrect about nitrogen fixation in nodule?

- [A] It is a high energy process
- [B] Leg-hemoglobin acts as oxygen scavenger
- [C] Mg is required as a cofactor for nitrogenase enzyme
- [D] Process use atmospheric nitrogen but not atmospheric hydrogen directly

31. Which of the following nitrogen fixers is found in rice fields associated with *Azolla*?

- (a) *Tolypothrix*
- (b) *Frankia*
- (c) *Anabaena*
- (d) *Spirulina*

32. Which of the following is not a biofertilizer?

- (a) Mycorrhiza
- (b) *Rhizobium*
- (c) *Agrobacterium*

(d) *Nostoc*

33. Which of the following is a pair of biofertilizers?

(a) *Salmonella* and *E.coli*

(b) *Rhizobium* and grasses

(c) *Nostoc* and legume

(d) *Azolla* and BGA

34. Which of the following fern is a biofertilizer?

(a) *Salvinia*

(b) *Azolla*

(c) *Pteridium*

(d) *Marsilea*

35. Which of the following is an endomycorrhiza?

(a) *Rhizobium*

(b) *Agaricus*

(c) *Glomus*

(d) *Nostoc*

36. Pick the correct statement

(a) legumes do not fix nitrogen

(b) legumes fix nitrogen independent of bacteria

(c) legumes fix nitrogen through bacteria in their roots

(d) legumes fix nitrogen through bacteria in their leaves

37. A biofertilizer involving a pteridophyte host is

(a) *Azotobacter*

(b) *Clostridium*

(c) *Anabaena*

(d) *Rhizobium*

38. Which of the following is used as a biocontrol agent against caterpillars of butterflies?

(a) *Trichoderma*

(b) *Streptococcus*

(c) *Bacillus Thuringiensis*

(d) *Saccharomyces cerevisiae*

39. Which of the following is the use of microbes as a biological control agent for pests/diseases?

(a) Bt-cotton to increase the yield of cotton

(b) Ladybird beetle for controlling aphids in mustard

(c) *Trichoderma sp* against plant pathogens

(d) *Nucleo polyhedron virus* against white rust in *Brassica*

40. A biocontrol agent against plant diseases

(a) *Trichoderma*

(b) *Glomus*

(c) *Bacillus thuringiensis*

(d) baculovirus

41. Which of the following is not a biopesticide?

(a) *Nucleopolyhedrovirus*

(b) *Xanthomonas campestris*

(c) *Bacillus thuringiensis*

(d) *Trichoderma harzianum*

42. This is a third generation pesticide.

(a) Pheromones

(b) Pathogens

(c) Carbamates and organophosphates

(d) Insect repellants

43. The process of using a natural predator to control a pathogen is called

(a) genetic engineering

(b) **biological control**

(c) confusion technique

(d) artificial control

44. Azolla pinnata has been found to be an important biofertiliser for paddy crops. This quality is due to the presence of

(a) N₂ fixing bacteria

(b) N₂ fixing cyanobacteria

(c) mycorrhizae

(d) **all of these**

45. Which of the following is widely used as a successful biofertiliser in Indian rice field ?

(a) Rhizobium

(b) Acacia arabica

(c) Acalypha indica

(d) **Azolla pinnata**

46. Which of the following is a non-symbiotic biofertiliser ?

(a) VAM

(b) **Azotobacter**

(c) Anabaena

(d) Rhizobium

47. Which one of the following is not a nitrogen-fixing organism ?

(a) Anabaena

(b) Nostoc

(c) Azotobacter

(d) **Pseudomonas**

48. The chemical substances produced by some microbes which can kill or retard the growth of other microbes are called

(a) antiseptics

(b) antacids

(c) **antibiotics**

(d) all of these

49. Biofertilisers are the living organisms which

- (a) bring about soil nutrient enrichment
- (b) maximise the ecological benefits
- (c) minimise the environmental hazards
- (d) **all of these**

50. Cyanobacteria are

- (a) heterotrophs
- (b) chemotrophs
- (c) **autotrophs**
- (d) organotrophs

51. Bacillus thuringiensis (Bt) strains have been used for designing novel

- (a) biofertilisers
- (b) bio-metallurgical techniques
- (c) bio-mineralisation process
- (d) **bio-insecticidal plants**

52. Bt toxin genes have been expressed in plants in order to provide resistance against

- (i) Lepidopterans and fungi
- (ii) Animals and bacteria
- (iii) Bacteria and fungi
- (iv) Coleoptera and dipterans
- (v) Lepidopterans

- a) i and ii b) ii and iv **c) iv and v** d) i and iv

53. Biopesticide include

- a) bioinsecticide
- b) bioherbicides
- c) **bioinsecticide and bioherbicide**
- d) bioinsecticide, bioherbicide and biofertilizers

54. The phenomenon of using a predator for controlling a pest is

- A) artificial control
- b) **biological control**
- c) confusion technique

d) genetic engineering

55. Biological control of agricultural pests, unlike the chemical control, is

a) polluting

b) self perpetuating

c) very expensive

d) toxic

56. White muscardine disease is caused by _____

(A) *Metarrhizium anisoplae*

(B) *Nosema* sp.

(C) *Beauveria bassiana*

(D) Granulosis virus

❖ IMPORTANT POINTS

1. Nitrogen fixation is also called as **Diazotrophy**.
2. **Feed Boldween and MC Coy**: 7 cross inoculation groups of N fixation in *Rhizobium*.
3. **Leghaemoglobin** pink in color in root nodules of legumes identified by Kubo.
4. **Nif genes** are responsible for Nitrogen fixation in BGA.
5. In *Azotobacter*, the range of fixation is **2-15 mg N fixed / gram** of carbon source utilized.
6. *Azospirillum* is gram -ve and contains **poly beta hydroxyl butarate** granules.
7. Preparation of sulphur oxidizing bacteria are called as **Biosuper of sulphobacteria**.
8. Symbiotic association of fungi and root system of higher plants is called as **mycorrhiza**.
9. *Azotobacter* forms **cyst** to withstand adverse conditions.

10. Azotobacter chroococcum in Indian soil: 10^4 - 10^5 gm/soil.
11. Beijerinckia indica used to prepare inoculant which fix atm. N **asymbiotically** in **acidic soil** where having high rainfall.
12. Phosphomicroorganisms when used with **rock phosphate** can save about 40% of P requirement of crop.
13. Which element play important role in nitrogen fixation: **Molybdenum**
14. Gene responsible for nitrogen fixation: **Nif gene**
15. Plants absorb nitrates from soil and convert them into- **Ammonia**
16. Bacteria genus is capable of oxidizing ammonia (NH₄)?: **Nitrosococcus**
17. The chief source of nitrogen for green plants is- **Nitrate**
18. During nitrogen fixation the enzyme nitrogenase catalyse the reaction. The reaction is high energy demanding which require approximately- **18 ATP**
19. **Azorhizobium** develops nodules on stem and roots.
20. Series of flavonoid signals that are present in plant organic metabolites lead o **exchange of recognition signals**.
21. All species of Rhizobium possess specific adhesion protein is called **Rhichadhesin**.
22. Rhichadhesin is **calcium binding protein**.
23. Root hair curling due to action of substances secreted by Rhizbium called as **nod factors**.
24. Bacteroid and peribacteroid membrane both form structure is called **Symbiosome**.
25. Actual site of nitrogen fixation in root nodules of leguminous plants: **Symbiosome**.
26. Pigment protect nitrogen fixation enzymes from oxygen: Leghaemoglobin.
27. Nif genes are **plasmid borne**.
28. **nod A,B,C** are responsible for synthesis of oligosaccharide called nod factor.
29. Nif gene organization and regulation of their expression is well studied in free living diazotroph **Klebsiella pneumoniae**.
30. Cyanobacteria fix atmospheric nitrogen by means of special cells called

heterocyst.

31. Shelf life of Rhizobium, Azotobacter and Azospirillum is not more than **6 months**.
32. For storage of cultural packets, a temp. of **20-25⁰ C** is considered satisfactory.
33. **BIS:** Bureau of Indian Standard
34. National biofertilizer Development Centre at **Ghaziabad**
35. **ISI** Indian Standard Institute
36. Book: **Biological control of plant pathogens** written by K.F. Baker and R.J. Cook
37. **Siderophores** are low molecular weight compounds, which possess high affinity for iron and aid transport into cells.
38. **Bacillus subtilis** effectively control Rhizoctonia solani in many crops by producing **Bacilysin and Fengimycin**.
39. **Zwittermicin A** antibiotic obtained from **Bacillus cereus** strain UW 85- Biological control agent for damping off and root rot of soybean.
40. **Agrobacterium radiobacter strain K84** responsible for bacteriocins agrosin 84 which control crown gall disease caused by Agrobacterium tumefaciens.
41. **AMF** arbuscular mycorrhiza fungi
42. **VAM** vesicular arbuscular mycorrhiza
43. No. of viable cells of Rhizobium at the time manufacture **10⁹/gm** of carrier.
44. **CIB** central insecticide board
45. **Trichogramma** is egg parasitoid (endoparasitoid).
46. Mostly used species of Trichogramma - ***T. chilonis.*, *T. japonicum***
47. **Cyrtolaemus mountrouzerri** Lady bird beetle is predator of mealy bugs.
48. **Chrysoperla** Common green lace wing are mass produced on eggs of Rice grain moth ***Corcyra cephalonica***.
49. **NPV** -Nuclear polyhedrosis virus
50. **White halo fungus-** *Verticillium lecani*
51. **Metarrhizium anisopliae** infecting Rhinoceros beetle/ grub.

52. **PBM-** Peribacteroid membrane
53. **MPN-** *most probable number*
54. **CIG-** Cross inoculation group.
55. **PGPR–** plant growth promoting rhizobacteria
56. For neutralization of carrier material, add **calcium carbonate**.
57. **White muscardian fungus-** *Baeoveria basiana*
58. **Green muscardian fungus-** *Metarrhizium anisopliae*
59. Sacchrophilic biofertilizser -**Acetobacter**
60. Toxin protein of Bacillus thuringensis- **δ endotoxin- Cry protein**