AP-PGCET-2024

BOTANY-STUDY MATERIAL ON "ALGAE"-I

GENERAL CHARACTERS OF ALGAE:

1. The study of all aspects of Algae is known as – Phycology / Algology.
2. In Latin, the word 'Algae' means - Seaweed. (Algae-Plural, Alga-Singular)
3. The term "Algae" was coined by – Linnaeus.
4. "Father of Phycology" – F. E. Fritsch.
5. "Father of Indian Phycology" – M. O. P. Iyengar.
6. The plant body of the Algae is known as – Thallus.
7. The plant body which is not differentiated into true root, stem, leaves is known as – Thallus.
8. Nutrition of the most of the algae is – Autotrophic.

Habitats in Algae:

9. Based on the habitat, most of the aquatic algae are – Phyto planktons.
10. The algae growing attached to the bottom of water body are called as – Benthophytes/Benthos. Ex-*Chara, Nitella.*
11. The algae which grow in terrestrial habitat are known as – Sapophytes. Ex- *Vaucheria, Fritschiella*.
12. The algae which grow under the surface of the soil are known as – Cryptophytes. Ex-Some Cyanobacteria.
13. The algae which grow on ice are known as – Cryophytes. Ex-*Chlamydomonas yellowstonensis, Haemotococcus nivalis.*
14. The algae which grow in hot water springs (temperature up to 85 degrees C) are known as – Thermophytes. Ex- Some Cyanophyceans.
15. The algae which grow along the shores of lakes & ponds are known as – Epactiphytes. Ex- *Oedogonium, Spirogyra*, Diatoms, *Scytonema*.
16. The algae which grow on the surface of the other plants are known as – Epiphytic algae. Ex-*Oedogonium, Coleochaete.*
17. The algae which grow on the surface of the animals like fishes, snails, Tortoise are known as – Epizoic algae. Ex-*Cladophora* on Molluscs.
18. The algae which grow in the tissues of animals are known as – Endozoic algae. Ex- *Zoochlorella.*
19. The algae which grow as parasite on Tea plant & causes Red rust is – *Cephaleuros virescens*.
20. The algae which form symbiotic association with other plants are known as –Symbiotic algae.

Ex- *Protococcus, Cystococcus*, *Trentipholia*- Chlorophyceae. *Nostoc, Anabaena, Scytonema, Stigonema* - Cyanophyceae.

• Classification of Algae

According to F. E. Fritsch, Algae are classified into 11 classes based on the cell wall components, types of pigments, Structure of Thallus, nature of reserve food material, mode of reproduction, types of flagella, type of life cycle.

1) Chlorophyceae 2) Xanthophyceae 3) Chrysophyceae 4) Bacillariophyceae 5) Cryptophyceae 6) Dinophyceae 7) Chloromonadinae 8) Euglinineae / Euglenophyceae 9) Phaeophyceae 10) Rhodophyceae 11) Cyanophyceae

21. Based on cell organization Algae, Prokaryotic algae belong to – Cyanophyceae / Myxophyceae (known as Blue green algae).
22. Based on cell organization Algae, Mesokaryotic algae belong to – Dinophyceae (Dinoflagellates-Ex-*Noctiluca, Gonyaulax*)

Cell wall components:

23. The most abundant cell wall component in Algae is – Cellulose.
24. The cell wall components in Chlorophyceae are – Cellulose & Pectin.
25. The cell wall component in Xanthophyceae is – Pectin.
26. The cell wall components in Phaeophyceae are – Alginic acid, Fucoidan, Fucin.
27. The cell wall components in Bacillariophyceae & Chrysophyceae is – Pectin & Silica.
28. The cell wall components in Rhodophyceae is – Cellulose, Pectin, Agar.
29. The cell wall component in Cyanophyceae is – Peptidoglycan/ Murein.

Flagella:

30. Flagella are absent in – Rhodophyceae & Cyanophyceae.
31. Flagella in Algae are 2 types.
    1. Whiplash / Acronematic: - The flagella have a smooth surface due to absence of mastigonemes.
    2. Tinsel / Pleuronematic: - The surface of the flagella is covered with fine filamentous appendages called Mastigonemes / Flimmers.
32. If the motile cell has same type of flagella is known as Isokont. Ex- Chlorophyceae.
33. If the motile cell has two types of flagella is known as Heterokont. Ex- Phaeophyceae, Xanthophyceae.
34. Flagella in Algae & Eukaryotes are made up of – Tubulin protein.
35. Flagella in Prokaryotes are made up of – Flagellin.

Photosynthetic pigments & Chloroplasts:

36. The plastids with Chl-a & Chl-b are known as – Chloroplasts.
37. The naked thylakoid like structures associated with cell membrane without Chl-b is known as – Chromatophore. (found in Cyanophyceae)

38. Cup shaped Chloroplast is found in – *Chlamydomonas.*
39. Disc shaped Chloroplast is found in – *Vaucheria, Chara*.
40. Ribbon / spiral shaped Chloroplast is found in – *Spirogyra*.
41. Reticulate shaped Chloroplast is found in – *Oedogonium*.
42. Star / Stellate shaped Chloroplast is found in – *Zygnema*.
43. Girdle shaped Chloroplast is found in – *Ulothrix.*
44. 5-types of Chlorophylls are found in algae. 1) Chl-a 2) Chl-b 3) Chl-c 4) Chl-d 5) Chl-e.
45. The most abundant Chlorophyll found in algae is – Chl-a.
46. Chl-b is found in – Chlorophyceae, Euglenophyceae.
47. Chl-c is found in – Phaeophyceae, Chrysophyceae, Cryptophyceae, Bacillariophyceae.
48. Chl-d is found in – Rhodophyceae.
49. Chl-e is found in – Xanthophyceae.
50. Both Carotenes & Xanthophylls are collectively known as – Carotenoids.
51. The Xanthophyll found in Phaeophyceae is – Fucoxanthin.
52. The Xanthophyll found in Cyanophyceae / Myxophyceae is – Myxo xanthophyll & Myxo xanthin.
53. The water soluble pigments which are confined to Rhodophyceae & Cyanophyceae are – Phycocyanin (Blue), Phycoerythrin (Red).
54. The proteinaceous structures which store starch & found in green algae are known as – Pyrenoids.

Reserve food materials:

55. Reserve food material of Chlorophyceae is – Starch.
56. Reserve food material of Rhodophyceae is – Floridian starch.
57. Reserve food material of Cyanophyceae is – Cyanophycean starch.
58. Reserve food material of Phaeophyceae is – Laminarin & Mannitol.
59. Reserve food material of Chrysophyceae, Bacillariophyceae, Xanthophyceae is – Leucosin.

Common names:

60. The algae belong to Chlorophyceae are known as – Green algae.
61. The algae belong to Xanthophyceae are known as – Yellow / Yellow – green algae.
62. The algae belong to Chrysophyceae are known as – Golden algae.

63. The algae belong to Bacillariophyceae are known as – Diatoms.
64. The algae belong to Dinophyceae are known as – Dinoflagellates.
65. The algae belong to Phaeophyceae are known as – Brown algae / Sea weeds.
66. The algae belong to Rhodophyceae are known as – Red algae.
67. The algae belong to Cyanophyceae are known as – Blue green algae, Cyanobacteria.

Thallus organization in Algae:

68. Unicellular motile forms – *Chlamydomonas*.
69. Unicellular motile forms are absent in Bacillariophyceae, Phaeophyceae, Rhodophyceae, Cyanophyceae.
70. Unicellular non-motile / Coccoid forms – *Chlorella, Spirulina, Diatoms*.
71. Multicellular motile Coenobium / Coenobial forms – *Volvox.*
72. Multicellular non-motile Coenobium / Coenobial forms – *Hydrodyctiyon*.
73. Multicellular non-motile Palmelloid forms – *Tetraspora.*
74. Unbranched filamentous forms – *Spirogyra, Oedogonium*.
75. Branched filamentous forms – *Cladophora.*
76. Heterotrichous forms – *Ectocarpus, Coleochaete, Fritschiella, Batrchospermum, Stigonema*.
77. Siphonous forms – *Protosiphon, Vaucheria*.
78. Uniaxial pseudoparenchymatous forms - *Batrchospermum, Dumortia.*
79. Multiaxial pseudoparenchymatous forms – *Polysiphonia, Codium*.
80. Parenchymatous forms – *Ulva, Enteromorpha, Laminaria, Fucus, Dictyota, Porphyra.*

Reproduction of Algae: 3 types- I) Vegetative II) Asexual III) Sexual

I) Vegetative reproduction:

81. Fission ------ Ex - *Chlamydomonas, Diatoms, Desmids*.
82. Fragmentation ------- Ex - *Spirogyra, Oedogonium, Nostoc.*
83. Hormogonia ----------Ex – *Nostoc, Oscillatoria.*

II) Asexual reproduction: Algae reproduce asexually by producing a variety of spores. Some of them are…

84. Zoospores: The spores which have flagella are known as Zoospores (motile). Ex- *Chlamydomonas, Oedogonium, Ectocarpus, Vaucheria*.
85. Aplanospores: The spores which do not have flagella are known as Aplanospores (non-motile). Ex- *Chlamydomonas,Vauchria, Ulothrix.*

86. Hypnospores: Thick walled aplanospores are known as Hypnospores. Ex- *Vauchria, Ulothrix.*
87. Akinetes:The thick walled resting spores are formed from vegetative cells during unfavourable conditions. Ex-*Spirogyra,Nostoc,Anabaena*
88. Tetraspores: The non-motile, haploid spores are formed in tetrads are known as Tetraspores. Ex- *Polysiphonia*.
89. Auxospores: The rejuvenescent spores which are formed only in Diatoms are known as Auxospores. Ex- Diatoms.

III) Sexual reproduction:

90. Sexual reproduction occurs in all classes of algae except – Cyanophyceae.
91. When the male & female gametes come from same individual, the plant is known as – Homothallic.
92. When the male & female gametes come from different individuals, the plants are known as – Heterothallic.
93. Based on the type of gametes involved in fusion, it is of 4 types. 1) Isogamy 2) Anisogamy 3) Physiological anisogamy 4) Oogamy.
94. Fusion of similar (in Size, Shape, Motility) male & female gametes is known as – Isogamy. Ex- *Spirogyra, Chlamydomonas*.
95. Fusion of dissimilar (in Size or Shape or Motility) male & female gametes is known as – Anisogamy. Ex- *Ulva, Enteromorpha.*
96. Fusion of morphologically similar gametes (in Size & Shape) but differ in physiologically (male gamete is motile, female is non motile) is known as Physiological anisogamy. Ex- *Spirogyra, Ectocarpus*.
97. Fusion of morphologically & physiologically dissimilar gametes (male gamete is small & motile, female is big & non motile) is known as Oogamy. Ex- *Volvox, Oedogonium, Chara, Vaucheria, Polysiphonia.*
98. Fusion of male & female gametes is known as – Syngamy / Fertilization.
99. Female gamete of algae is known as – Egg / Ovum / Oosphere.
100. The resultant diploid cell formed after fertilization is – Zygote / Oospore.
101. Embryo development from zygote is absent in - both Algae & Fungi (Non-embryophytes).

Life cycles of Algae:

102. The morphological & cytological changes occur during the growth & development from zygote in algae is known as – Life cycle/history.
103. The life cycle in which all the phases are haploid except zygote is known as – Haplontic Life Cycle. Ex- *Chlorella, Chlamydomonas, Chara, Oedogonium, Spirogyra* etc.
104. The life cycle in which all the phases are diploid except gametes is known as – Diplontic Life Cycle. Ex. *Fucus, Ascophyllum.*
105. The life cycle in which the Diploid phase is alternating with haploid phase is known as – Diplo-haplontic life cycle.
It is of 2 types. 1) Isomorphic type 2) Heteromorphic type

106. The life cycle in which both gametophytic & sporophytic phases are morphologically similar & alternates with each other is known as Isomorphic Diplo-haplontic life cycle. Ex- *Ulva, Ectocarpus, Dictyota*.
107. The life cycle in which both gametophytic & sporophytic phases are morphologically dissimilar & alternates with each other is known as Heteromorphic Diplo-haplontic life cycle. Ex- Bryophytes, Pteridophytes, Gymnosperms, Angiosperms.
108. The life cycle in which two haploid phases are alternating with one diploid phase is known as – Haplobiontic life cycle. Ex- *Porphyra*
109. The life cycle in which two diploid phases are alternating with one haploid phase is known as - Diplobiontic life cycle. Ex- *Polysiphonia.*

Economic Importance of Algae:

Useful aspects:

110. Algae are considered as – Primary producers of Nature.
111. The algae which are used as food from Chlorophyceae are – *Chlorella, Ulva, Enteromorpha, Monostroma.*
112. The algae which are used as food from Phaeophyceae are – *Laminaria, Sargassum, Alaria, Durvillea, Pelvetia.*
113. In Japan, the food item "KOMBU" is prepared from – *Laminaria* (Devil's Apron)
114. The algae which are used as food from Rhodophyceae are – *Porphyra, Chondrus, Palmaria, Gelidiella, Gracillaria.*
115. The algae which are used as food from Cyanophyceae are – *Nostoc, Spirulina.*
116. The algae which are used as Fodder for cattle are – *Fucus, Laminaria, Ascophyllum.*
117. The algae which are used as Feed for Hens (Poultry) are - *Gracilaria*
118. The algae which are used as Feed for fishes are – *Spirulina, Cladophora, Oedogonium, Spirogyra.*
119. The algae which are used as Feed for Sheep are – *Rhodymenia palmata.*
120. Sea weeds (Brown Algae) are rich in Minerals so they are also used as – Fertilizers.
121. The Blue green algae which are used as Bio-fertilizers are – *Nostoc, Spirulina, Anabaena, Anabaenopsis, Aulosira, Tolypothrix etc.*
122. Alginates (Salts of Alginic acid) are obtained from – *Fucus, Sargassum, Laminaria, Ascophyllum, Macrocystis, Padina.*
123. Sodium alginate is used for preparation of – Plastics, Paints, Flame proof fabrics, Surgical gauze, Buttons, Water proof material etc.
124. Sodium alginate is also used for preparation of artificial seed coat for - somatic embryos / embryoids during Tissue culture.
125. Agar / Agar-Agar is obtained from the cell walls of – Red algae like *Gelidium, Gelidiella, Gracilaria, Gigartina, Chondrus, Euchema etc.*
126. Agar is used as Stabilizer & emulsifier in food, Cosmetics, Leather, Canning of fish, making of capsules of Antibiotics & as Laxative.
127. Agar is also used as Solidifying agent for Nutrient culture medium during Tissue culture.
128. Carrageenin is obtained from the cell walls of – Red algae like *Chondrus crispus* (Irish moss), *Gigartina*.

129. Carrageenin is used as - emulsifier in pharmacy, Textiles, Leather, Paints, Cosmetics, Tooth paste, Brewing industries.
130. Diatoms & their fossilized accumulations are known as - Diatomite / Diatomaceous earth / Kiesulguhr.
131. Diatomite is used for making – Insulators, Blast furnaces, Tooth paste, Metal polishes and Sugar, Oil & Brewing industries for filtration.
132. Alfred Nobel used Diatomite as absorbent for making – DYNAMITE
133. Diatomite is insoluble, Porous, chemically inert & can resist very high temperatures up to 1500 degree Celsius.
134. Funori is a type of glue(gum) obtained from Red algae like – *Gloiopeltis furcata*.
135. Iodine is obtained from Brown algae like – *Laminaria, Ecklonia, Fucus etc.*
136. Bromine is obtained from Red algae like – *Polysiphonia, Rhodymenia, Rhodomela.*
137. Antibiotic Chlorellin is obtained from – *Chlorella.*
138. The algae which kill the larvae of mosquitoes are – *Chara & Nitella.*
139. The algae which help in sewage disposal are – *Chlorella, Chlamydomonas, Scenedesmus.*
140. The algae which are used to study Photosynthesis in plants are – *Chlorella, Scenedesmus.*
141. The alga which is used to study Genetics & Cytology is – *Acetabularia.*
142. The algae which are used to reclamation of Saline & Alkaline soils are – *Nostoc, Anabaena, Scytonema etc.*
143. The algae which are used as a source of Biofuel are - *Chlorella, Scenedesmus, Sargassum, Gracillaria etc.*
144. The algae which are used as Oxygen generating & Water, Food recycling are - *Chlorella, Synechococcus.*
145. The algae which are used as SCP (Single Cell Protein) are – *Chlorella, Spirulina.*

Harmful effects of Algae:

146. The algae which cause Toxicity of water are – *Anabaena, Microcystis, Lyngbya, , Nodularia, Gloeotrichia, Gymnodinium etc.*
147. The algae which cause "Biofouling" (damaging of Ships & Boats)– Diatoms, *Ectocarpus, Enteromorpha* etc.
148. The algae which cause "Algal Blooms" (Accumulation of algae on water surface) are - *Chlorella, Chlamydomonas, Microcystis, Anabaena.*
149. Biological control of algae can be done by using – Cyanophages like LPP-1, Phycophages.
150. Chemical control of algae can be done by using Algicides like – Chlorine, Copper sulphate, Potassium permanganate etc.

All the Best

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