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❖ **Notes on Bryophytes : Adaptation to land habit, Range of thallus organization, ecological and economical importance.**

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❖ **UNIT II: BRYOPHYTES**

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❖ ADAPTATIONS TO LAND HABIT:

Bryophytes are first land plants. Evidences support that Bryophytes are evolved from Algae. During the process of origin they developed to certain adaptations to land habit.

These are:

1. **Formation of a compact multi cellular plant body** which helped in the conservation of water by reducing cell surface area exposed to dry land condition.
 - a. **Presence of cuticle** further reduces loss of water by evaporation. i.e, Development of compact plant body covered with epidermis.
2. **Development of special organs e.g., rhizoids** for attachment and absorption of water.
3. **Development of photosynthetic tissues e.g., airpores :** into special chambers for the absorption of carbon dioxide without losing much water and exposure to light. i.e, Absorption of carbon dioxide from atmosphere for photosynthesis.
4. **Gametes are produced and protected** by the special multi cellular organs (antheridia and archegonia).
5. **Protection of reproductive cells** from drying and mechanical injury i.e., jacketed sex organs. Heterogamy (production of two types of gametes) is evolved, forming non motile egg containing stored food and motile sperms.

6. **Multi-cellular embryo** is formed which is retained and protected inside the female reproductive body during its development, i.e, Retention of zygote within the archegonium.

7. **Alternation of spore-producing generation** (sporophyte) with gamete producing generation gametophyte enabled the plant to produce and test the best genetic combinations for adapting to the versatile terrestrial conditions.

8. Production of large number of thick walled spores.

9. Dissemination of spores by wind.

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❖ RANGE OF THALLUS ORGANIZATION

Thallus organisation (Gametophyte) in bryophytes

- Thallus organisation in bryophytes shows various distinct lines such as

(1)Thalloid liverworts

(2)Hornworts

(3) Mosses

(1)Thalloid liverworts: 50 genera, 15% of total liverworts, range from simple or undifferentiated to complex or differentiated types.

Class: Hepaticopsida

(a) Simple undifferentiated thallus

Characters:

- Simple thallus organization.
- Plant body is thin, dorsiventrally flattened and prostrate.
- Thallus has wavy margins and dichotomously branched.
- Presence of simple, unicellular rhizoids.
- Internal structure is mostly simple e.g., *Pellia* and some shows little tissue differentiation e.g., *Porellia*.
- Reproduction takes place vegetatively through fragmentation.
- Plant is monoecious
- Sexual reproduction is advanced oogamous type.
- Sporophyte is differentiated into foot, seta and capsule.
- Examples- *Pellia* , *Porellia*.



Peltia

(b) Complex and differentiated thallus

Characters:

- Complex thallus organization.
- Plant body is flat, dorsiventral, prostrate, ribbon –like and more fleshy.
- Plants are dichotomously branched and rosette form.
- Presence of multicellular hairs or scales.
- Presence of 2 types of rhizoids *viz.*, smooth walled and tuberculate or pegged rhizoids.

- Complex internal differentiation of tissue

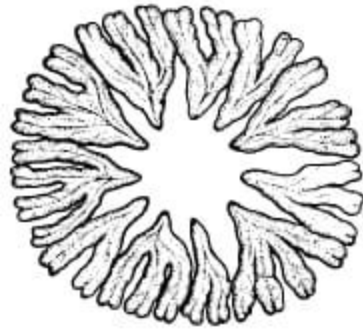
e.g., Differentiation into chlorophyll rich upper assimilatory

(photosynthetic) region and colourless lower storage region . Air

chambers are present on the upper region.

- Vegetative reproduction takes place by adventitious branches and gemma like bodies called **gemma cups (distinctive feature of *Marchantia*)**.
- Rarely monoecious, most of the species are dioecious.
- Elaters are associated with spore dispersal.
- Examples : *Riccia* , *Marchantia*.

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Riccia



Marchantia

(2) Hornworts

Class: Anthocerotopsida

Characters:

- Plant body is small dorsiventral and prostrate.
- Thallus is sub- orbicular or variously lobed.
- Dorsal surface of the thallus is smooth or velvety , scales and mucilage hairs are absent.
- Internal tissue differentiation is absent. No air chambers and air pores are present.
- Vegetative reproduction takes place by the growth of apical region and progressive death of the older parts.
- Species may be monoecious or dioecious.
- The defining characteristic of the hornworts (*Anthocerotophyta*) is the narrow, pipe-like sporophyte.
- Sporophyte consists of foot and capsule made up of sterile tissue known as columella. Seta is absent.
- Dispersal of spores by air current. Elaters absent.
- Examples: *Anthoceros* , *Notothylas*



Anthoceros

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(3) Mosses

Class : Bryopsida (Musci)

Characters:

- Gametophyte shows two distinct stages of development – (i) simple protonema and (ii) leafy gametophores.
- Most developed gametophytes: well defined leaves, axis, rhizoids.
- Stem chlorophyllous when young.
- Leaves, unicostate, sessile, spirally arranged on the stem.
- Moss gametophore leaves and parichaetial leaves (associated with archegonia), perigonal leaves (antheridia).
- Well differentiated internal structure.
- Vegetative reproduction by lateral branches , bud like gemmae or secondary protonema.
- Sexual reproduction is advanced oogamous type.
- Sporophyte structure vary greatly in different species.
e.g., In *Sphagnum* bulbous foot , small spherical capsule and suppressed seta is present.
In *Polytrichum* conical foot a long seta and an angular capsule alongwith various other structures such as calyptras, jacket, columella , operculum and peristome teeth are present.
- Examples: *Sphagnum* , *Polytrichum*, *Funaria*, *Pogonatum*.



Sphagnum



Polytrichum

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❖ UNIT III: TYPE STUDIES : BRYOPHYTES

❖ Ecological and Economic importance of Bryophytes:

1. **Protection from soil erosion:** Bryophytes, especially mosses, form dense mats over the soil and prevent soil erosion by running water.

2. **Soil formation:** Mosses are an important link in plant succession on rocky areas. They take part in binding soil in rock crevices formed by lichens. Growth of *Sphagnum* ultimately fills ponds and lakes with soil.

3. **Water retention:** *Sphagnum* can retain 18-26 times more water than its weight. Hence, used by gardeners to protect desiccation of the seedling during transportation and used as nursery beds.

4. **Peat:** It is a dark spongy fossilized matter of *Sphagnum*. Peat is dried and cut as cakes for use as fuel. Peat used as good manure. It overcomes soil alkalinity and increases its water retention as well as aeration. On distillation and fermentation yield many chemicals.

5. Ecological indicators:

Liverworts and mosses have been found to be good indicators of environmental conditions. Terrestrial bryophytes are used as one of the characterizing plants in classifying forest types.

Few aquatic mosses can analyze the presence of nutrients and inorganic salts in water. Thus, indicates the pH of water.

Polytrichum sp can detect the acidity of soil.

6. **As food:** Mosses are good source of animal food in rocky and snow-clad areas.

7. Medicinal uses:

- (a) Decoction of *Polytrichum commune* is used to remove kidney and gall bladder stones.
- (b) Decoction prepared by boiling *Sphagnum* in water for treatment of eye diseases.
- (c) *Marchantia polymorpha* has been used to cure pulmonary tuberculosis.
- (d) Many of them has antibiotic properties.

8. Other uses:

- (a) Bryophytes are used as packing material for fragile goods, glass wares etc.
- (b) Some bryophytes act as indicator plants. For example, *Tortell tortusa* grow well on soil rich in lime.

References:

- (i) Studies in bBotany Vol. I
- (ii) S.Chand ., Botany for Degree Students Bryophytes
- (iii) www.google.com