An Introduction to Bryophytes

Professor Geeta Asthana
Department of Botany
University of Lucknow
Lucknow

Disclaimer: The e-content is exclusively meant for academic purposes and for enhancing teaching and learning. Any other use for economic/commercial purpose is strictly prohibited. The users of the content shall not distribute, disseminate or share it with anyone else and its use is restricted to advancement of individual knowledge. The information provided in this e-content is developed from authentic references, to the best of my knowledge

Bryophytes



Moss - Funaria



Hornwort - *Anthoceros*



Liverwort - *Marchantia*

Thalloid Bryophytes



Liverwort - Pellia sp.

Leafy Bryophyte



Moss – Rodobryum sp.

Bryophytes

Avascular Archegoniate Plants

Systematic Position in Plant Kingdom

Algae Bryophytes Pteridophytes
Oogonia Archegonia
Avascular Vascular

(Avascular Archegoniate Plants)

Similarities with Algae

- Thallus like Plant body.
- Lack of vascular tissue.
- Absence of root.
- Gametophyte is conspicuous phase in the life cycle.
- Autotrophic.
- Photosynthetic Pigments (chlorophyll a & b).
- Reserve food (Starch).
- Motile gametes.

Similarities with Pteridophytes

- Terrestrial habit of Plant.
- Multicellular Jacketed sex organs (Antheridia & Archegonia).
- Motile male gametes.
- Development of Embryo.
- Retention of Embryo within Archegonia.
- Heteromorphic Alternation of Generations.

Differences between Algae & Bryophytes

Algae

- Aquatic Habit.
- Plant body unicellular to multicellular, filamentous.
- Sex organs naked.
- Female sex organ Oogonia.
- Embryo not produced.
- Gametophyte & sporophyte generally independent & free living.
- Sporophyte not differentiated.
- Isomorphic/Heteromorphic alternation of generations.

Bryophytes

- Terrestrial Habit.
- Plant body undifferentiated (thalloid) or differentiated (leafy).
- Sex organs jacketed.
- Female sex organ Archegonia.
- Embryo produced.
- Gametophyte independent & sporophyte dependent of gametophyte.
- Sporophyte differentiated.
- Heteromorphic alternation of generations.

Differences between Bryophytes & Pteridophytes

Bryophytes

- Main plant body is gametophyte.
- Plants may be thalloid or leafy.
- Vascular tissue absent.
- Sporophyte attached & dependent on gametophyte.
- Sporophyte determinate in growth.

Pteridophytes

- Main plant body is sporophyte.
- Plants differentiated into root, stem & leaves.
- Vascular tissue present.
- Sporophyte independent & autotrophic.
- Sporophyte indeterminate in growth.

Characteristics of Bryophytes

- First Land Plants / Pioneer of Land Vegetation
- Amphibians of Plant Kingdom
- Confined to humid & moist places
- Generally grow in hilly areas, sometimes in plain also ranging from sea level to high altitude
- Grow on variety of habitats

Terricolous (On Soil)

Corticolous (On tree trunk)

Foliicolous (On leaf surface)

Saxicolous (On rocks)

Rupicolous (On stone)

Characteristics of Bryophytes Gametophyte

- Main plant body is gametophyte which may be Thalloid or Leafy.
- Thalloid gametophytes are undifferentiated and grow prostrate over the substratum.
- The leafy gametophytes are differentiated into leaf and stem. They may be prostrate or erect growing.
- The plant body (both thalloid & leafy) are attached to the substratum by means of rhizoids.

Characteristics of Bryophytes Sex Organs

- Sex Organs are jacketed, present either at the apex of shoot (terminal) or on dorsal surface of thallus or on specialized receptacle.
- Antheridia: with uniseriate or biseriate stalk and variously shaped (spherical/elongated) antheridial body with single layered jacket enclosing numerous antherozoids.
- Archegonia: Flask shaped, with short or long neck, swollen basal portion venter and axial row of neck canal cells, single ventral canal cell & an egg.

Characteristics of Bryophytes Fertilization

- Water is necessary for fertilization.
- Mature antheridia rupture in contact with water releasing the antherozoids which swim in the film of water reaching to archegonia.
- At maturity, archegonial cover cells, Neck Canal Cells (NCC) & Ventral Canal Cell (VCC) disintegrate and fertilization takes place.
- Fertilized egg divides mitotically forming first embryo which get differentiated into sporophyte.
- Embryo/developing sporophyte remain within the calyptra protective covering developed from the wall of archegonial venter.

Characteristics of Bryophytes Sporophyte

- Sporophyte consists of foot, seta & capsule.
- Foot is embedded in the gametohyte. It anchors the sporophyte and derives nourishment.
- Seta is the stalk like structure which holds the capsule.
- Capsule is variously shaped (spherical, oval or elongated) having single to multi-layered capsule wall enclosing spores and elaters in Liverworts & Hornworts while only spores in case of Mosses.
- Spores germinate and produce new gametophyte.

Suggested Reading:

- Asthana Geeta 2006. "Bryophyta". In: e-book 'Diversity of Microbes and Cryptogams'. NISCAIR CSIR, New Delhi. 2006, http://nsdl.niscair.res.in/dspace.
- Gangulee, H.C. and A.K. Kar. 1995. College Botany Vol. II. Books Allied (P) Ltd. Calcutta.
- Parihar, N.S. 1959. An Introduction to Embryophyta Vol. I. Bryophyta III Edition. Central Book Depot, Allahabad.
- Udar, R. 1976. An Introduction to Bryophyta. Shashidhar Malviya Prakashan, Lucknow.

Photographs by the Research Team, Bryology Laboratory, Department of Botany, University of Lucknow, Lucknow