

## KINGDOM: PLANTAE

### PLS201: BIOLOGY OF SEEDLESS PLANTS (Moss)





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### **Introduction**

Today, for those of us that are going to become famous bryologist like our lecturer, as well as those needing the knowledge in their field of study; will be more aware and knowledgeable about the value of bryophytes around us and their importance.

### **Objectives**

At the end of this lecture, we will be able to:

1. appreciate the need to be knowledgeable about the bryophytes value
2. have explicit knowledge of the features that separate bryophytes from other plants
3. be more confident in identifying them in our surroundings
4. understand their contributions to our lives

### **Main content**

Bryology is the study of bryophytes. Bryophytes are in many ways an evolutionary dead end. They probably evolved from the advanced green algae at about the same time as the first vascular plants, Pteridophyte. Both bryophytes and Pteridophyte are embryophytes because they share multicellular sex organs, but bryophytes lack vascular tissues. The classification of bryophytes, therefore, falls in the following divisions:

1. Bryophyta for mosses
2. Anthocerotophyta for hornworts
3. Marchantiophyta for liverworts

### **Background of bryophytes**

Bryophyte is a collective term (English) use for mosses, liverworts (liver-like plant), and hornworts (horn-like plant). Of the three groups; mosses have the most abundant species, and hornwort ranks the least (100 spp. in six genera).

### **Members of bryophytes**

Only members of the division Bryophyta are “true” mosses. Many other plants and algae resemble true mosses, but never close relatives. Examples of the “fake” mosses are

1. Irish moss, a red alga (*Chondrus crispus*)
2. Reindeer moss, a lichen (*Cladina* spp)
3. Club moss, a pteridophyte (*Lycopodium* spp)
4. Spanish moss a plant in pineapple family (*Tillandsia uneoides*)

To remember the fake mosses use this rhyme: “Irish-rent-club in–Spain”.

## Characteristics of bryophytes

### Moss

1. The gametophyte is leafy-stem (leaves growing from the stem)
2. Rhizoids, multi-celled, and branched



Figure 1. Acrocarpous moss with sporophytes

3. Protonema (filamentous, algal-like) well developed (from germinating spore)
4. A sporophyte (foot, seta, capsule, and spores) well developed (Fig 1)
5. Capsule mouth equipped with peristome teeth for spore dispersal
6. Lack of elaters or pseudo-elaters in the capsule

### Hornwort

Hornwort species are naturally rare in distribution throughout the world. In Nigeria, only one species, *Phaeoceros carolinianus* encountered on a wet vertical cliff at Obudu Cattle Ranch (Egunyomi *et.al.*, 2013). Hornwort gametophyte is like a saucer, with upturned wrinkled, or lobed margin, the underside of the thallus lack scales, the sporophyte is horn-like, and lack seta and pseudo-elater helps in spore dispersal (Fig 2). This tiny plant (diameter =1-2 cm) shared certain traits with algae because they both have single large chloroplast with pyrenoid in each photosynthetic cell. Notwithstanding, hornwort is still advanced over liverworts in having stomata on its gametophyte, cyanobacteria and nostoc in a cavity filled with mucilage in hornworts, fix nitrogen into nitrate useable by plant.



Figure 2. Hornwort. *Phaeoceros carolinianus*

## Liverwort

1. Gametophytes (thallus and leafy) Figures 3 A-B.
2. Protonema is underdeveloped
3. Thallus species (flattish green sheet, somewhat wrinkled or lobed)
4. Thallus thin translucent (simple) to opaque (complex)
5. Whitish thallus spp. (unusual non-photosynthetic liverwort) Cryptothallus that steal food from other plants via fungi
6. Leaves growing from the stem in leafy species
7. Gametophyte produce mucilage, to protect the growing points from drying out, and to absorb and retain water
8. Cells contain chloroplasts and oil bodies
9. Rhizoids (root-like), unbranched single, celled, colourless, for attaching to substrate. Few with multi-celled rhizoids
10. Rhizome-like found in the genus, *Haplomitrium*. The underside of thallus has 1 to 2 rows scales at the margin
11. Spore capsule is either embedded in the thallus or stalked in leafy species
12. Capsule, spherical to cylindrical, blackish when mature, split open to release the spores
13. Elaters (spiral-like) twist and untwist to aid spore dispersal depending on the humidity level
14. Seta is weak and short-lived



Figure 3 A-B. Liverwort. A=Thalloid. B=Leafy

### Forms/Habits of bryophytes

Bryophytes have two alternating plant bodies:

1. Gametophytes (independent)
  - a. Leafy
  - b. Thallus
2. Sporophytes (dependent)
  - a. Foot (inside the gametophyte)
  - b. Seta (stalk)
  - c. Capsule (contains spores)
3. Acrocarpous moss (upright habit)
  - a. Mat-like (individual plants tightly packed together)
  - b. Cushion-like (with brown older layer and a living green layer above)
4. Pleurocarpous moss (creeping habit)
  - a. stems with off-shoots (upright, short leafy branches) creep on top of the substrate
  - b. stem creep under the substrate with short erect leafy branches above the substrate (*Gigaspermum repens*)
  - c. Pendulous (long creeping stem with a small area of attachment to the substrate, e.g. *Papillaria flavolimbata*)



### Habitats of bryophytes

Bryophytes were nicknamed as amphibians of the plant world because they are the first plant to explore the land, and they remain in humid, moist, shady habitats. Significant groups of the substrate on which bryophytes grow include

1. Trees shaded part (leaves, twigs, branches, trunks, and exposed roots)
2. Rock shaded part (spaces and surface)
3. Decaying woods
4. Leaves litters, and plant debris on the forest floor
5. Bare soil
6. Organic waste (animal dung, and bones)
7. Artificial structures (culvert, and fences),

### Ecology of bryophytes

1. Bryophytes are pioneers on bare rock with lichens
2. Bryophytes capture and recycle nutrients wash with rainwater from the atmosphere.
3. Bryophytes bind soil to prevent erosion
4. Bryophytes provide seedbeds for higher plants
5. Bryophytes are essential in the generation of a new environment (succession)
6. They reduce flooding and erosion and contribute to humus formation

### Economic uses of bryophytes

1. Peat moss (compressed *Sphagnum*) provide heat and electricity energy
2. *Bryophytes are used under splints when setting broken bones. And for sanitary diapers*
3. During the world war, bryophyte (*Sphagnum* spp.) used as bandage because of its antiseptic and absorbent properties.
4. Certain bryophytes used for packing dishes and stuffing furniture,
5. Peat moss improves the water holding capacity of soil
6. Peat moss, acidic in nature, prevent the growth of bacteria
7. Bryophytes are not an essential source of food, but a few made palatable to a snail, *Limicolaria aurora*, (Oyesiku and Ogunkolade, 2006; Oyesiku and Bello 2012)
8. Bryophytes used as a soil conditioner in nurseries and potting mixtures
9. Natural acidity produced by bryophytes inhibits microbial growth and gives it antiseptic properties. ( Ariyo *et.al.*, 2011; Oyesiku and Caleb, 2015)
10. Bryophytes are sensitive indicators of atmospheric pollutants



### **Conclusion**

This lecture is an eye-opener to the world of bryophytes, which many of us not aware. By now, we must have learnt how to recognise the common bryophytes and where to find them. Our knowledge of bryophytes is insufficient to utilise them entirely, because of lacks of interest and funding for the research.

### **Summary**

Having studied this lecture note, We should have:

1. understanding of members of bryophytes
2. a better idea of the traits that separate them from each, and other plants
3. the skills ready to get going with identification in our surroundings
4. a better understanding of their ecology

### **References/Further readings**

- Ariyo O.A., Shonubi O.O., Oyesiku O.O., Akande A.O. (2011). Antimicrobial Activity of the Indigenous liverwort, *Riccia nigerica* Jones, from Southwestern Nigeria. *Evansia* **28** (2): 43-48
- Egunyomi A., Oyesiku O.O., Ariyo O.A. (2013). Contribution to the study of anthocerotophyta (Hornworts) in Nigeria. *Nigerian Journal of Botany* **26**(1): 79-84
- Oyesiku O.O., Bello G.B. (2012). Impact of moss (*Hyophila crenulata*) and corn (*Zea mays*) meal fed to snail (*Limicolaria aurora*) in Southwestern Nigeria. *International Journal of Agricultural and Food Science* **2**(3): 100-102.
- Oyesiku O.O., Caleb O. J. (2015). Antimicrobial Activity of Three Mosses, *Calymperes erosum*, Müll.Hal, *Racopilum africanum* Mitt. *Cyclodictyon* Mitt. from Southwest Nigeria. *IOSR Journal of Pharmacy and Biological Sciences* **10** (2 III): 1 – 5.
- Oyesiku O.O., Ogunkolade O. R. (2006). The relationship between the Nigerian garden snail, *Limicolaria aurora* and the moss, *Hyophila crenulata*. *Journal of Bryology* **28**: 104:-107.





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***Tutorial-marked questions***

1) List the members of bryophytes that we know.

2) States at least four habitats of bryophytes