

BOTANY [Hons.] Second Semester C3P (Practical)

Mycology



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Study 8a: Study of Phaneroplasmodium from actual specimens and /or photograph

Description: The creeping multinucleate apparently naked Plasmodium representing the somatic phase in the life cycle of Myxomycetes belonging generally to the order Physarales. The mature phaneroplasmodium appears as a gigantic structure. In the beginning of its development, it appears like the primitive proloplasmodium. However, the multinucleate slimy protoplasm of the phaneroplasmodium is extremely granular. It is distinguished into ectoplasm and endoplasm. On maturity, it has an anterior fan-shaped perforated protoplasm. While, the posterior zone is made of a reticulate network of tubular veins/strands showing brisk streaming movement.

Study 8b: Study of *Stemonitis* sporangia [photographs]

Description: *Stemonitis sp.* occur on dead wood and leaves in clusters. These slime molds are 1-1.5 mm wide and up to 2 cm tall. The brownish, cylindrical top portions (sporangia) are supported by narrow, black stalks. They look like brown hairs growing on wood. At some point, plasmodia convert into spore-bearing structures. In *Stemonitis sp.* the plasmodium converts into a clustered mass of stalked sporangia bearing hypothalli. A sectional view shows columella with capillitia

Students please Note: The relevant photographs will be sent to all of your email-IDs.

Study 10a: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates.

Description: Most of the lichens exhibit in any one of the following 3 primary growth forms:

- i) Crustose**
- ii) Foliose**
- iii) Fruticose**

CRUSTOSE LICHENS-

They have crust like appearance and form a coating over a surface or substratum [rock, soil, car, walls etc.]. They may have bright, vibrant colors [red, orange, yellow] or pale in appearance like greens and grays. Crustose lichens are tightly adhered to or embedded in their substrate. They have no lower cortex and consist of about 3/4th portion of all lichen growth forms.

FOLIOSE LICHENS-

Foliose lichens represent 2 distinct surface. They are attached to the substrate loosely. Their thallus exhibit flattened lobes, which are heteromerous and dorsoventral. There are 2 types of foliose lichen growth forms. One is the laciniate thalli which are attached comparatively firmly to the substratum on which they grow [e.g. *Lobaria pulmonaria*]. The complete lower surface may be in contact with the substratum or the margin of the lobes are free and bends upwards. The attachment is by rhizines or rhizoidal hyphae. The second type or umbilicate lichens have sheet or plate like appearance. Their thalli are attached by a central discoid holdfast known as the umbilicus [all the species of *Umbilicaria sp.*].

FRUTICOSE LICHENS

Fruticose lichens thallii can be extended into a pendant or tufted hair-like, upright branched structure. Many fruticose lichens have round branches covered by a single cortex. Other fruticose lichens show flat branches intermingling with each other.

In *Ramalina* sp., the cortex is round on both branch surfaces. However, in *Evernia* sp., the thallus is tufted from a basal blackened holdfast.

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Study 10b: Study of soredia and apothecium through permanent slides

SOREDIA:

A soredium is the most common method of vegetative reproduction in lichens. Soredia are tiny bulge like outgrowth present on the upper surface by the thallus. They are not covered by any protective outer cortical layer. Soredia can be abundantly produced so that the lichen thallus have a powdery appearance. They are short lived.

Soredia are produced from exposed medulla tissue but commonly they originate from a defined structure, a soralium which is in the algal zone below the upper cortex. Each of them consists of a few algae cells surrounded by a mass of fungal hyphae.

Being very light in weight, they are easily disseminated by wind or rain water. After falling on suitable substratum, they can germinate quickly on damp substrate like tree bark and develop into a new lichen e.g., *Parmelia sp.*, *Bryoria sp.* etc.

APOTHECIUM:

An apothecium is a fungal reproductive structure of the fungal partner in a lichen. The fungus reproduces itself through the production of spores which disseminate and germinate into new fungi. They will *not* produce new lichens. It is to be understood that the fungus and the algal partner must disperse together for a lichen to reproduce.

Apothecia are inconsistent in shape but normally they are disc- or saucer-shaped. This is the ascocarp of the fungal partner which must belong to the Ascomycetes. The hymenium is the tissue containing the asci with ascospores. It generally forms the disc which are concave, flat or sometimes convex upper surface of the apothecium.

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Study 10c: Study of ectomycorrhizae and endomycorrhizae (photographs)

ECTO-MYCORRHIZAE:

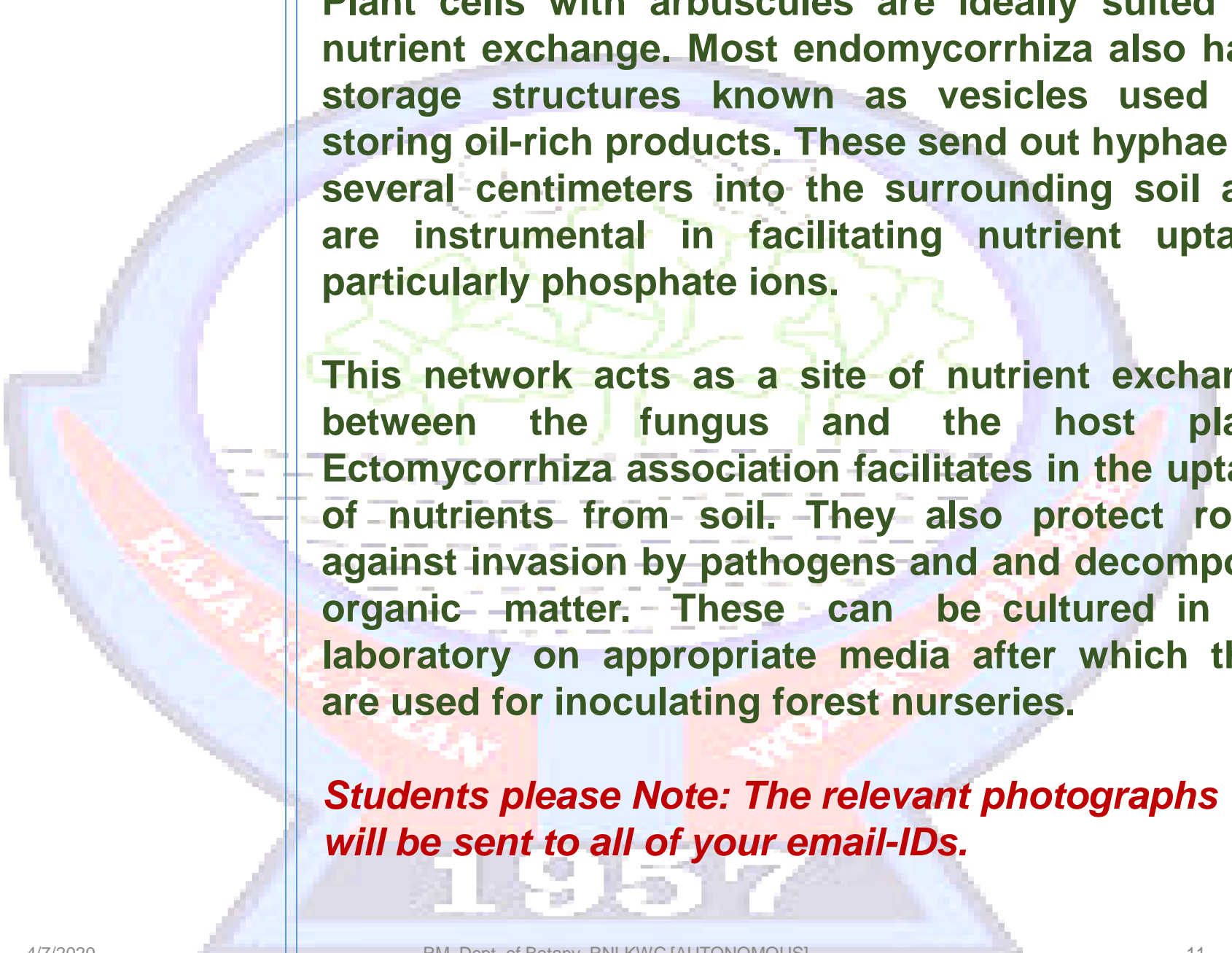
Ectomycorrhiza are the most common type of mycorrhizae. The angiospermic trees of the temperate forest belonging to the families of Pinaceae, Salicaceae, Betulaceae, Fagaceae and Tiliaceae, as well as in some members of Rosaceae, Fabaceae, Myrtaceae and Juglandaceae exhibit ectomycorrhizal associations. Most of fungi are basidiomycetous fungi e.g. *Boletus* sp., *Laccaria* sp., *Rhizopogon* sp., *Scleroderma* sp., *Alpova* sp., *Pisolithus* sp., etc. Some fungal members of Ascomycetes also form ectomycorrhiza e.g. *Tuber* sp., and *Cenococcum* sp. etc.

The mycelium of ectomycorrhizal fungi forms a sheath, or mantle, around the roots of the symbiont plant. From the mantle, a hyphal network called the Hartig net extends into the root, between the cells, usually just a few cells deep penetrating between the epidermis and cortex of ectomycorrhizal plants.

This network acts as a site of nutrient exchange between the fungus and the host plant. Ectomycorrhiza association facilitates in the uptake of nutrients from soil. They also protect roots against invasion by pathogens and decompose organic matter. These can be cultured in the laboratory on appropriate media after which they are used for inoculating forest nurseries.

ENDO-MYCORRHIZAE:

Arbuscular mycorrhiza (AM) earlier known as the endomycorrhiza, are characterized by structures within root cells of tree species called arbuscules. They grow and ramify, tree like, within the cell. The fungal partners belong to the Phycomyetes. Endomycorrhizal associations are found in bryophytes, pteridophytes, gymnosperm (exception Pinaceae) and most of angiosperms, commonly in Fabaceae, Rosaceae, Poaceae and Arecaceae.



Plant cells with arbuscules are ideally suited for nutrient exchange. Most endomycorrhiza also have storage structures known as vesicles used for storing oil-rich products. These send out hyphae for several centimeters into the surrounding soil and are instrumental in facilitating nutrient uptake, particularly phosphate ions.

This network acts as a site of nutrient exchange between the fungus and the host plant. Ectomycorrhiza association facilitates in the uptake of nutrients from soil. They also protect roots against invasion by pathogens and decompose organic matter. These can be cultured in the laboratory on appropriate media after which they are used for inoculating forest nurseries.

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References/sources used:

1. Botany for Degree Students: Fungi. Vashishta B.R./ Sinha A.K. & Kumar Adarsh S. Chand Publishing, 2016
2. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/foliose-lichen>
3. <https://nph.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1469-8137.1987.tb00195.x>

Further reading/ Viewing:

1. <http://website.nbm-mnb.ca/mycologywebpages/NaturalHistoryOfFungi/SlimeMoulds.html>
2. <https://ucmp.berkeley.edu/fungi/lichens/lichenmm.html>
3. <https://www2.palomar.edu/users/warmstrong/pljan98c.htm>
4. <https://www.sciencedirect.com/topics/immunology-and-microbiology/apothecium>
5. http://mycosphere.org/pdf/Mycosphere_6_6_1.pdf