LICHENOLOGY

-Archana

LICHENS

- Slow growing, long living
- Symbiosis of Fungi and Green alga/cyanobcterium
- Phycobiont, Mycobiont
- Fungal partner – absorbs water and protects from drought
- Algal partner – Supplied food
- Worldwide distribution, diverse substrata
- Do not grow in areas with heavy air pollution but can tolerate extreme temperatures

- Saxicoles – on rocks – Eg. Porina
- Corticoles – On tree bark – Eg. Parmelia, Usnea
- Terricoles – In Soil – Eg. Terricoles
- Aquatic – Eg. Hymerelia

- Color of the thallus depends on the algal partner
- Indicators of air purity

Classification based on fungal partner

1. Ascolichen
2. Basidiolichen
3. Deuterolichen

Classification based on thallus

1. **Crustose** – thin, flat, crust-like, firmly attached

Eg. Graphis, Rhizocarp

2. Foliose/foliaceous:

Flat, broad, leaf-like, resembles crinkled leaves, loosely spreads on the substratum with thread like rhizines. Eg. Parmelia

3. Fruticose:

Slender, branched, shrubby. Attached to the base by basal disc, and grows erect or as hangings. Eg. Usnea

4. Leprose:

Fungal hyphae surrounding one or more algal cells. Fruiting bodies not observed so not scientifically identified or named

- **Squamulose:** Scale like forms, slightly lifted from the surface
- **Gelatinous:** Simplest ones- Algae and fungi are equally distributed.

Flavoparmelia caperata

Internal Structure

- **1. Crustose lichen:**
- Homomerous
- Algal and fungal components irregularly distributed
- no definite differentiation of cellular layers

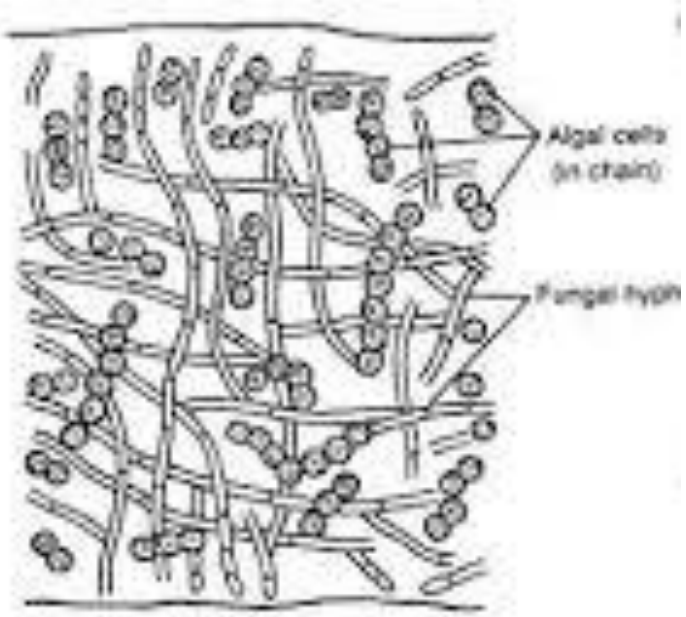
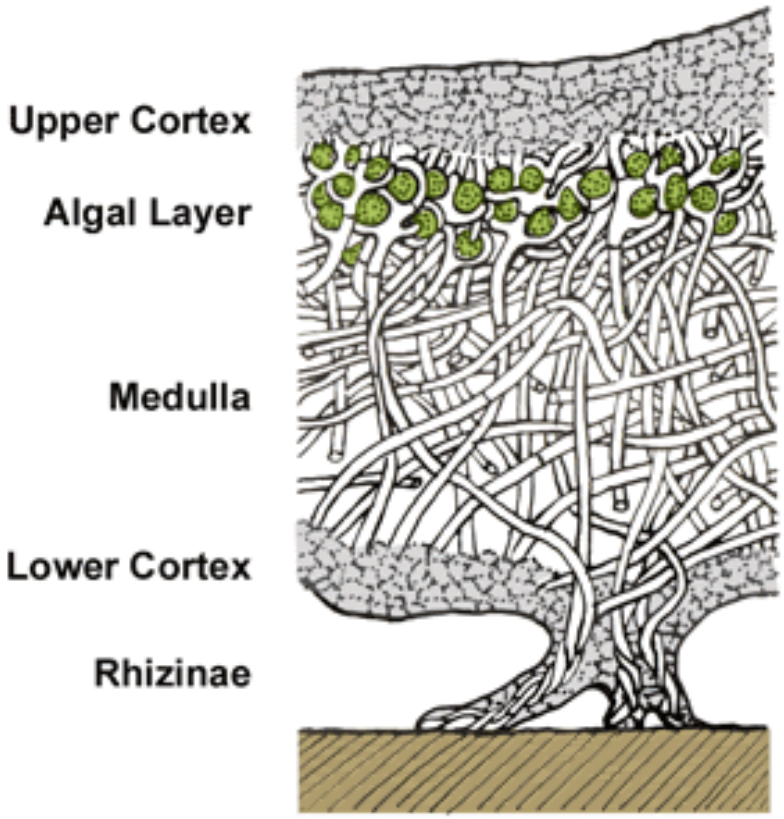


Fig. 4.113 : Internal structure of lichen thallus : A.

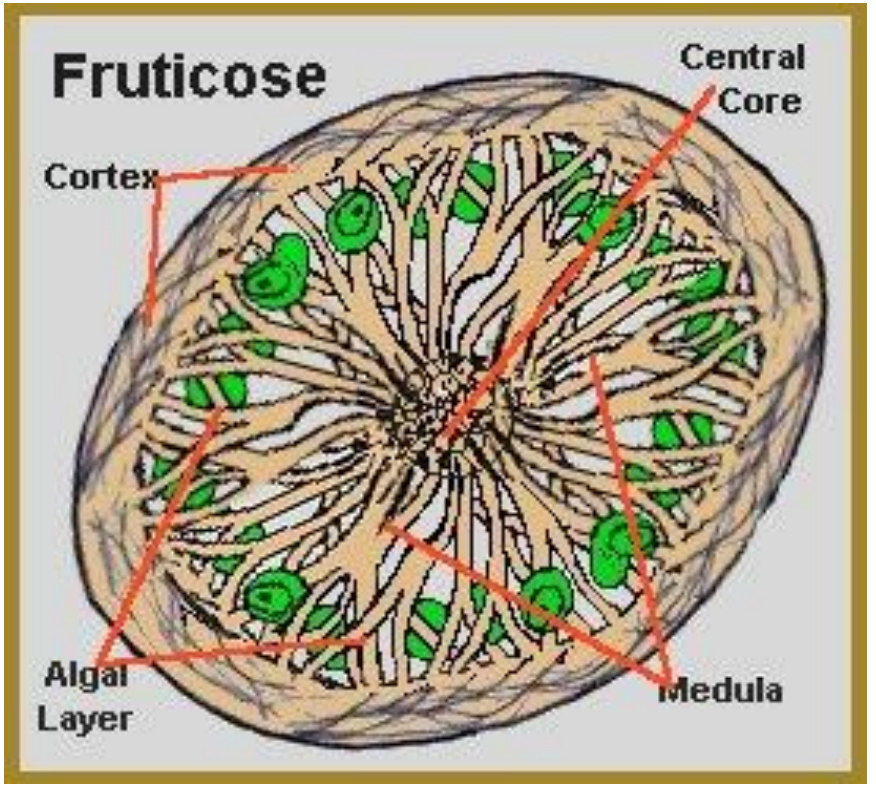
2. Foliose lichen:

- Heteromerous
- Upper cortex (Fungal), algal layer, medulla (fungal – loosely arranged) and lower cortex (Compact fungal)
- Lower cortex with rhizine (attachment)



3. Fruticose lichen:

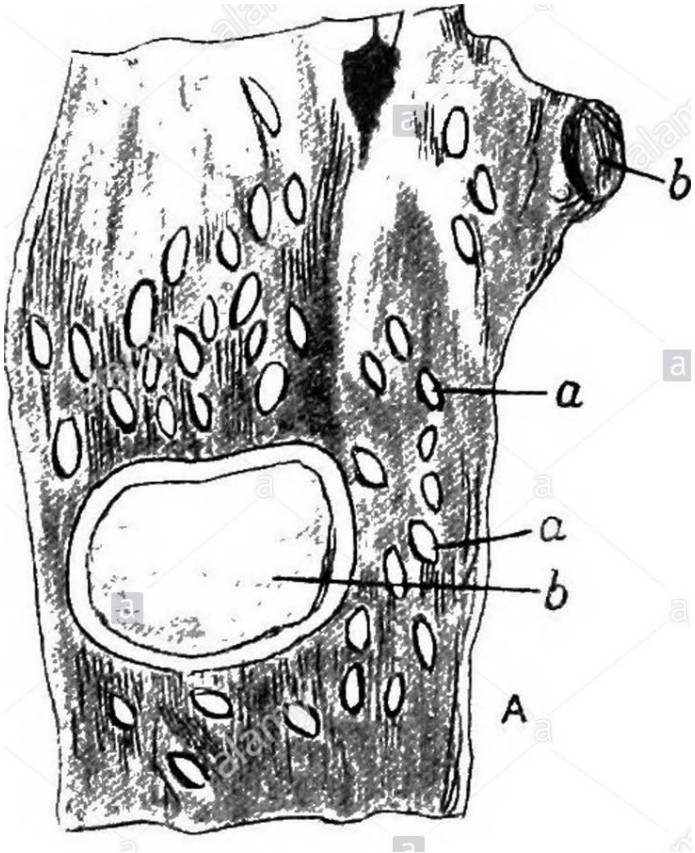
- Radially symmetrical
- Heteromerous
- 3 zones – upper pseudocortex, middle algal and inner medulla
- Pseudocortex – compact fungal
- Middle - photosynthetic
- Medulla – fungal compact



Peculiar vegetative structures

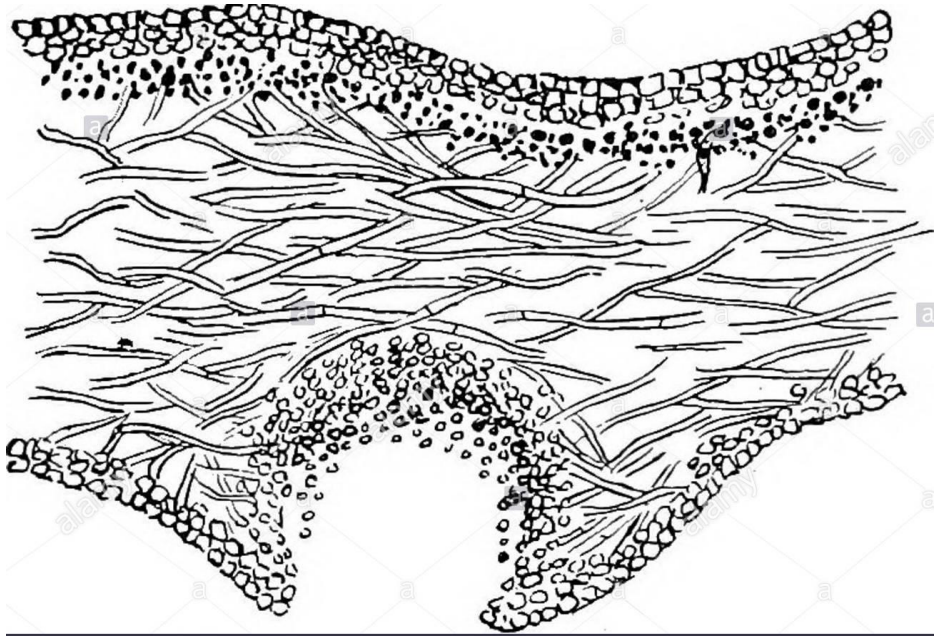
1. Breathing pores:

- Depressions for gas exchange on the upper surface of some foliose lichens
- Loosely woven hyphae



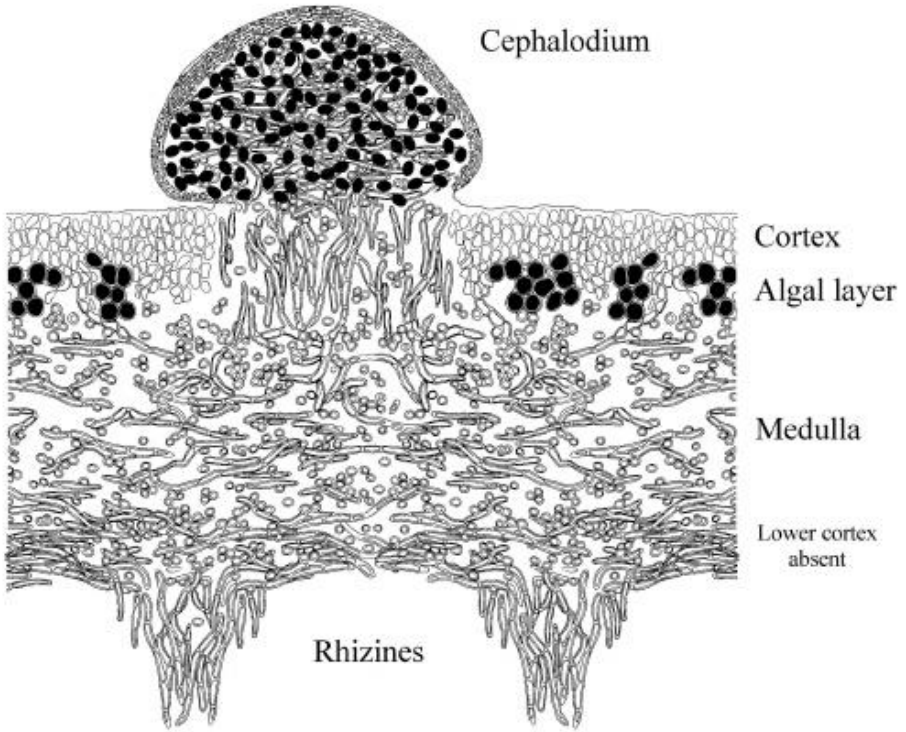
2. Cyphella:

- Circular pits on the lower surface with apical rims
- For aeration and respiration
- Loosely woven fungal hyphae



3. Cephaloidia:

- Small, hard, gall like internal or external swellings
- Formed of algal cells and enclosed by fungal hyphae



4. Isidia:

- Stalked, branched, papillate outgrowths
- Algal and fungal components covered with a cortex
- Increases the photosynthetic efficacy by increasing surface area

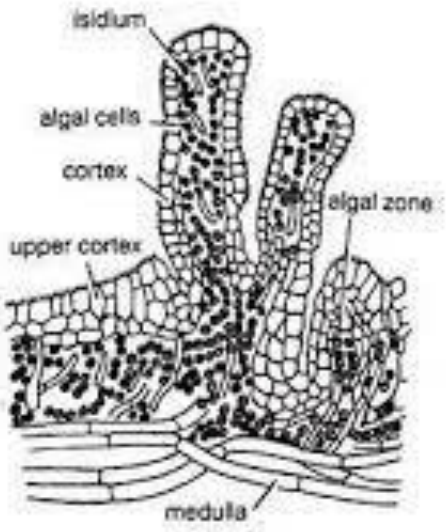


Fig. 11. Lichens : Isidia. Vertical section of thallus passing through isidia

5. Soredia:

- Minute rounded bud like outgrowths
- Appear as greyish powder in the surface
- Each soredia has one or more algal cells covered by fungal mycelia
- Disseminated by wind
- Vegetative reproduction

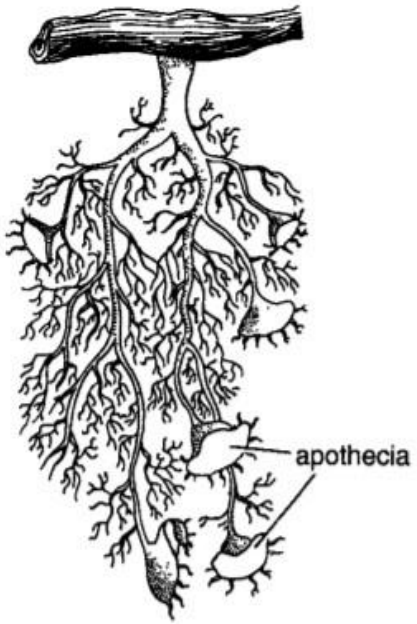
USNEA

Class: Lichens

Sub-class: Ascolichens

Type : Fruticose

- Cylindrical, ribbon-like, extensively branched thallus
- Heteromerous
- Algal component restricted to a specific zone

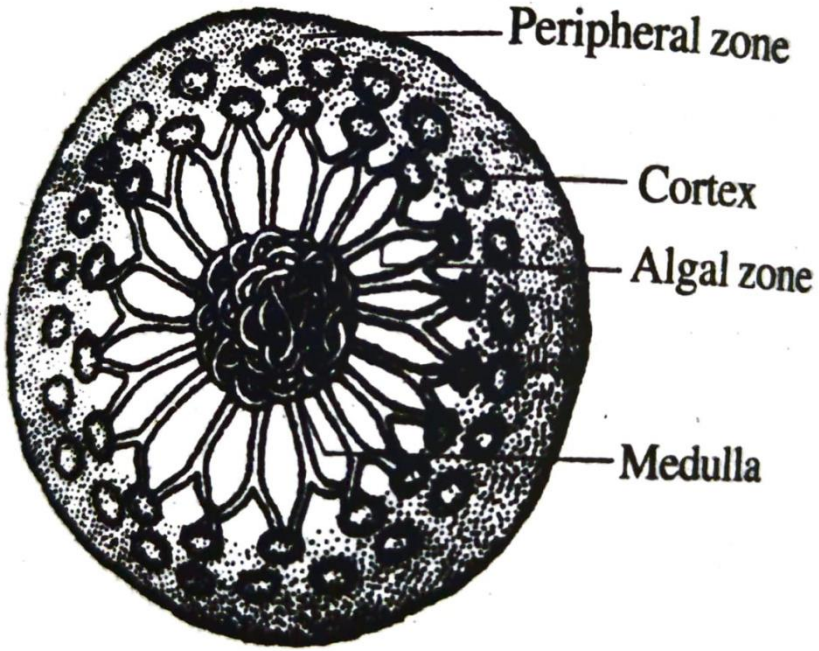


Usnea sp. A fruticose ascolichen to show external features.

Thallus structure

- C.S reveals 4 major zones

1. **Peripheral zone:** thick, protective, closely interwoven hyphae with mucilage
2. **Cortex:** Broad, loosely interwoven hyphae
3. **Algal zone:** loose hyphae tangled with algal cells, photosynthetic
4. **Medulla:** central core, closely interwoven hyphae



T.S. of thallus

Reproduction

1. **Vegetative reproduction**

- Fragmentation
- Soredia

2. Sexual reproduction

- Performed by the fungal partner
- Male – **Spermagonium** – flask shaped immersed in thallus, fertile hyphae produces rounded cells at the tips – Spermatia, non-motile and liberated
- Female – **Ascogonium** – on ascogonial filament – has a coiled structure with a straight trichogyne

Fertilization:

- Spertmatia liberated
- Reaches trichogyne
- The cells in between them dissolves
- Nucleus of spermatia passes to ascogonium
- Dikaryotization and formation of diploid ascogonium
- Trichogyne collapses and asci are produced at the terminus
- Each ascus has two haploid nuclei which fuses and forms a diploid nucleus – divides twicw forming acospores (n)
- Sterile hyphae - paraphyses

Structure of Apothecium

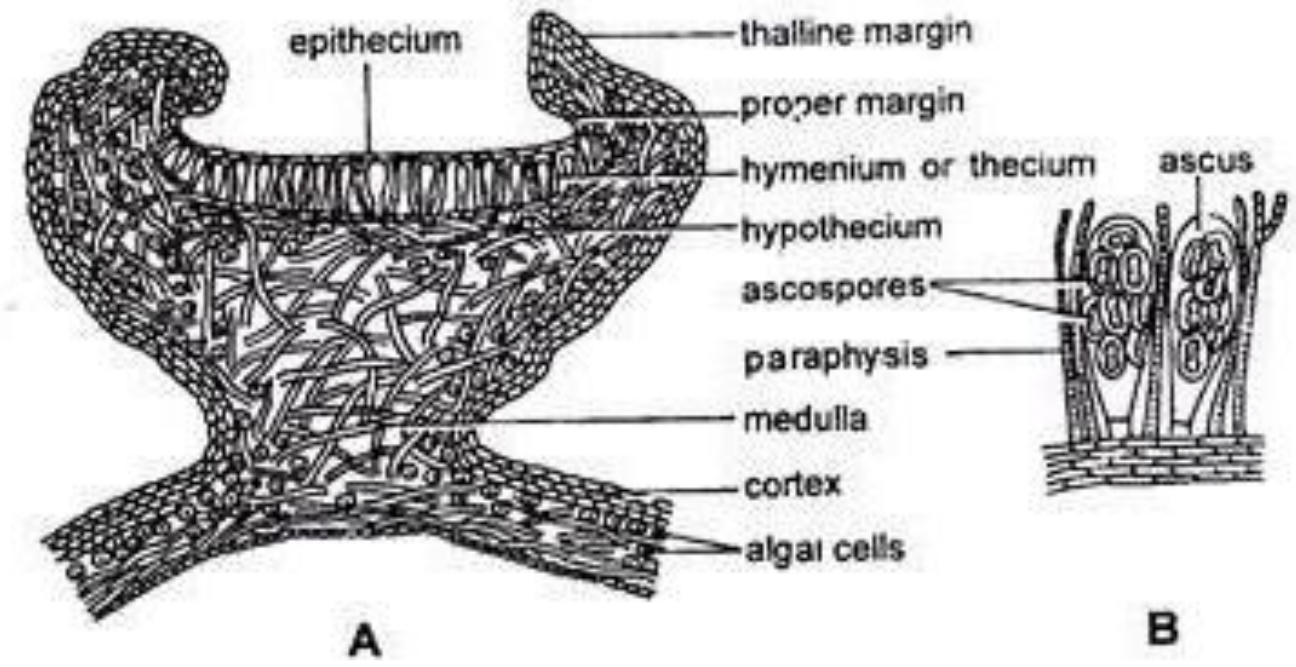


Fig. 14. Lichens : (A) Apothecium. Vertical section of apothecium, (B) Highly magnified portion of hymenium

Economic importance

- Nutritional purposes - Cladonia
- Medicinal uses – Usnic acid
- Industrial uses- pH indicator
- Food – Lichenin carbohydrate
- Dyes – hydroxyaldehydes
- Cosmetics and perfumes