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➤ Lichens are a small group of curious plants. They are made up of **algal** and **fungal** components living in **symbiotic relationship**. The algal component is known as **phycobiont** the fungal component as **mycobiont**.

➤ The term lichen was first given by **Theophrastus** for superficial growth on bark of *Olea europea* (olive tree)

➤ Initially lichens were considered to be individual plants and were included in mosses, but later Schwendener (1867) gave the dual hypothesis i.e. there are two components in Lichen and defined lichen as “Fungi parasitizing algae”.

➤ Lichen is quite different from the algal and fungal partner

➤ They are in mutual association where both the partner get benefited.

➤ Largely the mycobionts belong to Ascomycota (cup fungi) but, few of them belongs to Basidiomycetes (Mushroom) or Deuteromycetes (fungi imperfect).

# Habitat of Lichens

Lichens grow in varied habitat and can also grow in such habitat where other plants would not grow , e.g. bare rocks and arctic region.

On the basis of habitat Lichens are following types:

1. **Saxicolous lichens:** Lichens which grow on rocks
2. **Corticolous lichens** – Lichens grow on bark of tree

The bark help lichens in trapping their spores

It contain mostly fruticose and foliose species

3. **Terricolous lichens:** Lichens grow on earth crust

✓ Often form a dominant component of the ground vegetation in the extreme environments.

✓ It plays a vital role in maintenance and ecological stability of the soil crusts with reference to their physical stability, hydrology and growth of soil microflora.

# Classification of Lichen

## A. Classification on the basis of fungal partner

### 1. Ascolichens: Fungal partner belong to ascomycetes

(a) **Gymnocarpae** : Fruiting body is disc like apothecium . These lichens are also known as discolichens. e.g. *Parmelia*

(b) **Pyrenocarpae** : Fruiting body is flask shaped perithecium.

e.g. *Dermatocarpon*

2. **Basidiolichens**: The fungal component of these lichen is the member of class Basidiomycetes. e.g. *Corella* , *Dictyonema*

## B. Classification on the basis of structure of lichen thallus

Lichens are of three types

1. **Crustose lichen**: These are present in the form of thick layer on the substratum and these can not be separated without breaking them.

e.g. *Rhizocarpon* , *Lecanora*





**Fig: Crustose lichen**

**2. Foliose lichens:** These are like dried leaves and lobed thallus. They are attached with substratum with the help of rhizoid like rhizines.

e.g. *Parmelia*, *Peltigera*, *Xanthoria*, *Physcia* etc.



**Foliose lichens**

**3. Fruticose Lichens:** These are shrubby lichens with well developed, shrub like cylindrical and branched thallus. They grow erect or hang from the substratum. The plant body is attached to the substratum with the help of a basal mucilagenous disc.

e.g. *Alectonia*, *Cladonia*, *Letharia* and *Usnea*



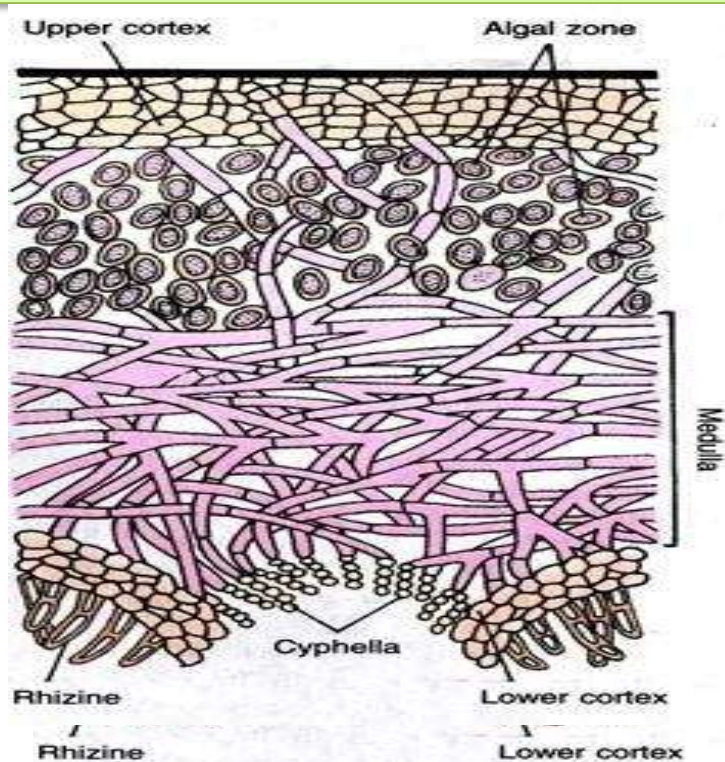
**Fruticose lichen**



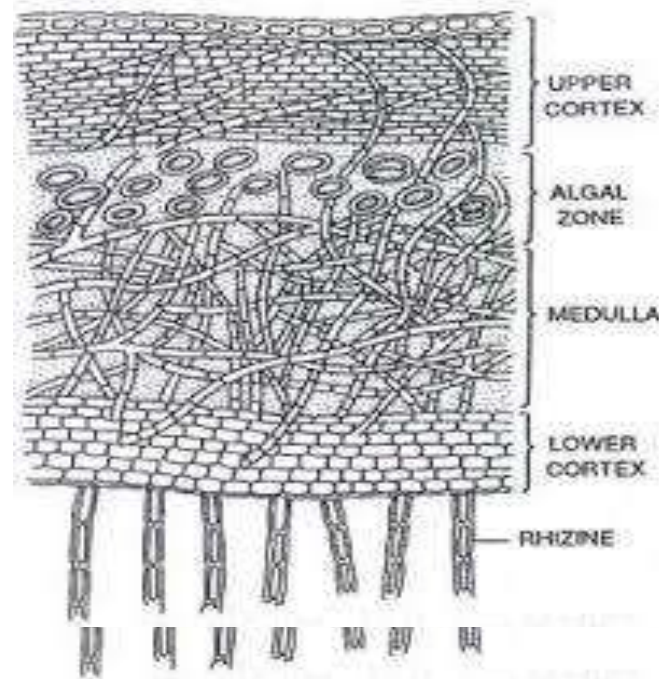
## C. Classification on the basis of anatomy of thallus

1. **Homiomorous:** Where algal and fungal partners are uniformly distributed throughout the lichen thallus. These are rare e.g. *Leptogium* and *Collema*
2. **Heteromorous:** Algal and fungal partners are not uniformly distributed. These are common and most of the lichens are of this types.

The different zones are upper cortex, algal zone, medulla and lower cortex.



**Fig. V.S of heteromorous lichen thallus passing through cyphella**



**Fig. V.S of heteromorous lichen thallus**

In thallus the mycobiont predominates with 90% of the thallus volume and provides shape, structure and colour to the lichen with partial contribution from phycobiont.

The thallus of the lichen is divided into three layers :-

1. Cortex
2. Algal layer (Photobiont)
3. Medulla

### **1. Cortex Layer**

- It is band of compacted fungal hyphae.
- Cortex serve as a protecting layer and consist of upper and lower cortex layer.
- The upper cortex layer protect the tissues beneath and also supplies mechanical support to prevent the breaking of the thallus due to winds or other external forces.
- The lower cortex layer present in some ,is same as upper cortex layer and possess rhizoids.



## **2. Algal Layer (Phycobiont)**

- ✓ Algal cells are present which are completely surrounded by fungal tissue.
- ✓ This layer is responsible for by photosynthesis and providing food.
- ✓ It makes a great contribution in thallus colour

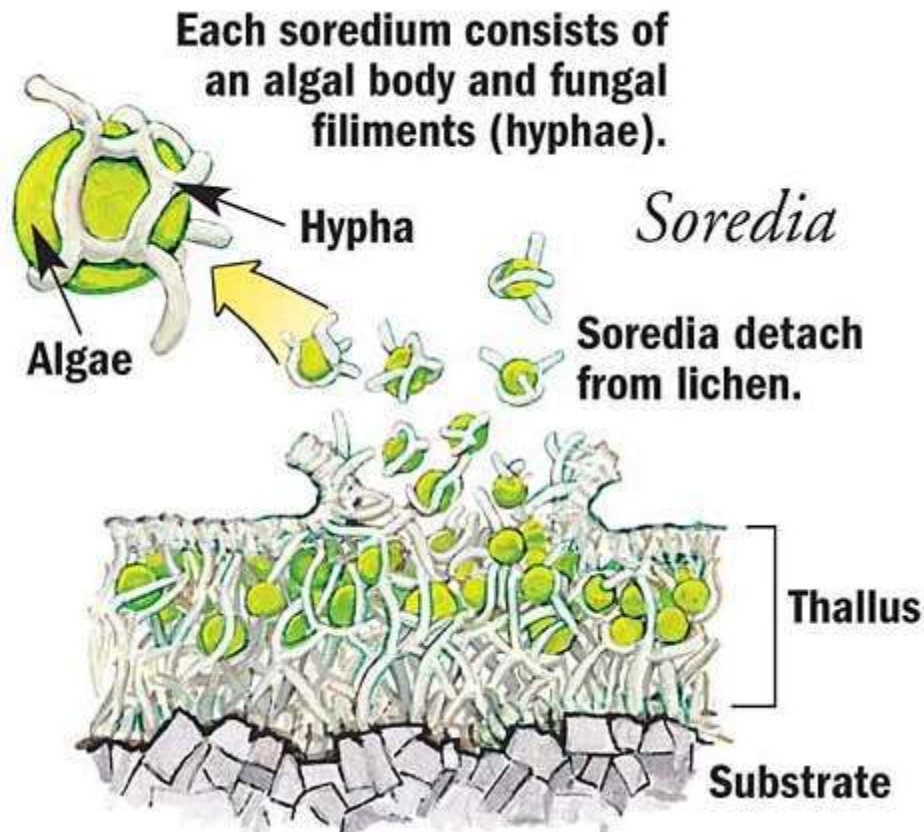
## **3. Medulla**

- ✓ It is a loose weave of fungal hyphae.
- ✓ Lichen thallus is majorly consist of medulla

## **Reproduction in Lichens**

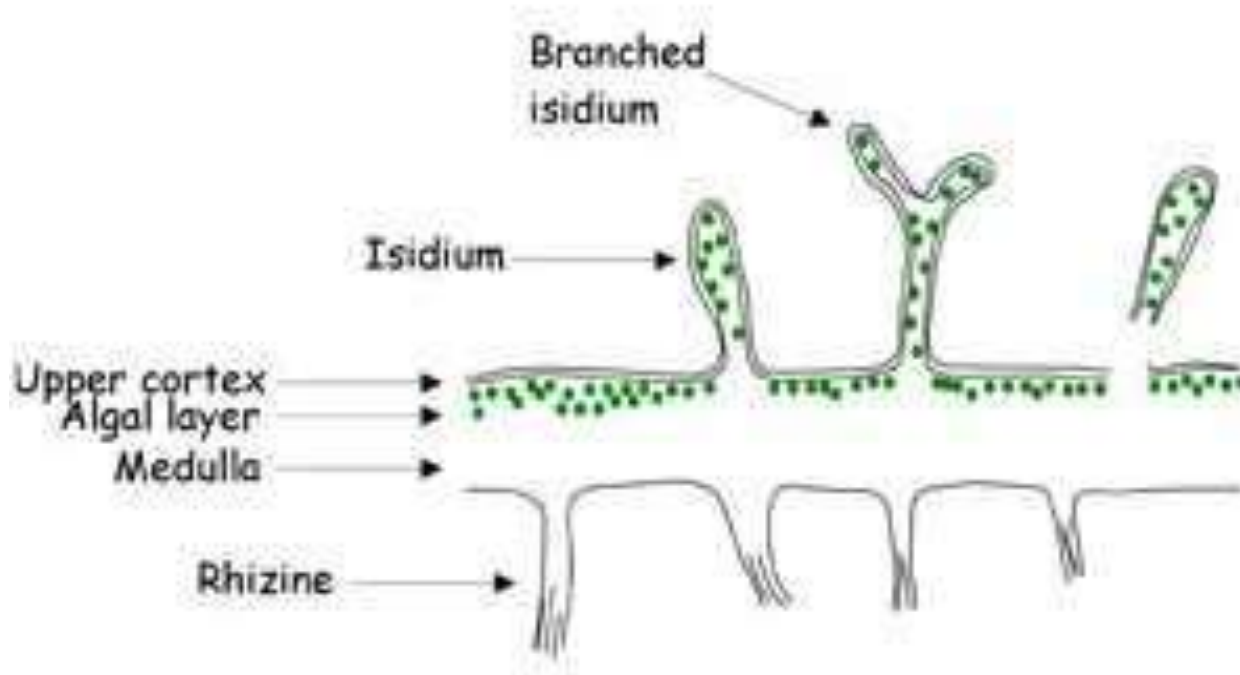
- The vegetative reproduction in lichens takes place by fragmentation and also achieved by the development of special propagules which are unique to lichens.
- Vegetative propagules of lichens are:- Soredia, Isidia, and various thalline structures such as squamules, lobules, phyllidia, blastidia, fragments or even the whole thallus.
- commonest among them are soredia and isida

**Soredia:** Are cluster of algal cells wrapped into the fungal hyphae. It originate in the medulla and algal layer and erupt through pores or cracks in the cortex. It can grow anywhere on the thallus but sometimes soredium production is confined to delimited area called **Soralia** .



**Isidia:-** Are stalked, branched or unbranched, outgrowths form on the thallus surface. It consists of algal cells and fungal hyphae covered by cortex.

- When it detaches from the parent and give rise to the new thallus. or if it remains in the parent thallus it will increase the photosynthetic efficiency by increasing the surface area
- Fruticose and foliose produce isidia but it is much rare in crustose lichen



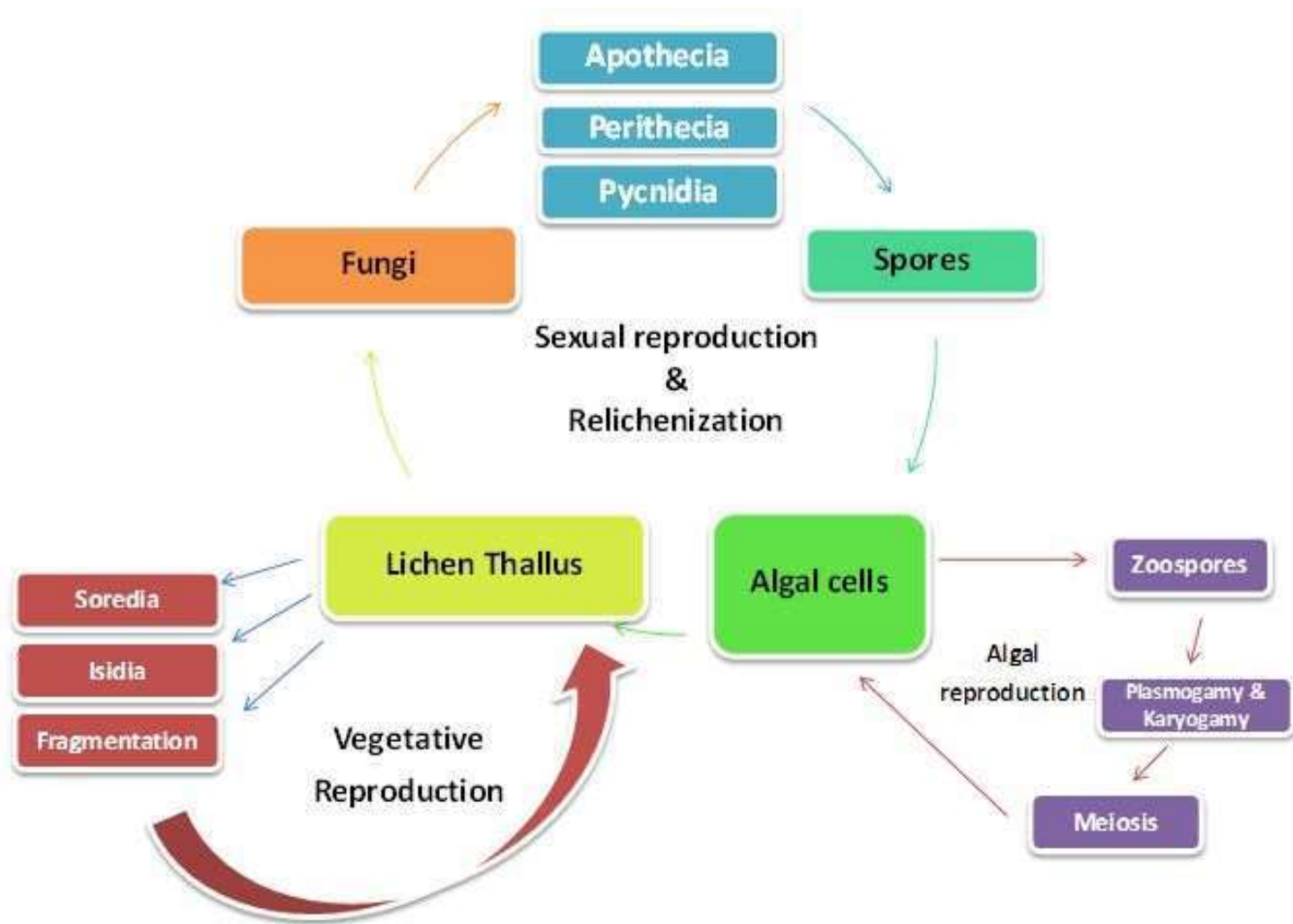
**Asexual reproduction:** By formation of pycnidiospores or pycniospores which are produced inside pycnidium which is a flask shaped structure opening through a pore called ostiole. Pycniospores on coming in contact with suitable algae form new lichen thalli.

## **Sexual reproduction**

Sexual reproduction is the function of fungal partner. Only fungal partner reproduce sexually, and the new fungus that grows must have to find it an alga partner.

➤ As a result, asexual reproduction is more beneficiary than sexual reproduction in the lichen world.





**Life cycle of lichens**

## Some special structure associated with thallus of lichens

**Breathing pores:** Loosely arranged areas in upper cortex are breathing pores and help in gaseous exchange.

**Cyphellae:** Loosely arranged areas in lower cortex are cyphellae and these also help in gaseous exchange . Cyphellae are analogous to stomata of higher plants.

**Cephalodia:** These are rounded outgrowth on the upper cortex surrounded by cortex. They retain moisture.

**Isidia:** Elongated outgrowths on upper cortex containing same algal and fungal partners as are found in main lichen thallus. They increase the surface area of lichen and are means of vegetative reproduction.

## ECONOMIC IMPORTANCE OF LICHENS

**Lichens as food and fodder:** *Cladonia rangifera* (reindeer moss) are found in tundra region is used as food and fodder for reindeer , musk etc.

- *Parmelia* is used as food in South India
- *Lecanora* is used as delecious food in Israel
- *Cetraria* (Iceland moss) is edible in Iceland

### **Lichens as source of Dyes:**

- Litmus(acid base indicator) is obtained from *Roccella montaignei*.
- Orchil (blue dye) is obtained from *Cetraria* and *Lecanora*.

### **Lichens as source of medicines:**

- Usnic acid an important broad spectrum antibiotic is obtained from *Usnea* and *Cladonia*
- *Peltigera canina* is used against hydrophobia.
- *Xanthoria parietina* is used against jaundice.
- *Lobaria pulmonaria* is used against lung infection.

**Role of Lichens in soil formation:** Lichens secrete some organic acid which break down rock and help in soil formation

**As culture media:** Lichens are important constituents of some culture media used for culture of fungi and bacteria in laboratories

**Lichens as source of cosmetics and perfumes:** Some lichens having aromatic odour like *Everina* and *Ramalina* are used for manufacturing soaps

**Ecological importance:** Crustose lichens are pioneers in xerosere

**Lichens as indicators of SO<sub>2</sub> pollution:** As lichens are very sensitive to air pollution, specially SO<sub>2</sub> pollution, so serve as indicator of air pollution





**Thank You !!**