

CONCEPT MAP

LICHENS

Lichens are composite or **dual organisms** representing an intimate symbiotic relationship between algae and fungi (De Bary, 1879). The algal component of lichen is known as **phycobiont** whereas the fungal component is known as **mycobiont**. The fungal component predominates algal component, such an association is known as **helotism** (Crombic, 1885). There are about 400 genera and 1600 species of lichens. They usually grow on bark of trees, dry logs (**corticolous**), bare rocks (**saxicolous**) or soil (**terricolous**), etc.

Classification

On the basis of fungal component

Ascolichens

The fungal component of these lichens is a member of Class Ascomycetes. They are called **gymnocarpeae** if the fruiting body is a disc like apothecium (also known as discolichens, e.g., *Parmelia*). They are called **pyrenocarpeae** if the fruiting body is a flask shaped perithecium (also known as pyrenolichens, e.g., *Dermatocarpon*).

Basidiolichens

The fungal component of these lichens is a member of Class Basidiomycetes. Genera like *Corella* and *Dictyonema* belong to this group.

Deuterolichens

The fungal component of these lichens belongs to Class Deuteromycetes.

On the basis of external morphology

Crustose lichen

These are encrusting lichens with an inconspicuous, thin and flat thallus, firm in texture. The thallus is very closely adhered to the substratum and provides a crust-like appearance.

Examples: *Graphis*, *Haematomma*, *Lecanora*.



Crustose lichen

Foliose lichen

These lichens are flat with leaf-like and lobed thallus attached to the substratum with the help of rhizoid-like **rhizines**.

Examples: *Parmelia*, *Physcia*.



Foliose lichen

Fruticose lichen

Shrub-like, cylindrical and branched thallus that grow erect or hang from the substratum with the help of a basal mucilaginous disc.

Examples: *Alectonia*, *Cladonia*.



Fruticose lichen

Internal Structure

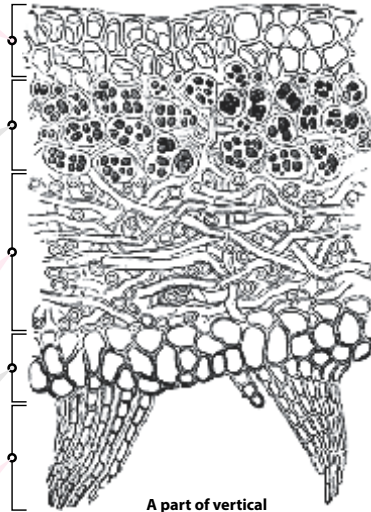
Upper cortex
Composed of compactly interwoven fungal hyphae arranged at right angles to the surface of thallus, usually lacking intercellular spaces (if present, then filled with gelatinous substance).

Algal zone
This layer is composed of green or blue green algae. The algal cells remain embedded in the tangled network of fungal hyphae. Sometimes algal cells and fungal hyphae are uniformly distributed throughout the thallus (**homoisomerous**) whereas sometimes algal cells form a distinct layer within thallus (**heteromerous**).

Medulla
Central part of thallus, comprised of loosely interwoven fungal hyphae with large spaces between them.

Lower cortex
Composed of compactly arranged fungal hyphae running parallel or perpendicular to surface of thallus.

Rhizines
Some hyphae of lower cortex descend down and help in attachment of thallus to substratum. These are known as rhizines.



A part of vertical section of lichen

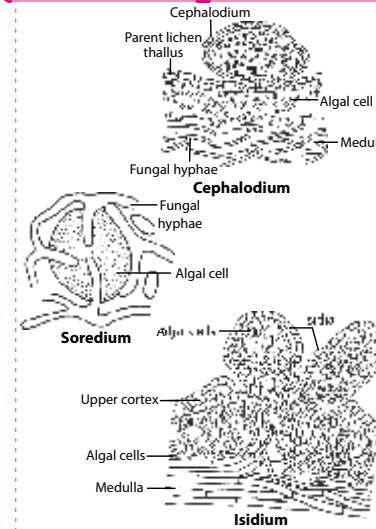
Reproduction

Lichens reproduce both by asexual and sexual means.

Asexual reproduction

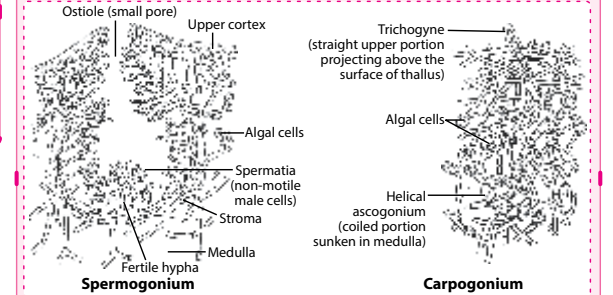
Asexual reproduction occurs by following structures:

- Cephalodium** : These appear as small, hard, dark-coloured, gall-like swellings on the free surface of some lichen thalli. They contain the same fungal hyphae as in the thallus but the algal component is always different.
- Soredium** : Small bud-like outgrowths over the upper surface of thalli, containing one or few algal cells closely enveloped by a weft of fungal hyphae. Both fungus and alga are same as in parent thallus.
- Isidium** : These are small outgrowths on the upper surface of the lichen thallus each consisting of an outer cortical layer made up of fungal cells followed by an algal layer of the same kind as in the thallus.

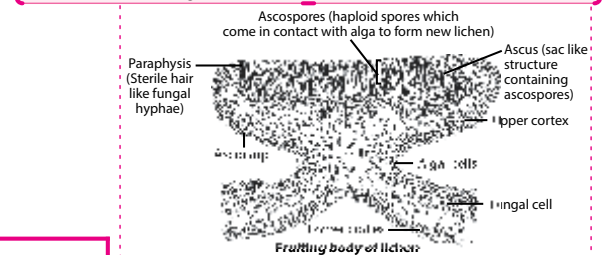


Sexual reproduction

In lichens, the process of sexual reproduction is performed only by the fungal component. The female sex organs are known as **carpogonia**. The male sex organs are known as **spermatogonia**. A carpogonium is differentiated into a basal coiled ascogonium and an elongated multicellular trichogyne. Each spermatogonium is a flask-shaped receptacle immersed in a small elevation on the upper surface of thallus. The spermatogonium usually develops close to carpogonium.



Spermata adhere to the projected part of sticky trichogyne. On dissolution of the walls between them the nucleus of spermatium migrates into the carpogonium through trichogyne. The male nucleus fuses with the female nucleus. Several branched ascogenous hyphae develop from the base of the fertilised ascogonium. The terminal binucleate cell of ascogenous hypha develops into an ascus. The two nuclei within the ascus fuse to form a diploid nucleus which forms eight haploid daughter nuclei meiotically, each metamorphosing into an ascospore. The ascospores are hyaline and green or brown in colour. They are released gradually from the ascus, and on coming in contact with a suitable alga, form a new lichen thallus.



Economic Importance

- As food** : Species of *Lecanora*, *Parmelia*, *Umbilicaria* and *Cetraria islandica* are used as food in many parts of the world. *Umbilicaria esculenta* is a delicacy in Japan, while the species of *Parmelia* are used as curry powder in India.
- As medicine** : *Parmelia perlata* is specially useful in dyspepsia and in the treatment of snake and scorpion bites. *Cladonia*, *Cetraria* and *Pertusaria* are used in intermittent fever. *Cladonia pyxidata* is useful in whooping cough. *Usnea* sp. are used to stop bleeding. Erythrin, obtained from *Roccella montagnei*, is used in angina. *Lobaria pulmonaria* and *Cetraria islandica* are used in tuberculosis and other lung diseases.
- As dyes** : Red and purple dyes are obtained from *Ochrolechia androgyna* and *O. tartarea*. **Orchil**, a blue dye is obtained from some lichens (e.g., *Cetraria islandica*). *Parmelia omphalodes* is the source of a brown dye. **Litmus**, an important acid-base indicator dye in chemical laboratories, is obtained from *Roccella montagnei* and *Lasallia pustulata*.
- In tanning industry** : *Cetraria islandica* and *Lobaria pulmonaria* are used as tanning agents in leather industries.
- In cosmetics** : *Evernia* and *Ramalina* are the source of essential oils, used in the manufacture of cosmetic soaps. *Ramalina calcaris* is used for whitening hair in wigs. *Pseudevernia furfuracea* and *Evernia prunastri* are widely used in the manufacture of perfumes.

Ecological Significance

Lichens are pioneer plants in ecological succession, which help in colonisation of bare rocky habitats. They secrete some organic acids which disintegrate rocks and form soil and substratum for subsequent establishment of other vegetation types. Lichens can be used as air pollution indicators especially of the concentration of sulphur dioxide in atmosphere. Several lichens are also harmful to us. They cause a considerable loss due to etching of glass surfaces and marble stones. Some lichens, such as *Letharia vulpina* (wolf moss) are poisonous.