



## Lichens: A Beneficial Alliance of Fungus and Algae

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A lichen is now defined as a 'self-supporting association of a fungus (mycobiont) and a green alga or cyanobacterium (photobiont), 'resulting in a stable thallus of specific structure'. In other words the permanent symbiotic association between fungi and algae is called Lichen. The fungal component of lichen is called Mycobiont. The algal component of lichen is called Phycobiont. The branch of biology deals with lichens is called Lichenology. Acharius is considered as Father of lichenology

The association between two organisms where both partners are mutually benefitted is called Symbiosis. The term symbiosis was coined by de Bary. Algae prepares the food and diffuses out which is absorbed by the fungus. In turn, the fungus protects the algae from unfavourable conditions and provides water and minerals. This type of symbiosis is called Heliotism. Mycobiont is predominates in lichens than algal component (~ 90%). Lichen body neither resembles algal or fungal morphology. In 1868, Schwendener (Swiss botanist), discovered the dual nature of lichens. Lichen produces a specific acid known as lichen acid.

The fungal partner usually contributes most of the biomass to this symbiosis, including the external surface. It is thus termed the exhabitant, whereas the unicellular or filamentous photobiont cells are collectively called the inhabitant because they are located inside the lichen thallus. Most lichens have a characteristic appearance which permits their identification if suitable keys are available.

### Distribution

There are 13500 known species of lichens with world-wide distribution. Lichens can grow in varied environments. They can survive in extreme hot deserts and cold mountain elevations. *Cladoniapocillum* can survive even at 101<sup>0</sup>C. Lichens can survive long periods of drought. They do not grow in and around cities and near smoky polluted industrial areas. Thus lichens used as indicators of air pollution.

### Habitat

Lichens generally grows on tree trunks, foliage, rocks, walls and roof, bare earth. Tree trunks on the hills are the most common site for lichen growth. Lichens are classified based on the habitat things.

Type	Grows on/in	Generally found in
Saxicoles	Rocks	Cold areas of the world
Corticoles	Tree bark	Tropical and sub-tropical areas of the world
Follicoles	Leaves	
Terricoles	Soil	Hot areas with scanty rain and dry summer

Few species of lichen are aquatic (*Peltigera*-marine). Lichens are mostly perennial and slow –growing. Some lichen thalli live for over 1000 years and can be used for determining the age of rock surfaces because of their slow growth rate. This discipline is

known as lichenometry (Hale, 1983; Innes, 1988). Crustose lichens are commonly used for lichenometry because they have the slowest growth rate. An example is the 'map lichen', *Rhizocarpon geographicum*. Lichens are the first to start colonization of bare rocks. Order of capacity to start rock colonization: crustose > foliose. Lichens can cause the weathering of rocks by secreting oxalic acid which reacts chemically with the rock surface; the rate of degradation may be 0.53.0 mm/ century.

### Composition of Lichens

Lichens are composed of mycobiont and photobiont. Generally mycobionts are mainly Ascomycotina and few Basidiomycotina and Anamorphic fungi. In Ascomycotina, majority are Discomycetes and others are Pyrenomycetes or Loculoascomycetes.

Photobionts are generally belongs to 26 genera. Among them 18 belongs to Chlorophyceae (*Trebouxia*, *Cladophora*, *Trentepohlia*), 7 belongs to Cyanophyceae (*Gloeocapsa*, *Nostoc*) and remaining one related to Xanthophyceae (*Heterococcus*).

*Nostoc* (blue algae) and *Trebouxia* (green algae) are most common photobionts

### Classification of Lichens

Since the structure of lichens is almost entirely due to the fungal partner, lichen taxonomy is synonymous with the taxonomy of the mycobiont. Lichens are classified based on the nature of the mycobiont and kind of the fruiting body.

1. Ascolichens
2. Basidiolichens
3. Lichen imperfectii

(1). **Ascolichens:** Majority of lichens are Ascolichens. Mycobiont belongs to Ascomycotina. They are again classified into

- A. Gymnocarpae : in which the fruiting body is Apothecium.
- B. Pyrenocarpae : in which the fruiting body is Perithecium.

(2). **Basidiolichens:** Mycobionts belongs to the Basidiomycotina. They produce basidia and basidiospores during reproduction. Eg: *Cora*.

(3). **Lichen Imperfectii:** Fungal component belongs to Deuteromycotina, lacks sexual reproduction.

### Morphology of The Lichen Thalli

Lichen exhibits numerous thalli, those are grouped under

#### I. Crustose: (crust like)

- Most common type is the crustose thallus.
- Fungal hyphae are loosely associated with photobiont cells.
- Examples: *Graphis*, *Verrucaria*

#### II. Foliose: (leaf like)

- Lower cortex is present below the medulla
- Attachment to the substratum is often by bundles of hyphae termed rhizinae.
- As a result, the thallus appears leaf-like or lobed and can be detached from the substratum without being damaged.
- Example: *Physcia*, *Sticta*, *Parmelia*

#### III. Fruticose : (shaped like a miniature shrub)

- The thallus has a shrub-like or branched appearance and is raised from the substratum or hangs down from it.
- In some cases a fruticose thallus may develop from a basal crustose or foliose thallus. Stratification in fruticose thalli is often tubular/ concentric rather than horizontal.
- Examples: *Uronea*, *Cladonia*, *Evernia*

## Reproduction of Lichens

Most lichen thalli produce vegetative propagules containing both symbionts. The most common vegetative propagules are soredia, i.e. small clumps of hyphae enclosing a few algal cells. They are produced over the entire surface of the thallus or in differentiated structures called soralia. Soredia are usually hydrophobic and are dispersed by wind, perhaps following their initial detachment by the impact of a rain drop. Isidia are larger, upright cylindrical structures which contain both symbionts. They serve to increase the surface area of the lichen thallus but can also become detached and then function as vegetative propagules. In some lichens such as *Cladonia*, squamules broken off a vegetative thallus are capable of establishing a new thallus. Animals can also play a role in dispersing lichens.

## Uses

- The reindeer moss in tundra and the 'Iceland moss' in Iceland and some sps of *Lecanora* are used in the cure of hydrophobia
- The lung wort- *Lobaria pulmonaria* is used in the treatment of lung infections
- Orchill obtained from sps of *Roccella* and *Lecanora* is used in dyeing of woolen and silk fabrics
- The strain purified form of orchill used for microscopic preparation

## References

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2. Introduction to Fungi, H.C. Dube
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