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A STUDY OF UNVEILING THE HIDDEN WORLD OF LICHENS

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ABSTRACT
The word symbiosis has shown to be quite effective in describing the interaction between the two different species present in lichens, since it entails the primary attribute of living in a synchronized and well-mixed fashion so as to create a single biological unit. When the algal partner (photobiont) absorbs moisture and carbon dioxide from the atmosphere through the tissues of the mycobiont, it acts as a heterotroph and the fungus (mycobiont) gain photosynthetic products from the algae. It has been demonstrated physiologically and ultrastructurally that the fungus parasitizes the algae in a regulated manner, and in a few cases, kills the algal cells, making lichen relationships an example of commensalism or even parasitism, depending on the species. For the most part, lichenized fungi are ecologically obligatory biotrophs yet physiologically flexible. In lichens the mycobiont accounts for most of the thallus's volume and provides the lichen's form, structure, and color, with some help from the algae. As a result, lichens are classified according on how their mycobionts are classified, and are not traditionally considered to be a distinct taxonomic category. Less than half of all ascomycetes and one-fifth of all fungus live in lichens.

KEYWORDS: Unveilin, Hidden World, Lichens, word symbiosis

INTRODUCTION

Formed by the symbiotic relationship of representatives of as many as three kingdoms—fungi and a protista or a monera—lichens are a distinct class of perennial cryptogamic creatures. Theophrastus, the "father of botany," used the name "lichen" in 300 B.C. to describe the thin layer of lichens that forms on the outer layer of olive tree bark. When first characterized, lichens were classified with other algae and mosses based on their outward appearance. On the other hand, de Tournefort (1700) classified "lichens" as a distinct genus within the plant kingdom. Erik Acharius, the "father of lichenology," invented various words based on the unusual structures of lichens, and he classified many new genera and species based on exterior morphology in his enormous works. After the invention of the microscope, the dualistic theory of lichens was discovered, and since then, other definitions have been developed for use in modern writings. Until the publication of "Introductory Mycology," lichens were understood to be any relationship between a fungus and an alga in which the two organisms were so entangled as to form a single thallus. Nevertheless, lichens were properly characterized by Kirk et al. (2001) as an ecologically obligatory,

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persistent mutualism between an exhabitant fungal partner and a resident population of extracellularly situated unicellular or filamentous algal or cyanobacterial cells.

Lichens' photobiont consists of both prokaryotic (Cyanophyceae) and eukaryotic (Chlorophyta) organisms, and they are typically basic photosynthetic organisms (Tribophyceae, Phaeophyceae, Chlorophyceae and Pleurostrophyceae). Except for the thalli of cyanolichens, where the photobionts are evenly dispersed, the photoautotrophic mass is often less than 10% of the total thalline mass. Over 100 species of photosynthetic partners from 43 genera and 5 classes have been identified as main or secondary constituents of lichen taxa. Ninety percent of all lichens belong to the genus Trebouxia, followed by the green alga Trentepohlia and the oxygenic photosynthetic bacterium Nostoc.

Reproduction, structure and classification of lichens

Lichens are capable of sexual and asexual reproduction. Although the photobiont of lichens can reproduce in a limited fashion, the mycobiont has the potential to completely express itself through both sexual and asexual reproduction. Nevertheless, horizontal or vertical transmission of the photobiont is necessary for lichens to reproduce, as both the fungal and photosynthetic partners must be passed on from one generation to the next. The mycobiont, which is responsible for horizontal transmission of the photobiont, reproduces sexually by way of fusion and meiosis, resulting in the formation of spores. This kind of reproduction is frequently viewed as unreliable since the fungus spores, upon germination, seek out a suitable photobiont and resynthesize the lichen symbiosis (Lutzoni and Miadlikowska, 2009). Most fungi produce one of three distinct kinds of spore bodies: apothecia (a cup- or disc-shaped fruiting body), perithecia (a globe- or flask-shaped structure that remains immersed in the thallus), or pycnidia (pear-shaped or globose receptacles within which conidia are formed).

When the mycobiont reproduces asexually, the photobiont is passed down from generation to generation vertically. Soredia (groups of algal cells encircled by fungal filaments) and isidia (delicately attached, elongated outgrowth on the surface of thallus which gets easily detached) are two examples of specialized vegetative propagules that can be used to pass on the photobiont and mycobiont to the next generation.

Lichens are extremely unusual organisms because their fungal and algal cells are entangled in a spongy thallus. Foliose lichens are characterized by having three or four layers of cells or hyphae in their thallus (Hebert, 2010). The fungal hyphae's outermost layer of the epicortex agglutinates tightly to form a tough, impenetrable barrier. Next to the epicortex is the thicker, several hundred micrometer-thick cortex, and below that is the algal layer, where the algae cells are encased in strands of tightly interwoven fungal hyphae, either wrapped singly by hyphae or in some cases perforated by a haustorium. After the algal layer comes the medulla, a layer of loosely packed hyphae that stores many of the lichen's specialized chemicals. The lower cortex, found below the medulla, is similar to the upper cortex except that it contains rhizines, which resemble fungal roots (Hebert, 2010).

Lichens can be broken down further based on their development habits, shape, size, and substrate. Crustose lichens (like Arthonia inconspicua and Pertusaria tetrathalmia) and foliose lichens (like Dirinaria applanata and Parmotrema subarnoldii) have a flat, crust-like appearance, whereas fruticose lichens have a shrubby, branching appearance (e.g. Ramalina conduplicans, Usnea pectinata). There are several other types of lichen growth, including the leprose, powdery lichens (like Lepraria coriensis), the squamulose, lichens with small scale-like structures that lack lower cortex (like Normandina sp.), the placonoid, lichens that are closely attached to the substratum at the center and lobate or free at the margin (like Phyllopsoracorallina), and the dimorphic,

Microlichens include crustose, leprose, placodioid, and squamulose lichens, which are smaller and require microscopic studies for identification. Macrolichens, on the other hand, include foliose, dimorphic, and fruticose lichens, which are comparatively larger and can be identified with a hand lens or stereo zoom microscope (Awasthi, 1988, 1991).

Corticolous lichens are those that thrive on the bark and trunks of trees; saxicolous lichens are those that thrive on rocks; muscicolous lichens are those that thrive on moss; terricolous lichens are those that thrive in soil; foliicolous lichens are those that thrive on leaves; and omnicolous lichens are those that thrive on everything (growing on more than one substratum).

Diversity and ecological realm of lichens

Lichens are the first terrestrial organisms to colonize new environments after a global disaster. Primary succession begins with lichens because they thrive in the extreme circumstances of the lithosere and other settings with low precipitation, high UV radiation, and great temperature swings. Lichens break down rocks and create soil by secreting organic acids, paving the way for the growth of subsequent plant life.

As lichens do not have roots and do not need to tap continuous reservoirs of water like higher plants do, they are capable of flourishing in a broad range of natural settings, from the coldest Arctic tundra to the hottest deserts and from the hardest rocky beaches to the most poisonous slag heaps. Lichens, however, are abundant in temperate and alpine regions and abundant in the tropics.

One of the strangest species, lichens have the capacity to live for thousands of years yet develop very slowly (Smith, 1926). The annual linear expansion might be negligible or it can be many millimeters. As lichens grow so slowly, their contribution to the ecosystem's primary output is minimal. Lichens are also notable for being poikilohydric. Desiccation causes lichens to undergo a cryptobiosis, or metabolic suspension, when the symbiont cells are sufficiently dehydrated to cease most biochemical activity.

A forest's lichens may only make up a small percentage of its total biomass, but they play a crucial role in the forest's ecosystem by regulating soil erosion and affecting the local climate.

Yet, a select group of fast-growing lichen species—particularly cyanolichens—can make a substantial contribution to forest nitrogen fixation (Slack, 1988) and mineral cycling patterns in the ecosystem, boosting biomass by as much as 20-40% annually. That's why lichens are so important; they boost the soil's nutrient levels, making them more accessible to other plants. As lichens are often long-lived creatures that are quite picky about their environment, they may be used to make year-round estimates of species richness and habitat potential.

CONCLUSION

Lichens are a type of self-supporting fungal, algal, or cyanobacterial association that serves as a repository for new compounds and genes because of its ecological need and stability. Studies on lichens have been largely ignored in the past, despite the fact that they are among the first land colonists of terrestrial ecosystems and can resist a succession of disastrous events of the earth. In recent years, however, lichen floristic researches have expanded significantly in response to the necessity to evaluate the country's plant riches. Manipur is a state that has not been completely studied for its lichen abundance, despite being classified as a "treasure trove" of old and unusual flora due to its richness in diversity and variability of species, such as these uncommon nonvascular cryptogrammic lichens.

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