

LICHENS OF WESTERN GHATS

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Abstract

Lichens are composite organisms consisting of a symbiotic association of a fungus with a photosynthetic partner usually either a green algae or cyanobacterium. They are present in a wide range of habitats throughout the world and dominate terrestrial ecosystems. There are about 2040 species of lichens present in India of which around 950 species belonging to 150 genera and 54 families are present in the Western Ghats. The Western Ghats which stretches from southern part of Gujarat to Kanyakumari in Tamil Nadu is one of the world's important 'Biodiversity Hotspots'. The Western Ghats harbor almost 45% of the total lichens in India, the highest for any region in the country. Out of these 253 species are endemic to Western Ghats. Among different states Tamil Nadu has the highest number of lichens with 657 species followed by Karnataka, Kerala and Maharashtra with 336, 288 and 91 species respectively. The crustose lichen dominates in Western Ghats represented by 618 species followed by foliose lichens and fruticose lichens, which are represented by 269 and 62 species respectively. Parmeliaceae with 137 species belonging to 22 genera is the dominant family in the Western Ghats while Graphis is the dominant genus with 49 species.

Lichens are simplest form of plants consisting of a symbiotic association of a fungus (the mycobiont) with a photosynthetic partner (the photobiont), usually either a green algae or cyanobacterium. The algal partner synthesizes food by photosynthesis and shares with fungal partner in turn the fungus give protection to the algae. They grow in diverse climatic conditions and on diverse substrates. The ability to quickly absorb and retain water from many sources makes it possible for lichens to live in harsh environments like deserts and Polar Regions, and on exposed surfaces like bare rocks, walls, roofs and tree branches. Approximately 20,000 species of lichens have been reported globally (Hawksworth, 1991). The main body of lichen is called a thallus. By their appearance the lichens are grouped into three categories of growth forms:

Crustose lichens: The thallus is closely attached to the substratum without leaving any free margin.

Foliose lichens: They are also called as leafy lichens. The thallus in this case is loosely attached to the substratum at least at the margin.

Fruticose lichens (shrubby): Here the lichen thallus is attached to the substratum at one point and remaining major portion is either growing erect or hanging.

It is estimated that there are about 2040 species of lichens present in India (Awasthi, 2000). Western Ghats contain around 950 lichen species belonging to 150 genera and 54 families (Nayaka S., 2006). It harbors almost 45% of the total lichens in India, the highest for any lichenogeographical region in the country. Out of these 253 species are endemic to Western Ghats (Nayaka S., 2006). Among different states Tamil Nadu has the highest number of lichens with 657 species followed by Karnataka, Kerala and Maharashtra with 336, 288 and 91 species respectively (Nayaka S., 2006).

There are 618 species of crustose lichens in Western Ghats followed by foliose lichens and fruticose lichens, which are represented by 269 and 62 species respectively. Parmeliaceae with 137 species belonging to 22 genera is the dominant family in the Western Ghats while Graphis is the dominant genus with 49 species (Nayaka S., 2006). Perithecia bearing lichens (Pyrenocarpous) mostly with crustose thallus exhibit their luxuriance in the Western Ghats represented by 177 species, belonging to lichen families Arthopyreniaceae, Astrotheliaceae, Pyrenulaceae, Strigulaceae, Trichotheliaceae, Trypetheliaceae, Verrucariaceae. The Graphidaceae, Physciaceae and Thelotremataceae lichens with 137, 103, 90 and 72 species respectively also dominate the area. The family Arthoniaceae contains more number of endemic species.

Table 1- Dominant Lichen Families in Western Ghats (Nayaka S., 2006)

S.No.	Family	Species	Genus
1	Parmeliaceae	137	22
2	Graphidaceae	103	6
3	Physciaceae	90	9
4	Pyrenulaceae	79	3
5	Thelotremataceae	72	4
6	Arthoniaceae	47	4
7	Trichotheliaceae	44	3

Table 2- Dominant lichen genus in Western Ghats (Nayaka S., 2006)

S.No.	Genus	Species
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1	<i>Graphis</i>	49
2	<i>Porina</i>	42
3	<i>Pyrenula</i>	42
4	<i>Parmotrema</i>	35
5	<i>Pertusaria</i>	33
6	<i>Lecanora</i>	32
7	<i>Usnea</i>	30

The lichens contain large number of secondary metabolites. Approximately 700 compounds have been reported from lichens. Most of these compounds are weak phenolic acids which are produced by the fungal partner and have a multiple biological activity: antiviral, antibiotic, antitumor, allergenic, plant growth inhibitory and enzyme inhibitory. (Lawrey J.D, 1994). Eg-*Ramalina hossei* is used as antifungal against *Aspergillus niger* and *A.fumigatus*. Extracts of *Parmotrema pseudotinctorum* inhibits both Gram positive and Gram negative bacteria. Usnic acid, a very active lichen substance is used as tumor inhibitor and as analgetic. Large amounts of *Pseudevernia furfuracea* and *Evernia prunastri* are used in the perfume industry. The lichens have been household items of Indians since ancient times as medicines and in various cultural events. The common condiments used in food dishes called 'Garam Masala', 'Meat Masala', 'Sambar Masala' also contains lichen powder or whole plants as a major ingredient. Eg-*Parmotrema tinctorum* is used as spice and flavoring agent (Upreti, D.K et.al, 2006). Some species of lichens are burned in holy sacrificial fires known as 'Havan' or 'Homa'. Eg-*Parmotrema nilgherrense*. Ayurvedic medicines like 'Charila' and 'Ushna' contain different species of lichens.

Lichens have evolved efficient mechanisms for accumulating nutrients from the environment in which they live. They adsorb metal ions such as Ca^{2+} via an ion exchange mechanism and can trap tiny particles of rock, soil or any other heavy metal pollutants within their structure. This ability of lichens can be efficiently used for monitoring the pollution levels and chemical analysis of lichen samples can be used to determine the extent and type of pollutant emissions around a particular industrial installation (Negi H.R., 2003). Thus lichens are considered as Bioindicators of environmental pollution.

The various activities in hilly regions such as agriculture, mineral extraction, tourism, hydroelectric and road building projects leads to the rapid extinction of lichens. Factors such as urbanization, forest fires and deforestation have been identified as the major threats to the lichen flora of India (Negi H.R., 2003). So it is necessary to create

awareness among the students, common people, forest officials and authorities regarding the importance of lichens and the actions to be taken to conserve their diversity.

There are still many regions to be studied for lichens in India. The study about lichen diversity and biological activities of Western Ghat lichens is not done in detail. Thus further study is required to investigate new lichen substances and their applications.

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