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## ASSESSMENT OF LICHEN BIODIVERSITY FROM THE SANJEEVANI HILLS OF TAMIL NADU, INDIA

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### Abstract:

An investigation into the lichen population was carried out in the southern Indian state of Tamil Nadu's Sanjeevani Hills. The study determined that the most prevalent families were Physciaceae and Parmeliaceae, focusing on four distinct locations in the hills. About a quarter of the total number of lichens were found at an elevation of 1300 m MSL on the 18th hairpin loop. This specific elevation above sea level was preferred by fruticose lichens, like *Ramalina* sp. Substrate specificity analysis revealed that 80% of the lichens were corticolous, 10% were saxicolous, and 5% were muscicolous. The present study is a preliminary investigation and a future reference for other researchers.

**Keywords:** Physciaceae, hairpin loop, fruticose and substrate specificity.

### Introduction

Symbiotic relationships between fungi and algae result in lichens, a special kind of non-vascular cryptogram. Being the most prevalent life form on Earth, they occupy over 8% of its surface. Olive tree bark contains a thin growth known as "lichen". The word 'lichen' has its origins in Greece. The terms "photobiont" and "mycobiont" denote the algal and fungal partners, respectively.

These small organisms can grow on various surfaces and are incredibly successful in their symbiotic relationships. Trees, twigs, wood, rocks, mosses, soil, evergreen plants, and

even other plants can all support their growth. Lichen growth is facilitated by various factors, including the presence of moisture, the altitude at which light is exposed, the quality of clean air, and any disruptions to their substrates. In challenging environments across the planet, lichens have managed to thrive as distinct species thanks to protection measures. Many of these plants have various commercial uses such as food, animal feed, architectural models, decorations, perfumes, and test organisms for studying atmospheric pollution. [1] estimated that around 7800 to 9200 metric tons of lichen are harvested annually for perfume production primarily in Morocco, Yugoslavia, and France. [2] stated that China has also started employing lichens, like oak moss and *Evernia mesomorpha*, specifically for use in perfumery.

Renowned for their variety and abundance, lichens constitute a significant component of India's flora. With about 2,450 species found on the Indian subcontinent, the region's topography and climate variations have led to rich lichen diversity. Of these, about 2,040 species (representing 322 genera and 72 families) are found exclusively in India. Remarkably, over 23 percent of these taxa are unique to India. It is acknowledged that the country's principal lichen hotspots are the Western Ghats and the Himalayas. About 1,250 species are found in the eastern Himalayas, compared to roughly 92237 species in the west Himalayan region. Tamil Nadu has been found to have one of the highest numbers of lichen species of any state, with a total of 812 species recorded, according to sources [3] and [4].

Lower plants, including lichens, bryophytes, pteridophytes, algae and fungi, have been the subject of much research, but their ecological and medicinal benefits have not been given the credit they merit. Because there are still many unexplored areas in India that contain valuable lichen resources, our understanding of lichens from different floristic regions remains incomplete despite significant exploration and surveying efforts over the past 50 years. Additionally, it is difficult to identify these species because the majority of type specimens and earlier collections are kept in European herbaria. Consequently, lichens have received little scientific attention, making comparisons challenging.

## **Materials and Methods**

### **Study Area**

The Sanjeevani hills, which are situated in Tamil Nadu's Eastern Ghats' Sholavandhan range, constitute the research area (Figure 1). Another name for the Sanjeevani hills is Sirumalai Hills. At an elevation of 1,400 meters above sea level, these hills are home to nine reserved forests totaling 4,4769,74 acres. They are located between longitudes 77°10' to 77°20' east and latitudes 8°50' and 9° north. Rainfall during the monsoon season can range from light to heavy and last for several days. The average annual rainfall is between 156 and 195 cm. Dense stands of trees and shrubs line the stream banks, and the leaves of these plants are the main source of organic debris in the water. This habitat is dominated by a specific species of riparian tree.

### **Methodology**

Starting at 1100 meters above sea level and going up to 1400 meters above sea level, we took lichen samples from the Sanjeevani hills. Four locations, totaling eighteen hairpin loops on the road ascending to the hills, were included in the survey area. We meticulously

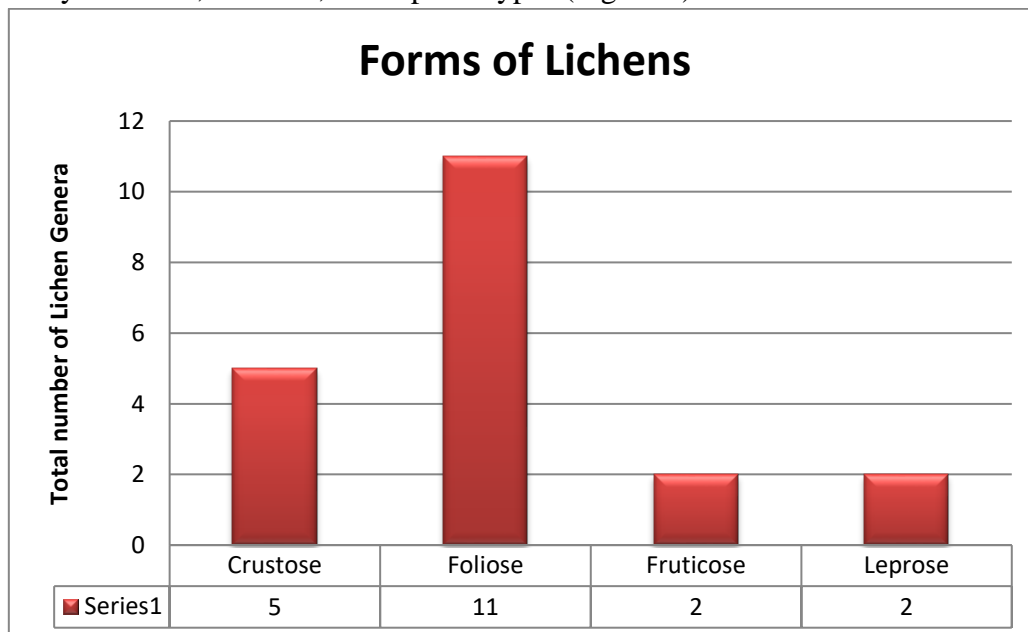
gathered lichen samples for identification of species diversity in our lab at a height of 1300 meters, or the 18th loop. We used morphological traits seen through a hand lens, microscopic inspection, spot tests, and TLC results, as shown in the [3, 5 and 6] handbook, to identify macrolichens.



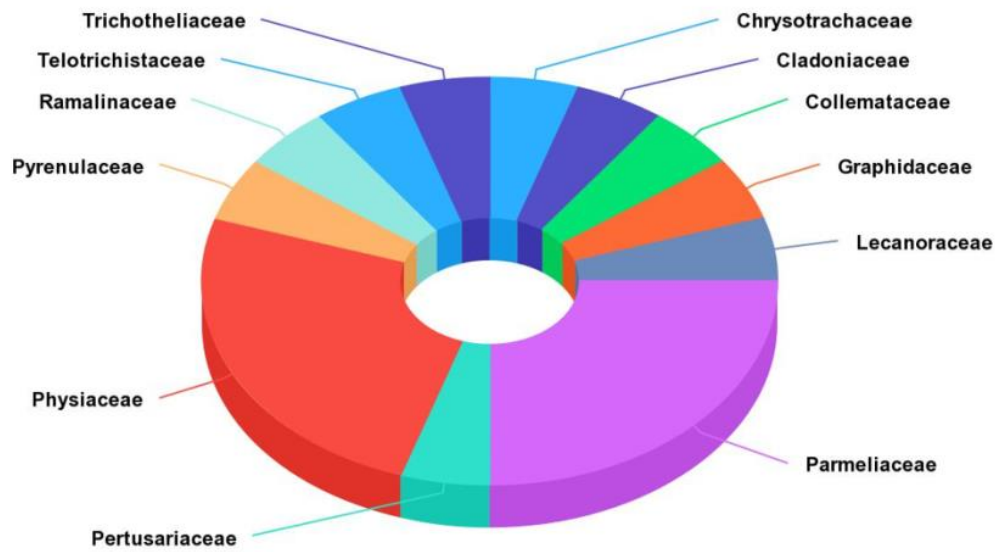
**Figure 1. Map of Sanjeevani Hills.**

## Results and Discussion

In the current study, representative lichen samples were collected from four different sites in the Sanjeevani hills of the Eastern Ghats in southern India. The findings showed that 20 distinct lichen species were present in the samples taken from the study area (Table 1). The latitude and longitude of the locations were sourced from Google Maps. Diverse substrates produced diverse lichen species, the most prevalent of which were foliose species, followed by fruticose, crustose, and leprose types (Figure 2).



**Figure 2. Forms of Lichen diversity in Sanjeevani hills**



**Figure 3. Dominant lichen families in Sanjeevani Hills**

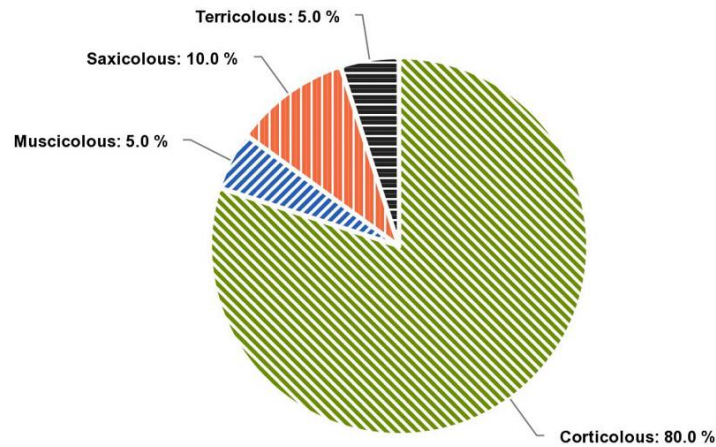
**Table 1. Lichen diversity in Sanjeevani hills**

| S. No | Lichen                        | Altitude | Family           | Bark/Rock   | Location      | Forms    |
|-------|-------------------------------|----------|------------------|-------------|---------------|----------|
| 1     | <i>Buellia punctata</i>       | 1200 m   | Physciaceae      | Corticolous | 16/18         | Crustose |
| 2     | <i>Caloplaca sp.</i>          | 1100 m   | Teloschistaceae  | Corticolous | 13/18         | Foliose  |
| 3     | <i>Chrysothrix chlorina</i>   | 1100 m   | Chrysothricaceae | Corticolous | 13/18         | Leprose  |
| 4     | <i>Cladonia sp.</i>           | 1300 m   | Cladoniaceae     | Muscicolous | 18/18         | Foliose  |
| 5     | <i>Dirinaria sp.</i>          | 1300 m   | Physciaceae      | Corticolous | 18/18         | Foliose  |
| 6     | <i>Dirinaria sp.</i>          | 1100 m   | Physciaceae      | Terricolous | 13/18         | Foliose  |
| 7     | <i>Graphis sp.</i>            | 1100 m   | Graphidaceae     | Saxicolous  | 13/18         | Crustose |
| 8     | <i>Heterodermia diademata</i> | 1100 m   | Physciaceae      | Corticolous | 13/18 & 18/18 | Foliose  |

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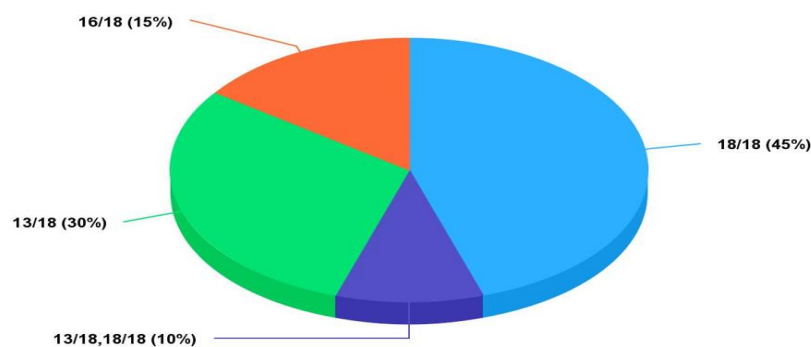
|    |                                       |        |                  |             |       |           |
|----|---------------------------------------|--------|------------------|-------------|-------|-----------|
| 9  | <i>Heterodermia</i><br><i>sp.</i>     | 1200 m | Physciaceae      | Corticolous | 16/18 | Foliose   |
| 10 | <i>Leconora</i> sp.                   | 1200 m | Leconoraceae     | Corticolous | 16/18 | Crustose  |
| 11 | <i>Leptogium</i><br><i>cyanascens</i> | 1300 m | Collemataceae    | Corticolous | 18/18 | Foliose   |
| 12 | <i>Parmelinella</i> sp.               | 1300 m | Parmeliaceae     | Corticolous | 18/18 | Foliose   |
| 13 | <i>Parmotrema</i><br>spp.             | 1100 m | Parmeliaceae     | Corticolous | 13/18 | Foliose   |
| 14 | <i>Parmotrema</i><br>spp.             | 1300 m | Parmeliaceae     | Corticolous | 18/18 | Foliose   |
| 15 | <i>Pertusaria</i> sp.                 | 1300 m | Pertusariaceae   | Corticolous | 18/18 | Crustose  |
| 16 | <i>Porina</i> sp.                     | 1100 m | Trichotheliaceae | Corticolous | 13/18 | Leprose   |
| 17 | <i>Pyrenula</i> sp.                   | 1300 m | Pyrenulaceae     | Corticolous | 18/18 | Crustose  |
| 18 | <i>Ramalina</i><br><i>usneansis</i>   | 1300 m | Ramalinaceae     | Corticolous | 18/18 | Fruticose |
| 19 | <i>Usnea</i><br><i>longissima</i>     | 1300 m | Parmeliaceae     | Corticolous | 18/18 | Fruticose |
| 20 | <i>Xanthoparmelia</i><br><i>sp.</i>   | 1200 m | Parmeliaceae     | Saxicolous  | 18/18 | Foliose   |

Approximately a quarter of all lichen species belonged to the Parmeliaceae and Physciaceae families (Figure 3). Among the foliose lichens in the Parmeliaceae family were *Parmotrema reticulatum*, *Usnea* sp., *Xanthoparmelia* sp., *Parmotrema* sp., and *Parmelinella* sp. In the Physciaceae family, *Heterodermia* sp., *Buellia punctata*, and *Dirinaria* sp. were notable genera. Research conducted by [7] found that the Western Ghats of Nilgiri Hills in Tamil Nadu, India were predominantly populated by members of the Parmeliaceae lichen family. The present results are not in correlation with the findings of [8] who concluded that Physciaceae was dominant in Maruthamalai hills.

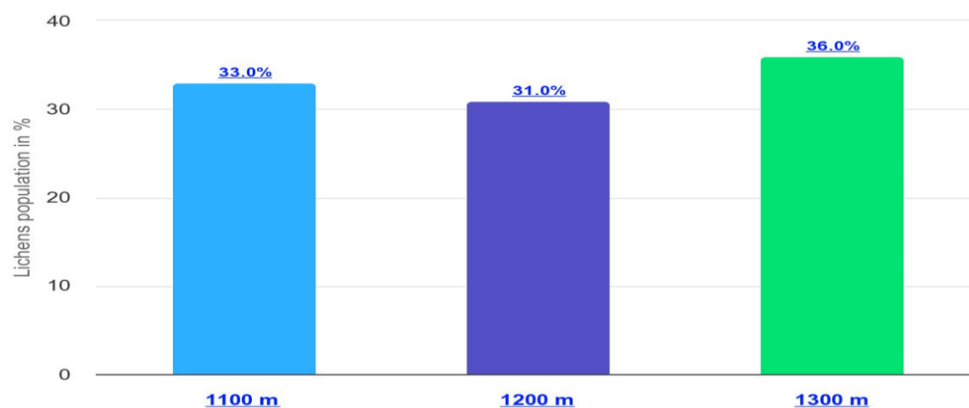


**Figure 4. The substrate-specificity of lichen diversity**

Eighty percent of the species of lichen found in the study area were found on tree bark, suggesting a temperate climate (Figure 4). The diversity of saxicolous lichens, a different class of lichens that includes those that grow on rocks, was 10%. The results are in agreement with the work conducted by [9]. This study represents an initial effort to explore the diversity of lichens found on the road side of Sanjeevani Hills. Thus, it suggests that the preliminary results of this study can be useful to future researchers and scholars who wish to know more about the lichens in Sanjeevani Hills.



**Figure 5. Distribution of lichens in different hairpin loops at Sanjeevani Hills**



**Figure 6. Lichen diversity at different altitudes in the Sanjeevani Hills**

As we observed from the tenth hairpin loop, which covers an altitude range of 1100 m MSL to 1400 m MSL, we came across samples of lichen on a variety of surfaces. There were eighteen hairpin turns on the road that led uphill in Sanjeevani. We observed that there were lichens growing in the bend curves at the 13th and 18th loops (Figures 5–6).

## Conclusion

Past explorations have left many unexplored regions in terms of lichen diversity. One particular region that hasn't received much attention yet is Sanjeevani Hills, which is found in the Eastern Ghats of Tamil Nadu. The current preliminary research shows the existence of twenty different species of lichen, which suggests that the study area has a humid, pleasant atmosphere that is ideal for lichen growth. The representative species of lichen were gathered from the side of the road, and it was discovered that the lichen diversity was significantly affected by altitude. These results imply that additional surveys ought to be conducted in various interior Sanjeevani Hills regions in order to gather more comprehensive data on rare and endangered species for potential future bioprospecting projects.

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