Diversity of lichens in Nepal

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Nepal is rich in lichen flora. But, studies on this particular aspect in this country is woefully lacking. The present paper attempts to document the major lichen species present at the five physiographic regions of Nepal. Tropical forests have been dominated by the crustose lichens and rarely fruticose forms; the subtropical, temperate, sub-alpine and alpine forests have various species of both crustose and fruticose forms. The lower elevations are dominated chiefly by crustose forms, the middle regions by folioses while the higher elevations are rich in fruticose forms of lichens. Some lichens were found to prefer specific hosts, and the lichen diversity is very much related to the diversity of trees and shrubs.

Keyword : Lichen, diversity, tropical forest, sub-tropical forest, temperate forest, sub-alpine forest, alpine forest, Nepal.

Studies on lichen flora of Nepal started after N. Wallich in 1826, Sir J. D. Hooker and T. Thomson (1872 - 97) visited Nepal for botanical studies. Among foreigners Poelt and Awasthi are the most significant contributors in the lichen flora of Nepal. Despite being a very crucial living organism of the world, no Nepali researchers took any interest on this subject till 1979. Therefore, there is still a great paucity of research work on lichens of Nepal.

Lichens are formed by the symbiotic association between fungi and algae; majority are bio-indicator of air pollution. Therefore, their distribution is very much related to habitats susceptible to pollution. Yarraton (1972) stated that occurrence of epiphytic lichen communities depend primarily on environmental changes which ultimately causes the growth of different types of vegetation. As trees or plant species are specific to the environment, so do epiphytic lichens. Rundel (1988) and Hyvärinen (1992) also stated that lichens are specific to various micro and macro environmental habitats. They have much more ability to accumulate toxic heavy metals such as Cadmium (Cd) and Lead (Pb) from atmosphere, (Devkota *et al.* 1997).

Lichens in Nepal

Of the 20,000 estimated total lichen flora of the world, our knowledge is limited only to 513 species, 85 genera and 32 families (Sharma, 1995, Baniya, 1996 and Pathak, 1998). Sharma (1995) opined that there would be more than 2,000 species of lichens in Nepal.

On the basis of altitude and climate, Stainton (1972) classified thirty five types of forests in Nepal. Lichens which form an integral composition of the forest, their diversity is based upon such forest types. A gross distribution of lichen according to the forest types of the five physiographic zones have been given below.

Tropical forest

This type of forest lies below the 1000m. The chief tree species of this region are *Shorea robusta, Dalbergia sissoo, Michelia champaca, Acacia catechu,* etc. These forests are mainly dominated by crustose lichens. Dominant crustose include the species *Lecanora, Lecidea, Bullia, Caloplaca, Bacidia, Pertusaria, Pyxine,* etc. and the foliose species have *Dirinaria, Physcia, Parmelia, Leptogium, Collema,* etc. This region has rarely fruticose species. Sometimes species of *Usnea* and *Ramalina* are found growing at moist places. But such lichens are sterile.

Subtropical forest

Subtropical forest that occurs between 1,000m to 2,000m have chiefly *Schima wallichi, Castanopsis indica, Pinus roxburghii, Engelhardtia spicata, Acer oblongum, Alnus nepalensis,* etc. These tree species make habitat suitable for most of the crustose lichens such as the different species of *Anthracothecium, Pyrenula, Lecidea, Bacidia, Pyxine,*

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etc. Among them the rough bark of *Alnus nepalensis* and *Castanopsis indica* are highly favoured by *Glyphis cicatricosa* and *Pyrenula immersa* (Upreti and Singh 1993). The foliose lichens of this type of forest include the species of *Heterodermia, Coccocarpia, Leptogium, Collema, Physcia, Parmelia and Candelaria.* The fruticose lichens of this forest include the different species of *Cladonia, Ramalina and Usnea.*

Temperate forest

This type of forest is found between 2000m to 3000m. The major elements of the forest are different species of *Quercus, Rhododendrons, Cedrus deodara, Abies pindrow, Picea smithiana,* etc. The dominant crustose lichens of this regions are *Chrysothrix chlorina Bacidia nigrofusca, Graphis scripta, Pertusaria velata, Ochrolechia* sp., *Lecidea* sp., *Anthracothecium leucostomum, Anthracothecium himalayense* etc. Among them *Chrysothrix chlorina* is specific to dry side of *Abies* trees and two species of *Anthracothecium* grow nicely in the rough bark of *Quercus* species.

The natural and undisturbed forests of this region provide suitable habitats for some foliose lichens such as *Peltigera polydactyla, Lobaria retigera, Nephroma helveticum* and *Cetraria* species. Other common foliose genera are *Heterodermia, Anaptychia, Leptogium, Collema, Parmelia,* etc.

Table: Diversity of lichens in Nepal

Family	Species
Permeliaceae	83
Physciaceae	48
Lecideaceae	46
Usneaceae	45
Cladoniaceae	40

Family	Genera
Physciaceae	8
Parmeliaceae	7
Unseaceae	7
Lecideaceae	7
Lecanoraceae	7

Genera	Species
Parmelia	59
Cladonia	40
Caloplaca	38
Lecidea	24
Hetrodermia	23
Usnea	23

The tall trees of this region also serve as good substrata for different fruticose species. These include the species of *Bryoria, Alectoria, Usnea, Ramalina etc. Among them Bryoria confusa, Ramalina sinensis* and *Usnea himalayense* are good indicators of coniferous and broad leaved *Quercus* species.

Subalpine forest

This forest encompasses between 3000m to 4000m. The dominant tree species of this region are *Abies spectabilis, Rhododendron campanulatum, Rhododendron barbatum, Betula utilis, Larix* spp. etc. The papery back of *Rhodoendron* and *Betula* species are good hosts of different crustose species such as *Calicium, Caloplaca, Lecanora, Anthoria,* etc. Similarly, the foliose species of *Sticta, Hypogymnia, Nephromopsis, Cetraria, Umbilicaria* grow into the boles and branches of the trees. The fruticose species include the genera of *Cladonia, Sulcaria, Usnea, Baeomyces,* etc. Among them *Usnea longissima* and *Sulcaria sulcata* are the chief and dominant species of this region.

Alpine forest

The alpine forests are found above 4000m and above. However, the tree line may differ at eastern and western sectors of Nepal. Here, the vegetation becomes bushy. Different species of *Juniperus, Ephedra, Berberis, Rhododendron* are the common hosts of lichens. Open boulders are carpeted by different species of lichen. The common crustose lichens are the species of *Buellia, Lecidea, Rinodina, Bacidia,* etc. The foliose species are the species of *Umbilicaria, Nephroma* etc. The fruticose species are the species of *Cladonia, Stereocaulon, Usnea, Thamnolia, Tephromela,* etc.

Nepal is rich in lichen flora. The lower elevations are dominated chiefly by crustose forms, the middle regions by folioses while the higher elevations are rich in fruticose forms of lichens. The diversity of lichens is very much related to the diversity of trees and shrubs. Further research on the occurrence of lichens in relation to host species seems to be a very much need for Nepal.

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