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## **Lichens on man-made substrates**

It is well known that the surface of all materials exposed to the environment will, sooner or later, become colonized by different groups of living organisms. The extent of colonization will depend on the environmental conditions and on the characteristics of the substratum. Lichens are well adapted to colonize bare and stable surfaces in many climatic conditions, giving rise to a biological mosaic of colours and textures. In addition to natural substrata, these include a host of human-manipulated or manufactured ones (i.e. artifacts), including fashioned stonework, asphalt, glass, concrete, cement, plaster, ceramic and terracotta tiles, bricks, processed wood products, and various types of metals (Brightman & Seaward 1977).

### **Peculiarities and colonization of lichens**

Growth on external surfaces, whether natural or man-made, presents challenges especially of water availability. Owing to their poikilohydric nature lichens can survive in various climatic conditions. Many lichens have limited mechanisms to prevent desiccation; they dehydrate and remain dormant when their environment dries out, but can rehydrate when water becomes available again. Lichens usually absorb water directly into the thallus through aerosol, mist and water vapors, due to this nature lichens can live long in dry areas.

Lichens are well known natural sensors of changing environment and the presence or absence of particular species and the composition of communities may be indicative of one or more identifiable factors. Lichens can be used as an early warning system for other biota which without remedial action would subsequently

suffer stress or indeed extinction through human mismanagement (Aptroot & James 2002).



Plate 1: **A-B** Vehiculicolous lichens: Lichen mosaic on abandoned car. **C**. Ferricolous lichens: *Heterodermia diademata* on electric iron pole. **D**. *Ramalina conduplicans* on plastic rope.

Lichen communities in urban areas are frequently lacking in diversity and complexity. The major factors leading to loss of diversity of lichens in an area may include local accumulation of high concentrations of toxic airborne contaminants produced by various urban related activities, removal and/or replacement of natural substrata and alteration of natural hydrological cycles. The impact of urban development, especially air pollution, often extends into adjacent natural lichen communities. Prior to the onset of the industrial age, stone and wooden buildings, gates, fences and tombstones as well as glass, bricks and tiles in urban areas supported quite diverse lichen communities. As industrial activities developed in and around human population centres, lichen communities on natural substrata declined with the available man-made substrata supporting limited lichen assemblages. However, in recent years many urban centres have experienced a recovery of lichen

populations due to a widespread switch to cleaner fuels and greater efforts to control or at least reduce emissions from some of the more damaging air pollution sources (Seaward 1997).



Plate 2: **E-H:** Fabricicolous lichens, **E.** *Lecanora achroa*. **F.** *Micarea excipulata*. **G.** *Ramalina conduplicans*. **H.** *Flavopunctelia soledica*.

The association of lichens with human artifacts has attracted the attention of many researchers, not only by cataloguing species but also investigating the effects lichen growth has on them. India exhibits rich diversity of different organism groups including lichens, and most of the phytogeographical regions of the country are well explored. The following report provides notes on lichen colonization of a variety of artifacts, observed during the last few years during collection trips to many different regions of the country.

1. Lichens on iron poles (*ferricolous*): The Lingmala forest area of the north-western Ghats has moist damp climatic conditions which provides excellent habitats for many lichen taxa to colonize different substrates. In addition to many other substrates, *Heterodermia diademata* was also found growing widely over iron

electric poles. The electric poles erected inside dense forest, have rusted, rough moist surfaces (Fig. C).

2. Lichens growing on abandoned motor cars (*vehiculicolous*): Cars provide a mixture of materials suitable for lichen growth such as metal, glass, plastic and rubber, substrata of considerable dimension and diversity, provided they are not moving or regularly cleaned and the environmental conditions are favourable. Aptroot *et al.* (2014) enumerated 40 species of lichens found growing on vehicles and termed such lichens as vehiculicolous. Brodo *et al.* (2001), Tucker (2001) and Bennett (2002) also listed lichens found growing on abandoned cars. The city of Darjeeling in the Eastern Himalayas has a moist climate throughout the year and vehicles abandoned along the road side in open places exhibit good growth of *Phaeophyscia hispidula*, *Heterodermia diademata*, *Lecanora* sp. and *Leptogium* sp. (Figs A, B).
3. Lichens on decayed cloth (*fabricolous*): In the Tawang area of Arunachal Pradesh, traditionally prayer flags with small colourful cloth pieces are hosted in and around monasteries in high places. The cloth pieces fallen on the ground decay and become laden with soil, provide suitable habitat for lichens. Such prayer flags bear luxuriant growth of *Flavopunctelia soledica*, *Lecanora achroa* and *Micarea excipulata* (Figs D-H). Earlier Upreti and Dixhit (2002) reported *Heterodermia diademata*, *H. firmula*, *H. incana*, *Lecanora flavidofusca*, *Micarea* sp., *Parmotrema nilgherrense*, *P. tinctorum*, *Pertusaria* sp., *Phaeophyscia endococcina*, *P. hispidula* and *Xanthoria candelaria* growing on plastic netting in the nursery of the Royal Botanic Garden, Kathmandu, Nepal.

Aptroot *et al.* (2014) suggested that such substrata covered with lichens might make a truly eye-catching tourist attraction while serving as outreach objects for public education about lichens and their importance. Our observations suggest that ferricolous, vehiculicolous and fabricolous lichens are a rather frequent phenomenon if conditions for such growth are suitable.

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## **A humungous *Verrucaria* thallus?**



Seen in a salt marsh on the Adriatic coast of Slovenia. Jestng aside, presumably the areoles seen in many *Verrucaria* thalli are also formed by contractions in response to desiccation? Comments welcomed.....