



Biodiversity on Bark: Lichen Associations with *Illicium griffithii*

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INTRODUCTION

Imagine walking through the misty forests of Northeast India and looking at an *Illicium griffithii* tree. Its bark may appear rough, quiet and lifeless. But look closely and an entirely different world begins to emerge. Patches of green, grey, yellow and brown may cover the bark, representing lichens and other organisms that form an often-overlooked component of forest biodiversity.

A Botanical Treasure of Northeast India

Illicium griffithii Hook. f. & Thomson is an important medicinal and spice-producing tree species associated with the forests of the Eastern Himalaya, particularly Northeast India (Paul *et al.*, 2013). The species has attracted scientific interest because of its ecological importance, traditional uses and valuable phytochemical constituents. Its fruits contain essential oils and a range of secondary metabolites, including terpenoids and other bioactive compounds (Saraswathy *et al.*, 2010; Vijayakumar *et al.*, 2012). The species has also been investigated for its genetic diversity, reproductive biology and regeneration challenges (Duchok *et al.*, 2005; Borah *et al.*, 2021; Marbaniang *et al.*, 2018).

However, the importance of a tree in an ecosystem extends beyond its fruits, flowers, leaves and wood. Trees also provide living surfaces for numerous organisms. Among these are epiphytic lichens, which can transform seemingly ordinary bark into a miniature ecosystem.

A Miniature Ecosystem on the Bark

Lichens are complex associations between a fungus and a photosynthetic partner, usually a green alga or cyanobacterium (Nash, 2008). They can grow on rocks, soil, branches and tree trunks, often occupying habitats where few other organisms can survive. When lichens grow on trees, they are commonly referred to as epiphytic lichens. They use the tree mainly as a surface for attachment and growth rather than as a source of nutrients.

Tree bark provides lichens with a physical surface for attachment and growth. However, the suitability of bark as a habitat can vary considerably between tree species and even between different parts of the same tree. Factors such as bark texture, acidity, moisture, light

availability, canopy cover, altitude and tree age can influence the establishment and distribution of lichen communities. Thus, the trunk of a mature tree is not simply part of the tree but it can become a complex habitat supporting a variety of organisms.

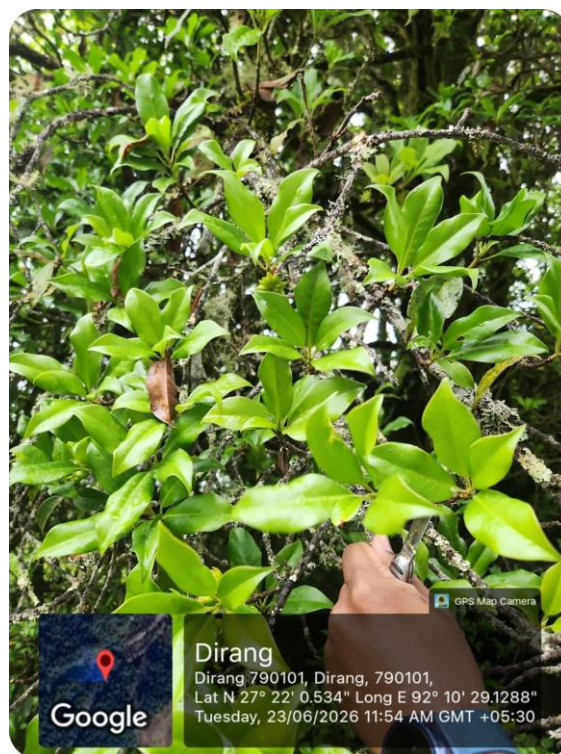


Fig 1: *Illicium griffithii* and associated lichen species, Photo: Rekha Mahato

Why Are Lichens Important

Lichens are much more than colourful patches on tree trunks. They contribute to nutrient cycling and can provide microhabitats for small organisms. Over time, they also contribute organic matter to their surroundings and participate in ecological processes occurring on tree surfaces (Nash, 2008). Perhaps their most widely recognized ecological value is their sensitivity to environmental conditions. Many lichen species respond to changes in air pollution, humidity, temperature, light and habitat disturbance. Because of this sensitivity, lichen communities can provide useful information about environmental quality. For this reason, lichens are often described as bioindicators—living organisms whose presence, absence or abundance can help scientists understand environmental conditions.

Why Look at Lichens on *Illicium griffithii*

The relationship between a tree and the organisms living on its bark provides an interesting way to understand forest biodiversity. *Illicium griffithii* occurs in humid forest environments where temperature, rainfall, elevation and canopy conditions create suitable microclimates for epiphytic organisms. The complex bark surfaces of mature trees can provide numerous niches for lichens and other epiphytes.

Different lichen growth forms may occur on tree bark. These include:

- **Crustose lichens** - forming thin, crust-like layers closely attached to the substrate.
- **Foliose lichens** - having leaf-like structures that are generally more loosely attached.

- **Fruticose lichens** - forming shrubby, hair-like or branched structures.

The presence of these different growth forms contributes to the structural diversity of the forest ecosystem.



Fig. 2: Fruticose lichen associated with *Illicium griffithii*. Photo: Rekha Mahato



Fig. 3: Foliose lichen associated with *Illicium griffithii*. Photo: Rekha Mahato

Methods for Studying Lichens

Lichen studies involve careful observation and recording of their host tree, habitat, altitude, canopy conditions and location, along with their colour, shape and other visible features. Lichen specimens can then be examined using morphological and anatomical characteristics, including thallus structure, reproductive structures and microscopic features. Chemical characterization is also an important part of traditional lichen identification. Spot tests such as K, C, KC and P tests can reveal characteristic chemical reactions, while thin-layer chromatography (TLC) can help detect lichen substances and distinguish closely related taxa (Awasthi, 2000). Modern studies increasingly complement these traditional approaches with

DNA-based identification, which can help resolve species that are difficult to distinguish using morphology alone.

Lichens as Natural Environmental Monitors

One of the most fascinating aspects of lichen biology is their potential role in environmental monitoring. Because lichens obtain much of their water and nutrients directly from the atmosphere and surrounding environment, they can be particularly sensitive to atmospheric pollutants and changes in microclimate (Nash, 2008). Changes in lichen abundance and community composition can therefore provide clues about environmental disturbance. In relatively undisturbed forests, diverse lichen communities may reflect suitable combinations

of moisture, clean air, stable microclimates and mature vegetation. Conversely, changes in these communities may signal environmental stress. This makes lichen diversity potentially useful for long-term forest health monitoring.

Conserving More Than a Tree

The conservation of *I. griffithii* is important not only because of the species itself but also because of the ecological relationships associated with it. The species already faces challenges related to habitat disturbance and regeneration (Duchok *et al.*, 2005; Paul *et al.*, 2013). Reproductive limitations and seed dormancy can further complicate natural population recovery (Marbaniang *et al.*, 2018; Borah *et al.*, 2024). Protecting natural populations therefore has the potential to conserve not only *I. griffithii* but also the many organisms associated with its habitat. This broader perspective changes how we think about conservation. Conservation is not simply about counting trees; it is about protecting the communities that trees support.

Beyond the Bark

The next time we walk through a forest, it is worth looking beyond the spectacular flowers, fruits and large trees. Look at the bark. A patch of lichen may appear insignificant, but it can represent an intricate biological association that has developed over years. A mature tree can provide shelter and habitat for a community of organisms that remain largely invisible to us. *Illicium griffithii* reminds us that the value of a tree extends far beyond what we can see at first glance. A forest is not simply a collection of trees. It is a network of living relationships and sometimes, those relationships begin on the bark.

REFERENCES

- Awasthi, D.D. (2000). *A Handbook of Lichens*. Bishen Singh Mahendra Pal Singh, Dehradun.
- Borah, R., Bhattacharjee, A., Rao, S.R., Kumar, V., Sharma, P., Upadhaya, K. & Choudhury, H. (2021). Genetic diversity and population structure assessment using molecular markers and SPAR approach in *Illicium griffithii*, a medicinally important endangered species of Northeast India. *Journal of Genetic Engineering and Biotechnology*, 19, 118.
- Duchok, R., Kent, K., Khumbongmayum, A.D., Paul, A. & Khan, M.L. (2005). Population structure and regeneration status of medicinal tree *Illicium griffithii* in relation to disturbance gradients in temperate broad-leaved forest of Arunachal Pradesh. *Current Science*, 88, 673-676.
- Marbaniang, E.J., Venugopal, N., Verma, S., Raina, R., Khajuria, A. & Gautam, K. (2018). Floral biology and embryological studies are important for conservation of threatened plants having reproductive bottlenecks: a case study of *Illicium griffithii* Hook. f. & Thomson. *Current Science*, 115, 576-587.
- Nash, T.H. III (Ed.). (2008). *Lichen Biology*. 2nd ed. Cambridge University Press, Cambridge.
- Paul, A., Kalita, J., Khan, M.L. & Tripathi, O.P. (2013). *Illicium griffithii* Hook. f. & Thoms.-A potential source of natural off-farm income to the rural people of Arunachal Himalaya, India. *Indian Journal of Natural Products and Resources*, 4(2), 131-137.
- Saraswathy, A., Shakila, R., Lavanya, S.M. & Arunmozhidevi, A. (2010). Essential oil constituents of *Illicium griffithii* and its antimicrobial activity. *Pharmacognosy Magazine*, 6(23), 208-211.
- Vijayakumar, A., Duraipandiyan, V., Jeyaraj, B., Agastian, P., Raj, M.K. & Ignacimuthu, S. (2012). Phytochemical analysis and in vitro antimicrobial activity of *Illicium griffithii* Hook. f. & Thoms. extracts. *Asian Pacific Journal of Tropical Disease*, 2(3), 190-199.