



Original Research Article

First Report of Foliicolous Lichen Biota in South Karnataka-India

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A B S T R A C T

Lichens that colonize on live leaves are called foliicolous lichens. India has a rich collection of foliicolous lichens with 116 species from Andaman and Nicobar Islands, Palni and Nilgiri Hills and Northeast India. Whereas, foliicolous lichens in Karnataka is not reported. In the present study 18 species, belonging to 16 genera and 12 families are recorded. Family Gomphillaceae dominated with 4 species *Aulaxina quadrangular*, *Echinoplaca epiphylla*, *Tricharia allostrigasa* and *Tricharia triseptate*. *Sporopodium xantholeucum* (Mull. Arg.) Zahlbr and *Strigula subelegans* Vainio are universally distributed in all reported regions in India. These findings will lead to further research on foliicolous lichens and provide a better understanding of their distribution within the Southern Karnataka region. This is the first detailed report on foliicolous lichens and their distribution in South Karnataka.

Keywords

Foliicolous,
Karnataka,
Kodagu,
Western Ghats

Introduction

Lichens are fungi that live with symbiotic association of algae or cyanobacteria. Lichens that colonize on live leaves are called foliicolous lichens. These leaf-inhabiting lichens are widely distributed in wet or moist, highly humid (60 to 90%) or foggy tropical and subtropical forests throughout the world. They occur only on ephemeral substrate, *i.e.* surface of leaves with a relatively short lifespan of 1-3 years, corresponding to the longevity of their phorophyte leaves (Lücking, 1998). These lichens have an accelerated life cycle and respond rapidly to changes in environmental conditions (Lücking, 1997). About 716

species of foliicolous lichens have been reported so far from the world (Lücking *et al.*, 2000), of which 116 species are reported from India (Pinokiyo and Singh, 2004). Though the maximum diversity of lichens in India is recorded from the South Indian regions, the Eastern and Western Himalayas (Awasthi, 2000), they are unexplored in southern Karnataka of India. Karnataka is the seventh largest state situated on a tableland where the Western and Eastern Ghats ranges converge into the complex, in the western part of the Deccan Peninsular region of India. About 38,724 km² (14,951 sq mi) of Karnataka (*i.e.* 20% of the

state's geographic area) is covered by forests. Karnataka is rich in diverse lichen flora with 336 species (Singh and Sinha, 2010), reported from Western Ghats (Nayaka and Upreti, 2005) and central Karnataka (Nayaka and Upreti, 2002; Shrvanakumara *et al.*, 2010; Vinayaka and Krishnamurthy, 2010; Vinayaka *et al.*, 2010; 2012). Follicolous lichens in Karnataka are no where reported, hence this would be the first report on the diversity of leaf-colonizing lichens in Southern part of Karnataka.

Materials and Methods

Collection of lichens

Lichen specimens found to be grown on leaves were collected from Kodagu district, which lies in the southern part of Karnataka. Kodagu is one of the micro hotspot biodiversity within the larger hotspots of the Western Ghats, which occupy an area of 4108 sq.km. Kodagu has approximately 65 per cent of its geographical area under tree cover, making it one of the most densely forested districts in the country ranging from dry to moist deciduous and evergreen forests. Phorophytes were collected and deposited in the herbarium of Department of studies in Botany, Manasagangotri, University of Mysore, Karnataka, India.

Identification of lichens

The external morphology was studied under dissecting binocular microscope. The anatomy of the thallus and apothecia were studied under a compound microscope. The section of dry material was taken with the help of a safety razor blade and mounted in water or in cotton blue in lactophenol. The colour of medulla, epithecium, hypothecium and ascus were recorded. The shape and size of the asci, ascospores and conidia were

measured. The measurements of the thallus, medulla, epithecium, and hymenium were generally taken in the sections mounted in cotton blue. The thallus size was measured in centimeter, lobe size and ascocarps in millimeter and thallus medulla, epithecium, hymenium thickness, asci and ascospores size in milimicron. Chemistry of the specimens was done by spot tests and Thin Layer Chromatography (TLC). Identification was done using relevant keys (Lücking and Cáceres, 2002; Awasthi, 1991).

Results and Discussion

A total of 18 foliicolous lichens have been recorded, belonging to 16 genera and 12 families (Table 1). Of which 13 species are reported to be new to Karnataka. The region is dominated by crustose growth form with 15 species and foliose growth form with 3 species (Fig 1). Family Gomphillaceae dominated with 4 species *Aulaxina quadrangular* (Stirton) R. Sant., *Echinoplaca epiphylla* Fèe., *Tricharia allostrigasa* R. Sant. and *Tricharia triseptate* R. Sant. Foliose lichens like *Dirinaria confluens* (Fr.) D.D.Awasthi., *Heterodermia comosa* (Eschw.) Follmann & Redón and *Heterodermia obscurata* (Nyl.) Trevisan were also found to be grown on leaves. Family Echtelechiaceae with 2 species *Calopadia phyllogena* (Müll.Arg.) Vězda and *Sporopodium xantholeucum* (Müll. Arg.) Zahlbr. and the rest with one species each were recorded (Fig. 2). Lichen taxa namely *Aulaxina quadrangular* (Stirton) R. Sant., *Bacidia apiahica* (Müll.Arg.) Zahlbr., *Byssoloma subdiscordans* (Nyl.) P. James, *Calopadia phyllogena* (Müll.Arg.) Vězda, *Cryptothecia candida* (Kremp.) R. Sant., *Dimerella dilucida* (Krumpel.) R. Sant., *Echinoplaca epiphylla* Fèe., *Flavobathelium epiphyllum* Lücking, Aptroot & G.Thor, *Graphis foliica* var.

major Awasthi & Singh, *Sporopodium xantholeucum* (Müll. Arg.) Zahlbr., *Strigula subelegans* Vainio, *Tricharia allostrigasa* R.

Sant. and *Tricharia triseptate* R. Sant is reported to be new to Karnataka (Fig. 3).

Table.1 List of foliicolous lichens in South Karnataka-India

Sl.no.	Lichen species	Family	Growth form
1	<i>Aulaxina quadrangular</i> (Stirton) R. Sant.	Gomphillaceae	Crustose
2	<i>Bacidia apiahica</i> (Müll.Arg.) Zahlbr	Bacidiaceae	Crustose
3	<i>Byssoloma subdiscordans</i> (Nyl.) P. James	Pilocarpaceae	Crustose
4	<i>Calopadia phyllogena</i> (Müll.Arg.) Vězda	Echtolechiaceae	Crustose
5	<i>Chrysothrix candelaris</i> (L.) J. R. Laundon.	Chrysothricaceae	Crustose
6	<i>Cryptothecia candida</i> (Kremp.) R. Sant.	Arthoniaceae	Crustose
7	<i>Dimerella dilucida</i> (Krumpelh.) R. Sant.	Gyalectaceae	Crustose
8	<i>Dirinaria confluens</i> (Fr.) D.D.Awasthi.	Physciaceae	Foliose
9	<i>Echinoplaca epiphylla</i> Fèe.	Gomphillaceae	Crustose
10	<i>Flavobathelium epiphyllum</i> Lücking, Aptroot & G.Thor	Incertae sedis	Crustose
11	<i>Graphis foliica</i> var. <i>major</i> Awasthi & Singh	Graphidaceae	Crustose
12	<i>Heterodermia comosa</i> (Eschw.) Follmann & Redón	Physciaceae	Foliose
13	<i>Heterodermia obscurata</i> (Nyl.) Trevisan	Physciaceae	Foliose
14	<i>Porina</i> sp.	Porinaceae	Crustose
15	<i>Sporopodium xantholeucum</i> (Müll. Arg.) Zahlbr.	Echtolechiaceae	Crustose
16	<i>Strigula subelegans</i> Vainio	Strigulaceae	Crustose
17	<i>Tricharia allostrigasa</i> R. Sant.	Gomphillaceae	Crustose
18	<i>Tricharia triseptate</i> R. Sant	Gomphillaceae	Crustose

Fig.1 Percentage of lichen growth form in present study

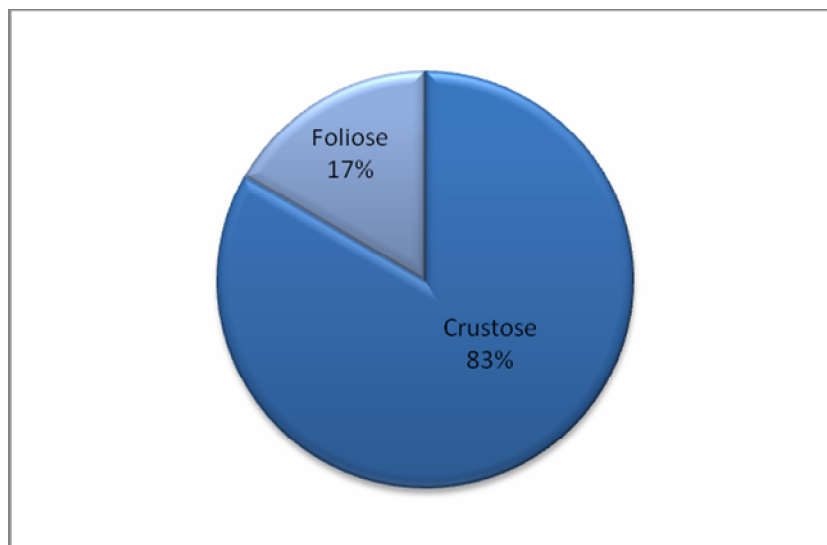


Fig.2 Dominance of lichen families with respect to species

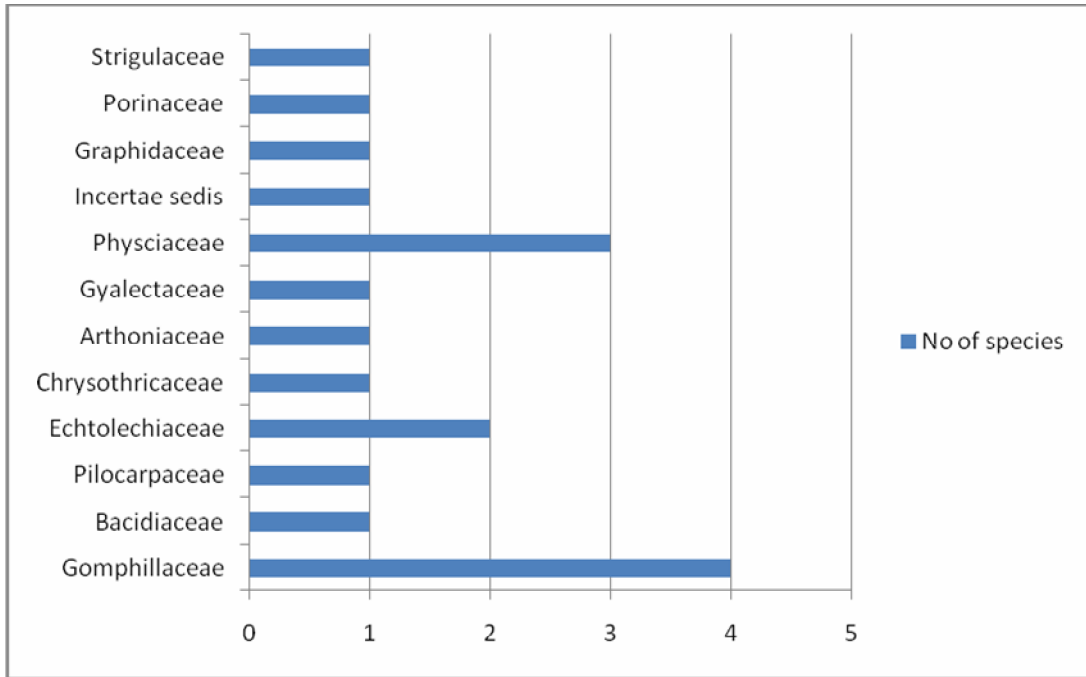


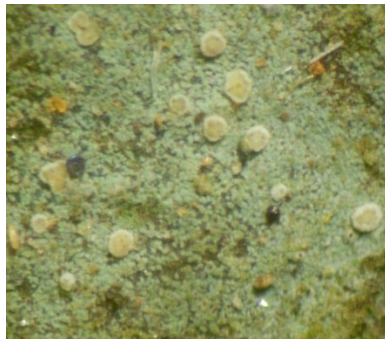
Fig.3 Few foliicolous lichens found in South Karnataka (a-i)



a) *Aulaxina quadrangular*

b) *Byssoloma subdiscordans*

c) *Calopadia phyllogena*



d) *Dimerella dilucida*



e) *Echinoplaca epiphylla*



f) *Heterodermia comosa*



g) *Heterodermia obscurata* h) *Sporopodium xantholeucum* i) *Strigula subelegans*

Follicolous lichens apparently do not show any damage or negative effect on their phorophyte, although some species that grow between the cuticle and epidermis, may utilize nutrients from their host leaf. The concept of a foliicolous taxon is consequently ecological rather than systematic (Serusiaux, 1989), henceforth lichens were collected randomly from different parts of south Karnataka region. Southern Karnataka comprises Kodagu, Chamarajnar and Mysore districts, where foliicolous lichens were keenly surveyed in this region. But these leaf-colonizing lichens were found only in certain parts of Kodagu district, which lies in a Western Ghats belt contains evergreen to semi-evergreen and moist deciduous forest.

But the regions like Mysore and Chamarajanagar are dry-deciduous with thorn-shrub protected areas (Rao and Razi, 1981). Singh and Pinokiyo (2003, 2006, 2008) have reported several follicolous lichens from humid tropical and subtropical forest in Eastern parts of India. In the present study 18 species of foliicolous lichens are reported from the Kodagu district in Karnataka, in which 13 species are found to be new to this region. A rich collection of foliicolous lichens is reported in India mainly from the Andaman and Nicobar Islands with 23 species (Sethy and Patwardhan, 1987), Palni and Nilgiri Hills

with 9 species (Awasthi and Singh, 1972) and the Northeast India with 29 species (Singh and Pinokiyo, 2003), under 34 genera and 15 families. Compared to our study foliicolous lichen species like *Sporopodium xantholeucum* (Müll. Arg.) Zahlbr. and *Strigula subelegans* Vainio is found to be grown in all reported regions in India (Pinokiyo *et al.*, 2006), whereas species like *Bacidia apiahica* (Müll.Arg.) Zahlbr., *Byssoloma subdiscordans* (Nyl.) P. James, *Tricharia allostrigasa* R. Sant. are found only in northeast parts and Nilgiri hills and Palni hills, *Aulaxina quadrangular* (Stirton) R. Sant.

Are found in Andaman and Nicobar islands and North East region. Foliose lichen species like *Dirinaria confluens* (Fr.) D. D. Awasthi. *Heterodermia comosa* (Eschw.) Follmann & Redón and *Heterodermia obscurata* (Nyl.) Trevisan that grows as corticolous are found as foliicolous and crustose lichens like *Chrysothrix candelaris* (L.) J. R. Laundon., *Cryptothecia candida* (Kremp.) R. Sant., *Dimerella dilucida* (Kruppelh.) R. Sant., *Flavobathelium epiphyllum* Lücking, Aptroot & G.Thor are reported to be new species. Henceforth these findings will lead to better understanding on foliicolous lichens and gives an encouragement for further research to study distribution of lichens within the Southern Karnataka region.

Acknowledgement

One of the authors (Rashmi S.) is grateful to University of Mysore for awarding NON-NET fellowship to carryout research.

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