

Foliicolous lichens and their diversity in Meghalaya, India

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India harbours rich foliicolous lichen diversity represented by 130 species, of which 106 species occur in north eastern India. Foliicolous lichen diversity in Meghalaya is represented by 46 species belonging to 9 families and 19 genera. The paper reports 1 species viz. *Asterothyrium decipiens* (Müll. Arg.) R. Sant. as new to Indian lichen flora and 45 species as new records for the state of Meghalaya. Dominant families are represented by Trichotheliaceae (21 spp.), Strigulaceae (11 spp.), Ectolechiaceae (6 spp.), Pilocarpaceae (5 spp.) etc. while dominant genera include *Strigula* (11 spp.), and *Porina* (10 spp.). All the species identified are enumerated along with their localities.

Key-words—Foliicolous lichens, Indicators, Diversity, Meghalaya.

INTRODUCTION

Lücking et al. (2000) recorded 716 species of foliicolous lichens from all over the world. Of these, 130 species are known from India (Singh, et al., in press). They form one of the important components of biodiversity in tropical and subtropical forests and have the potential to play an important role in the ecosystem management (Pinokiyo et al., 2006). The collections from the state of Meghalaya have resulted in the discovery of one species as new record for India and 45 species as new records for the state of Meghalaya. However, earlier only one species *Byssolema leucoblepharum* was known (Santesson, 1952) from Meghalaya.

MATERIAL AND METHOD

About 400 specimens collected mainly from Khasi and Garo hills of Meghalaya were studied for identification. The morphological characters were studied under 10 × lens and anatomical details by cutting thin sections with the help of sharp blades and examining them under Compound Binocular microscope. Chemicals like 10% KOH, Cotton blue and Iodine solution were used for mounting and staining the sections. Identification and updating of nomenclature were done following the publications of Santesson (1952) and Lücking et al. (2000). All the specimens examined are deposited in the herbarium of Botanical Survey of India, Eastern Circle, Shillong, Meghalaya.

FLORISTIC DIVERSITY OF FOLIICOLOUS LICHENS IN MEGHALAYA

The collection of 46 species of foliicolous lichens distributed under 9 families and 19 genera constitutes 35% of total foliicolous lichen flora of India (130 spp.) and 43% of northeast India (106 spp.) The families, Trichotheliaceae and Strigulaceae with 11 spp. each are dominant, followed by other families like Ectolechiaceae with 6 spp., Pilocarpaceae with 5 spp., etc. At generic level *Strigula* shows maximum species diversity with 11 spp., followed by *Porina* with 10 spp. The remaining genera are represented by 1 or 2 species only. Among the states of Northeast India, Meghalaya (46 spp.) stands second in position after Arunachal Pradesh (97 spp.) as far as their foliicolous lichen diversity is concerned. Foliicolous lichens of Meghalaya show wide range of distribution as most of them are pantropical. The rich sites of distribution of foliicolous lichens in Meghalaya are mainly tropical areas in Garo and Khasi hills. All the identified species are enumerated along with their localities.

ENUMERATION OF TAXA

Arthonia Ach. (Arthoniaceae)

A. palmulacea (Müll. Arg.) R. Sant.

This species is found in association with *Porina monocarpa* and *Tapellaria nana*.

Locality: Garo hills, Revak forests, K. Singh 13002 C.

A. trilocularis Müll. Arg.

The species occurs in association with species of *Strigula*, *Echinoplaca*, *Porina* and *Gyalectidium*.

Locality: Pynursula, Singh 13040 C, 13142 A.

Aspidothelium Müll. Arg. (Aspidotheliaceae)

A. scutelicarpum Lücking

This species is found in association with species of *Strigula* and *Mazosia*.

Locality: Garo hills, Baghmara village, K. Singh 13116 B; Revak forest, Singh 12994 A, 12996 E, 12997 D, 12994 A, 12996 E, 13003 F, 13007B, 13008 D; Pynursula, K. Singh 13037 B; Wogyllum, K. Singh 13124 C; 13125 A, 13126 B, 13127 A, 13128 C.

Asterothyrium Müll. Arg. (Asterothyriaceae)

Asterothyrium decipiens (Rehm.) R. Sant., Symb. Bot. Ups. 12 (1): 325, 1952; *Stictoclypeolum decipiens* Rehm., Hedwigia 44: 10, 1904.

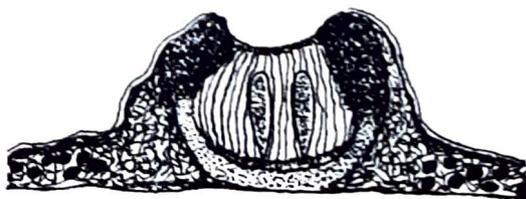
(Text figs. 1-3).

Thallus smooth, corticated, white to grayish-white often with greenish tinge, nitidous, dispersed, formed of rounded algiferous thallus patches, 5-12 mm across; hypothallus absent. Symbiotic algae, a species of Chlorococcaceae; algal cells green rounded, 8-12 μm in diameter.

Apothecia immersed in the thallus, central portion forms grooves with raised (inclined) margin, first appearing as a black flat spot, then for a long time as squat-conoid with a central apical opening; margin black to blackish grey, usually 0.03-0.05 mm wide; disc dark brownish grey 0.15-0.2 mm in diam., epruinose; excipulum hyaline in lower portion; dark brown to black in marginal and apical portion, paraplectenchymatous, I+ red; hyaline portion 5-10 μm thick; cells 3-5 μm across; outer side of the exciple covered by thalline cortex; epithecium colourless; 5-10 μm thick; hymenium hyaline, 70-80 μm high; paraphyses hyaline, simple, 1.5 μm thick; apices slightly clavate; hypothecium colourless, 12-20 μm thick; asci oval, 4-8-spored, 60-70 \times 15-25 μm ; ascospores 1-septate, \pm ellipsoid, usually constricted at the septum; ends rounded and rather thick (1-2 μm) walled, 30-30 \times 10-14 μm ; Pycnidia brown to black, squat or conoid with triangular or rounded base, 8-15 mm across; conidiophores simple, fusiform, 6-7 \times 2 μm .

Distribution : Tropical America, Asia and Australia. Recorded for the first time from India.

Remark : Morphologically, this species resembles *Asterothyrium pitteiri* which has 2(4)-spored ascus. This Indian material has smaller apothecia.

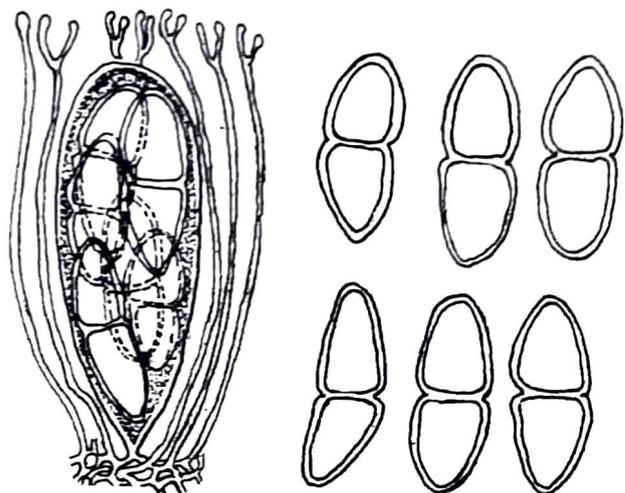


1

Fig. 1.

150 μm

Figs. 2 & 3.

50 μm 

2

3

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road, near Konjar, K. Singh 13133 B; Revak forest, K. Singh 13004 D.

Byssolecania Vainio (Pilocarpaceae)

B. deplanata (Müll.Arg.) R. Sant.

A rare species found in association with *Mezosia melanophthalma* (Müll.Arg.) R. Santt.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore near Konjar, K. Singh 13134 C.

Byssoloma Trevisan. (Pilocarpaceae)

B. leucoblepharum (Nyl.) Vainio

Locality: Reported by Santesson (1952) from Meghalaya.

B. polychromum (Müll.Arg.) R. Sant.

Usually found in association with *Echinoplaca pellicula* and *Tricharia albostrigosa*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road near Konjar, K. Singh 13135 A; on the way to Dawki, near Pynursula forest, K. Singh 104 B, 112, 115 A; Pynursula, Morty, K. Singh, 13041 A.

Calopadia Vezda (Ectolechiaceae)

C. perpallida (Nyl.) Vezda

The species grows in small independent patches.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road, near Konjar, K. Singh 13130; Revak forest, K. Singh 12993.

Cryptothecia Stirton (Arthoniaceae)

C. candida (Krempelh.) R. Sant.

A common species found spreading all over the leaf surface, often associated with different species of *Strigula*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road near Konjar, K. Singh 13134 A, 13139 A; Revak forest, K. Singh 13012 B; Pynursula, K. Singh 13039 A.

Echinoplaca Fee (Gomphillaceae)

E. epiphylla Fee

Found associated with the species of *Strigula* and *Porina*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12996 B, K. Singh 13006C.

E. pellicula (Müll. Arg.) R. Sant.

A rare species found associated with *Porina nitidula* and *Strigula subtilissima*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore, near Konjar, K. Singh 13135 B; Revak forest, K. Singh 13001 A; Pynursula, Morty, K. Singh 13040 A.

Fellhanear Vezda (Pilocarpaceae)

F. bouteillei (Desm.) Vezda

A common species found associated with *Strigula subelegans*.

Locality: Meghalaya, Garo hills, Baghmara village, K. Singh 13118 A; Williamnagar road, Watghuthuni, K. Singh 13121; Revak forest, K. Singh 12997 A.

F. semecarpi (Vainio) Vezda

The species is usually found in association with species of *Strigula*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12989 A, 12997 C, 12998 D, 13004 A, 13010 D.

Cyalectidium Müll. Arg. (Gomphillaceae)

G. filicinum Müll. Arg.

This species is very common and usually occurs associated with species of *Porina*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road near Konjar, K. Singh 13131, 13132, 13133 C, 13140, 13144, 13143 A; Revak forest, K. Singh 12995 A, 12999 B, 13000 A, 13037 C; 6 km towards Baghmara side, K. Singh 12990 A; Pynursula, Morty, K. Singh 13038, 13040 B, 13042; Wategutham, K. Singh 12991 A.

Loflammia Vezda (Ectolechiaceae)

L. gabrielis (Müll. Arg.) Vezda

Found in association with *Aspidothelium scutellicarpum* and *Mazosia melanophthalma*.

Locality: Revak, Garo hills, Singh 13007 C.

L. intermedia (R. Sant.) Vezda

A rare species found in association with *Porina conica* and *Mazosia phyllosema*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 13007 C.

Mazosia Massal. (Opegraphaceae)

M. melanophthalma (Müll. Arg.) R. Sant.

The species usually grows together with species of *Porina*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road, near Konjar, K. Singh 13134 B, 13139 B; Wogyllum, K. Singh 13123 C, 13125 D, 13128 B; Revok forest, K. Singh 13007 A, 13009 A, 13043; on the way to Dawki, near Penursula forest, K. Singh 115 D, Pynursula, Morty, K. Singh 13041 B.

M. phyllosema (Nyl.) Zahlbr.

A common species found associated with species of *Porina* and *Mazosia*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road near Konjar, K. Singh 13138 C, K. Singh 13138 C; Revak forest, K. Singh 13037 A; Wogyllum, K. Singh 13127 C.

M. rotula (Mont.) Massal.

A common species found together with *Strigula smaragdula* Fr.

Locality: Meghalaya, Garo hills, forest, K. Singh 13003 C; Wogyllum, K. Singh 13124 C, 13125 B.

Opegrapha Ach. (Opegraphaceae)

O. filicina Mont.

A common species occurs in association with *Gyalectidium filicimum*.

Locality: Meghalaya, Garo hill, Revak forest, K. Singh 12998 D.

Porina Müll. Arg. (Trichotheliaceae)

Porina albicera (Krempelh.) Vainio

A rare species found in association with *Strigula subtilissima*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 13008 A.

P. applanata Vainio

A common species found abundantly in association with *Tapellaria nana*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12998 F; Maheskola, Rani Kore road near Konjar, K. Singh 13138 A.

P. atrocoerulea Müll. Arg.

This species is rather scarce and found often associated with species of *Strigula* and *Gyalectidium filicimum*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12995 C, 13000 D, 13009 B **P. conica** R. Sant.

A very common species usually found with species of *Porina virescense* and *Echinoplaca epiphylla*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12996 C

P. cupreola (Müll. Arg.) Schilling

The distribution of this species is rare but wherever found it occurs in abundance.

Locality: Meghalaya, Garo hills, Revak forest, 12996 D, 13003 C.

Porina epiphylla (Fee) Fee

A common species found associated with species of *Mazosia*, *Strigula* and other species of *Porina*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12998 A; Wogyllum, K. Singh 13123 B, 13124 B; 13125 C, 13126A; 13128 A.

P. limbulata (Krempelh.) Vainio

The species is found associated with *Arthonia trilocularis*, *Trichothelium epiphyllum* and *Gyalectidium filicimum*.

Locality: Meghalaya, Pynursula, Morty, K. Singh 13041 C, 13044 D.

P. monocarpa (Krempelh.) Schilling

The species is found associated with *Arthonia palmulacea*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 13002 B, 13009 B; Pynursula, Morty, K. Singh 13040 F.

P. nitidula Müll. Arg.

The species is found in association with *Echinoplaca pellicula* and *Strigula subtilissima*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 13001 D.

P. virescens (Krempelh) Müll. Arg.

Occurs abundantly sometimes covering whole surface of leaves and found associated with *Aspidothelium scutellicarpum*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 13003 D.

Sporopodium Mont. (Ectolechiaceae)

S. xantholeucum (Müll. Arg.) Zahlbr.

A common species found together with *Gyalectidium filicimum* and *Asterothyrium decipiens*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road, near Konjar, K. Singh 13133 A; Revok forest, K. Singh 13014 A.

Strigula Fr. (Strigulaceae)

S. antillarum Fr.

The species is found in small patches spreading all over the leaf surface.

Locality: Meghalaya, Garo hills, Toka, Baghmara village, K. Singh 13117.

S. concreta (Fee) R. Sant.

Found associated with *Arthonia trilocularis* and other species of *Strigula*.

Locality: Meghalaya, Garo hills, Maheskola, K. Singh 13143 B; Revak forest, K. Singh 13000 C, 13012 A; West Khasi hills, Sonapahar area, 10 to 15 km from Tura, K. Singh 13145 C.

S. maculata (Cooke & Masee) R. Sant.

This species is found in association with *Tapellaria nana*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12989 B, 12990 D, 13003 E, 13012 D; On the way to Dawki, near Penursula forest, K. Singh 110 C, 115 C.

S. melanobepha (Krempelh.) R. Sant.

This species is found associated with *Aspidothelium scutellarpum*.

Locality: Meghalaya, Garo hills, Baghmara village, K. Singh 13116 A.

S. nemathora var. *hypothelia* (Nyl.) R. Sant.

A common species found in association with other species of *Strigula*.

Locality: Meghalaya, Garo hills, Baghmara, Williamnagar road, Watguthuni, K. Singh 13122 A; Revak forest, K. Singh 12990 C; Maheskola, K. Singh 13143 C; West Khasi hills, Sonapahar area, 10

to 15 km from Tura, K. Singh 13145 A;

S. nitidula Mont.

This species is found in association with other species of *Strigula* and *Tapellaria nana*.

Locality: Meghalaya, Garo hills, 6 km towards Baghmara side, K. Singh 12990 C.

S. orbicularis Fr.

Found associated with *Aspidothelium scutellarpum*.

Locality: Meghalaya; Garo hills, Maheskola, Rani Kore road near Konjar, K. Singh 6844; Revak forest, K. Singh 12994 B; West Khasi hills, Sonapahar area, 10 to 15 km from Tura, K. Singh 13145 B.

S. phyllogena R.C. Harris

Found Associated with *Cryptothecia candida* and *Trichothelium epiphyllum*.

Locality: Meghalaya, Garo hills, Maheskola, Rani Kore road, near Konjar, K. Singh 13138 B, Revak forest, K. Singh 13004 B; Pynursula, K. Singh 13039 B, 13044 A; Wogyllum, K. Singh 13127 B, 13128 D.

S. smaragdula Fr.

Found in association with other species of *Strigula*.

Locality: Meghalaya, Garo hills, Baghmara, Williamnagar Road, Watguthuni, K. Singh 13122 C; Maheskola, Rani Kore road, near Konjar, K. Singh 13138 D; Revok forest, K. Singh 13003 C, 1300 E, 13008 C, 13010 E; 6 km towards Baghmara side, K. Singh 12992.

S. subelegans Vainio

Found associated with the species of *Fellhanera*.

Locality: Meghalaya, Garo hills, Revak forest, K. Singh 12997 B, 12980 C, 13012 C.

S. subtilissima (Fee) Müll. Arg.

Usually found associated with other species of *Strigula* or alone.

Locality: Meghalaya, Garo, hills, Baghmara, Williamnagar road, Watguthuni, K. Singh 13120, 13122 B; Revak forest, K. Singh 12994 C, 13001 B, 13008, 13010 B, 13011; Revak forest, 6 km towards Baghmara, K. Singh 13006 A.

Tapellaria Müll. Arg. (Ectolechlaceae)

T. bilimbioides R. Sant.

A common species found associated with *Gyalectidium filicimum* Müll. Arg.

Locality: Meghalaya, Watghuthuni, K. Singh 12991 B.

T. nana (Fee) R. Sant.

The species is found in association with species of *Porina* and *Strigula*.

Locality: Meghalaya, Garo hills, Maheskola, K. Singh 13141; Revak forest, K. Singh 12995 D, 12996 A, 12998 E, 12999 A, 13000 B, 13001 C, 13002 A, 13004, 13006 B, 13010 C; West Khasi hills, Sonapahar area, 10 to 15 km from Tura, K. Singh 13145 D.

Tricharia Fee (Gomphillaceae)***T. albostrigosa*** R. Sant.

A very common species found alone or associated with *Mazosia melanophthalma*.

Locality: Meghalaya, On the way to Dawki, near Penursula forest, K. Singh 107, 110 C, 104 A, 115 B, 106, 109.

Trichothelium Müll. Arg. (Trichotheliaceae)***T. epiphyllum*** Muü Arg.

A common species found in association with *Porina limbulata*.

Locality: Meghalaya, Pynursula, Morty, K. Singh 13040 D, 13044 C

CONCLUSION

Foliicolous lichens are known to have high potential to act as indicators of the environmental conditions and can play an important role in ecosystem management. However, in India, the basic floristic information on this group of lichens is inadequate. It is, therefore, essential to explore the unexplored areas for their exact status and side by side detailed investigations on their life cycle, physiology, adaptations, interactions, ecology, etc. will be helpful to find out their practical uses.

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