
Lichen flora of Pichavaram and Muthupet mangroves (Southeast Coast of India)

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An enumeration of 21 species belonging to 14 genera and 10 families of lichens are provided from Pichavaram and Muthupet mangroves of Tamil Nadu State.

Key words – lichenized ascomata – lichen taxonomy – mangroves of Tamil Nadu – Muthupet Lagoon

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Introduction

Mangroves are the unique ecosystem developed along estuarine seacoasts and river mouths in tropical and subtropical regions of the world. They are commonly found in the intertidal zone and are a bridge between terrestrial and marine ecosystems, harbouring a unique microbial biodiversity. Mangrove forests are one of the world's most productive tropical ecosystems (Smith et al. 1991, Kathiresan 2000, Logesh et al. 2012).

Due to their unique nature and physiology lichens have an ability to colonize various substrates as epiphytes. The different species of phorophytes provide excellent habitat for lichens to colonize on their trunk, branches, twigs and even on leaves. The nature and texture of tree bark plays a vital role in colonization by lichens. Lichens present in the mangroves are termed manglicolous lichens.

The population of lichens on mangroves is very low when compared to the lichens of terrestrial ecosystems, as their growth is arrested by the high level of salinity and moisture. Accounts of the diversity and distribution of lichens growing on trees in India has been provided by Upreti & Chatterjee (1999), Satya et al. (2005), and Rawat et al. (2009). However, except for a little information (Mohan & Hariharan 2000, Jagadeesh Ram 2006), no account of lichens from Indian mangroves are available. In the present study, an attempt has been made to enumerate the lichens growing on mangroves of Pichavaram and Muthupet of Southeast Coast of India.

Pichavaram mangroves are situated at the delta of Vellar and Coleroon and make a Vellar-Coleroon estuary complex, considered among the healthiest mangrove occurrences in the world. It is located at N 11° 2' 00.9", E 79°

47' 11.2" and consists of *Avicennia*, *Rhizophora* and *Excoecaria* as the major vegetation.

Muthupet mangroves are situated in the Palk Strait region (N 10° 25' 79.5", E 79° 39' 00.2") and it is also a lagoon type ecosystem. *Avicennia marina* and *Excoecaria agallocha* are found as single dominant species, with *Rhizophora* in a few patches. The rivers Paminiyar, Koraiyar, Kilaithankiyar, Marakkakoraiyar and other tributaries of the river Cauvery flow through Muthupet and adjacent villages. The rivers form a lagoon before meeting the sea. The northern and western borders of the lagoon are occupied by muddy silt ground which is devoid of mangroves. The mangroves beyond Muthupet lagoon are discontinuously found along the shore and extended up to Point Calimere.

Methods

The present study is based on an examination of 250 specimens of lichens collected during December 2010 to November 2011. The specimens were examined morphologically, anatomically and chemically. The chemical components of the lichens were identified by the standardized TLC methods (Orange et al. 2001) and crystallography. Chromatograms were developed in the solvent system A (toluene: dioxan: acetic acid, 180:60:8). The specimens were identified and authenticated following literature on lichens by Awasthi (1991, 2007). Voucher specimens were deposited in the Herbarium of National Botanical Research Institute, Lucknow (LWG).

Lichen species of Pichavaram and Muthupet Mangroves

1. *Amandinea montana* (H. Magn.) Marbach, Biblioth. Lichenol. 74: 93. 2000.- *Buellia montana* H. Magn., Bot. Not. 2: 199. 1954. (Caliciaceae)

Specimen examined – Pichavaram mangroves, Main Channel, on bark of *Rhizophora apiculata*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012318 (LWG).

2. *Bacidiopsis psorina* (Nyl.) Kalb, Biblioth. Lichenol. 88: 305. 2004. - *Bacidia psorina* (Nyl.) G. Pant & D.D. Awasthi, Biblioth. Lichenol. 40: Addendum. 1991. (Ramalinaceae)

Specimens examined – Pichavaram mangroves, Sanikuttai Vaikkal, on bark of *Rhizophora mucornata*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan 10-012319 (LWG). Muthupet mangroves, Maravakkadu area, on bark of *Excoecaria* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016815 (LWG).
3. *Buellia confusa* D.D. Awasthi, Biblioth. Lichenol. 40: 2. 1991. (Caliciaceae)

Specimen examined – Pichavaram Mangroves, Main Channel, on bark of *Rhizophora apiculata*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012322 (LWG).

4. *Caloplaca ferruginea* (Huds.) Th. Fr., Nova Acta Regiae Soc. Sci. Upsal., ser. 3, 3: 223. 1861. (Teloschistaceae)

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Rhizophora* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016817 (LWG).

5. *Diorygma junghuhnii* (Mont. & Bosch) Kalb, Staiger & Elix, Symb. Bot. Upsal. 34(1): 157. 2004. (Graphidaceae)

Specimen examined – Muthupet Mangroves, Sethuguda area, on bark of *Avicennia* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-012324 (LWG).

6. *Dirinaria aegialita* (Afzel. ex Ach.) B.J. Moore, Bryologist 71: 241. 1968. (Caliciaceae)

Specimens examined – Pichavaram mangroves: Main Channel, on bark of *Excoecaria agallocha*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012316 (LWG). Muthupet mangroves, Maravakkadu area, on bark of *Excoecaria agallocha*, 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016816 (LWG).

7. *Dirinaria applanata* (Fée) D.D. Awasthi in D.D. Awasthi & M.R. Agarwal, J. Indian Bot. Soc. 49: 135. 1970. (Caliciaceae)

Specimen examined – Pichavaram mangroves, Main Channel, on bark of *Excoecaria agallocha*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012308 (LWG).

8. *Dirinaria confluens* (Fr.) D.D. Awasthi, Biblioth. Lichenol. 2: 28. 1975. (Caliciaceae)

Specimen examined – Pichavaram mangroves, Main Channel, on bark of

Excoecaria agallocha, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012317 (LWG).

9. *Graphis lineola* Ach., Lichenogr. Universalis: 264. 1810. (Graphidaceae)

Specimen examined – Pichavaram mangroves, Neduodam, on bark of *Rhizophora mucornata*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012309 (LWG).

10. *Graphis scripta* (L.) Ach., K. Vetensk-Acad. Nya Handl. 28: 145 (1809). (Graphidaceae)

Specimen examined – Pichavaram mangroves, Keeriguda, on bark of *Rhizophora mucornata*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012321 (LWG).

11. *Herpothallon granulorum* Jagadeesh Ram & G.P. Sinha, Lichenologist 41(6): 610. 2009. (Arthoniaceae)

This species is a new record for Tamil Nadu State.

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Avicennia* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-012325 (LWG).

12. *Lecanora achroa* Nyl. in Crombie, J. Linn. Soc., Bot. 14: 263 (1876). (Lecanoraceae)

This species is a new record for Tamil Nadu State.

Specimens examined – Pichavaram mangroves: Neduodam, on bark of *Rhizophora mucornata*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012311 (LWG). Muthupet mangroves, Sethuguda area, on bark of *Rhizophora* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016817, 11-016814 (LWG).

13. *Lecidea granifera* (Ach.) Vain. in Hiern, Cat. Welwitsch Afric. Pl. 2(2): 424. 1901. (Lecideaceae)

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Excoecaria* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-012322 (LWG).

14. *Opegrapha subrimulosa* Nyl., Flora 49: 293. 1866; Ertz, Biblioth. Lichenol. 102: 115. 2009. (Roccellaceae)

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Avicennia* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016818 (LWG).

15. *Opegrapha vulgata* (Ach.) Ach., Biol. Mem. 27(2): 54. 2001. (Roccellaceae)

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Avicennia* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016816 (LWG).

16. *Parmotrema tinctorum* (Despr. ex Nyl.) Hale, Phytologia 28: 339. 1974. (Parmeliaceae)

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Avicennia* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-012326 (LWG).

17. *Pyrenula interducta* (Nyl.) Zahlbr., Cat. Lich. Univers. 1: 433. 1922. (Pyrenulaceae)

Specimen examined – Pichavaram mangroves, Main Channel, on bark of *Avicennia officinalis*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012320 (LWG).

18. *Pyrenula ochraceoflava* (Nyl.) R.C. Harris, Mem. N. Y. bot. Gdn 49: 96. 1989. (Pyrenulaceae)

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Rhizophora* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016817 (LWG).

19. *Pyrenula leucostoma* Ach., Syn. Meth. Lich.: 124. 1814. (Pyrenulaceae)

Specimen examined – Muthupet mangroves, Sethuguda area, on bark of *Excoecaria* sp., 16.11.2011, Logesh Acharya Raja & Arumugam Sathishkumar. 11-016816 (LWG).

20. *Pyxine cocoes* var. *prominula* (Stirt.) D.D. Awasthi, Indian J. Bot. 3(2): 183. 1980. (Caliciaceae)

Specimen examined – Pichavaram mangroves, near guest house, on bark of *Rhizophora apiculata*, 22.12.2010, Logesh Acharya Raja & Kandasamy Kathiresan. 10-012312 (LWG).

21. *Roccella montagnei* Bél. em. D.D. Awasthi, Cladistics 23: 10-11, 2007. (Roccellaceae)

Key to the lichen species of Pichavaram and Muthupet mangroves

1. Thallus foliose or fruticose.....2
- 1a. Thallus crustose.....7
2. Thallus foliose.....3
- 2a. Thallus fruticose.....*Roccella montagnei*
3. Thallus loosely attached to the substrate, rhizines present.....4
- 3a. Thallus tightly adpressed to the substrate, rhizines absent..... 5
4. Large thallus lobes, up to 20 mm wide, upper side grey.....*Parmotrema tinctorum*
- 4a. Small thallus lobes, up to 1–2 mm wide, UV+.....*Pyxine cocoes* var *prominula*
5. Thallus without isidia and soredia.....*Dirinaria confluens*
- 5a. Thallus isidiate or sorediate.....6
6. Thallus with thick isidia or dactyls becoming crateriform and sorediate apically
.....*Dirinaria aegialita*
- 6a. Thallus lacking isidia and soredia on lamina.....*Dirinaria applanata*
7. Apothecia or perithecia present.....8
- 7a. Apothecia absent, thallus whitish grey, soredia with calcium oxalate crystals
.....*Herpothallon granulosum*
8. Fruiting body perithecia.....9
- 8a. Fruiting body apothecia.....11
9. Ostioles apical, ascospores 3-septate, without cilia, ascospores mostly less than 50 µm long,
spores subducta type.....*Pyrenula interducta*
- 9a. Hamathecium filaments unbranched, endospore thickened.....10
10. Ascospores muriform, less than 80 µm long, 4–8 per ascus, hamathecium not
inspersed.....*Pyrenula leucostoma*
- 10a. Ascospores transversely septate, 10–23 µm long with 3 primary septa..*Pyrenula ochraceoflava*
11. Apothecia lirellate.....12
- 11a. Apothecia round to sessile.....16
12. Ascocarps sunken or sessile, round to elongate.....13
- 12a. Ascocarps not sunken, paraphyses branched and raised from the thallus.....14
13. Spores 1–3-septate, fusiform, 15–16 × 2–3 µm, ascocarps minute.....*Opegrapha subrimulosa*
- 13a. Ascocarps curved, constricted at base, spores 20–25 × 3–4 µm.....*Opegrapha vulgata*
14. Disc distinctly white, pruinose, paraphyses branched.....*Diorygma junghuhnii*
- 14a. Ascocarps generally not fissuring, labia well developed and distinctly carbonized.....15
15. Hymenium inspersed with oil globules, spores transversely septate 25–40 × 4.5–7.5 µm, 5–9-
septate.....*Graphis lineola*
- 15a. Hymenium clear, not inspersed with oil globules, spores transversely septate, 18–60 × 6–8.5
µm, 5–13-septate.....*Graphis scripta*
16. Apothecia lecanorine.....17
- 16a. Apothecia lecideine.....18
17. Apothecia round, sessile, up to 1mm in diameter; smooth, verruculose, upper cortex hyaline,
inspersed with small crystals pigmentation dissolving in K.....*Lecanora achroa*
- 17a. Apothecia scattered to clustered, sessile, round, disc ferruginous to reddish brown, thalline
margin absent.....*Caloplaca ferruginea*
18. Excipulum hyaline, formed by paraplectenchymatous tissue.....19
- 18a. Excipulum indistinctly or distinctly cellular, epithecium brown to olive brown.....20
19. Spores hyaline, transversely septate.....*Bacidiopsora psorina*
- 19a. Spores simple, ovoid to ellipsoid, thick-walled, 8-spored.....*Lecidea granifera*
20. Hymenium inspersed with oil globules, epithecium dark brown, spores 22–23 × 8–9 µm
.....*Buellia confusa*
- 20a. Hymenium not inspersed with oil globules, spore sessile, internal stipe dark brown, spores 18–
19 × 9–10 µm.....*Amandinea montana*

Specimens examined – Pichavaram mangroves, Main Channel, on bark of *Rhizophora apiculata*, 22.12.2010, Logesh Aacharya Raja & Kandasamy Kathiresan. 10-012314, 10-012315 (LWG). Muthupet mangroves, Sethuguda area, on bark of *Rhizophora* sp., 16.11.2011, Logesh Aacharya Raja & Arumugam Sathishkumar. 11-012323, 11-016819 (LWG).

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