

ON THE SPECIES OF *CLADONIA* FROM ARUNACHAL PRADESH AND MANIPUR, INDIA

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Abstract

The paper deals with 21 taxa of the lichen genus *Cladonia* from Arunachal Pradesh and Manipur. A key for their identification is also provided. *Cladonia calycantha*, *C. farinacea*, *C. gymnopoda* and *C. parasitica* are the new records for the Indian lichen flora.

The Lichen genus *Cladonia* Hill, a member of the family Cladoniaceae sensu Zahlbruckner (1926) is characterized by a two fold thallus—a primary squamulose prostrate system, and a secondary erect system consisting of hollow, cylindrical, simple or branched, apothecia bearing structures called podetia and simple, hyaline spores. About 40 species reported (Awasthi, 1965; Singh 1980) from India are generally distributed in temperate and subalpine regions, with more concentration in North East region. In this paper 21 species are reported from Arunachal Pradesh and Manipur of which four species, viz., *Cladonia calycantha*, *C. farinacea*, *C. gymnopia* and *C. parasitica* are new records for India. For identification a key to all the 21 species is given. As the descriptions of other taxa are already available in Indian literature only the new records are provided with description. However, each of the remaining species is accompanied with citations, localities and their frequency of occurrence in the area. The specimens studied are deposited with the cryptogamic unit herbarium of Botanical Survey of India, Shillong (Assam) and the duplicates with Central National Herbarium, Howrah (CAL).

Key to the Species

1. Podetia with interior of cups and axils closed 2
1. Podetia with interior of cups and axils open 13
2. Apothecia and pycnidia K+red 3
2. Apothecia and pycnidia K—..... 6
3. Podetia cup-bearing, cups broad, deep, goblet-shaped..... 4
3. Podetia cupless 5
4. Podetia esorediate..... 5. *C. coccifera*
4. Podetia granular soresediate..... 15. *C. pleurota*
5. Podetia club-shaped, esquamulose, cortex mostly absent..... 1. *C. bacillaris*
5. Podetia simple, squamulose, corticate in patches..... 9. *C. didyma*
6. Podetia cupless..... 3. *C. cartilaginea*
6. Podetia cup bearing 7
7. Primary squamules narrow (1-3 mm)..... 8
7. Primary squamules broad (5-10 mm)..... 9
8. Cups not centrally proliferated..... 16. *C. pityrea*

8. Cups centrally proliferated.....13. *C. gymnopoda*
 9. Podetia with large (3-8 mm in diam.) deep, goblet shaped cups..... 10
 9. Podetia without cups or with tiny (1-3 mm in diam), shallow cups..... 12
 10. Podetia verruculose corticate at base, soresdiate below cups.....4. *C. chlorophaea*
 10. Podetia chinky areolate, corticate or decorticate and esoresdiate 11
 11. Cups gradually flaring, margin subentire.....21 *C. verticillata*
 11. Cups abruptly flaring, margin dentate.....2. *C. calycantha*
 12. Podetia tapering, not branched, esquamulose or squamules only at base.....
 6. *C. coniocra*
 12. Podetia not tapering, branched, squamulose throughout.....12. *C. gracilis*
 13. Podetia profusely branched, esquamulose and arachnoid.....17. *C. rangiferina*
 13. Podetia sparingly branched, squamulose, anarachnoid..... 14
 14. Podetia soresdiate 15
 14. Podetia esoresdiate 16
 15. Podetia farinose soresdiate, cupless.....10. *C. farinacea*
 15. Podetia granular soresdiate, cup bearing..... 17
 16. Podetia with cups 20. *C. turgida*
 16. Podetia cupless 18
 17. Podetia up to 30 mm tall, K+yellow, P. +yellow..... 14. *C. parasitica*
 17. Podetia up to 70 mm tall, K-, P+yellow-red..... 18. *C. scabriuscula*
 18. Podetia KC+yellow 8. *C. delavayi*
 18. Podetia KC 19
 19. Podetia UV 11. *C. furcata*
 19. Podetia UV + 20
 20. Podetial surface smooth..... 7. *C. crispata*
 20. Podetial surface rough19. *C. squamosa*

1. *C. bacillaris* (Ach.) Nyl., Not. sallsk, F. Fl. Fenn. Forh. 8 : 179. 1866—*Baeomyces bacillaris* Ach., Meth. Lich., p. 329. 1803.

On decaying wood, moderately common. Arunachal Pradesh, Subansiri, Ziro, Singh 605; Tirap, Namdapha, Deban, Singh 681; W. Kameng, Rupa-Thungrei, Bandrima, Singh, 1952.

2. *C. calycantha* De. ex Nyl., *Ann. Sci. Not. Bot.*, 4(11) : 209, 1859.

Primary thallus squamulose; squamules minute with upperside brownish and lower-side white, esoresdiate, also present on podetia and on the rim of cups. Podetia 10-30 mm tall, cup-bearing; cups proliferating from centre into 2-3 tiers, 1-3 mm across, abruptly flaring, imperforate, margin entire to dentate. Apothecia sterile, present at tips of minute stipes on margin of cups, brownish-black, 0.5-1.0 mm in diameter, K-; pycnidia present on the margins of cups, sessile. Podetia and squamules K-, KC-, C-, P+orange-yellow to red.

The species is distinguished by the presence of centrally proliferated, esoresdiate, abruptly flaring cups. It is close to *C. verticillata*, but the latter is characterized by much bigger primary squamules, gradually flaring cups with less dentate margin. This species distributed in America, many Asian countries, Australia, and Europe, is a new record for India.

Specimens examined—Arunachal Pradesh, Subansiri, Hapoli-Yazali road, Singh 561; Kameng, Thungrei-Bandrima forest foot tract, Singh, 1524.

3. *C. cartilaginea* Mull. Arg., *Lich. Beiter. Fl.*, **63** : 260. 1880.

On decaying wood, moderately common. Arunachal Pradesh, Tirap, Namdapha, Singh 173.

4. *C. chlorophaea* (Flörke) Spreng., *Syst. Veg. ed.*, **16.4** : 273. 1827.

Cenomyce chlorophaea Florke in Sommerf., *Suppl. Fl. Lappon.*: 130. 1826.

Terricolous in moist places, scarce, Arunachal Pradesh, Subansiri, Hapoli-Yazali road, Singh 565; W. Kameng, Tawang, Singh 1818.

5. *C. coccifera* (L) Willd., *Fl. Berolin*, **361** : 1787—*Lichen cocciferus* L. sp. Pl., p. 1151. 1753.

On hard soil along the road-side, moderately common. Arunachal Pradesh, Kameng, new Bomdila forest, Singh 1526; Sangsela, Rao 7737-annotated as *C. bellidiflora* (Ach.) Schaer.

6. *C. coniocraea* (Flörke) Spreng., *Syst. Veg. ed.*, 16-4: 272. 1827.—*Cenomyce coniocraea* Flörke, *Deutsch. Lich.* 7 : 11. 1821.

On decaying wood, moderately common. Arunachal Pradesh, Tirap, Namdapha, Singh 692; Kameng, Tawang, Singh 1817.

7. *C. crispata* (Ach.) Flot., *Wendt. Therm. Warmbr.* p. 96. 1839.—*Baeomyces turbيناتus* var. *crispata* Ach., *Meth. Lich.*, p. 341. 1805.

On soil in moist places, scarce. Arunachal Pradesh, West Kameng, Tawang, Singh 1822.

8. *C. delavayi* des Abb., *Candollea*, **16** : 203. 1958.

Terricolous, common at higher elevations in Kameng District of Arunachal Pradesh. Sange to sela, Rao 7726, 13759 (Assam).

9. *C. didyma* (Fée) Vain., *Acta. Soc. F. Fl. Fenn.*, **4** : 137. 1887.—*Scyhophora didymous* Fée., *Meth. Lich.*, p. 98. 1824.

Terricolous, scarce, Arunachal Pradesh, Kameng, Thungrei-Bandrima forest, Singh 1523.

10. *C. farinacea* (Vain.) Evans, *Rhodora*, **52** : 95. 1950.—*Cladonia furcata* var. *scabriuscula* f. *farinacea* Vain., *Acta. Soc. F. Fl. Fenn.*, **4** : 339. 1887.

Primary thallus squamulose; squamules irregularly lobed, upper side yellowish grey and lower side white, esorediate marginally. Podetia 10-30 mm tall, without cups, irregularly to dichotomously branched, branches isotomic to anisotomic with open axils or branches split lengthwise and tipped with apothecia. Apothecia sterile, brown-black, up to 1 mm in diameter, K-; pycnidia absent. Podetia and squamules K-, C-, KC-, P+ yellow-orange red.

The species is distinguished by irregularly to dichotomously branched, cupless podetia with open axils.

C. farinacea has so far been reported from Japan, America and Australia. It is recorded for the first time from India,

11. *C. furcata* (Huds.) Schrad., *Spic. Fl. Gern.*, p. 107, 1794.—*Lichen furcatus* Huds., *Fl. Angl.*, p. 458. 1762.

Terricolous; very common. Arunachal Pradesh, Subansiri, Zirc area, Singh 355, 366, 399, 400, 476, 556; Kameng, Sessa, Nichephu, Singh 1186; Bomdila, Singh 1674; Tawang, Singh 1824; Manipur, Ukhrul, Singh 550488; None, Singh 550900.

12. *C. gracilis* (L) Wild., *Fl. Berol.* : 363. 1787.—*Lichen gracilis* L, *Sp. Pl.* : 1152. 1753.

On very moist moss covered soil, under *Rhododendron companulatum* shrub at higher elevations, scarce. Arunachal Pradesh, Sange to Sela, Rao 7768.

13. *C. gymnopoda* Vain., *Acta. Soc. F. Fl. Fenn.*, 10 : 172. 1894.

Primary thallus squamulose, squamules irregularly lobed, esorediate; podetia 5-30 mm tall; esorediate, cup-bearing, cups narrow, abruptly flaring, proliferating from centre into 2-3 tiers. Apothecia absent, pycnidia brown, on margins of cups. Podetia and squamules K-, C-, KC-, P+orange.

The species is distinguished by the presence of narrow, centrally proliferated cups with esorediate podetia. In centrally proliferated condition of cups it is subsimilar to *C. verticillata* and *C. calycantha* but both of them have smooth, chinky areolate cortex. The species is distributed in Java and Nepal. It is a new record for India.

Specimens examined—Arunachal Pradesh, Kameng, Bomdila forest, Singh 1527; Dirang Road, Singh 1745.

14. *C.* cfr. *parasitica* (Hoffm.) Hoffm., *Deutschl. Fl.*, 2 : 127. 1796.—*Lichen parasiticus* Hoffm., *Enum. Lich.*, p. 39. 1784.

Primary thallus squamulose, squamules irregularly incised lobed, marginally granular soresediate. Podetia 5-15 mm tall, cupless, squamulose and granular soresediate, simple to irregularly branched, axils open. Apothecia stipitate, brown to brown black, up to 0.5 mm in diameter, K-, sterile; pycnidia lacking. Podetia and squamules K+ yellow C-, KC-, P+yellow-orange.

The taxon is distinguished by the presence of short tapering ecorticate, simple to irregularly branched, squamulose and soresediate podetia. In soresediate condition it is subsimilar to *C. vulcanica* Zoll. and *C. polydactyla* (Florke) Spreng., but both of them have closed axils and K+red apothecia.

The species known so far from many countries in Asia, America, Europe and Africa is a new record for India.

Specimens examined—Arunachal Pradesh, Kameng, Sange-Sela, Rao 3821.

15. *C. pleurota* (Flörke) Schaer., *Enum. Lich. Eur.*, p. 186. 1850.—*Capitularia pleurota* Flörke, *Ges. Naturf. Freund. Mag.*, 2 : 218. 1808.

On soil, moderately common at higher elevations. Arunachal Pradesh, West Kameng, Bomdila, Singh 1827; Shera Basti forest, Singh 1573; Tawang, on the way of Pinga teng, Singh 1819.

16. *C. pityrea* (Flörke) Fr., *Nov. Sched. Crit.* p. 21. 1826—*Capitularia pityrea* Flörke. *Berl. Magaz.*, 2 : 135. 1808.

On hard soil along the road-cuttings, very common in the area. Arunachal Pradesh, Tirap. Namdapha, Singh 166, 197, 963; West Kameng, Sessa-Nichephu, Singh 1182,

1184; Bomdila, Tipi Road, Singh 1126; on the way of Vaijaintimala fall, Singh 1270, 1271; Dukhampani, Drizingpam forest, Singh 1520; new Bomdila forest, Singh 1528; Shera basti forest, Singh 1672; Dirang Road, Singh 1746; Dirang yang, Singh 1828. Manipur Ukhrul, Hunderg, Singh 552253; Samsai, Singh 550629.

17. *C. rangiferina* (L) Wigg., *Prin. Fl. Holsat.*, p. 90. 1780.—*Lichen rangiferinus* L. *Sp. Pl.*, p. 1153. 1735.

On very moist moss covered soil under *Rhododendron companulatum* shrub at higher elevations, moderately common. Arunachal Pradesh, Sange-Sela, Rao 7767.

18. *C. scabriuscula* (Del. in Duby) Nyl., *Flora*, **58** : 447. 1875.—*Cenomyce scabriuscula* Del. in Duby., *Bot. Gall. ed.*, **2** : 623. 1830.

On hard soil along the road cuttings, very common in the area. Arunachal Pradesh, Tirap, Namdapha, Singh 207; West Kameng, Sessa, Nêchephu, Singh 1187; Vajainti Malafall 1188; Sherabasti forest, Singh 1670, 1971; Dirang, Singh 1675; Bomdila; Tawang, Singh 1820; Bomdir, Singh 1825; Manipur, Ukhrul, Nagaimu, Singh 54641, Lungshong Khong, Singh 550475, 550476; Karang, Mapith hill peak, Singh 54955.

19. *C. squamosa* (Scop). Hoffm., *Deutschl. Fl.*, **2** : 125. 1796.—*Lichen squamosus* Scop., *Fl. Carn.* ed. 2. **2** : 368. 1772.

Terricolous, common at higher elevations. Arunachal Pradesh, Subansiri, Singh 521; Kameng, Tawang, Singh 1821; Rao 14599.

20. *C. turgida* (Ehrh.) Hoffm., *Deutschl. Fl.* **2** : 124. 1796.—*Lichen turgidus* Ehrh., *Pl. Crypt. Exs.*, p. 297. 1793.

On soil in shady places, scarce. Manipur, on the way to Sugnu, Singh 551027.

21. *C. verticillata* (Hoffm.)

Terricolous, very common in the area. Arunachal Pradesh, Subansiri, Ziro, Singh 378, 471, 562; 608; West Kameng, Sessa-Nichephu, Singh 1183; Dukhampani, Drizingpam, Singh 1521; Thungrei, Singh 1526, 1826; Manipur, Churachandpur, Singh 550485, 550689; Tegopad, Singh 550950; Ukhrul, Lungshong Kong, Singh 550484; Siroi hill, Singh 55045.

Remarks—The species *Cladonia aggregata* (Sw.) Ach., reported earlier from Arunachal Pradesh (Awasthi, 1961), has been placed under a separate genus *Cladia* as *Cladia aggregata* (Sw.) Nyl. not dealt herein, although it grows abundantly on ground at higher elevations ca. 1800 m in Arunachal Pradesh.

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