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

K. P. SINGH AND D. K. UPRETI*

*Bolanical Survey of India, Shillong
*National Botanical Research Institute, Rana Pratap Marg, Lucknow 226 001, India

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. gymnopoda* 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 sorediate | 15. *C. pleurota* |
| 5. Podetia club-shaped, squamulose, 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

9. Podetia with large (3-8 mm in diam.) deep, goblet shaped cups

10. Podetia with cups or with tiny (1-3 mm in diam.), shallow cups

11. Podetia verruculosely corticate at base, sorediate below cups

12. Podetia chinky areolate, corticate or decorticate and esorediate

13. Cups gradually flaring, margin subentire

14. Cups abruptly flaring, margin dentate

15. Podetia tapering, not branched, esquamulose or squamules only at base

16. Podetia not tapering, branched, squamulose throughout

17. Podetia profusely branched, esquamulose and arachnoid

18. Podetia sparingly branched, squamulose, anarchnoid

19. Podetia sorediate

20. Podetia esorediate

21. Podetia farinose sorediate, cupless

22. Podetia granular sorediate, cup bearing

23. Podetia with cups

24. Podetia cupless

25. Podetia up to 30 mm tall, K+ yellow, P+ yellow

26. Podetia up to 70 mm tall, K-, P+ yellow-red

27. Podetia KC+ yellow

28. Podetia KC

29. Podetia UV

30. Podetia UV +

31. Podetial surface smooth

32. Podetial surface rough


Primary thallus squamulose; squamules minute with upperside brownish and lower-side white, esorediate, 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, imperfectate, 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, esorediate, 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.

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

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

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

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

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

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

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

    Primary thallus squamulose; squamules irregularly lobed, upperside 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.

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.


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


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.


Primary thallus squamulose, squamules irregularly incised lobed, marginally granular sorediate. Podetia 5-15 mm tall, cupless, squamulose and granular sorediate, 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 ecorctic, simple to irregularly branched, squamulose and sorediate podetia. In sorediate condition it is subsimilar to *C. vulcanica* Zoll. and *C. polydactyla* (Flörke) 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.


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.


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,
Singh & Upreti—On the species of Cladonia

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.


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


On hard soil along the road cuttings, very common in the area. Arunachal Pradesh, Tirap, Namdapha, Singh 207; West Kameng, Sessa, Nechephu, Singh 1187; Vaijaintimala 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.


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


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.

Acknowledgements

One of the authors (K. P.) is thankful to the Director and Deputy Director, Botanical Survey of India, Shillong for encouragement and facilities for the present work.

References

