**Cyathodium denticulatum** Udar et Srivastava: A rare liverwort new to Chhattisgarh, Central India

**Ashwini Kumar Dixit, Mery Aradhna Kerketta**

Department of Botany, GuruGhasidas Vishwavidyalaya, Bilaspur 495001, Chhattisgarh, India

**ABSTRACT**

This article reports the occurrence of the thalloid liverwort *Cyathodium denticulatum* Udar et Srivastava was collected first time from the Achanakmar – Amarkantak Biosphere Reserve (AABR) Bilaspur, Chhattisgarh. It is shown that *Cyathodium denticulatum* a narrow Himalayan endemic has been reported earlier from Darjeeling, India. There is no record of its occurrence from central India. *Cyathodium denticulatum* is a rare species known only from eastern Himalayan region. A key to related Indian taxa and taxonomic description is provided.

**KEY WORDS:** Central India, New Record, Cyathodiaceae, Liverwort, Achanakmar – Amarkantak Biosphere Reserve (AABR)

**INTRODUCTION**

The Achanakmar – Amarkantak Biosphere Reserve (AABR) is enlisted in World Network of Biosphere Reserve (WNBR) in 2012 by UNESCO under Man and Biosphere (MAB) programme. Which is situated between latitude 21°15’N-21°58’N Longitude 81°25’E-82°5’E North West of the Maikaal ranges from Anupur district Madhya Pradesh to Bilaspur, Chhattisgarh. This region is located in the northern part of Bio-Geographic zone 6-A (Deccan peninsula and central highlands) about 61% of this reserve lies in ATR (Achanakmar Tiger Reserve) Chhattisgarh with surface area covering 383, 5510 ha. A preliminary survey shows that liverworts are quite dominant at Bilaspur-ATR forest area and a numbers of phylogenetically significant taxa viz. *Marchanita papillata* Raddi, *Reboulia hemisphaerica* (L.) Raddi, *Aneura pinguis* Marchan are found [1]. A checklist of 17 species of liverworts were recorded from AABR region which include two species of *Cyathodium*, one is not recognised [2]. Although *Cyathodium cavernarum* was recorded collectively from protected area Achanakmar-Amarkantak Biosphere Reserve [3,4] as well as other region of Bilaspur district (Figure 1). However, the area was thoroughly surveyed by many bryologist recently a comprehensive work has been done and floristic account was publicized [5,6]. A check list of Indian bryophytes enumerated ca. 700 species including *Cyathodium denticulatum* [7]. This data categorised 67 liverworts endemic included *Cyathodium denticulatum*. Whereas, researcher earlier reported rare distribution of *C. denticulatum* in India [8]. *Cyathodium denticulatum* have been enumerated for the first time from Central India.


*Cyathodium* is closely allied to Targoniaceae as it is reduce form of it and also resembles several feature of *Reboulia* [13,15]. The species considered to be most primitive, and highly distinctive characters among the genera presence of plated scales, differentiated storage zone, branched receptacles and involucres with dentate free margins provided the concept of legacy, which given rise to other species through *C. foetidissimum* [13]. Phylogenetically this taxa retained in Marchantiales on the basis of thallus development. The evolutionary tendencies initially proposed by Udar [16] on the basis of Sporoderma. Udar and Srivastava (17) introduced a new species *C. denticulatum* udar et Srivastava from Darjeeling.

**MATERIAL AND METHODS**

The fresh specimen of plant was collected from their natural localities (AABR) around Bilaspur district of Chhattisgarh.
The morpho taxonomical studies done, vegetative as well as reproductive parts of this plant was observed. The anatomical structure of thallus, spores and elaters were studied under Leica digital Microscope (DM 2000). The hand sections of thallus were mounted in 30% aqueous solution of glycerine for observation. The voucher specimens have been deposited in the Department of Botany, Guru Ghasidas Vishwavidyalaya, and Bilaspur. The identification key of taxa in the country given below the description is based on collected material and the key. Conservation status and key to all 9 taxa reported earlier from India is provided (Table 1).

**Key to the Species of Genus Cyathodium in India**

1. Plants without midrib, air chambers in one layer, storage zone absent subgenus Cyathodium subgen. nov.
2. Plants with distinct midrib, Thallus differentiated into storage zone, air Chambers in 1-3 Layers subgenus Metacyathodium subgen. nov.

**Key to the Species of Subgenra Metacyathodium**

2a. Monoecious, Spore Verrucose C. foetidissimum.
2b. Dioecious, spore verrucose......3
3. Involucre denticulate, spore ornamentation verrucose, Incomplete reticulation, C.denticulatum

**Taxonomic Observation**

*Cyathodium denticulatum* Udar et Srivastava [17]

Thalli yellowish-green (2.5-3.5cm long and 1-2.5 cm wide) once twice dichotomously branched with distinct midrib: Dorsal pore simple, Large slightly elevated rings, air chambers are present at midrib zone Thallus differentiated into assimilatory zone and storage zones with 2-3 layer Chambers, Rhizoids hyaline ventral scales filamentous. Plant dioecious male plant smaller than female plant (2-4.5cm long and 3-5 cm wide) involucre ovoid to elliptical, projecting beyond the thallus apex, 2.4mm long 2mm wide bivalve, margin denticulate, marginal cells of involucre valves pigmented brown, dentitions 300-500 μm long. Each involucre contains one sporophyte. Capsule oval, blackish-brown, 0.75-1.2mm diameter, capsule wall single layered, upper half is dehiscing part thick brown with annular thickenings and dehiscent in to two halves. Spores (70-80μm diameter) dark black, isopolar, verrucose, verrucae Y-shaped forming incomplete reticulations. Elaters reddish brown (800-900μm long 20-30μm wide), few in number (15:4 spore elaters ratio) trispiral (Figures 2 and 3).

**Distribution**: Darjeeling, India (Eastern Himalaya), Achanakmar – Amarkantak Biosphere Reserve Chhattishgarhi (Central India).
Table 1: Account of species in India

<table>
<thead>
<tr>
<th>Characters</th>
<th>C. aureonitens</th>
<th>C. cavernarum</th>
<th>C. smaragdinum</th>
<th>C. indicum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thallus</td>
<td>Thallus green midrib absent</td>
<td>Thallus green midrib absent</td>
<td>Thallus green midrib absent</td>
<td>Thallus green midrib absent</td>
</tr>
<tr>
<td>Sexuality</td>
<td>Dioecious</td>
<td>Monoecious</td>
<td>Monoecious</td>
<td>Dioecious</td>
</tr>
<tr>
<td>Antheridium</td>
<td>Stalked</td>
<td>Sessile</td>
<td>Sessile</td>
<td>Sessile</td>
</tr>
<tr>
<td>Involucrue</td>
<td>Hairy</td>
<td>Smooth</td>
<td>Smooth</td>
<td>Smooth</td>
</tr>
<tr>
<td>Spores</td>
<td>Spinate isopolar, oval blackish brown</td>
<td>Black spores isopolar, Baculate, spinate oval blackish brown</td>
<td>Black, Deep brown, Granulate oval blackish brown</td>
<td>Baculate, backish oval blackish brown</td>
</tr>
<tr>
<td>Elaters</td>
<td>Reddish brown, Bispiral 8-11 per cells 245-480m</td>
<td>Bispiral and trispiral in same capsule, 4-8 per Capsule</td>
<td>36-52m, Baculate, backish oval blackish brown, 56-64m</td>
<td>8-12 per capsule elongate trispiral oval blackish brown</td>
</tr>
<tr>
<td>Distribution</td>
<td>Eastern Himalaya, Western Ghats</td>
<td>Bombay, Malabar hill, central India, Gujarat</td>
<td>Mallabar hills, garh Khandala, Pratap</td>
<td>Endemic to N.E. Himalaya, Nainital</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characters</th>
<th>C. tuberculatum</th>
<th>C. mehranum</th>
<th>C. tuberosum</th>
<th>C. denticulatum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thallus</td>
<td>Thallus green to florocenose midrib absent</td>
<td>Thallus dark green and storage zone air chambers present</td>
<td>Thallus dark green midrib absent oil cells present with one layer air chamber</td>
<td>Thallus dark green, midrib, storage zone with air chambers present dioecious</td>
</tr>
<tr>
<td>Sexuality</td>
<td>Monoecious/dioecious</td>
<td>Dioecious</td>
<td>Dioecious stalked</td>
<td>Dioecious stalked</td>
</tr>
<tr>
<td>Antheridium</td>
<td>Sessile</td>
<td>Sessile</td>
<td>Stalked</td>
<td>Stalked</td>
</tr>
<tr>
<td>Involucrue</td>
<td>Hairy</td>
<td>Hairy</td>
<td>Hairy</td>
<td>Hairy</td>
</tr>
<tr>
<td>Spores</td>
<td>Oval spores, Tuberculate tubercles,</td>
<td>Baculate apolar, muricate</td>
<td>Spinate isopolar double sculpture, dark brown</td>
<td>Verrucose, blackish brown</td>
</tr>
<tr>
<td>Elaters</td>
<td>Reddish brown elongated tri-, tetra spiral except from the tips</td>
<td>Reddish brown trispiral 640-900m</td>
<td>15-50 per capsule 280-360m tri-spiral</td>
<td>Reddish brown 8-10 per capsule 760-800m elongated tri-spiral</td>
</tr>
<tr>
<td>Distribution</td>
<td>Endemic to eastern Himalayas</td>
<td>Eastern Himalayas Arunachal pradesh</td>
<td>Eastern Himalaya-d arjeeling, Sikkim, western Himalaya, western ghates poona (karle caves) Gangetic plains</td>
<td>Darjeeling</td>
</tr>
</tbody>
</table>

Figure 2: Cyathodium denticulatum Udar et Srivastava A. Female thallus with involucrue B-C. Portion of involucrue (with dentate margin of valve) D. Capsule Wall with annular band E. Capsule wall inner view F. Spore G-G’. Elaters
Dixit and Kerketta


Ecology: on moist soil and rocky surface.

DISCUSSION

During the present investigation on liverworts of Bilaspur and Achanakmar–Amarkantak Biosphere reserve the species Cyathodium denticulatum have been identified from the region. Cyathodium denticulatum Udar et Srivastava is reported from Chhattisgarh state for the first time considered as rare showing narrow range of distribution.

The authors are grateful to Bilaspur regional Forest department for providing facilities for exploration. This research is funded by University Grant commission by Indian Government.

REFERENCES

15. Parihar, N.S. An annotated revised census of Indian Hepatics. Univ. Allahabad Studies (Botany Section); 1961-62. 1-56.