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Short Communication

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

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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 Resrve (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* (L.) Dumort 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.

So far about 13 taxa of *Cyathodium* sp. Recorded from different bryogeographical regions of world [9]. The genus *Cyathodium* Kunze (Cyathodiaceae K. Mull.) [10,11] comprises 13 species among those 8 are validly recognised [12]. Authors [13] have reported occurrence of eight species in India. Totally Indian subcontinent the genus *Cyathodium* is represented by 9 taxa [13,14] namely *C. mehranum* Singh, *C. tuberculatum* Udar et Singh, *C. tuberosum* Kash., *C. smaragdinum* Schi ffn., *C. aureonitens* (Griff.) Mitt. *C. cavernarum* kunze, *C. indicum* Udar et Singh, *C. denticulatum* Udar et Srivastava, *C. foetidissimum* schiffn. Majority of the species are endemic, whereas *C. cavernarum* kunze, widely distributed [14].

Cyathodium is closely allied to Targioniaceae 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]. Phyllogenetically this taxa retained in Marchantiales on the basis of thallus development. The evolutionary tendencies initially proposed by Udar [16] on the basis of Sporoderm. 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.

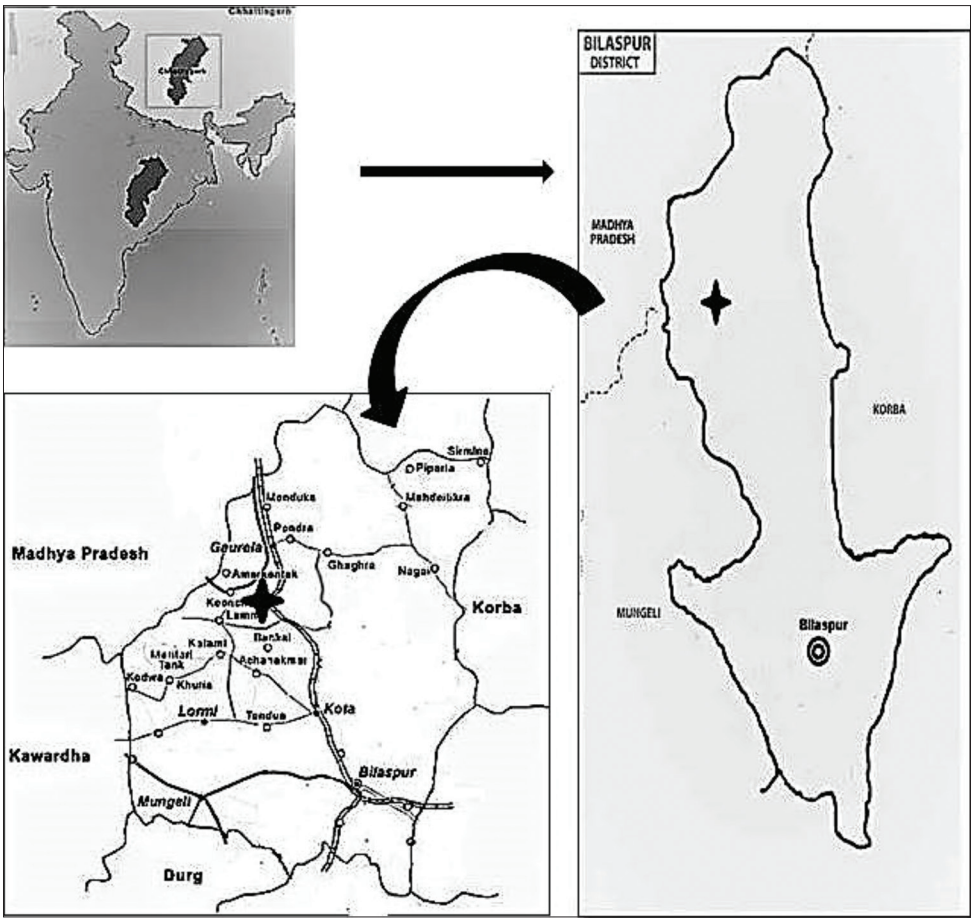

Figure 1: Distribution map from AABR, Bilaspur district of Chhattisgarh, Central India Source maps of India

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 (2.5-3.5cmlong 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 (2-4.5cmlong 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 daimeter) dark black, isopolar, verrucose, verrucae Y-shaped forming incomplete reticulations. Elaters reddish brown (800-900μmlong 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 Chhattishgarh (Central India).

Table 1: Account of species in india

Charaters	*C.aureonitens*	*C.cavernarum*	*C.smaragdinum*	*C.indicum*
Thallus	Thallus green midrib absent	Thallus green midrib absent	Thallus green midrib absent	Thallus green midrib absent
Sexuallity	dioecious	Monoecious	Monoecious	dioecious
Antheridium	stalked	sessile	sessile	sessile
Involucure	Hairy	smooth	smooth	smooth
Spores	Spinate isopolar. oval blackish brown	Black spores isopolar, Baculate, spinate	Black, Deep brown, Granulate 36-52m	Baculate, backish brown,apopolar,56-64 m
Elateres	Blackish brown 8-15 per capsule tri spirate, large	Reddish brown, Bispiral 8-11 per cells 245- 480m	Bispiral and trispiral in same capsule, 4-8 per Capsule	8-12 percapsule elongate trispiral
Distribution		Eastern Himalaya Weastern Ghats Bombay, Malabar hill, central india ,Gujrat Gangetic, plains, java, Africa America.	Mallabar hills, garh Khandala, Pratap	Endemic to N.E.Himalaya, Nainitaal

Charaters	*C.tuberculatum*	*C.mehranum*	*C.tuberosum*	*C. denticulatum*
Thallus	Thallus green to florocennse midrib absent	Thallus dark green and storage zone air chambres present	Thallus green midrib absent oil cells present with one layer air chamber	Thallus dark green,midrib, storage zone with air chambers present
Sexuallity	Monoecious/ dioecious	dioecious	dioecious	dioecious
Antheridium	seeile	sessile	stalked	stalked
Involucure	Hairy	Hairy	Hairy	denticulate
Spores	Oval spores Tuberculate tubercles,	Baculate apolar, muricate	Spinate isopolar double sculpture, dark broen	Verrucose, blakish brown
Elateres	Reddish brown elongated tri-, tetra spiral except from the tips	Reddish brown trispiral 640-900m	15-50 per capsule 280-360m tri- spiral	Reddish brown 8-10 per capsule760-800m elongated tri spiral
Distribution	Endemic to eastern Himalayas	Eastern Himalays Arunachal pradesh	Eastern Himalaya-d arjeeling, Sikkim,western Himalaya , western ghates poona (karle caves) Gangetic plains	Darjeeling

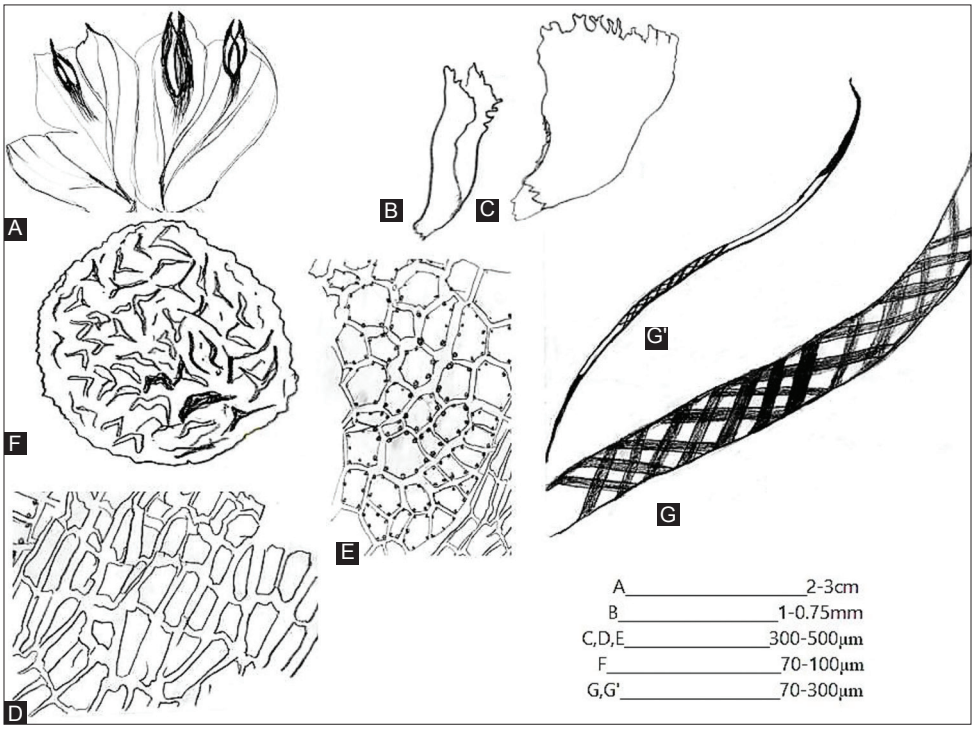

Figure 2: *Cyathodium denticulatum* Udar et Srivastava A. female thallus with Involucure B-C. Portion of involucre (with dentate margin of valve) D. Capsule Wall with annular band E. Capsule wall inner view F. Spore G-G'. Elaters

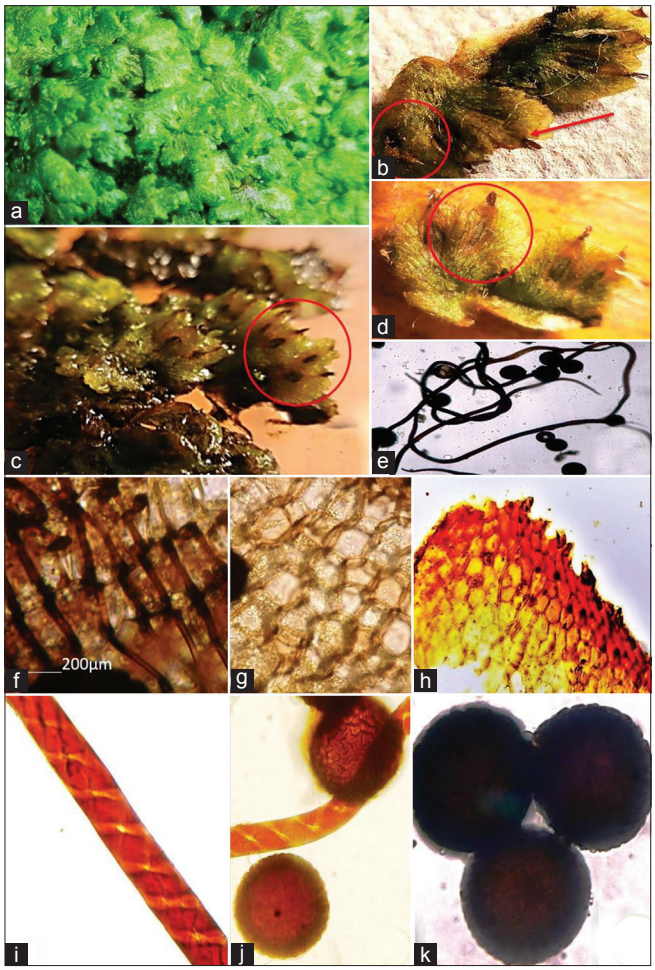

Figure 3: Cyathodium denticulatum Udar et Srivastava a.young population b. mature thallus with female sporophyte and male sporophyte c-d. female thallus dorsal view with apical portion of the Involucure (margin of valve) f-g. Capsule wall h. Marginal cells of Involucre (with dentate margin of valve) e, i-j Elaters and Spores

Specimen examined: Herbarium: Bryology: 360116 (CHP/BRY/ANT/360116/GGV/BOT/MAK) 27-12-2016; location 27-12-2016; location Chhaprwa- (AABR) lat: 22.24.17.855 log: 81.52.7.8900 alt: 433 Det., Mery Aradhna.

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 species *Cyathodium denticulatum* Udar et Srivastava has not been described in the recent past from any new locality other than those mentioned by pioneer bryologist [8,17]. It has been recollected now after 45 years from Bilaspur, also it assessed as "rare" in Himalayan region [13]. It is easily identifiable due to highly distinctive characters among the genera viz. dentate margin and apical involucre. This study suggests there is a need to strengthen and updating database of Bryophyte status, which will guide in the development of new conservation strategies for the region and AABR.

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