

A NEW SPECIES OF *CYATHODIUM* KUNZE, *C. DENTICULATUM* UDAR ET SRIVASTAVA SP. NOV., FROM DARJEELING (EASTERN HIMALAYAS), INDIA¹

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ABSTRACT

In the present paper a new species of *Cyathodium*, *C. denticulatum*, is described from Darjeeling (Eastern Himalayas), India. The species is characterized by thallus with distinct assimilatory and storage zones, air chambers in 2-3 layers and free margins of the involucre distinctly denticulate.

INTRODUCTION

A majority of the species of *Cyathodium*, among all the known species of the genus, have been recorded from India. These are: *Cyathodium aureonitens* (Griff.) Mitt. (GRIFFITH, 1849: from Assam; STEPHANI, 1900: from Dehradun, Bombay and Calcutta), *C. smaragdinum* Schffn. (SCHIFFNER, 1938-39: from Bombay and Khandala in Western Ghats), *C. tuberosum* Kashyap* (KASHYAP, 1914, 1929: from Western Himalayas and Punjab Plains; *Syn. C. penicillatum* St., STEPHANI, 1917: from Mussoorie), *C. cavernarum* Kze** (TIWARY, 1929: from Banaras), *C. barodae* Chavan*** (CHAVAN, 1937: from Baroda), *C. flabellatum* Mehra (MEHRA 1957; MEHRA & SOKHI, 1969: from Panjab) and *C. acrotrichum* Schffn. (SCHIFFNER, 1938-39: from Kurseong).

Except *C. foetidissimum* Schffn. (LANG, 1905) of Java, Sumatra and Tahiti, all other species so far described are characterized by the absence of a distinct midrib in the thallus. The presence of empty air chambers in a row delimited by unistratose partition membranes and upper and lower epidermal layers is common to all the species. However, the taxon described in this paper shows a highly significant thallus structure in having distinct assimilatory and storage zones and 2-3 layers of empty air chambers. Such thallus organization closely corresponds to those in species of *Asterella*, *Plagiochasma*, *Cryptomitrium* and *Reboulia* of the family Rebouliaceae. The involucre in this species is also highly distinctive and different from other species. It projects conspicuously beyond thallus apex and its free margins are significantly denticulate. Since the diagnostic characters of the present species differ from all the known species of *Cyathodium* described so far, it is considered here as a new species.

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*Some earlier as well as recent records of this species from localities apart from western Himalayas seem erroneous.

**The specimens of *Cyathodium* collected by Tiwary from Banaras Hindu University were identified as *C. cavernarum* by Goebel and *C. tuberosum* by Kashyap. However, Goebel's identification correctly typifies the plant.

***This species is synonymous with *C. cavernarum* (see UDAR, 1964).

It is unfortunate that the specimens available for study do not show mature sporogonia. Consequently the spore characteristics could not be investigated. However, the exine sculpturing of the spore, as evident from their structure from semi-mature sporogonia, conform to the usual 'spiny or pimply' pattern prevalent in the genus.

The material of the present paper was collected by Mr. Harihar Nath Singh from Darjeeling (India) in October, 1969 and was kindly placed at the disposal of one of us (R.U.) for investigation. Thoroughly cleaned thalli were fixed in form-acetic-alcohol and later preserved in 90% alcohol.

TAXONOMIC DESCRIPTION

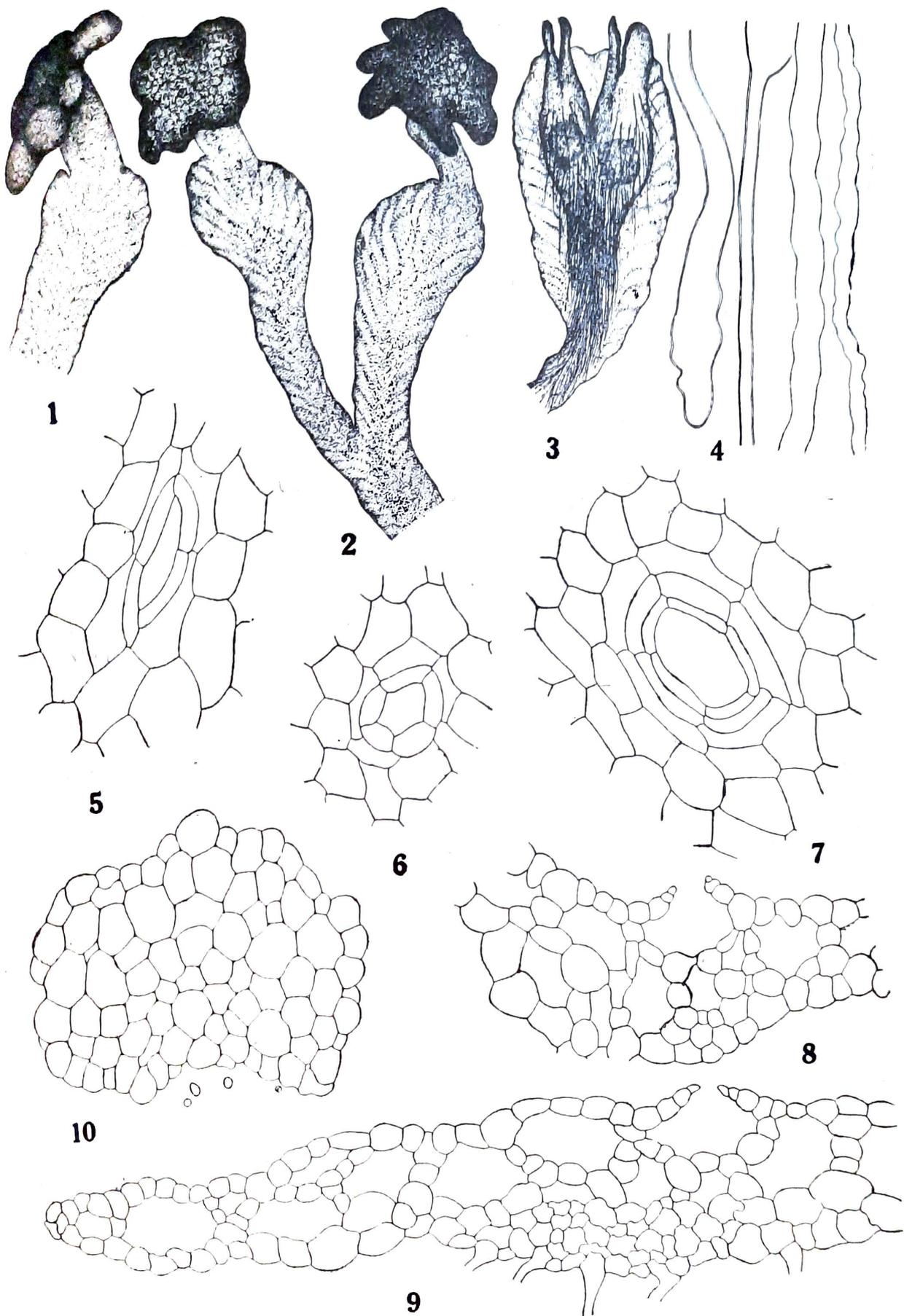
Cyathodium denticulatum sp. nov

Diagnosis—Plantae superpositae, semel vel bis dichotome ramosae, in humis super petras in caespitibus aggregatae. Costa plus minusve conspicua superficie ventrali. Thallus cum regionibus assimilativis et penaribus. Cavernulae aeriae regione costae 1-2(3) stratae, marginibus vero 1-stratae, sine filis assimilativis; stomata simplicia, leviter elevata, unusquisque cum 1-3 annulis concentricis 4-5 cellulorum. Regio penaria compacta, 2-4 (5) strata. Rhizoidea simplicia, sinuosa, tenuia vel uniformiter pachydermica; rhizoidea tuberculata incognita. Squamae ventrales minutae cellululis chloroplastis. Dioica. Plantae masculae 2.5—6.5 mm longae, 1.25—1.5 mm latae; antheridia receptaculis pedunculatis terminalibus portata; receptaculum umbonatum (vel convexum) supra, 4-6 lobatum, unusquisque lobus squamis ventralibus; pedunculus ca. 1-1.15 mm longus, sulco rhizoidali vadoso. Plantae femineae 3-6 mm longae, 1.25-2.5 mm latae. Involucrum ovoideum vel ellipticum, ultra apicem thalli procurrens, bivalvatum; cellulae marginales valvae brunneae; margines liberi denticulati et apparenter interordinati. Sporophyta juvenis, in capsulam sphaericam, setam minutam et pedem differentiatam. Sporae et elateres immaturi.

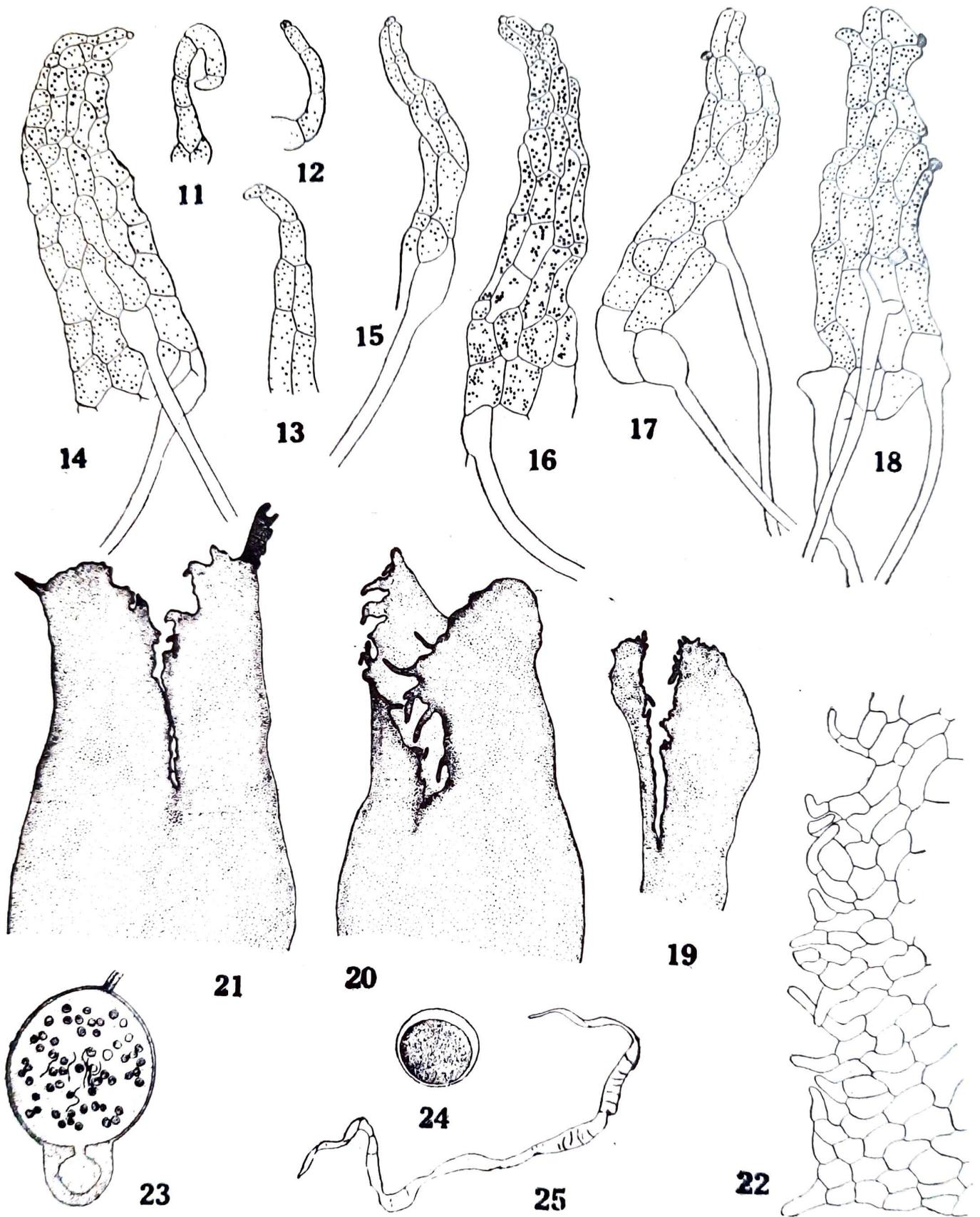
Typus positus in herbario hepatico, sectionis botanices, Universitatis Lucknow, Lucknow (India), sub numero 12674 *Cyathodium denticulatum* Udar et Srivastava sp. nov. in humis super petras crescens. Leg. Harihar Nath Singh. Loc. Darjeeling mense October 1969. Det. R.U. et S.C.S., mense augusti, anni 1970.

Description—Plants overlapping, forming tufts on moist soils on rocks, once or twice dichotomously branched. Midrib more or less conspicuous on ventral surface. Thallus with assimilatory and storage zones. Air spaces in 1-2(-3) layers in the midrib region, 1 layered at the margins, devoid of assimilatory filaments; pores simple, slightly elevated, with 1-3 concentric rings of 4-5 cells in each. Storage zone compact, 2-4(5) layers of cells thick. Rhizoids simple, sinuous, thin or uniformly thick-walled; tuberculate rhizoids not seen. Ventral scales minute filamentous or small cell-plates, cells with chloroplasts. Dioecious. Male plants 2.5-6.5 mm long, 1.25-1.5 mm broad, antheridia borne in terminal stalked receptacles; receptacle umbonate (or convex) above, 4-6 lobed, each lobe with scales ventrally; stalk ca 1-1.15 mm long, with a shallow rhizoidal furrow. Female plants 3-6 mm long, 1.25-2.5 mm broad. Involucre ovoid or elliptical, projecting beyond thallus apex, bivalved, marginal cells of the valve pigmented brown, free margins denticulate (teethed) and apparently interlocking. Sporophyte young, differentiated into spherical capsule, minute seta and foot. Spores and elaters immature.

Type Specimen deposited in the Hepatic Herbarium, Department of Botany, University of Lucknow, Lucknow (India). No. 12674 *Cyathodium denticulatum* Udar et Srivastava sp. nov. growing on moist soil over rock. Coll. Harihar Nath Singh, Locality: Darjeeling, October 1969. Det. R.U. and S.C.S. August, 1970.



Text-figs. 1-10. *Cyathodium denticulatum* sp. nov. 1, 2. Male plants $\times 13.7$ and $\times 12.5$ respectively, 3. Female plant $\times 13.7$, 4. Rhizoids $\times 200$, 5-7. Epidermal pores $\times 200$, 8-9. Cross section of two thalli $\times 105$ 10. Cross section of stalk of male receptacle $\times 105$,



Text-figs. 11-25. *Cyathodium denticulatum* sp. nov. 11-18. Ventral scales, note the presence of chloroplasts in cells and mucilage papillae at the margins $\times 105$, 19-21. A portion of involucres from different thalli, note the dentate margins of the valve $\times 44$, 22. Marginal cells of the involucre $\times 105$, 23. A young sporophyte enclosed within calyptra $\times 44$, 24. Young spore $\times 200$, 25. Young elater $\times 105$.

Characteristics of the species: (1) Dioecious. (2) Antheridial receptacle stalked. (3) Involucre projecting beyond thallus apex, bivalved, free margin of the valve distinctly denticulate. (4) Thallus with distinct assimilatory and storage zones. (5) Air chambers 1-2(-3) layered without assimilatory filaments.

REMARKS

PROSKAUER (1951) remarked that "*Cyathodium* is a reduced member of the Marchantiales in which the lower part of the main thallus has been "lost", leaving only the (empty) air-chambers". However, *C. denticulatum* clearly retains the lower part of the main thallus which consists of 3-4 layers of compactly arranged parenchymatous cells becoming 2-1 cell layers thick at the margins.

It is significant that *Cyathodium denticulatum* approaches not only *Targionia* in having denticulations on the free margins of the involucre, but also to members of the family Rebouliaceae in having more or less similar type of internal organization of the thallus and presence of operculum or lid in the capsule wall. This shows that the genus *Cyathodium* is more allied to family Rebouliaceae rather than to Exormothecaceae (MEHRA & SOKHI, 1969). It may be considered therefore, that *C. denticulatum* is most primitive amongst all the known species of the genus *Cyathodium* being derived by reduction from forms like Rebouliaceae and giving rise to other species of *Cyathodium* through an intermediate taxon *C. foetidissimum* which still retains the remnant of the lower part of the main thallus but has air-chambers reduced to single layer.

ACKNOWLEDGEMENT

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