

# Discovery of a new taxonomic character in genus *Cyathodium* (Cyathodiaceae: Marchantiales) from India

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## ABSTRACT

Presence of stalked tubers on the ventral thallus surface of *Cyathodium* was recently recorded from Maharashtra. This is a new taxonomic character hitherto undescribed under the genus, the same has been described here.

**Key-words:** *Cyathodium*, character, stalked tubers, Maharashtra.

## INTRODUCTION

Genus *Cyathodium* Kunze is a small terrestrial bryophyte with luminescent-green thalli, represented by fourteen species in the world (Singh & Singh 2007, Söderström *et al.* 2016). The majority of its species are confined to Asia and Neotropical regions, while two species namely *C. cavernarum* Kunze and *C. foetidissimum* Schiffner are pantropical (Schiffner 1938, 1939, Srivastava & Dixit 1996, Salazar Allen 2001, Duckett & Ligrone 2006). Interestingly, in India the genus is represented by a maximum of nine species (Singh *et al.* 2016).

The genus *Cyathodium* grows terrestrially in hilly areas on the calcareous rocks, ditches, near caves and other deeply shaded walls or buildings, and in the plains the species occurs on soil or old brick walls. The presently studied specimens (tuberiferous *Cyathodium*) were collected on 17<sup>th</sup> October 2014 from Khandala (Maharashtra), which were growing as epiphytes on the bark of an angiospermic tree at an elevation of 510 m asl. The average annual precipitation of the area is ~1050 mm and the annual mean temperature is ~26.4°C (min. 14.3°C in January and

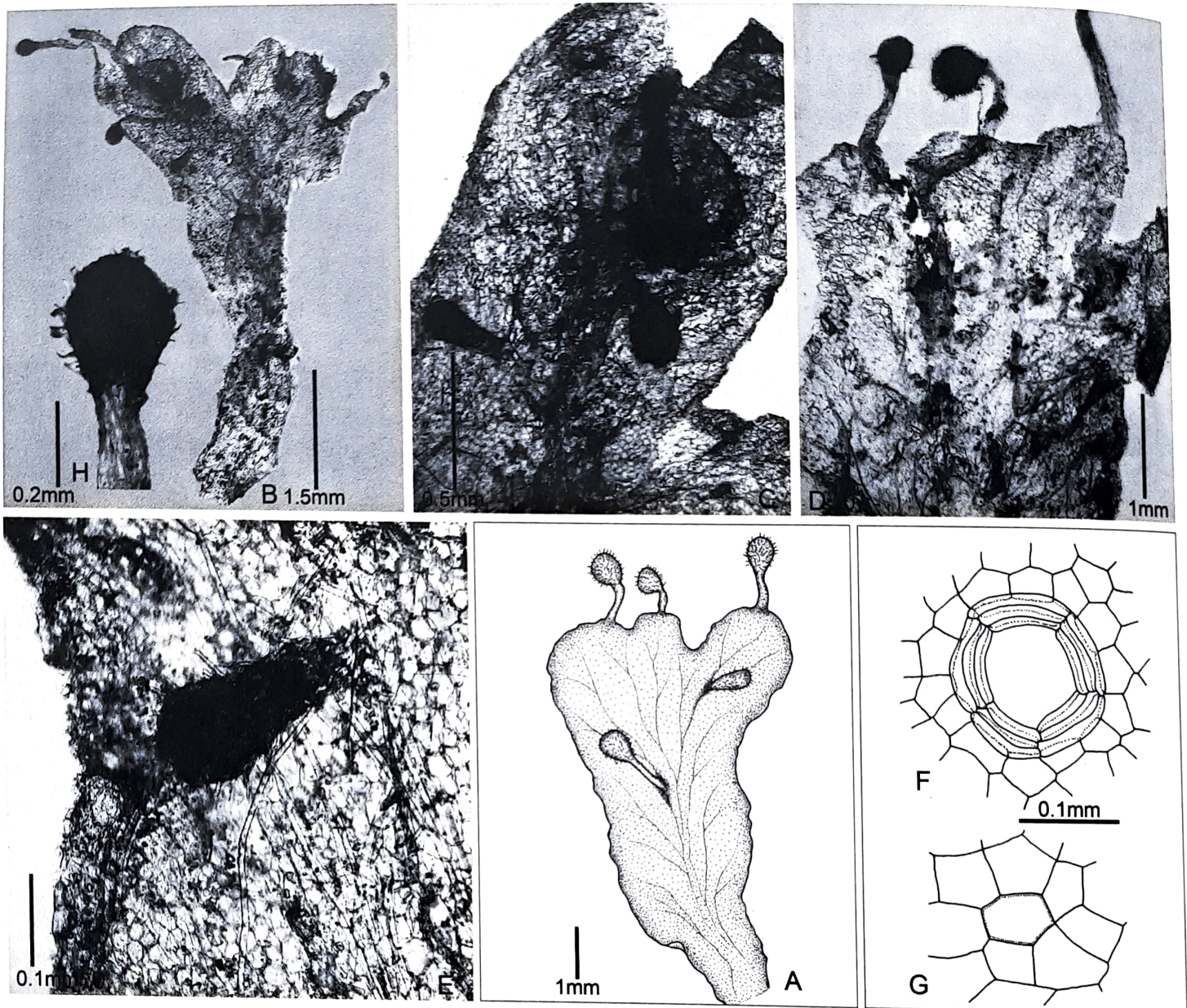
max. 33.3°C in April and May). The specimens had a very striking habit due to the presence of stalked tubers on the ventral surface of the thalli. The tubers are very easily detached, which suggests that they function as vegetative dispersal units. Like other members of the order Marchantiales, none of the species of *Cyathodium* are epiphytic. However, *Cyathodium cavernarum* has a tendency to grow at tree bases (pers. comm.: D.K. Singh and in our observation), but is certainly not a true epiphyte. It, therefore, came as a considerable surprise to discover a new phorophyte for this delicate group of plants.

## TAXONOMIC OBSERVATIONS

*Cyathodium cf. tuberosum* Kashyap, New Phytol. 13: 210. 1914; Liverw. W. Himal. 1: 53. 1929; S.C.Srivast. & Renu Dixit, J. Hattori Bot. Lab. 80: 169. 1996.

### (Text-Figure 1 A-H)

Thallus is yellowish-green to whitish-green in colour, fluorescent, thin, delicate, 5–10 mm long, 2.0–3.5 mm wide, dichotomously branched, lobes are oblong-obcordate, margin entire. Dorsal pores usually



**Text-Figure 1.** *Cyathodium cf. tuberosum* Kashyap. **A.** A vegetative thallus bearing apical, marginal and ventral tubers (rhizoids not drawn). **B.** A thallus bearing apical, marginal, ventral tubers and young involucre. **C.** An apical portion of thallus bearing young ventral tubers and involucre. **D.** A portion of apical portion of thallus bearing apical tubers. **E.** A portion of thallus enlarged showing ventral tubers. **F.** A dorsal epidermal pore. **G.** A ventral epidermal pore. **H.** An apex of a tuber (All figures and micrographs from S.K. Singh 135152).

confined to anterior part of the thallus, oval,  $80-140 \times 70-120 \mu\text{m}$ , consisting of 2-3 concentric rings of 4-5 cells each, epidermal cells chlorophyllose,  $37.5-87.5 \times 35.0-70.0 \mu\text{m}$ , thin-walled. Ventral pores bounded by epidermal cells of thallus and rarely present. Air chambers in a single layer, without filaments, partition 3-4 cells high, uniseriate. Midrib absent. Rhizoids numerous on ventral surface of thallus and at young involucre, hyaline, both smooth and tuberculate. Ventral scales simple, filamentous, usually confined to

the growing region of the thallus, 1-2 seriate, 5-6 cells high, usually with terminal, rounded mucilage papillae. Long stalked tubers usually present at the apical, marginal as well as on the ventral surface of the thallus, densely covered with hairs and rhizoids. Dioicous male plants not seen. Young involucre are present, large, ovoid with more or less circular mouth, growing at the base of the sinus between the apical lobes of the thallus, outer surface covered with numerous long hairs, rhizoids and ventral scales. Mature sporophytes not seen.

**Specimens examined:** India, Maharashtra, Khandala, 18°45'48"N 73°22'05"E, 510 m, 17.10.2014, epiphytic, S.K. Singh 135152, 135153 (ASSAM).

## DISCUSSION

Tubers are a less known character in the genus *Cyathodium* and reported only in four species, namely *Cyathodium tuberosum* Kashyap, *Cyathodium steerei* Hässel, *C. areonitans* (Griff.) Mitt. and *C. mehranum* Singh. The tubers are marginally placed, usually sessile or sub-sessile in all the species. However, in *C. areonitans* (syn. *C. flabellatum* Mehra) and *C. mehranum* they are shortly stalked (Mehra & Sokhi 1972, Singh 1983). But, interestingly, the presence of tubers on the ventral surface of the thalli was not recorded in any of the species in various publications on *Cyathodium* or in its world monograph. We could also not come across any species of *Cyathodium* bearing tubers on the ventral surface of the thalli while conducting field explorations and subsequent studies of the different parts of the Indian Himalayan region.

All the tuberiferous species are dioicous and found either as terricolous or saxicolous plants. It is well known that dioicous species develop sporophytes less frequently than the monoicous species (Longton & Hedderson 2000). Formation of spores in dioicous species may result in the spatial separation of male and female gametophores. Thus the asexual propagules may be of particular importance in building up and maintaining local populations in dioicous species and especially in the case of epiphytic forms.

*C. tuberosum* has a wide range of distribution within India from the hills to the plains. Kashyap (1929) simply remarked that the plants growing in the hills form tubers, while those in the plains are devoid of them. Our plants closely resemble *C. tuberosum* in their almost all similar vegetative features but differ in frequently having stalked tubers on the ventral surface of thalli and apical as well as marginal tubers are also stalked as compared to sessile apical and marginal tubers in typical *C. tuberosum*. It is also interesting to note that the presence of vegetative tubers on the ventral

surface of the thalli is recorded not only for the first time in *C. cf. tuberosum* but also for the entire genus.

The question remains as to whether typical plants of *C. tuberosum* with apical and marginal tubers are genetically distinct from plants with long stalked tubers on the ventral surface of the thalli or they are simply induced by particular environmental conditions.

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