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An Association between *Macromitrium sulcatum* (Hook.) Brid.  
and *Ulothrix zonata* (Weber & Mohr) Kützing

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**Abstract**

In succession of terrestrial ecosystem, bryophytes, algae and lichens constitute the primary components. Not only phylogenetically but also physically they are related to each other, as they are also found in close association and intermixed with each other on same substratum. A chlorophycean alga *Ulothrix zonata* (Weber & Mohr) Kützing has been found growing as an epiphyte on moss *Macromitrium sulcatum* (Hook.) Brid.. The association is peculiar as the algal filaments form a close net over the surface of moss leaves and axis.

**Key words:** Association, Algae, Moss, Phorophyte.

**Introduction**

Bryophytes are known to grow in close relationship with organisms as diverse as algae, fungi, pteridophytes, gymnosperms and angiosperms among plants and protozoa, rotifers, nematodes, earthworms, molluscs, insects and spiders among animals. Direct interface of bryophytes includes food supply, shelter and nesting material for small mammals and invertebrates. Indirectly, they serve as a matrix for a variety of interaction between organisms (Srivastava and Alam, 2005; Iqbal et al., 2011). The association between algae and bryophytes is relatively rare among all. Parihar and Pant (1975) and Reese (1981) reported the occurrence of Blue Green Algae (BGA) with *Sphagnum* and other mosses. Tufa formation is another example of this association. Parihar and Pant (1975) reported the *Barbula*, *Hymmenostiella* and *Bryum* play an important role in the formation of tufa by forming their association with *Petalonema* sp., *Cladophora* sp. Along with some unicellular algae, diatoms, liverworts and few angiospermic forms which complete the tufa forming community. Some of the green algae, *Chlorochytrium* sp. Occurs on *Bryum capillare*, *Funaria flavicens* and *Tortella flavovirens*. Algal (bga) and moss relationship in natural habitat is also reported by El Saadawi and El Kheir (1973) and stated that these associations are a type of protection measure to combat the severe environmental conditions. It is evident as algae and bryophytes both are pioneer colonizers on barren rocks. Anderson and Rushforth (1977) stated that the algae associated with the mosses are usually diatoms, followed by bga and then the members of green algae. Thus the association of green algae with mosses is not so common.

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While examining the collection of bryophytes from Ranthambhore Tiger Reserve (Rajasthan) during monsoon, few interesting plants of moss were noticed enshrined with filamentous alga. Detailed laboratory study revealed the presence of an epiphytic green alga as an epiphyte on moss plant.

### Observations

A critical examination of entire collection revealed the presence of green alga associated with terrestrial moss. The *Ulothrix zonata* (Weber & Mohr) Kützing is an uniseriate, filamentous taxa. Each cell contains a distinct nucleus, a central vacuole, and a large, thin chloroplast with at least one pyrenoid. The specialized cell for attachment is called the holdfast. In most species, all the cells can form reproductive bodies. *Ulothrix* reproduces vegetatively by fragmentation, asexually by non-motile resting spores and motile quadriflagellate spores (zoospores), and sexually by biflagellate gametes. This alga belongs to family Ulotrichaceae Kützing. In this study this alga has found all over the surface of leaves and on stem and moss plant serve as phorophyte (Plate 1; Fig. 1-8). The availability of water or moisture is limiting for alga and the characteristic leaves of the moss can hold the water to great extent for the proper growth of the alga.

Phorophyte: Moss: *Macromitrium sulcatum* (Hook.) Brid., is of common occurrence all over India as a terricolous taxa.

**Specimen examined:** India: West India: Rajasthan- Ranthambhore Tiger Reserve, alt. ca. 700m, date 4.09.2011, legit.: Afroz Alam & S C Sharma, BVH-786003, det.: Afroz Alam

### Discussion

The present association between green alga and moss may be attributed with ecological dynamics, moss are considered to be pioneers on naked rocks and their leaves can hold sufficient amount of water which is critical for alga to survive. Due to this water retaining capacity of moss they can retard the desiccation of plant in unfriendly conditions. In this way they provide an excellent associate to alga. Therefore the present finding is a good example of Epiphytism which is common in warm and humid tropics. Drought is a limitation to this mode.

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**Plate 1 (next page): Fig.1. Moss plant with epiphytic alga, Fig.2. Enlarged view of association, Figs. 2&3. Algal filaments on stem, Figs. 4&5. Algal filaments on leafy region, Figs. 6&7. Net of algal filaments**

