

OCCURRENCE OF MYCORRHIZA IN A MOSS *ENCALYPTA VULGARIS* HEDW

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Abstract: Present communication deals with the study on the occurrence of mycorrhiza in mosses. Out of 34 moss taxa screened from diverse habitats in Jammu (J&K state), only one population of *Encalypta vulgaris* Hedw. collected from Kishtwar was found to be mycorrhizal. It seems to be the first report on the occurrence of mycorrhiza in moss rhizoids.

Keywords: *Encalypta*, Moss, Mycorrhiza, Rhizoids

INTRODUCTION

Mycorrhizae are defined as associations between fungal hyphae and organs of higher plants concerned with absorption of substances from the soil (Harley and Smith 1977). According to a definition proposed later by Brundrett (2002) mycorrhiza represents a symbiotic association essential for one or both partners, between a fungus and a root of a living plant that is primarily responsible for nutrient transfer. Bryophytes lack true roots but possess rhizoids that perform the function of absorption. Thus, the association between rhizoids and fungus can be legitimately referred to as mycorrhiza.

Bryophytes being the first group of plants to exploit terrestrial habitats must have acquired a large number of morpho-anatomical and physiological modifications which enabled them to survive in changed environmental conditions. One of these adaptations it seems was development of symbiosis with fungi before evolution of true mycorrhiza. It is opined that fungi originally switched from gametophytes of liverworts to roots of sporophytes of tracheophytes (Redecker *et al.*, 2000).

Since glomeromycotean fungi (Redecker *et al.*, 2000) and liverworts (Groth-Malonck *et al.*, 2004) are believed to have appeared during the same period about 476-432 million years ago, there is a strong possibility that symbiotic fungal associations of liverworts could be possible ancestors of mycorrhizae (Nebel *et al.*, 2004).

MATERIAL AND METHOD

A total of 34 moss taxa were collected from different habitats such as rock surface, brick wall, moist soil etc. Mycorrhizal associations were studied after cleaning and staining of rhizoids and other parts of the gametophyte. Rhizoids were boiled in 0.05% KOH for 2-3 hrs and then stained in trypan blue for 5-7 hrs. Stained rhizoids were mounted in glycerine and observed under microscope for presence of AM fungal hyphae, vesicles and arbuscules which were

later photographed using NIKON ECLIPSE 400 camera.

RESULT AND DISCUSSION

While two of the three bryophyte groups (liverworts and hornworts) are frequently known to form mycorrhizal associations (Rayner, 1927; Schubler *et al.*, 2001; Russell and Bulman, 2005), mosses which form the largest living group of bryophytes are generally known to be non-mycorrhizal (Russell and Bulman, 2005; Read *et al.*, 2000; Pocock and Duckett, 1985; Carafa *et al.*, 2003).

Preliminary studies undertaken by Verma (2009) on mycorrhizal associations among some bryophytes of Jammu region revealed that while out of thirty one liverwort/hornwort taxa studied, rhizoids of eleven (35.4%) were mycorrhizal (Verma, 2011), there was a total absence of mycorrhiza in mosses (unpublished data, personal communication).

There are, however, a few stray reports of occurrence of fungal associations in mosses. Fungal hyphae were reported for the first time by Peklo (1903) in the capsules of bugmoss *Buxbaumia*. Subsequently, Dowding (1959) observed AM fungus *Endogone fascicula* to occur between leaves of mosses collected from Alberta swamps. In both these publications, however, fungal hyphae were recorded in organs other than rhizoids. Hyphae, vesicles and spores of *Glomus epigaeum* were observed by Parke and Linderman (1980) in *Funaria hygrometrica* only when it was grown along with asparagus. Rabatin (1980) also mentioned the presence of characteristic fine hyphae and spores of *G. tenuis* in leaf and stem tissues whereas rhizoids lacked any fungal penetration.

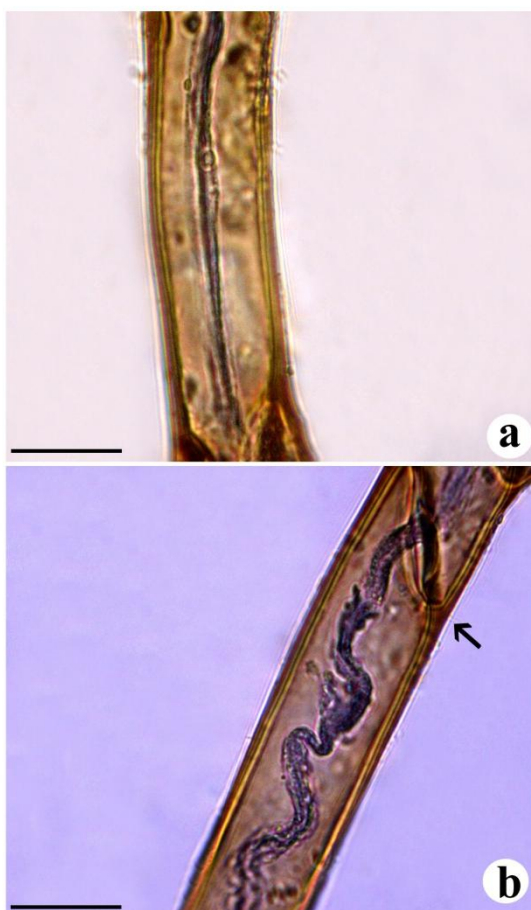
Observations of Zhang and Guo (2007) are extremely interesting who screened 24 Chinese mosses belonging to 16 families in China and found AM fungal structures (spores, vesicles, hyphal coils) in 21 (87.5%) species. In this case also, these structures were observed only in stem and leaf tissues. Like the earlier workers, they also did not record any fungal structures associated with rhizoids.

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Present communication seems to be the first report on the occurrence of mycorrhiza in moss rhizoids. During the present investigation, 34 moss taxa collected from diverse habitats between 1005 to 1810m altitude in three districts of Jammu region (Kishtwar, Rajouri and Poonch) were screened for the presence of mycorrhizal associations (Table 1). Out of these, only one population of *Encalypta vulgaris* Hedw. collected from Parwajan, Kishtwar

(J&K) at an altitude of 1493 m growing in association with *Mannia foreauii* was found to be mycorrhizal. Mycorrhizal frequency, however, was very low. Hyphal strand observed in rhizoids was slightly coiled. Vesicles and arbuscules were not observed. In the present case, hyphal strand was observed in rhizoids only while other parts of gametophyte lacked any fungal structures.

PLATE



Figs. 1 a and 2 b: W.M of rhizoids of *Encalypta vulgaris* showing fungal hyphae. Note the presence of oblique septa in Fig. 1 b (arrow).

Bar 10µm

Fig. 1. W.M of the moss *Encalypta vulgaris*

Fig. 2 & 3. W.M of rhizoids showing fungal hyphae. Note the presence of coiled hypha in Fig. 2 b

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