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Mycorrhizal association with *Melocanna baccifera* (Roxb) Kurz

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Abstract

The Mycorrhizal fungi of Muli Bamboo, *Melocanna baccifera,* planted in Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram, India revealed the occurrence of *Glomus aggregatum* (41%), *G.etunicatum* (30%), *G. glomerulatum* (20%) and *Sclerocystis rubiformis* (9%). 54% of roots were colonized with mycorrhizal fungi. This study provides the baseline data on the mycorrhizal fungi for this plant.

Keywords: fungi, *Glomus, Muli* bamboo, mycorrhizal association, *Sclerocystis*

INTRODUCTION

Melocanna baccifera (Roxb.) Kurz, known as "Muli Bamboo" is a thin walled, sympodial but non clump forming bamboo, belonging to the family Poaceae of the tribe Bambusae, growing naturally in the hilly areas of Bangladesh, Myanmar and occurs in north eastern regions of India (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim, Tripura and West Bengal). It is cultivated in Nepal and several other places for its use in roofing, basketry, mat weaving, flute making and pulp and paper industries. Young shoots and the tender inner parts of seeds are edible and leaves are used in preparing liquor. Such an interesting plant collected as an offset from Forest Research Institute, Dehra Dun, Uttarakhand on Sept. 5, 1988 by Dr. K.C. Koshy (coll. No. 4330), planted on Sept. 20, 1988 in Bambusetum of Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram, Kerala (GPS N 08^0 45.305' E$077^0$01.491'$^{\pm 25}$ft, Acc. No. 58). Since the plant flourishes well in this locality, it created interest among the authors to study its association with the mycorrhizal fungi.

Methodology

The rhizosphere soil samples from the *Melocanna baccifera* (Roxb.) Kurz was collected up to the depth of 10 cm. Wet sieving and decanting method (Gerdemann and Nicolson, 1963) was followed to isolate the arbuscular mycorrhizal spores. Terminal feeder roots were collected from different portion of the plant to assess the mycorrhizal colonization percentage. Mycorrhizal colonization was measured as per Philips and Hayman (1970). Root hairs were cut in to small pieces (1cm), decolorized by boiling them in 10% KOH for one hour and cooled to room temperature, washed thoroughly in distilled water, stained with Lacto phenol-cotton-blue to study the presence of vesicles and arbuscules.

The percentage of mycorrhizal colonization calculated as:

$$\text{Percentage of root colonization} = \frac{\text{No. of mycorrhzal root segment}}{\text{Total no. of root segment}} \times 100$$

The relative frequency of spores calculated as:

$$\text{Relative frequency} = \frac{\text{No. of isolates for each species}}{\text{Total no. of isolates}} \times 100$$

Fungal spores were identified on the basis of spore morphology (Schenk & Perez, 1990).

RESULT

The roots (54%) of *Melocanna baccifera* (Roxb.) Kurz were colonized with mycorrhizal fungi, hyphae up to 8 µm broad, pass through root surface and dichotomously branched at the entry point in to the root epidermis. Vesicles (plate 1-b) produced in the cortex, intra or intercellular, globose, 5-25 µm in diameter.

The spore count was 128 spores/100 gm of soil, represented *Glomus aggregatum, G.etunicatum, G. glomerulatum* and *Sclerocystis rubiformis.* The spores of *G aggregatum* and *G.etunicatum* showed maximum relative frequency (Graph -1).

Description to the species

1.Glomus aggregatum Schenck & Smith *emend*. Koske, Mycologia 74(1): 80, 1982. (Plate 1-c)

Chlamydospores formed in loose clusters, globose, subglobose, obovate, 32-42 x 32-42 µm diam., hyaline to yellow; wall yellow to yellowish brown, up to 3 µm thick, outer wall slightly thicker and lighter in colour

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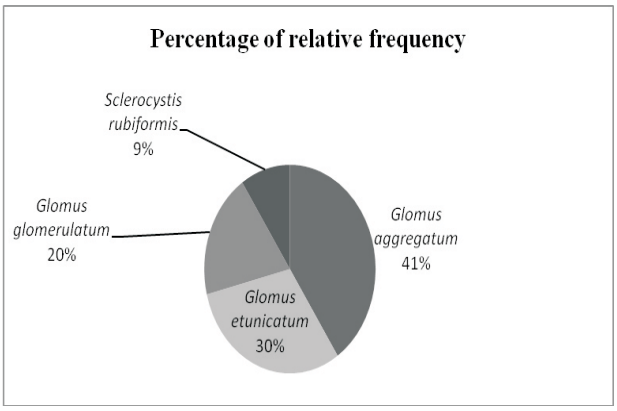

Figure 1.

than the inner wall, walls separable with slight pressure and most apparent in stained preparations. Hyphae at the point of attachment to spore was up to 5 µm wide. Spore contents continuous with hyphal contents in young spores but separated from hyphae on older spores by inner spore wall, pore not occluded by hyphal wall thickening. Hyphal attachment straight to sharply recurved at the spore base.

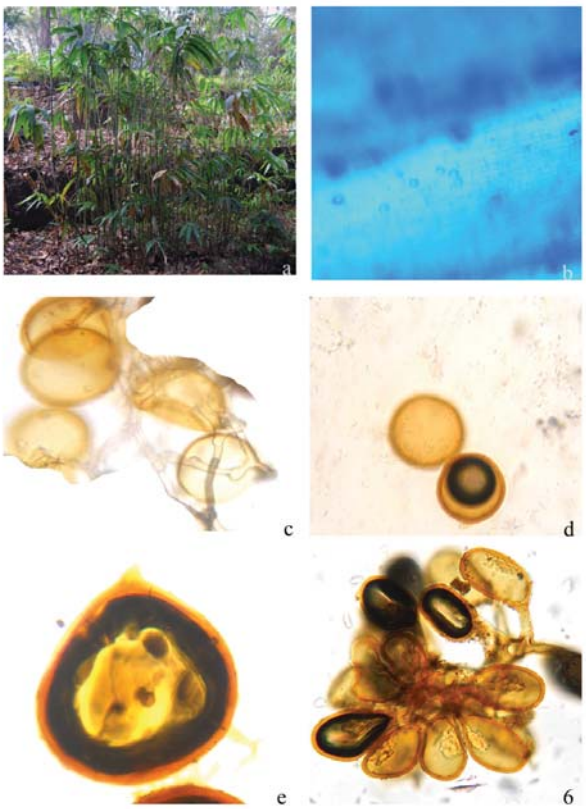

Plate 1-a. Habitat of Melocanna baccifera (Roxb) Kurz.
b. Vesicles on the root of Melocanna baccifera (Roxb) Kurz.
c. Chlamydospores *Glomus aggregatum* Schenck & Smith emend. Koske
d. Chlamydospores *Glomus glomerulatum* Sieverding.
e. Chlamydospores *Glomus glomerulatum* Sieverding.
f. Chlamydospores *Sclerocystis rubiformis* Gerd. & Trappe

Material examined: Isolated from rhizosphere soil of *Melocanna baccifera* (Roxb.) Kurz, Bambusetum, TBGRI, Sept. 29, 2010, P.P. Rajesh Kumar TBGT slide no. 145.

2.*Glomus etunicatum* Becker & Gerd., Mycotaxon 6 (1): 29, 1977. (Plate 1-d).

Chlamydospores formed singly in soil or in dead roots, adherent debris, globose to subglobose 96-102 µm diam., wall smooth to roughened. Spore wall 3-5 µm thick, outer wall hyaline, up to 3.2 µm thick, inner wall persistent, yellow to brown, laminated, 2 µm thick. Intact outer wall rarely present on mature spores, inner wall darkening and becoming laminate with age. Hyphal attachments single, outer wall extending down attached hypha for a short distance. Attached hypha thickened by extension of inner spore wall for up to 8 µm., spore contents separated from attached hypha by a thin curved septum at maturity, opening occluded by inner wall thickening.

Material examined: Isolated from rhizosphere soil of *Melocanna baccifera* (Roxb.) Kurz,Bambusetum, TBGRI, Sep. 29,2010, P.P. Rajesh Kumar , TBGT slide no. 148.

3.*Glomus glomerulatum* Sieverding, Mycotaxon 29: 74, 1987. (Plate1-e)

Chlamydospores globose, yellowish brown, up to 64 µm in diam. Composite spore wall composed of two wall layers (wall 1 & 2) in one group (group A); wall 1 is yellow to brown, laminate and up to 3 µm thick, on the surface of this wall a layer of hyphae is adherent but normally the spore surface is smooth; wall 2 is hyaline, membranous, up to 0.5 µm thick and normally adherent to wall 1. Chlamydospores have 2 attached hyphae, yellow, straight to recurved. The pore of the hyphal attachment1.6 µm in diam. The pore is closed by second wall. Spore content hyaline, oily.

Material examined: Isolated from rhizosphere soil of *Melocanna baccifera* (Roxb.) Kurz, Bambusetum, TBGRI, Sep. 29, 2010, P.P. Rajesh Kumar, TBGT slide no. 147.

4. ***Sclerocystis rubiformis*** Gerd. & Trappe, Mycologia 82: 709, 1990. (Plate1 -f)

Sporocarps dark brown, subglobose to ellipsoid, 270-400 µm, consisting of a single layer of chlamydospores surrounding a central pluxes of hyphae, resembling a miniature blackberry. Peridium nearly absent, Chlamydospores dark brown, obovoid, ellipsoid to subglobose, 40-56 x 24-40 µm, with a small pore opening into the thick walled subtending hypha up to 6.4 µm. Spore wall laminate, 3.2 µm thick, often perforated projections on the inner surface. A variable stalk-like projection produced near the base of some spores.

Material examined: Isolated from rhizosphere soil of *Melocanna baccifera* (Roxb.) Kurz Bambusetum, TBGRI, Sep. 29, 2010, P.P. Rajesh Kumar TBGT slide no. 148.

DISCUSSION

Plants are associated with microbes since seed germination till death and subsequently, degrade the dead parts. Since they play vital role in the life of an individual plant during its life cycle, it is interesting and inevitable to understand the microbial association and their role in different steps and stages of the plants. Since *Melocanna baccifera* (Roxb.) Kurz is from the Himalayan region, brought and planted with the purpose of *ex situ* conservation in an altogether different climatic and topographic area, it is curious to know its adaptability. Hence the study has been conducted.

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