

ECOLOGICAL STUDIES OF VESICULAR ARBUSCULAR MYCORRHIZAL FUNGI (VAMF) ASSOCIATED WITH *DENDROCALAMUS STRICTUS* IN THE CENTRAL MADHYA PRADESH

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Preliminary survey of *Dendrocalamus strictus* associated VAM Fungi was done for different rhizospheric soil from bamboo growing regions of central Madhya Pradesh. Five VAM Forms were found to be associated with *Dendrocalamus strictus*, out of which *Glomus* emerged as the most prevalent genus. Among various species of *Glomus* observed during the study, *G. macrocarpum* and *G. fasciculatum* were found to be most abundant. The relationship of VAMF and type of *Dendrocalamus strictus* forest was evaluated based on the spore density and percent root infection. It was observed that mature undisturbed bamboo forests have highest VAM spore density and percent root infection over mature disturbed, young undisturbed and young disturbed *D. strictus* forests.

Keywords: Host preference; Percent root infection; Phosphate; Root exudates; Root infection; Spore density; VAM Fungi

Introduction

Madhya Pradesh enjoys a typical tropical climate congenial for the growth of bamboo plants. Mainly 5 species of Bamboo grow in the state viz; *Dendrocalamus strictus*, *Bambusa vulgaris*, *Bambusa arundinacea*, *Oxytenanthera nigrociliata* and *Cephalostachyum pergrasile*, of these *Dendrocalamus strictus* is commercially most important. Unfortunately, *Dendrocalamus* forests have been shrinking and degrading very rapidly posing difficulty in management and propagation¹. VA mycorrhizal fungi can improve the plant growth by enhanced uptake of phosphate and other micronutrients from the soil^{2,3}. In the present study, the task of studying *Dendrocalamus strictus* associated VAM forms were taken up in central Madhya Pradesh. Their isolation and identification was done and correlation between VAM specificity with host and nature of forest was established.

Materials and Methods

Dendrocalamus strictus growing regions of central Madhya Pradesh were identified on the basis of the map published by Prasad and Chadhar¹.

The classification of bamboo forest was done on the basis of age of bamboo plants and the type of condition of the forest. The following types of forests were identified:

1. *Mature and Undisturbed:* Sites where bamboo have grown over the years without destruction of the forest.
2. *Mature and Disturbed:* Sites which presently show mature bamboo plants but originally had different flora and interference is a regular feature to disturb the forest.
3. *Young and Undisturbed:* Sites where bamboo plants are young and have been

grown under protection to rule out the disturbance.

4. *Young and Disturbed*: Sites where bamboo plants are still young and growing close to agricultural area or on degraded land.

The soil samples were randomly collected from the rhizosphere of *Dendrocalamus strictus* between July 1992 to Dec. 1993 and stored in sealed polythene bags to retain the soil moisture. Spores of VAM fungi were collected from each soil sample by wet sieving and decanting method of Gerdemann and Nicolson⁴. To maintain uniformity, the soil moisture was eliminated by drying the soil sample prior to spore harvest. The spore density was calculated as total number of spores observed per 50 gm of soil sample.

Percent root infection: The roots were stained by the method of Phillips and Hayman⁵. The percent root infectivity was calculated by gridline intersect method⁶.

Identification: The spores were identified based on their morphology, spore wall layers, ornamentation and colour. The synoptic key of Trappe⁷, Bakshi⁸ and other related literature, were referred to, for identification.

Result and Discussion

The screening of rhizosphere soil from several *Dendrocalamus strictus* growing regions of central Madhya Pradesh shows the presence of several VAM fungal genera (Table 1). Among these, *Glomus* emerged as the dominant genus as reported by Jagpal and Mukerji⁹ and this genus was also found to be the most frequent with regard to its

distribution. Though the soil of one region differed from the other in physical and chemical conditions like pH, organic carbon, nitrogen, available phosphate and potassium, still *Glomus macrocarpum* and *Glomus fasciculatum* were found to be the two most abundant species in each region. Appasamy and Ganapathi¹⁰ also observed high prevalence of *G. fasciculatum* from the rhizosphere of bamboo plants from western Ghats. Since there exist a direct relationship between root exudates of host plant and VAMF growth, the root exudates of *Dendrocalamus strictus* mingled with soil might have promoted the growth and development specifically of *G. macrocarpum* and *G. fasciculatum*. With regard to the distribution of VAM Fungi different type of *Dendrocalamus strictus* forests, it was observed that in mature and undisturbed forest, the VAMF spore density and percent root infection was highest (Table 2) and the phosphate content of the soil in these areas were found to be very less i.e. around 5.5 kg/ha. This might be due to the fact that growth of *Dendrocalamus strictus* over the years have utilized the available phosphate from the soil favouring the growth of VAMF, since higher concentration of phosphate is reported to be inhibitory for VAMF growth¹¹. The sites whose natural flora and fauna have been destroyed by repeated human interference and *Dendrocalamus strictus* plants have been freshly planted i.e in young and disturbed forest the spore density and percent root concentration has have been found to be very less. The phosphate concentration in these areas were around 16.6 kg/ha which might have proved to be high enough in restricting the germination and growth of VAMF.

Table 1. Different VAM Forms isolated from the rhizosphere of *Dendrocalamus strictus* and frequency of occurrence of each genus.

VAMF Type	Frequency of the genus
<i>Acaulospora denticulata</i>	8%
<i>Acaulospora mella</i>	
<i>Acaulospora Sp.</i>	
<i>Gigaspora calospora</i>	15%
<i>Gigaspora Sp.</i>	
<i>Glomus bireticulata</i>	60%
<i>Glomus macrocarpum</i>	
<i>Glomus fasciculatum</i>	
<i>Glomus microcarpum</i>	
<i>Glomus mossea</i>	
<i>Glomus multisubstansum</i>	
<i>Glomus caledonicum</i>	
<i>Glomus sp.</i>	
<i>Sclerocystis rubiformis</i>	10%
<i>Sclerocystis coremioides</i>	
<i>Scutellospora sp.</i>	7%

Table 2. Type of *Dendrocalamus strictus* forest and association of VAM Fungi with regard to spore density and percent root infection.

<i>Dendrocalamus strictus</i> Forest type	No. of VAMF spore per 50 gm of soil	Percent root infection
Young and disturbed	35	39.9
Young and undisturbed	48	46.8
Mature and disturbed	55	48.5
Mature and undisturbed	226	54

In the present study no correlation could be established between the spore density and percent root infection, this is in accordance with the work carried out by Land and Schonback¹². From the present study it is clear that healthy mature and undisturbed *Dendrocalamus strictus* forest shows greater endomycorrhizal association than young undisturbed *Dendrocalamus strictus* forest and that the growth of *Glomus macrocarpum* and *Glomus fasciculatum* is particularly favoured over other VAM Forms.

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