MASS MULTIPLICATION OF *TRICHODERMA HARZIANUM* USING DIFFERENT ORGANIC WASTES FROM ARECA-COCOA CROPPING SYSTEM

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Introduction

A number of fungi and bacteria are widely used for the biocontrol of plant diseases incited by various pathogenic microorganisms. Though effective control measures using fungicides are available for combating these diseases, farmers do not accept fungicides, wherever organic farming or ecofriendly farming systems are practised. Hence, it has become inevitable to search for other methods of management measures against various diseases. In this context disease management through bioagents is gaining acceptance. Among the fungal bioagents *Trichoderma spp.* are the most important fungi used against a variety of soil-borne plant pathogens. Majority of them are highly potential hyperparasites or antibiotic producers (Levis and Papavizas, 1991). These mycoparasites can be mass multiplied in a variety of organic materials/ wastes for field application. Though these organisms are ubiquitous in tropical soils, the population levels are often inadequate to get a desirable level of disease control. Therefore augmentation of their population is imperative to achieve the required level of disease control. This can be achieved by multiplying the bio-agents in suitable organic wastes available in a particular system and augmenting the soil. The advantage with *Trichoderma* spp. is that they can be multiplied easily on a variety of crop residues. The use of organic residues for the mass multiplication of *T.*spp. is reported by many workers (Kousalya and Jayarajan, 1990; Mukopadhyay, 1987; Susheela Bai *et al.*,1994). One hectare of areca plantation can yield residual biomass of 5-6 tonnes and an equal quantity of wastes can be obtained from cocoa when grown as mixed crop in arecanut gardens (Ravi Bhat, 2001). *Trichoderma* spp. occur naturally in areca plantation soils. The present study was undertaken to explore the possibility of utilizing crop residues of areca-cocoa cropping systems for mass-multiplication of *T.harzianum.*

T.harzianum isolate from the soils of areca gardens of CPCRI Farm Vittal was used for this study. The bioagent was isolated using the selective medium (Elad *et al.*, 1980). Organic residues available in the areca-cocoa cropping system *viz.*, areca leaf, leaf sheath, bunch waste, areca husk, cocoa leaf (shed leaf) and cocoa pod husk were collected, chopped to small bits (approximately 3.0 cm) and steeped in water prior to sterilization to make the substrates sufficiently moist. The excess water was squeezed out. These processed materials were filled @ 200 g/bag(three replications/ substrate were maintained) in autoclavable high-density polybags and sterilized at 15 lbs at 121°C for 30 minutes. Sterilization was done twice to kill the native flora in these residues. After cooling thoroughly, the sterilized substrates were inoculated with 5

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mm inoculum disc of *T.harzianum* cut out from a five-day-old culture grown on the specific medium. Each substrate containing bag was inoculated by placing 2-3 inoculum discs between the layers of substrate and the inoculated poly bags were incubated at 27± 2°C for 15 days. Observations were recorded daily with respect to initiation of growth and establishment (full growth) of the bio-agent in each substrate.

Data recorded on the initiation and establishment of *T.harzianum* is furnished in the table given below :

Growth of *T.harzianum* on different organic wastes from areca-cocoa cropping system

Sl. No.	Substrates used	Time taken for growth initiation (No.of days)	Time taken for full growth (No.of days)
1.	Areca bunch waste	07	14
2.	Areca husk	07	22
3.	Areca leaf	13	19
4.	Areca leaf sheath	11	27
5.	Cocoa leaf	13	17
6.	Cocoa pod husk	17	39

Among the different substrates tested, initiation and establishment of *T.harzianum* was faster in areca bunch waste. It took 7 to 14 days for growth initiation and full coverage of the substrate respectively. Though initiation was faster in areca husk *i.e.*, 7 days, the time taken to cover the whole substrate was longer and the growth was only on the surface. The next best substrate was areca leaf sheath where 11 days were needed for initiation of growth. In both areca and cocoa leaves it took 13 days for growth initiation where as in cocoa pod husk more than a fortnight was taken to initiate the growth. Suseela Bhai *et al.* (1994) reported wide variation in the multiplication rate of *T.viride* and *T.harzianum* in different organic substrates including FYM, neemcake, tea waste and coffee husk and suggested that the variability may be due to differential ability of various combinations of carrier materials to support the growth rate of *Trichoderma* spp. Different organic substrates and by-products such as saw dust, wheat bran and coffee husk were reported as very good carrier media (Elad *et al.*, 1980; Sivan *et al.*, 1984; Suseela Bhai *et al.*, 1994). The variation in growth and sporulation observed in the present study indicated that the kind of substrate (bunch waste in this study) used for multiplication had a profound influence on the establishment of the bioagent. Though saw dust, wheat/rice bran and coffee husk are used as carrier media, these wastes/ byproducts are not available in majority of the areca growing areas, hence it works out to be costlier to get these materials from other places.

In an earlier study using locally available organic wastes, it was found that rice bran was the best medium followed by a combination of areca leaf sheath, *Glyricidia* FYM and rice bran (CPCRI, 2001). In the present study, the best growth and sporulation were recorded on areca bunch waste followed by areca leaf, leaf sheath and cocoa leaves, though the initiation of growth was comparatively delayed in the latter three substrates.

Thus, the results of the study clearly revealed that areca bunch wastes; areca leaves, leaf sheath and cocoa leaves can be used as substrates for the multiplication

of *T.harzianum*. For *in situ* application, the farmers themselves can multiply the biocontrol agent on any one of the above crop residues, and this will work out to be cheap and best. Advantage of utilizing these wastes is twofold *i.e.*, when the bioagent is multiplied and applied to the soil it will protect the root system from root pathogens and the organic substrates will improve the soil texture, which in turn will improve the development of root system. *T.viridae* and *T.harzianum* are reported to be effective in controlling soil borne fungal diseases like seed and seedling rots caused by *Phytophthora* spp, *Pythium* sp and *Fusarium* sp of cardamom; quick wilt of black pepper caused by *Phytophthora* spp and many fungal diseases of vanilla (Joseph Thomas, 2003).

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