J.Biol.Control, 4 (1), 70-71, 1990

Mass Multiplication of *Trichoderma* spp.

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Biological control of plant pathogens through antagonistic microorganisms is a promising alternative to the use of chemicals. One of the critical obstacles in biological control of plant pathogens is the paucity of methods for mass culturing and applying the antagonists to the soil. Mukhopadhyay (1987) has comprehensively reviewed the various growth media used for mass multiplication of *Trichoderma* spp. The present investigations were carried out to identify suitable substrates among the agricultural by-products and wastes for mass multiplication of *Trichoderma viride* Pers. Fr. and *T. harzianum* Rifai.

T. viride (Coimbatore isolate) and *T. harzianum* (Pantnagar isolate) antagonistic to *Macrophomina phaseolina* (Tassi) Goid were inoculated on 18 agricultural by-products and wastes to test their suitability as substrates for mass multiplication. Moisture content of the

Table 1. Growth of *Trichoderma* spp. in agricultural by-products and wastes

Substrate	($X10^6$ cfu/g)*	
	T. viride	*T. harzianum*
Tapioca rind	27.2^{a}	26.1^{a}
Tapioca refuse	26.4^{ab}	25.8^{a}
Well decomposed farm yard manure	25.9^{abc}	25.6^{a}
Press mud	25.2^{bc}	24.8^{b}
Gobar gas slurry	25.0^{bc}	24.4^{b}
Mushroom spent straw	24.3^{c}	23.5^{bc}
Paddy chaff	22.3^{d}	23.1^{c}
Wheat bran	21.9^{d}	22.0^{d}
Groundnut shell	20.0^{e}	19.2^{e}
Rice bran	18.1^{f}	17.5^{f}
Sugarcane bagasse	16.9^{fg}	15.4^{g}
Wheat straw	15.7^{gh}	17.8^{f}
Sheep manure	13.1^{i}	12.3^{i}
Poultry manure	0.7^{l}	1.0^{l}
Shelled maize cob	11.2^{j}	10.7^{jk}
Paddy straw	10.1^{jk}	11.0j
Chickpea husk	8.4^{k}	5.2^{k}
Peat soil (control)	10.0^{jk}	11.0^{j}

* Figures with the same alphabet are not significantly different (P=0.05) by DMRT

dried and powdered substrates were adjusted to 50 per cent except for tapioca rind and refuse and rice and wheat bran for which the moisture content was adjusted to 90 per cent. The substrates were sterilized in polypropylene bags (100 g/bag) at 1.41 kg/cm^2 pressure on three successive days. The sterilized substrates were inoculated with five mycelial discs of the culture of *T. viride* or *T. harzianum* and incubated for 20 days. The number of colony-forming units was assessed by dilution plate technique (Pramer and Schmidt, 1956) on the 21st day.

T.viride produced the maximum number of colony-forming units (27.2 x 10^6/g) on tapioca rind and was on par with tapioca refuse (26.4 x 10^6/g) and well decomposed farm yard manure (25.9 x 10^6/g). In control, the colony-forming units were 10.0 x 10^6/g of substrate (Table 1). The number of colony-forming units/g of substrate produced by *T. harzianum* was 26.1 x 10^6/g on tapioca rind and was on par with tapioca refuse (25.8 x 10^6/g) and well decomposed farm yard manure (25.6 x 10^6/g) while in control it was 11.0 x 10^6/g (Table 1). Pressmud, gobar gas slurry, mushroom spent straw, paddy chaff and wheat bran also supported good growth and sporulation of *T. viride* and *T. harzianum* (Table 1).

Wheat bran : saw dust : water (3 : 1 : 4) medium was used for mass multiplication of *T. harzianum* (Elad *et al.*, 1980; Mukhopadhyay *et al.*, 1986). Upadhyay and Mukhopadhyay (1986) used sorghum grain substrate for mass multiplication of *T. harzianum*. *T. viride* was multiplied on sand sorghum medium for the control of root rot of sugarcane seedlings (Padmanabhan and Alexander, 1987). Since some of these substrates are expensive and not available in large quantities, the findings of the present investigations will be useful to take up large scale biocontrol on a cost-effective basis.

Key words : *Trichoderma viride*, *T. harzianum* *Macrophomina phaseolina*, biological control

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