Study of *Trichoderma* as a biocontrol agent on selected diseases of ornamental foliage plants in Sri Lanka

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Abstract

Several species of the fungus, *Trichoderma* were isolated from organic rich soil samples obtained from Green Farms Limited (Ornamental foliage nursery), Marawila, Sri Lanka. The fungal species were identified based on their morphological, reproductive and molecular characteristics. On the basis of DNA sequence data analysis, the isolates were identified as *Trichoderma viride* strain NRRL 6418, *Trichoderma asperellum* strain D11, *Trichoderma* sp. Hy6, *Trichoderma* sp. ZAUT013 and *Hypocrea lixii* isolate TWC1(*Trichoderma harzianum*). The efficacy of locally isolated *Trichoderma* species to control three soil borne plant pathogens and one plant parasitic nematode were studied under *in vitro* and *in vivo* conditions.

The influence of environmental factors on the mycelia growth of the *Trichoderma* spp and the survival of the *Trichoderma* spp in normal field soil and in different organic substrates were studied. The phytotonic effect of *Trichoderma* spp on plant growth was also investigated. The investigation was also extended to evaluate the selected *Trichoderma* spp against regular pesticides and fertilizer mixtures.

The native isolates had antagonistic effects against the soil borne plant pathogens, *Helminthosporium* (*Bipolaris*) spp, *Sclerotium rolfsii*, *Fusarium oxysporum,* and plant parasitic nematode *Meloidogyne incognita. S. rolfsii* and *F. oxysporum* are causative fungi of collar rot on *Zamioculcas zamiifolia* and vascular wilt on *Crossandra infundibuliformis* respectively. *Helminthosporium*, spp complex is the causative agent of leaf spot on *Dypsis lutescens*. *M. incognita* is the causative agent of root knot on *Livistona rotundifolia. T. viride* NRRL 6418 was able to control *S. rolfsii* collar rot disease incidence in *Z. zamiifoila*, whereas *T. asperellum* D11 was able to control *F. oxysporum* wilt in *C. infundibuliformis,* while *T. viride* NRRL and *H. lixii* TWC1 mixture were able to control leaf spot caused by *Helminthosporium* spp complex on *D. lutescens* respectively. *H. lixii* TWC1 (*T. harzianum*) and *T. viride* NRRL 6418 were able to control root knot nematode *M. incognita* infecting *L. rotundifolia.* The three most effective isolates were *T. viride* NRRL, *T. asperellum* D11 and *H. lixii* TWC1 (*T. harzianum). Trichoderma* treatment significantly (*$p \leq 0.05$) enhanced growth of shoot, root and seed germinations of ornamental foliage plants when compared to untreated plants.

Different growth media such as *Pleurotus ostreatus* mushroom compost media, regular farm compost media, coir media and Ca $(NO_3)_2$ treated coir media were evaluated for their suitability to support the spore production of *Trichoderma* spp under field conditions. Mushroom compost media yielded the highest spore load of *Trichoderma* spp which was superior to other growing media. Regular farm compost was next best to support good spore development of *Trichoderma* spp. Normal coir and Ca $(NO_3)_2$ treated coir media did not support good spore development of the *Trichoderma* spp.
Protocol for on-Farm mass production of these isolates of *Trichoderma* spp was developed to help facilitate the establishment of an integrated eco-friendly disease management system for growers. The media evaluated in this study included the solid substrates barley seeds, paddy, cowpea (two varieties), maize and sorghum and semi-solid or liquid substrates such as potato dextrose, rice extract, paddy extracts respectively. Mycelia growth was fastest in parboiled barley and paddy media, the highest yield of spores of the *Trichoderma* isolates was also observed seven days after inoculation in barley and paddy media.

Key words: - *Trichoderma*, soil-borne disease, parasitic nematodes, ornamental foliage plants.