

RARE

**CONTROL OF DAMPING OFF AND BASAL ROT
DISEASES OF BIG ONION (*Allium cepa* L.) USING
Trichoderma asperellum and *Trichoderma virens***

By



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ABSTRACT

Big onion (*Allium cepa* L.) is a condiment grown for its flavorful bulbs in Sri Lanka as well as a number of other countries in the world. One of the problems associated with big onion cultivation is yield reduction due to infectious diseases that occur during various stages of growth. Some of the more economically important diseases are caused by fungal pathogens and thus studying these diseases will enable the development of strategies for their management. With this in view, one of the objectives of the present study was surveying the diseases prevalent in onion cultivations in Sri Lanka at different stages of growth and isolation and identification of the causative fungi.

Using biological agents in disease management practices as opposed to use of harmful fungicides offers an environmentally friendly solution. As *Trichoderma* spp. are widely used bio control agents of many fungal pathogens, *Trichoderma* spp. were isolated from the soil in local onion fields and characterized with a view of using the more effective isolates as biological control agent(s) of the more important fungal pathogens of onion.

Onion fields in the Matale and Anuradhapura districts were selected for the study. Diseased onion samples were collected from the fields and nurseries and the causative fungi were isolated and identified. Soil was collected from onion fields and soil fungi were isolated using the Warcup method.

Preliminary identification of all fungal species isolated was carried out based on their morphological features and sporulating structures. A *Fusarium* sp. and *Colletotrichum gloeosporioides* were isolated and identified from infected bulbs, leaves and flower stalks. *Fusarium*, *Curvularia*, *Alternaria* and *Sclerotium* spp. were

isolated and identified from seedlings showing damping off symptoms and the *Fusarium solani* was confirmed to be the causative agent of seedling damping off disease using Koch's postulates. Fourteen *Trichoderma* spp. were isolated from the soil samples.

Molecular characterization of *Trichoderma* spp. and *Fusarium* spp. was carried out using Polymerase Chain Reaction (PCR), using Random Amplified Polymorphic DNA (RAPD) and using Restriction Fragment Length Polymorphism (RFLP) for higher accuracy.

The *Trichoderma* isolates were tested for their ability to control the growth of *Fusarium solani* under *in vitro* conditions using dual culture assays. All *Trichoderma* spp. isolated showed inhibition of mycelial growth of the *Fusarium solani* under *in vitro* conditions.

Two of the more effective isolates were cultured in a low cost medium containing molasses and yeast. The cultured *Trichoderma* spp. were then added to a low cost carrier medium consisting of talc. The *Trichoderma* inocula prepared in this manner were applied using two methods *i.e.* soil application prior to planting of seeds and priming of onion seeds with the *Trichoderma* inoculum before planting. Both methods of introducing the *Trichoderma* inocula reduced disease incidence.

Severity of damping off disease significantly ($p \leq 0.05$) in pot and field experiments indicating that the *Trichoderma* inocula prepared in the present study can be used effectively against damping off disease of onion in the field. Subsequent *Trichoderma* spp. treatments *viz.* seedling root dipping or soil application at the time of transplanting using *T. asperellum* alone or *T. asperellum* together with *T. virens* are efficient means to control basal rot disease of *A. cepa* L. This is the first record of

an effective locally produced *Trichoderma* inoculum for the control of onion diseases in Sri Lanka.

Keywords: *Allium cepa* L., damping off disease, basal rot disease, *Fusarium solani*, *Trichoderma asperellum*, *Trichoderma virens*