



Use of *Trichoderma asperellum* to control
black rot disease of pineapple and
anthracnose disease of rambutan in
Sri Lanka

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Abstract

Black rot disease of pineapple (caused by *Thielaviopsis paradoxa*) is a common post harvest problem in Sri Lanka and other pineapple growing countries. Anthracnose caused by *Colletotrichum gloeosporioides* is the most common post harvest disease of rambutan (*Nephelium lappaceum* L.). Both diseases lead to loss of overall quality and shelf life of ripening and ripened fruits. Presently fungicides are used to control both diseases. Consumer resistance to the use of fungicides has precipitated the search for alternative approaches to control the above mentioned diseases.

Isolates of *Trichoderma* (TR1, TR2 and TP3) obtained from soil samples collected from rambutan orchards and pineapple plantations from different regions of Sri Lanka had similar morphological and physiological characteristics. Analysis of genome DNA of the isolates showed that all isolates were *Trichoderma asperellum*. This was the first report of the isolation of *T. asperellum* from a Sri Lankan habitat. *T. asperellum* had antagonistic effect against both *Th. paradoxa* and *C. gloeosporioides*. The antagonistic activity was mainly due to coil formation around the pathogen hyphae by *T. asperellum*. The pathogen then fails to grow, when transferred to fresh Potato Dextrose Agar (PDA) suggesting the fungicidal effect of the antagonist on the pathogen.

Laboratory experiments demonstrated that out of the several media examined Yeast Waste Residue (YWR) was the most suitable medium for mass propagation of *T. asperellum*. The powder formulation of *T. asperellum* at a concentration of 1% (aqueous) had the ability to control the growth of *Th. paradoxa*. This concentration was found to be the Minimum Inhibition Concentration (MIC) of the powder formulation. The effect of *T. asperellum* powder formulation treatment on *Th. paradoxa* inoculated soil was also examined. *T. asperellum* formulation reduced the pathogen concentration in treated soil to levels below that needed to cause disease.

The liquid formulation of *T. asperellum* had high antagonistic activity against both pathogens *in-vitro* as well as *in-vivo*. Pineapple (*Ananas comosus*) inoculated with 10^5 conidia/mL of *Th. paradoxa*, followed by an application of the liquid formulation either 10 or 30 min after inoculation, remained free of the black rot disease when stored at 28 °C for 7 days. Fruits treated with the blank formulation (formulation without conidia) and the control

fruits (untreated and fruits treated with sterile distilled water) developed characteristic symptoms of black rot disease. Correspondingly, black rot symptoms of the disease were observed in fruits that were inoculated and held as controls under similar storage conditions, with no formulation applications. No significant differences ($p > 0.05$) occurred among formulation treated, untreated (controls) and blank formulation treated fruits with respect to pH value, total soluble solids and titratable acidity. Fruits treated with the formulation more than 30 min after inoculation with the pathogen developed disease symptoms.

Similar results were obtained with the liquid formulation treated rambutan. As with pineapples the formulation was not effective if applied more than 30 min after inoculation of pineapples, with the pathogen. Further, no significant differences ($p > 0.05$) were observed between pH value, titratable acidity and total soluble solids of treated, untreated and blank formulation treated fruits. The shelf life of this formulation was retained for upto six months as the conidia remained viable for up to six months. The data suggests that the formulation of *T. asperellum* would be an alternative eco-friendly approach to the control of black rot disease in pineapple and anthracnose disease of rambutan.