

Formulation and stabilization of *Trichoderma* spp. in selected carrier materials

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Trichoderma spp. are one of the major biocontrol agents which have the ability to act against large numbers of foliar and soil borne pathogens and are eco-friendly good plant growth promoting agents. Present investigation was carried out with an attempt to determine 1) the best organic carrier material in which the viability and antagonistic activity retain for a sufficient duration and 2) optimum temperature at which the product can be stored without losing the viability and antagonistic activity. In the present study, three *Trichoderma* spp. (*T. asperellum*, *T. harzianum* and *T. virens*) were formulated in three carrier materials - coir dust, saw dust and waste of polished rice, which were rich in lignocellulosic organic compounds, nitrogen and mineral salts. In the preparation procedure, glucose and starch were added as carbon sources and cow dung was also added as a source of nitrogen as *Trichoderma* spp. require sufficient amounts of carbon and nitrogen sources for their growth and development. Three *Trichoderma* spp. were then inoculated separately (ten mycelial blocks with 1cm diameter from 7-day old cultures) into the carrier materials in sterilized polypropylene bags aseptically. Each treatment comprised of six replicates. Shelf life of these formulated products were studied along with viability tests, using spread plate method from which colony forming units were observed at three week intervals. Mean values of measurements were statistically analyzed using ANOVA and Tukey's pair wise test (Minitab 16). Antagonistic activity of three *Trichoderma* spp. against three post-harvest pathogens (*Colletotrichum musae*, *Fusarium oxysporum*, *Pestaliopsis microspora*) were monitored using dual culture method at room temperature (30°C) and 4°C where growth inhibition was measured. All three types of carrier materials were good media for the formulation of all three *Trichoderma* species and when reisolated, the highest Colony Forming Units were observed in waste of polished rice formulations, at 4°C; [*T. asperellum* (6.23 log CFU/g), *T. harzianum* (5.92 log CFU/g) and *T. virens* (6.04 log CFU/g)] compared to other two carrier materials. Optimum temperature for the storage of formulated products was 4°C that maintained the viability and antagonistic activity of *Trichoderma* propagules for 130 days compared to the storage at room temperature. However, the values for CFUs of all three *Trichoderma* spp. in three carrier materials were slightly reduced after storage at 4°C which was not significant. The growth of all three post-harvest pathogens were inhibited by the three *Trichoderma* spp. and the inhibition values ranged from 36.5% – 83.6%. Growth inhibition values obtained at room temperature (30°C) and 4°C were not significantly different. Among the cost effective three carrier materials at two different temperatures, waste of polished rice at 4°C was found to be significantly effective in retaining the viability and antagonistic ability of the tested *Trichoderma* species. This may be due to the presence of optimum C contents (35%), C:N ratio (28.42) and pH (6.7) which enhance the production of sufficient propagules of three *Trichoderma* spp.

Keywords: Carrier materials, Formulation, Stabilization, *Trichoderma*, Viability