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Enhancing the plant growth promoting activity of *Trichoderma viride* biopesticide using substrate supplementation and co-cultivation

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Substrate supplementation and co-cultivation approaches were used to enhance activity of biofungicide *Trichoderma viride*. Biopesticides were produced using corn cobs (T), corn cobs + 1% keratin (K), corn cobs + 5% lignin (L), and corn cobs + 1% keratin + 5% lignin (K+L). Also, biopesticides were produced through co-culturing with *Bacillus subtilis MTCC8142*, by sequential inoculation (B+T) and simultaneous inoculation (T3+B2) (B2+T3). The highest spore count was produced by (T3+B2) of 6.25×10^8 spores/g of substrate, followed by (T) of 6.20×10^8 spores/g of substrate. GC-MS characterization of ethyl acetate extract of biopesticides revealed different metabolites produced under different conditions. The zone of inhibition of extract was greatest for (T) of 21 mm, followed by (K) of 20.7 mm and for (B2+T3) of 18 mm at 10 mg/mL concentration. (K) and (B2+T3) did not affect antifungal properties; however, other substrate-supplemented and co-cultivated biopesticides decreased them. Competition between two microbes prevented (T3+B2) from producing antimicrobial metabolites; hence, no zone of inhibition was observed. The biopesticides (K), (L) and (B2+T3) significantly enhanced growth of chili plants (*Capsicum frutescens* L.), outperforming other biopesticides. The production of phthalates, also known as phytotoxins, by B+T resulted in a decrease in plant growth. Adding 1% keratin to corn cobs (K) and (B2+T3) sequential inoculation are best ways to boost plant growth promoting activity of *T. viride* without affecting its biocontrol activity.

Keywords: Biocontrol, Biofungicide, Biopesticides, *Capsicum frutescens*, Corn cobs, Plant-growth promotion, Solid-state fermentation