Bio-guided isolation of trichodermin from a native Trichoderma brevicompactum strain with potent antifungal activity against phytopathogenic fungi

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Abstract

In agriculture, the presence of soil-borne phytopathogenic fungi represents a limiting factor that causes significant crop losses. In this context, *Trichoderma brevicompactum* represents a viable alternative to chemical fungicides, acting as an effective biological control agent for managing fungal diseases. The objective of this work was to characterize the antifungal activity of a native isolate of *T. brevicompactum* FCQ18, obtained from soil associated with tomato cultivation, against *Macrophomina phaseolina*, *Rhizoctonia solani*, and *Sclerotinia sclerotiorum*. Direct confrontation assays showed inhibition of the growth of all evaluated phytopathogens. Additionally, antibiosis assays using cellophane membranes and dialysis indicated that the inhibitory effect is mainly due to low molecular weight molecules, as similar inhibition percentages were observed in both assays. Furthermore, a bio-guided isolation of the metabolite involved in antibiosis was performed. The organic extract of *T. brevicompactum* FCQ18 was fractionated using chromatographic techniques and its antifungal activity was evaluated, leading to the identification of a fraction with 100% inhibitory activity against the tested phytopathogens. Subsequent purification of the fraction with the highest antifungal activity allowed the identification of the principal compound responsible for the observed antibiosis, whose spectroscopic data corresponds to the mycotoxin trichodermin. The antifungal activity of trichodermin against the agriculturally important pathogens *M. phaseolina* and *S. sclerotiorum* is described for the first time.