# Pathogens and Biocontrol: Fungi Associated to Theobroma cacao in Guna Yala, Panama

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The cacao tree (Theobroma cacao L.) is of vital cultural importance to the Guna people, inhabitants of the Comarca Guna Yala, in Panama, where cacao fruit is used for consumption and attributed spiritual and medicinal value. During recent years, the Guna cacao production has greatly decreased, probably due to pathogenic organisms. In this study, we aimed to isolate and identify fungi associated to cacao plantations from the San Ignacio de Tupile region in Guna Yala and explore their properties as pathogens or biocontrol agents. Samples from cacao plants (leaves and pods) and surrounding soil were collected and processed following standard protocol. The isolated fungi were identified morphologically by their reproductive structures, and in-vitro antagonism tests were conducted with certain strains. Thirty-seven (37) pure strains were obtained (16 from soil, 13 from pods, and 8 from leaves). The identified genera included pathogenic fungi such as Fusarium spp. (21.62%) and Aspergillus spp. (5.41%), biocontrol agents such as Trichoderma sp. (2.70%), and others such as Penicillium spp. (13.51%), Geotrichum sp. (10.81 %), Paecilomyces spp. (5.41%), Curvularia sp. (2.70%), and a Dematophora-like colony (2.70%). The Trichoderma sp. strain screened for antagonism against isolated pathogens (Fusarium spp., Aspergillus sp.) showed significant activity against them. Our findings suggest that in the Guna cacao plantations, plant pathogens and biocontrol agents coexist. The high effectiveness of the studied Trichoderma sp. strain shows that it is viable to use as an effective biocontrol agent. We propose that the presence of plant pathogens may contribute to the cacao plant irregularities.

**Awards Won:**