POTENTIAL USE OF SOIL MICROORGANISMS FOR GROWTH AND DEVELOPMENT OF COCOA PLANTS.

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Introduction. The cultivated area with cocoa crops (*Theobroma cacao)* has been increased in Colombia during the last years demanding new technology for sustainability. Soil microorganisms for fertilization and pest and disease management are an alternative to the use of synthetic chemical products. In this work we isolated and identified vesicular arbuscular mycorrhizal fungi (VAM) and fluorescent *Pseudomonas* spp. bacteria, associated with cocoa crops located on two contrasting life zones. *Pseudomonas* sp. isolates were characterized by their total indole production ability. Selected isolates were used to evaluate their effect on cocoa plants under greenhouse conditions.
This work had as objective to isolate and evaluate soil microorganisms as a potential alternative for plant growth and development.

Methods.
Microorganisms were isolated from two life zones: tropical dry forest and tropical moist forest. The VAM genus was identified following the taxonomic keys from Peterson et al (1). For the greenhouse tests in cocoa plants, one fluorescent *Pseudomonas* sp. isolate was selected based on its ability for indole production according to the method reported by Gordon and Weber (2), modified by Patten and Glick (3). For VAM greenhouse tests the two most frequent identified genera from soil samples were used. Cocoa plant root colonization by VAM was measured; the Shannon diversity index was calculated for VAM identified on soil samples and cocoa plant growth and development for the different microorganisms evaluated were scored.

Results.
A higher Shannon diversity index value (1.9) and root colonization percentage for VAM fungi (5-20%) were found in the tropical moist forest compared to the tropical dry forest region (Shannon diversity index: 1.1 and 5-8% for VAM root colonization) surveyed. The phosphorus level in the tropical dry forest soil was very high compared to the tropical moist forest. This nutrient level may influence the composition and VAM root colonization values registered. The highest índole production for the flourescent *Pseudomonas* sp. was scored for an isolate from the tropical dry forest.

The cocoa plants tests performed at greenhouse conditions showed that the *Glomus* sp. strain alone or in combination with the selected fluorescent *Pseudomonas* sp. induce the best growth and development results suggesting that soil microorganisms have potential as an alternative to chemical fertilizers in cocoa crops (Figure 1).

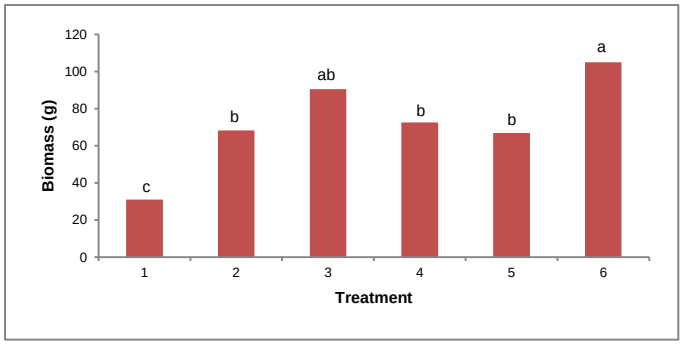

Figure 1. Cocoa plants biomass accumulation for the different microbe strains tested. Different letter represent significant differences between treatments. 1: Control; 2: *Acaulospora* sp.; 3: *Glomus* sp.*;* 4: *Pseudomona* sp.; 5: *Acaulospora* sp. + *Pseudomona* sp.; 6: *Glomus* sp. + *Pseudomona* sp.

Conclusions.
Selected strain of the VAM fungus *Glomus* sp., alone or in combination with fluorescent *Pseudomona* sp., improve significantly the growth and development of cocoa plants under greenhouse conditions.

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