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Indicators of biological activity and health of an Andean soil of Ecuador under agronomic management

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Abstract

In this project, the effects of various management practices, such as tillage, nitrogen fertilization, and crop rotation were investigated on the physical-chemical and biological properties of soil, along with the presence of arbuscular mycorrhizal fungi [AMF] in crops in the highlands of Ecuador, at the Tumbaco Experimental Teaching Field [CADET] of the Central University of Ecuador [UCE]. Soil samples from conventional tillage [CT] were analyzed in comparison with plots under no-till [NT] for the determination of the samples in the laboratory. Enzymatic activity and AMF colonization were analyzed. The total glomalin [TG] extraction protocol was followed with 50 mM sodium citrate pH 6.5 and Bradford reagent to read the color concentration in a spectrophotometer at 595 nm. Hyphae and total mycelium staining was performed with trypan blue following the line interception method; and acid phosphatase determination was performed with p-nitrophenol and p-nitrophenyl phosphate. The findings revealed differences in TG content, hyphal length, and acid phosphatase activity among different soil types, with NT plots exhibiting the highest AMF colonization rates. Furthermore, plots under NT promoted microbial activity and increased AMF spore density, suggesting that organic matter accumulation under this system improved soil quality compared to plots under CT. This study offers valuable information on the effects of soil management and represents a pioneering investigation of AMF in Andean soils. Finally, it was concluded that a greater amount of TG is an indicator of higher soil organic carbon content, with Andean soils being true carbon reservoirs.

Keywords: Glomalin, Arbuscular mycorrhizal fungi, Soil management

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