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Full Paper

Growth, Nutrient Uptake, and Soil Chemical Properties of Cacao Seedlings Using Biochar or AMF Grown in Acidic Soil

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This greenhouse study investigated the potential benefits of bamboo biochar (BB) and arbuscular mycorrhizal fungi (+AMF) applied individually or in combination to cacao seedlings. The commercially developed mycorrhizal fungi was provided by the National Institute of Molecular Biology and Biotechnology (BIOTECH), which contains 12 species belonging to 4 genera, *Gigaspora, Glomus, Acalauspora and Entrophospora.* Seedlings were grown in acidic (pH 4.3, H_2O) red soil amended with biochar (wt/wt) at 0 (control), 3.75, 7.5, and 15% and inoculated or uninoculated with the mycorrhizal fungi. The height, stem diameter, and dry weight of the roots, stems, and leaves of cacao significantly increased in mycorrhizal (+AMF) treatment after 6 mo. Regardless of biochar level, no effect in plant dry weight was observed. The combined addition of AMF + 15% BB synergistically improved the total biomass by 111% and nutrient (N and P) uptake compared to uninoculated cacao at 0% BB. The mycorrhizal fungi spore count from the rhizosphere and root infection in the cacao roots was generally improved by BB addition. Moreover, the chemical properties of the soil such as pH, available P, exchangeable K, and CEC were consistently improved by 15% BB. Thus, giving credence to a suggested practice of a combined treatment rather than individual application of the two soil amendments.

Keywords: arbuscular mycorrhizal fungi, black carbon, infertile soil, N and P uptake, root infection