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Effects of biochar from spent mushroom substrate on the physicochmical properties in a nutrient-poor soil

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Spent mushroom substrate (SMS) is a by-product of the mushroom industry. China has a large mushroom industry that accounts for about 75% of annual global mushroom production and generates substantial amounts of SMS. The traditional disposal of SMS is burning or deposit in landfills, which caused severe environmental challenges. Therefore, discoveries for good use of SMS have appealed researchers' interests in recent years. Biochar is a carbon-rich pyrolyzed biomass derived from different organic materials, including agricultural and forest residuals. It can increase soil fertility and grain yields via the promotion of nutrient retention in soil. There are few studies concerning soil improvement from biochar from feedstocks of SMS. The objective of our study was to investigate the effects of biochar from SMS application on soil physicochemistry in a nutrient-poor soil.

The present study was carried out on soils collected from a nutrient-poor soil in Fujian province, China. The pot experiment included four treatments: (1) control without fertilizer, (2) inorganic fertilizer, (3) inorganic fertilizer combined with low biochar, (4) inorganic fertilizer combined with high biochar. Soil were sampled in 6 months at the top 20 cm depth. Soil physicochemical properties(soil pH, moisture, bulk density, total porosity, total C, total N, total P, total K, available P, available K and the C/N ratio) were measured in bulk soils.

Data showed that soil pH, total C, total N, total P, total K ,available P,available K and the C/N ratio significantly increased but available N decreased, and soil bulk density and moisture were no significant difference with biochar addition. Results suggested that alkaline biochars applied at 40 Mg ha^{-1} can increase soil physicochemical properties more than the low level. Application of higher rates of biochar and long-term monitoring is needed to quantify the benefits of biochar under field conditions on soils in different environmental conditions.