

Abstract

Evaluating the Effect of Biochar on Nutrient Leaching and Rice Growth in Disturbed and Undisturbed Soil-Columns [†]

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Abstract: Soil fertilization stands on the top of the rice crop production issue. Nutrient leaching in rice crop production, leading to lower plant uptake and low yield, poses a challenge for Cambodian farmers and is becoming a key concern for the environment. The carbonized organic waste called biochar is known as potentially valuable input to enhance soil properties. It is introduced in many regions. A soil column-based experiment was conducted to evaluate the effect of biochar on the leaching of N and P and rice growth in link with soil structure. Two types of columns were built, using disturbed and undisturbed soil. Four rates of nutrient input including chemical fertilizer, chemical fertilizer +2 t/ha of biochar, chemical fertilizer + 4 t/ha of biochar, and control were applied to the plantation of rice cultivar (locally named, Sen-Pidor) in both conditions. Leachate (NH₄-N, NO₃-N, and PO₄³⁻) and rice growth were collected at 7-day intervals while the grain yield and biomass of plant were collected at the mature stage. Our primary results showed that the leachate and rice growth were not significantly different between the both conditions. However, the leaching of NH₄-N and NO₃-N in the column with chemical fertilizer + 4 t/ha of biochar was lower than the column with chemical fertilizer while PO₄³⁻ leaching was the same measured from both rates. Remarkably, the plant height was the highest under the disturbed condition with chemical fertilizer +2 t/ha of biochar whereas under the undisturbed condition it was the highest with chemical fertilizer +4 t/ha. In addition, biochar amendment at the rate of 4 t/ha enhanced rice yield by 32.17% in comparison with the column using chemical fertilizer, and by 52.77% in comparison with the control. Also, biochar amendment at the rate of 4 t/ha had a great impact on the biomass of plant compared to the column without biochar contact. Our results indicate that biochar amendment has the potential to minimize N leaching, but not P leaching, while enhancing rice yield and biomass of plant.

Keywords: column-based experiment; nutrient application; plant height; rice paddy

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