

Growth, Nitrogen Uptake and Yield of Upland Rice (*Oryza sativa* L.) Varieties as Affected by Biochar and Nitrogen Application in Ratanakiri, Cambodia

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Abstract

The study aims to determine the effect of biochar incorporation in combination with varying N fertilizer levels on the growth, yield and yield components, and nutrient use efficiency of selected upland rice varieties; evaluate the response of upland rice varieties to biochar application under field condition in Cambodia, based on growth, dry matter and yield parameters; and determine the effect of field application of biochar on soil properties and growth with Cambodian upland rice varieties.

Two experiments on upland rice varieties, Lavak, Dinok, Romdoul, and Kjey, were conducted at Ban Pong village, Ban Pong Commune, Veunsai District, Ratanakiri Province in the northeast Cambodia from August-November 2014. The first experiment, 60 kg N ha⁻¹ and 12 t biochar ha⁻¹ application improved grain yield by 14.89 g, 12.93 g, respectively. The interaction between 60 kg N ha⁻¹ and 12 t biochar ha⁻¹ application consistently increased grain yield (16.34g) of upland rice variety. Therefore, the best combination of biochar and N levels is 12 t and 60 kg, respectively. Growth, efficiency and yield parameters were consistently the highest with the application of each combinations and levels.

The second experiment, relatively higher grain yields were obtained with biochar and Nitrogen on Romdoul variety (2.51 Mg ha⁻¹) and Lavak variety (2.45 Mg ha⁻¹), followed by Dinok (1.98 Mg ha⁻¹) and the lowest was Kjey (1.42 Mg ha⁻¹). However, Romdoul produced yield that was relatively higher than that of Lavak. This suggests that with relatively high, but decreasing shoot weight of Romdoul during reproductive stage, assimilates contributed to the production of reproductive components. Therefore, all the evaluated Cambodian upland rice varieties performed best with the application of combined at the rate of 60 kg N ha⁻¹ and 12 t biochar ha⁻¹. With the same level of fertilizer application, Romdoul responded very well among the four test varieties, which was conduct parameters measured.