

Enriched rice husk biochar superior to commercial biochar in ameliorating ammonia loss from urea fertilizer and improving plant uptake

ABSTRACT

Adding value to agricultural leftovers and turning them into biochar is a viable way to replenish soil nutrients and boost crop productivity. To further validate the efficacy of enriched rice husk biochar, an incubation study and a pot experiment were conducted: (1) to describe the effect of enriched rice husk biochar addition on soil total N, soil exchangeable NH_4^+ and available NO_3^- and (2) to describe the effect of enriched rice husk biochar on improving N, P, K, Ca, and Mg uptake, use efficiency, and dry matter production of rice plants. The amount of NH_3 loss that was considerably reduced by rice husk biochar at 5 and 10 t ha⁻¹ was 34 % lower than the control. The availability of soil total N, exchangeable NH_4^+ , available NO_3^- , available P, and exchangeable cations was greatly enhanced by the addition of rice husk biochar. Due to the effective nutrient uptake that occurs with an increase in soil nutrient level, the physical growth of the rice plant (height, tiller number, greenness, and panicle number) increased significantly in treatments supplemented with 5 t ha⁻¹ rice husk biochar. When rice plants were treated with 5 t ha⁻¹ rice husk biochar, their absorption of N, P, and K increased by >80 %, respectively. The production of dry matter in rice plants increased as a result of the increased N intake. The application of 5 t ha⁻¹ of rice husk biochar enhanced the soil nutrients by reducing NH_3 loss and augmenting soil nutrients for efficient plant absorption, as demonstrated by the favourable enhancement of soil macro- and micronutrients and biomass of rice plants.