

Release Of Phenolic Acids And Carbon From Rice Fields On Central Kalimantan (Indonesia) Peatlands

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Abstract

An experiment was conducted on three physiographical peatlands; coastal at Samuda, transitional at Sampit, and inland at Berengbengkel, Central Kalimantan. Under water-saturated conditions, peat decomposition releases some toxic substances: phenolic acids, and greenhouse gases: CH₄ and CO₂. Some phenolic acids found in peat soils in Central Kalimantan were p-hydroxybenzoic, 0.687-0.967 mM; vanillic, 0.675-0.848 mM; syringic, 0.563-0.854 mM; p-coumaric, 1.385-1.975 mM; ferulic, 1.293-2.314 mM, and cinnamic acid, 1.329-2.281 mM. The concentration of most of these was toxic for rice growth, especially in the inland peat. Carbon released in form of CH₄ from IR-64 and local variety rice fields from coastal peat was 10.765 and 7.598 mg/square meter/hr, and inland peat, 7.383 and 6.101 mg/square meter/hr, which were higher than that from the transitional peat, 5.840 and 4.697 mg/square meter/hr, respectively. The release of CO₂ from IR-64 paddy fields was 49.237-51.485 mg/square meter/hr. Increasing intensity of soil tillage led to an increase in CH₄ and CO₂ emission. Application of an ameliorant, based on 5 percent maximum sorption of Fe, composed of 70 percent mineral soil material and 30 percent electric furnace slag suppressed the effect of the derived phenolic acids by 22-47 percent. Moreover, emission of CH₄ from IR-64 and local rice varieties from rice fields decreased by 57 and 67 percent, while emission of CO₂ decreased by 55 and 49 percent, respectively.