

Short-term field decomposition of pineapple stump biochar in tropical peat soil.

ABSTRACT

The transformation of biochar on tropical peat is yet to be studied as all previous studies have been conducted on mineral or forest soils. The objectives of this study were to investigate the physical and chemical changes experienced by pineapple stump biochar (PSB) in tropical peat and to determine the short-term decomposition model of PSB in a C-rich environment. Elemental composition was determined using CHNS-O analyzer and surface area with Brunauer-Emmett Teller (BET) method. Surface chemistry and structural study were conducted with Fourier Transform Infrared (FTIR) spectroscopy and ¹³C solid state Nuclear Magnetic Resonance (NMR) spectroscopy, respectively. The PSB short-term decomposition was conducted with a litter bag study and best fitted into the hyperbolic decay model compared to exponential decay model because no significant mass loss was detected after 4 months. The stagnant phase was probably due to interaction with metals from peat. Redox reaction was prominent on the surface and structural chemistry. Surface oxidation of PSB produced more O-functionalities (hydroxyl, carboxylic and phenolic) and achieved chemical recalcitrance after 12 months. The carbon structure was reduced or saturated causing a decrease in electronegativity. Further PSB decomposition probably depends on biotic decomposition.

Keyword: FTIR; Hyperbolic decay model; Litter bag study; NMR; Organic C.