IMPROVING SOIL CARBON RETENTION USING BENTONITE NANO-CLAY INCLUDED ORGANIC AMENDMENT IN REDDISH BROWN EARTH SOIL IN SRI LANKA

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Soil organic matter plays a key role in soil health through biological, physical and chemical properties. The retention time of soil organic matter is brief in tropics due to rapid mineralisation. General aim of this study was to improve the soil carbon retention by altering the mineralisation rate of common organic amendment; specifically, was to investigate the changes of soil chemical properties and crop performances with the presences of such treated amendment. Reddish brown earth soil was treated with *Gliricidia sepium* leaf and bark to equalise the organic matter content of the soil. Four types of treatments were used viz. organic amendment without additives (T_1), 1% Bentonite (W/W) + Humic acid (100 $mgkg^{-1}$) organic amendment (T_2) and 2% Bentonite (W/W) + Humic acid (100 $mgkg^{-1}$) organic amendment (T_3), and anun-amended control (T_0). Maize was the test crop and experiment was laid out on a completely randomized design. The mode of action between Bentonite nano-clay and Humic acid was observed using X-ray Powder Diffraction (XRD), Fourier-Transform Infrared Spectroscopy and Thermal Gravimetric Analysis (TGA). XRD analysis confirmed binding of Humic acid on the surface of Bentonite without intercalation. Differences in the peaks of the TGA graphs were clearly visible due to the modifications of Bentonite by adding Humic acid. The growth and yield parameters of the test crop was significantly ($p<0.05$) superior on organic amendment with 2% bentonite and Humic acid treated soils compared to the rest. Relative greenness (SPAD values) and plant height were early indicators that showed the efficacy of organic amendment with 2% bentonite and Humic acid in retaining and releasing nutrients for a better crop growth. Bentonite and Humic acid on organic amendments showed promising results in altering the natural mineralization of organic matter under tropical climate.

Keywords: Bentonite, Humic acid, Nano-clay, Organic amendment, Soil organic matter