

Soil organic carbon fractions and nitrogen availability in an Entisol affected by application of carbonaceous organic soil amendments

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It is challenging to enrich soil organic C (SOC) pool by applying easily decomposable organic soil amendments (OA) such as compost and animal manures. Carbon rich OA can be applied to enrich SOC content and restore fertility of degraded lands. But carbon rich OA may immobilize nutrients, especially N. Present study was conducted to examine the effects of applying different OA on changes in different SOC fractions and restoration of soil fertility. A field experiment was conducted with maize as the test crop in an Entisol in Peradeniya for two consecutive cropping seasons (*Yala* and *Maha*) with four treatments, i.e., soil treated with mineral fertilizers only (SSF) as control, SSF with biochar (BC+SSF), and SSF with cattle manure incubated with sawdust (CS-i+SSF). Mineral fertilizer application was adjusted to supply nutrients to match site-specific fertilizer requirement considering nutrients added through OA. Changes in total organic C (TOC), permanganate oxidizable C (POXC) and particulate organic C (POC) in soil, carbon management index (CMI) and potentially mineralizable N (PMN) were assessed at the end of each cropping cycle (85 days). In both seasons, C content in the smaller POC fraction (53-125 μm) was higher than the larger fraction (125-2000 μm) in all treatments. Incorporation of BC and CS-i significantly increased TOC in soil compared to SSF in *Yala* season (1st season). In *Maha* season, TOC contents were comparable among BC+SSF, CS-i+SSF and SSF treatments. Application of BC+SSF significantly increased ($p < 0.05$) CMI in the 2nd season (*Maha*) without inhibiting N-mineralization. CS-i+SSF and SSF exhibited comparable CMI values in both seasons while CS-i+SSF and BC+SSF exhibited comparable PMN in the 2nd season (*Maha*). According to the results application of BC and CS-i enriched soil C pools without negatively affecting soil N supply. Therefore, these amendments can be considered to restore soil fertility of the studied Entisol.

Key words: Carbon management index (CMI), Potentially mineralizable N, Soil fertility, Soil organic carbon

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