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SHORT COMMUNICATION

Fine Roots Carbon Mineralization and Soil Carbon Stabilization Under Major Tree Species of the Semi-arid Region of India

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Abstract Below ground biomass is a major determinant of soil carbon (C) storage in semi-arid ecosystem. An extended laboratory incubation study for a period of 323 days was carried out to ascertain the decomposition kinetics of fine roots of major trees (*Jatropha curcas, Leucaena leucocephala, Acacia nilotica, Azadirachta indica* and *Prosopis juliflora*) and a grass species (*Cenchrus ciliaris*) in the semi-arid region of India with the hypothesis that species with a slower decomposition rate will increase stability of soil organic carbon and will have higher potential to rehabilitate degraded sites in terms of soil quality. The results were confirmed by analyzing bio-chemically stabilized carbon pool of soils under different species. Decay constant (k) for fine roots carbon ranged from 0.14 to 0.21 year^{-1} under different tree species and followed the order; *Acacia* > *Jatropha* > Grass- *C. ciliaris* > *Leucaena* > *Azadirachta* > *Prosopis*. Acid non-hydrolysable C (biochemically stabilized C pool) of soil was maximum in *P. juliflora* (1.84 g kg^{-1}) followed by *Azadirachta* (1.79 g kg^{-1}). Results emanating from the present investigation suggest that fine roots of *A. indica* have greater carbon stabilization potential than other species of the region.

Keywords Fine roots · Semi-arid · Tree species · Carbon mineralization · Bio-chemically stabilized carbon · Decay constant · Residue quality

Introduction

The amount of carbon (C) stored in a soil is a function of the difference between C inputs, such as those from plant litter and roots, and C outputs, primarily through decomposition but also from the burning of organic material [1] and