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CARBON SEQUESTRATION IN SOME IMPORTANT GREAT SOIL GROUPS OF SRI LANKA

W. M. K. R. Wickramasinghe, S. P. Indraratne

Department of Soil Science, Faculty of Agriculture, University of Peradeniya

Soil minerals play an important role in retention of soil organic carbon through the formation of organo-mineral complexes. Potential for carbon sequestration could be different based on the soil properties.

An investigation was conducted to evaluate the carbon retention capacity and to develop relationships with soil properties for 10 soils of Sri Lanka representing the seven Great Soil Groups (four soil orders). Soils were Red Yellow Podzolic (RYP, Ultisol), Reddish Brown Earth (RBE, Alfisol), Red Latosol (RL, Entisol), Yellow Latosol (YL, Entisol), Immature Brown Loam (IBL, Inceptisol), Non Calcic Brown (NCB, Alfisol) and Sandy Regosol (SR, Entisol). The clay fraction was separated from each soil without treating for binding agents. This separated clay fraction was subjected to sequential extraction of carbon using 0.1 M NaOH and HF/HCl. The experiment was carried out in triplicate. In the sequential extraction 0.1 M NaOH removed the easily available C (T1), HF/HCl treatment removed the C bound to silicate minerals (T2) and the most stable C remained in the residue (T3). Clay mineralogy of the representative great soil groups was determined by the X-ray diffraction technique.

The highest amount of C bound with organo-mineral complexes (T2+T3) was indicated by the RYP soil (38.58 g/100g clay) which contained 25 % of clay and 2 % of OC. The lowest C bound with organo-mineral complexes was reported in SR soil (5.58 g/100g clay) containing 1% clay and 0.2% OC. Total OC in clay fraction of RYP and SR soils were 45.89 and 6.85 g/100g respectively. Organic C extracted from stable pools (T2+T3) showed a significant relationship with soil clay (R^2= 0.60) and OC contents (R^2= 0.58) at $p<0.05$. Kaolinite was the dominant clay mineral for all the great soil groups studied. The accessory clay mineral/s for RYP were vermiculite, chlorite and gibbsite, for IBL and RL was illite, for RBE and NCB were montmorillonite and illite, and for YL were Illite and Geothite. Mineralogical differences in accessory minerals could have contributed for varying amounts of C found with organo-mineral complexes in different soils.

The overall results indicated that the C retention capacity varies from soil to soil depending on their clay and OC contents. Observed clay mineralogical differences could also have contributed to the observed variation in C retention capacity.