Geophysical Research Abstracts
Vol. 17, EGU2015-13838-7, 2015
EGU General Assembly 2015

Total organic carbon in aggregates as a soil recovery indicator

Katia Luciene Maltoni (1), Ana Maria Rodrigues Cassiolato (1), Glaucia Amorim Faria (1), and William Dubbin (2)

(1) Faculdade de Engenharia, UNESP, Ilha Solteira, Brazil (maltoni@agr.feis.unesp.br), (2) Earth Sciences, Natural History Museum, London, United Kingdom (b.dubbin@nhm.ac.uk)

The soil aggregation promotes physical protection of organic matter, preservation of which is crucial to improve soil structure, fertility and ensure the agro-ecosystems sustainability. The no-tillage cultivation system has been considered as one of the strategies to increase total soil organic carbono (TOC) contents and soil aggregation, both are closely related and influenced by soil management systems. The aim of this study was to evaluate the distribution of soil aggregates and the total organic carbon inside aggregates, with regard to soil recovery, under 3 different soil management systems, i.e. 10 and 20 years of no-tillage cultivation as compared with soil under natural vegetation (Cerrado). Undisturbed soils (0-5; 5-10; and 10-20 cm depth) were collected from Brazil, Central Region. The soils, Oxisols from Cerrado, were collected from a field under Natural Vegetation-Cerrado (NV), and from fields that were under conventional tillage since 1970s, and 10 and 20 years ago were changed to no-tillage cultivation system (NT-10; NT-20 respectively). The undisturbed samples were sieved (4mm) and the aggregates retained were further fractionated by wet sieving through five sieves (2000, 1000, 500, 250, and 50 μm) with the aggregates distribution expressed as percentage retained by each sieve. The TOC was determined, for each aggregate size, by combustion (Thermo-Finnigan). A predominance of aggregates >2000 μm was observed under NV treatment (92, 91, 82 %), NT-10 (64, 73, 61 %), and NT-20 (71, 79, 63 %) for all three depths (0-5; 5-10; 10-20 cm). In addition greater quantities of aggregates in sizes 1000, 500, 250 and 50 μm under NT-10 and NT-20 treatments, explain the lower aggregate stability under these treatments compared to the soil under NV. The organic C concentration for NV in aggregates >2000 μm was 24,4; 14,2; 8,7 mg/g for each depth (0-5; 5-10; 10-20 cm, respectively), higher than in aggregates sized 250-50 μm (7,2; 5,5; 4,4 mg/g) for all depths. Although, with lower organic C contents, NT-10 and NT-20 presented the same behavior, i.e. greater amounts of organic C in bigger aggregates, (NT-10: 10,7; 9,5; 9,0 mg/g and NT-20: 18,8; 15,7; 8,6 mg/g, for each depth respectively 0-5; 5-10; 10-20 cm), and lower C contents in smaller aggregates (NT-10: 5,7; 6,1; 5,6 mg/g and NT-20: 8,2; 7,9; 6,3 mg/g , for each depth respectively 0-5; 5-10; 10-20 cm). The aggregates > 2000 μm, at 10-20 cm depth, showed similar C contents for NV, NT-10 and NT-20 (8,7; 9,0; 8,6 mg/g, respectively) suggesting that the C supply, even in natural environment, is not enough to increase organic C at 10-20 cm depth. The organic C concentration for aggregates sized 250-50 μm, in all three evaluated depths, is similar. Therefore, under NT-10 and NT-20 the smaller aggregates are not influenced by cultivation system, suggesting that the organic C inside the smaller aggregates can be retained for longer time in soil system. The results suggest, with regard to aggregate distribution and organic carbon content under NV, that soil under NT-20 is recovering.
Acknowledgement: This study received financial support from CNPq