SUITMA 11
11 th Conference on Soils of Urban, Industrial, Traffic and Mining Areas
Soils and the food, water, energy nexus
05.09.– 09.09 2022 Berlin, Germany

Urban soil carbon stability in semi-arid region: case study of Marrakech city

Beroigui Meriyeme[1,2*], Ouvrard Stéphanie[2], Schwartz Christophe[2], Boularbah Ali[1,3]

(1) Faculté des Sciences et Techniques Marrakech, Laboratoire des Bioressources et Sécurité Sanitaire des Aliments, Université Cadi-Ayyad, BP 549 Guéliz, 40000 Marrakech, Morocco
(2) Université de Lorraine, INRAE, LSE, F-54000 Nancy, France
(3) Center of Excellence for Soil and Fertilizer Research in Africa, AgrobioSciences Program, Mohammed VI Polytechnic University, Benguerir, Morocco

Email *: beroigui.miryame@gmail.com

Abstract

Since the 2000s, increasing attention has been paid to soil organic carbon (SOC) stock in urban soils. In semi-arid regions (i.e Marrakech city) in Mediterranean countries, soils are characterized by low OM (<2%). Moreover, under such climatic conditions, characterized by low rainfall but sometimes very intense, there is an increased risk of loss of the organic matter (OM) and of the soil degradation. The organic carbon compartment is the most complex, dynamic and reactive in soil. It is of extreme importance for soil functioning. Its appropriate levels in the soil guarantee the best fertility and reduce the impacts of human activity on the environment. It plays a key role in soil structural stability, erosion reduction and the preservation of soil biodiversity. In spit of that many studies quantified the storage capacity of OM in urban ecosystems, fewer who explain the accumulation and retention of organic carbon (C) and nitrogen (N) in soil. The relationship between soil structure and its ability to stabilize soil organic matter (SOM) is the keystone in soil C dynamics that has either been omitted or not investigated when developing SOM models. The main objectives of this work were to determine if the estimated concentration of C and N in clay plus silt sized particles would provide a useful indicator to characterize organic matter retention in soil and to estimate the capacity level using the Hassink (1997) model. Our study was conducted on seven different land uses of Marrakech urban soils, where twenty-six sites were chosen to study the stability of C. We investigated its dynamic through particle-size fractionation that consists of dispersing the soil with more or less force, in order to break the aggregates and separate the free SOM, physically protected and the physico-chemically bound. Most of studied whole soil has a significant higher fine sand and lower clay content, except for peri-urban agricultural soils irrigated by wastewater (SAS-WWE) where the both average of clay and fine silt contents exceeds 65%. The particle-size fractionation results showed that the studied soils are characterized by a significant <50 µm fraction, where the percentage of distribution reached a maximum of 60% for both SAS-WWE and peri-urban agricultural soils irrigated by well water (SAS-WW) compared to the control (43%), while the low value is 24% for landfill (LF). The characterization of OM retention over 26 urban soils clarified that soil texture with clay plus silt contents <32% tended to be saturated with organic matter, while the soils with greater than 70% clay plus silt content had potential to store more C.

Acknowledgement This work has received financial support from the MESRSFC and CNRST under contract PPR / 2015/22