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“Filling gaps and removing traps
for sustainable resource management”

Functional Diversity of the Soil Macro Fauna in Different Ecosystems

ONELIO FUNDORA¹, EMMA PINEDA², ILIÁ LUGO², GEORGINA GÁLVEZ³, BETTINA EICHLER-LOEBERMANN⁴

¹*University of Santa Clara, Fac. of Agriculture, Cuba*

²*Institut of Sugar Cane Research, Cuba*

³*Central University of Las Villas, Cuba*

⁴*University of Rostock, Fac. of Agricultural and Environmental Sciences, Germany*

Abstract

Cropping systems strongly affect biological soil characteristics. In order to determine long-term effects (30 years) of cropping systems on the diversity of soil macro fauna a study was carried out on Vertic Haplustept soils. Four sites with different cropping types were included in this study: i) annual crops, ii) perennial crop (monoculture of sugar cane), iii) forest, and iv) natural grassland. Different indicators of the macro fauna in the soil were determined, highlighting their function (soil engineers, detritivores, herbivores and predators) and considering their impact on soil fertility. The number of individuals per taxon (orders and classes) and per function was determined in an area of 25 cm × 25 cm and a soil depth of 0 to 10 cm and 10 to 20 cm. The results showed that in all cropping systems investigated indicators of the macro fauna were related to the soil fertility (soil organic matter, bulk density, and nutrient contents). The forest showed the highest functional biodiversity and a relative high abundance of taxa belonging to soil engineers (Haplotaxida and Hymenoptera) and detritivores (Dictyoptera, Isoptera, Pulmonata, and Spirobolina), which are also decisive for physical properties of soils and quality of soil organic matter. For the grassland and the sugarcane sites fewer individuals in comparison to forest were found. In tendency the grassland was superior to the sugarcane site in terms of functional biodiversity and soil fertility. The site with annual crops was found to have the lowest numbers of individuals. Presumably, the relative low amount of crop residues, periods without soil coverage, and higher frequency and intensity of tillage resulted in negative effects on these soil characteristics. Following, the management of cropping systems should also focus on aspects of soil biology and the diversity of soil organisms.

Keywords: Biodiversity, cropping systems, soil biology