

Macrofauna biodiversity comparison in soils of a Costa Rican banana plantation under organic and conventional farming

F.X. Castillo¹, L.O. Vera¹, B. Kohlmann¹ and M. Shintani²

¹EARTH University, A.P. 4442-1000, San José, Costa Rica

²University of Missouri, USA

bkohlman@earth.ac.cr

Abstract

This trial was conducted to determine differences in the macrofauna biodiversity, banana root biomass and soil chemistry in samples of a Costa Rican banana plantation of the Grand Nain variety under organic and conventional farming. The sites are situated inside EARTH University (Las Mercedes de Guácimo, Province of Limón). The locality is situated at 60 m.a.s.l., has an annual mean temperature of 23°C, 3700 mm annual mean rainfall

Two banana plantations, one under conventional farming, using fungicides, nematicides and soil fertilization; the other under organic farming (in association with Nitrogen fixating trees like *Moringa oleifera*, *Glericidia sepium* and *Flemingia sp.*, and fertilized with banana residues fermented to bokashi by EM) were sampled for macroarthropods and earthworms, as well as for banana root biomass and soil chemistry. Macrofauna specimens were counted, root biomass was weighted, soil chemistry was determined.

The resulting data were graphically represented in the form of pie diagrammes and dendrograms. The latter were analyzed using Fisher's exact test on two-way contingency tables.

The results show that there are statistically significant ($\alpha < 0.05$) differences in the macrofauna biodiversity and soil chemistry characteristics between both farming systems. More root mass variation was observed under organic farming, although root health could be visually appreciated to be much better.

The number of macroarthropod individuals was much higher in organic farming, and in general more biodiverse, than under conventional farming. Earthworms are an important element in organic banana soils, as well as larvae of Diptera; whereas a trend appears for root-eating beetle larvae of the families Scarabaeidae and Chrysomelidae, as well as larvae of Lepidoptera and Chilopoda to become important elements under conventional farming. Ants, were as expected, important in all systems. No differences were found during the dry and rain season. In relation to soil chemistry, the levels of K, N, and P were much higher and those of Cu, Fe, and Zn much lower under organic than under conventional farming. These differences are congruent with the different inputs used for organic and conventional banana farming.

Keywords: *soil macrofauna, biodiversity, Costa Rica, banana plantations, organic farming, conventional farming*