

## Enchytraeids (Oligochaeta, Enchytraeidae) as soil quality indicators in integrated systems in Paraná State

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**Introduction** Soil organisms can be useful to measure the sustainability of a system as bioindicators since they can respond quickly to changes in the environment. The enchytraeids are edaphic microannelids which play a role in the organic matter decomposition. The knowledge on these worms is still scarce in Brazil, but they are found worldwide and have been used as bioindicators of soil quality and contamination in Europe. Our objective was to evaluate the potential of the enchytraeid worms as indicators in different land use systems.

## **Material and Methods**

Five different systems were assessed in Ponta Grossa County, Paraná State, Southern Brazil: Integrated Crop-Livestock (ICL) with 7 years, Integrated Crop-Livestock-Forest (ICLF) with 7 years, *Eucalyptus* plantation (EU) with 20 years, No-till System (NT) with 30 years and Native Pasture (NP). The sampling and extraction of worms followed ISO 23611-3: 2007). Ten soil samples were collected per plot (50 m x 100 m), totalizing 30 points per system. The worms were extracted from each soil sample by a hot wet method for 3h 30 minutes and counted under a stereomicroscope. The worms were identified in vivo to genus level in only 2-3 of the 10 samples of each plot from warm season. Samplings were performed once at the end of the cold season (August-September 2012) and once at the end of the warm rainy season (April 2013). The data were submitted to univariate ANOVA and mean test Tukey (p < 0.05) and to multivariate Principal Component Analysis (PCA).

## **Results and Conclusions**

The enchytraeid abundance was clearly season-dependent, showing a total of 364 individuals in the cold season and 3514 in the warm season. In the cold season, worms were absent in 62% of the samples, against 11% in the warm season, probably as a reflex of its drier condition. Among the different systems, enchytraeids in ICL and ICLF were more abundant than in NP and EU in both seasons (ANOVA; Tukey, p < 0.05). In turn, the abundance in NT was as high as in the integrated systems in the warm season when there was a crop growing, but lower in the cold/drier season, when no crop was growing at the moment of the sampling. The highest genus richness was found in NP (5) and NT (5) followed by ICL (4), ICLF (3) and EU (3). The genus *Enchytraeus*, which is probably common in areas with higher degree of disturbance, composed 50% or more of the worms identified in each system, except in EU. The Principal Component Analysis (PCA) separated the systems in three groups: EU, NP and the more conservationist systems (ICL, ICLF and NT). The latter group was associated to the higher enchytraeid abundance and genus richness, NP, to the Achaeta genus and EU to no one of the biological variables measured. This separation is explained by the principal component (PC) 1 (70,2%) and PC 2 (18,4%), where PC 1 was represented mainly by enchytraeid abundance data. We conclude that enchytraeids were sensitive to the land use systems studied and may be good indicators of soil quality.

## **Reference cited**

International Organization for Standardization (2007) Soil quality — Sampling of soil invertebrates — Part 3: Sampling and soil extraction of enchytraeids