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Diversity of soil macrofauna in sugarcane [1].

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RESUMO: Soil macrofauna organisms are recognized as ecological indicators of soil management practices. Sugarcane monoculture can produce negative impacts on soil, including biodiversity loss, which should be evaluated. In that sense, the aim of this study is to determine soil macrofauna evolution and diversity under sugarcane (Saccharum officinarum L.) annual growth cycle (2012-2013). The study areas are located at Usina Itajubara in Coelho Neto municipality, in Maranhão State (Brazil). Soil macrofauna samples were collected in January of 2015. In order to collect soil macrofauna samples, 5 pitfall traps were placed in the field for 7 days. Descriptive statistics and biodiversity indices were used to carry out data analysis. Sugarcane harvest with straw burning initially promoted soil macrofauna taxa better adapted to system drastic changes. Moreover, as sugarcane growth year went by, soil macrofauna biodiversity indices similar to those reported at natural vegetation areas (Sandbank and Atlantic Forest) were observed.

Termos de indexação: bioindicator, soil macrofauna, functional groups.

INTRODUÇÃO

Brazil is the largest producer of sugarcane in the world. The main product of sugarcane is sucrose which is used as raw material in human food industries or is fermented to produce ethanol. Despite its economic importance, the intensive cultivation and processing of sugar produce negative environmental impacts. According to Rossetto et al. (2010) sugarcane monoculture leads to biodiversity loss and affects local and regional fauna and flora.

Soil is the habitat of different organisms that constantly interact and move thus determining physico-chemical and biological properties of soil (Correia, 2002). Soil macrofauna include a great variety of edaphic organisms larger than 2 mm in size (Baretta, 2007) that contribute to soil homogenization, soil structure improvement and therefore increase root penetration and air and water internal fluxes.

Edaphic macrofauna components include the following taxonomic groups: termites (Isoptera), woodlice (Isopoda), spiders (Arachnida), centipedes (Chilopoda), millipedes (Diplopoda), earthworms (Oligochaeta), slugs and snails (Mollusca), and ants (Hymenoptera) (Baretta, 2007). As those organisms have a large influence on soil physical, chemical and biological properties they are considered as "*ecosystem engineers*".

Thus the present study aims to determine soil macrofauna diversity under sugarcane (Saccharum L.) in Maranhão State (Brazil).

MATERIAL E MÉTODOS

The study area is located in Usina Itajubara in Coelho Neto municipality, in Maranhão State (Brasil).

The soils in the study area region derive from Barreiras group, comprising final tertiary sediments from continental origin and presenting sandy to clay texture (Brazil, 1969; Brazil, 1972).

In each area and sampling time, 5 pitfall traps were installed for 7 days in order to collect soil macrofauna samples (Correia & Oliveira, 2000). A pitfall trap is a plastic pot (9 cm high and 8 cm in diameter) placed at soil level and filled with 200 ml of 4% formolin to preserve collected individuals (Aquino et al., 2008). To reduce rain and surface flow damages, a plastic cover with a plastic dish was used and rails were made around the trap.

Initially, the data concerning soil macrofauna communities was analyzed using statistical descriptors to determine the main statistical moments to the total number of taxa in each area [number of taxa, minimum value, maximum value, mean, variance, standard deviation, coefficient of variation (%), skewness, kurtosis and Kolmogorov-Smirnov test ($p<0.05$)].

Then, abundance (individuals $trap^{-1}$ day^{-1}), Shannon index, total richness, mean richness and Pielou index were determined (Magurran, 2004).

RESULTADOS E DISCUSSÃO

Since sugarcane management practices included straw burning, a lower biodiversity was expected in

that area.

At the sugarcane area the negative effect on taxa diversity was worse due to the recent crop harvest with burning of harvest residues (Portilho et al., 2011).

Although the sugarcane area presented the lowest taxa richness, an increment in the dominance of carnivores (Araneae, Formicidae and Orthoptera) occurred possibly due to a great quantity of passive individuals (Figure 1).

Table 2 represents statistical descriptors and measures of central tendency for the total abundance. Shannon index indicates species abundance distribution, highlighting less common species (Magurran, 2004). The lower the value, the higher dominance can one particular species have on the study community (Magurran, 2004). In turn, Formicidae (55%), general predators of less frequent taxa, were dominant in the sugarcane area.

CONCLUSÕES

Sugarcane cultivation with straw burning initially promoted those taxa better adapted to drastic changes in the system (such as Formicidae). The biodiversity increase at the sugarcane area during its growth year has allowed the description of a food chain setting: Formicidae dominance at the beginning.

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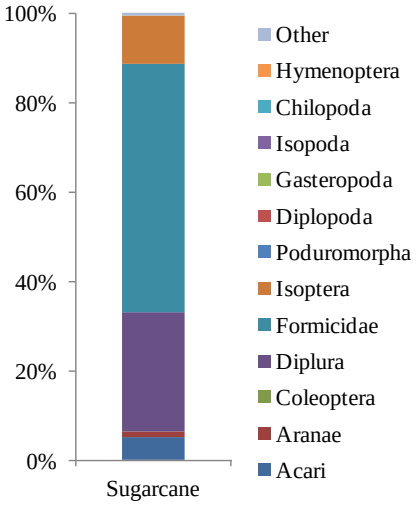

Figure. 1. Proportional specimen distribution among taxa.

Tabela 1 – Taxa richness of soil macrofauna communities.

	Sugarcane
	Acari
	Aranae
	Diplura
	Entomobryomorpha
	Formicidae
	Isoptera
Number of taxa	6

Tabela 2 – Statistical descriptors of the total abundance of individuals.

	Sugarcane
Minimum	1
Maximum	87
Mean	26.167
Variance	1116.567
Standard deviation	33.415
Coefficient of variation	127.701
Skew	1.546
Kurtosis	1.957
Kolmogorov-Smirnov test	0.275Ln

Tabela 3 – Daily abundance, taxa richness and biodiversity indices of soil macrofauna communities in sugarcane.

Land use	Individuals.trap^{-1}.day^{-1}	Standard deviation	Shannon	Total richness	Mean richness	Pielou
Sugarcane	4.457	2.071	1.641	6	2.4	0.635