SOIL MACROFAUNA COMMUNITIES UNDER INTEGRATED CROP-LIVESTOCK SYSTEMS IN A CERRADO FERRALSOL, BRAZIL

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INTRODUCTION

Soil invertebrates play major roles in soil functions by recycling organic matter, building biogenic structures, and regulating the activities of micro-organisms and other smaller invertebrates included in their functional domains (Lavelle et al., 2006).

Integrated crop-livestock systems (ICLS), that seem to be the best for conserving diversity and sustaining high levels of abundance of the macrofauna, are strongly promoted by agronomic research, but are still scarcely used by farmers due to the complexity of the management systems.

Only a few studies have been made in the Cerrado and, therefore, there is a lack of information for this region.

The objectives of this study were to (1) estimate the effects on the abundance and diversity of the macrofauna of ICLS systems in comparison to continuous crops or pasture; (2) evaluate the impact of tillage (no-tillage versus conventional tillage); and (3) examine the responses to fertilization regimes.

MATERIAL AND METHODS

- Site: Cerrado Agricultural Research Center (Embrapa Cerrados) at Planaltina-DF, 15º 35' S and 47º 42' W, altitude 1200 m;
- Soil: Latossolo Vermelho according to the Brazilian classification;
- Treatments: (1) P Continuous pasture; (2) C Continuous crop; (3) CR crop/pasture rotation; (4) PR pasture/crop rotation. (5) Native Brazilian savannah (typical Cerrado)Description: In the field, the CR and PR rotations changed every four years since 1991. At sampling, in May 2004, soybean (Glycine max (L.) Merr.) were used in the crop fields (C and CR systems) and the fodder specie utilized in the PR rotation system was Panicum maximum. At the time of sampling, CR was covered with soybean and PR with Panicum maximum. In the C, CR and PR systems, there were also two regimes of soil tillage during the crop stage (T+ = Conventional and T- = No-tillage system) and two fertilization regimes, (F1 = maintenance fertility and F2 = corrective fertility);
- Method: Macrofauna was sampled according TSBF methodology with modifications (Lavelle, 1988). At each plot, three 25 cm ×25 cm×30 cm samples, separated into three layers (0-10, 10-20 and 20-30 cm) were taken at regulars transects.

RESULTS

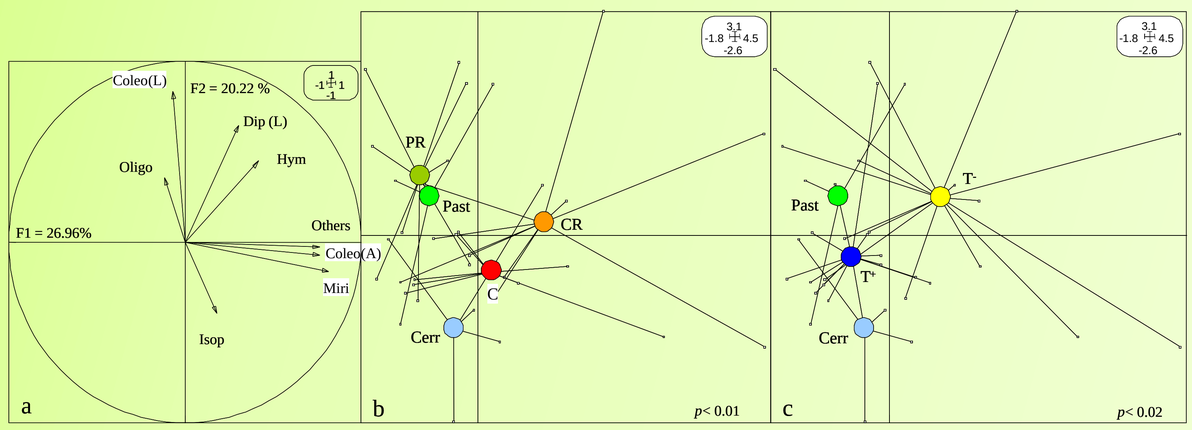

Figure 1. Correlation circle with factorial axes F1 and F2 (a) of soil macrofauna density of grand groups and PCA analysis for soil management systems (b) and effect of soil tillage systems (c) in a central plateau at Planaltina, DF. Cerr Cerrado; C Continuous crop; CR Crop/Pasture rotation; Past Continuous pasture; PR Pasture/Crop rotation; T+ Conventional Tillage; T- No-tillage; p - probability for groupings to be non-significant (permutation tests). Coleo(A) Coleoptera adult; Coleo(L) Coleoptera larvae; Miri Miriapoda; Isop Isoptera; Oligo Oligochaeta; Hym Hymenoptera; Dip (L) Diptera larvae; Others.

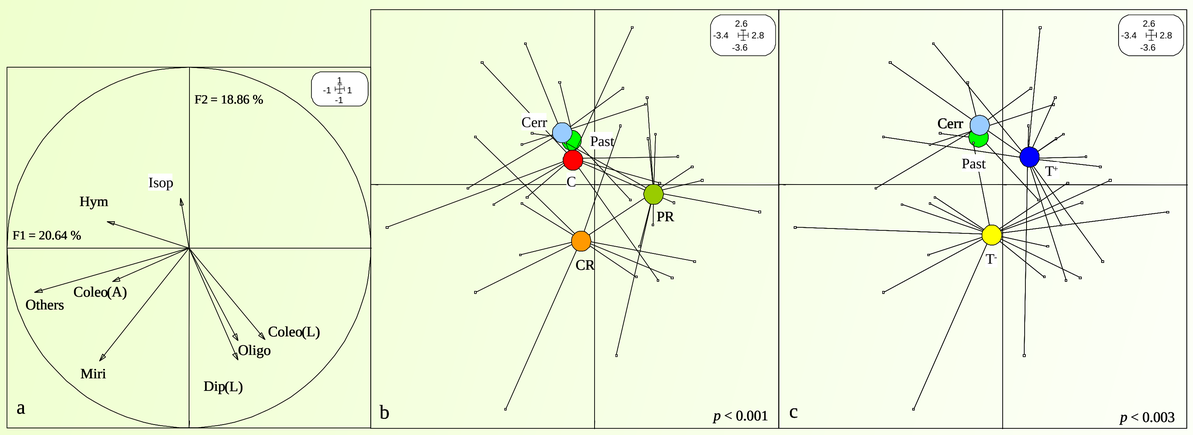

Figure 2. Correlation circle with factorial axes F1 and F2 (a) of soil macrofauna morphoespecies richness of grand groups and PCA analysis for soil management systems (b) and soil tillage systems © in a central plateau at Planaltina, DF. Cerr Cerrado; C Continuous crop; CP Crop/Pasture rotation; P Continuous pasture; PC Pasture/Crop rotation; SP Continuous Pastures; CT Conventional Tillage; NT No-tillage; *p* - probability for groupings to be non-significant (permutation tests). Coleo(A) Coleoptera adult; Coleo(L) Coleoptera larvae; Miri Miriapoda; Isop Isoptera; Oligo Oligochaeta; Hym Hymenoptera; Dip (L) Diptera; Others.

A total of 234 morphospecies were found, distributed among 30 subgroups (Orders or families). The soil faunal density was maximum in the Cerrado (Savannah) vegetation (4796 ind m^{-2}) and minimum in the continuous crop system (501 ind m^{-2}). However, a large part of the total number of individual densities is due to termites (Isoptera), whose values are extremely variable, from 0 to 4.340 ind m^{-2}. The density decreased according to the intensification of land use, especially in continuous soil system management.

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