

Soil fauna activity in natural and improved secondary vegetation (capoeira)

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ABSTRACT

The main goal of this work is to monitor the abundance and the vertical distribution of soil invertebrate in enriched secondary vegetation with fast growth leguminous tree. The enrichment experiment is located in Igarapé-Açu, State of Pará, in small farmer's land where the following trees species were under observation: *Acacia mangium*, *Inga edulis*, and *Sclerolobium paniculatum* (the trees were planted at a spacing of 1mx2m) and one 6-year-old fallow without enrichment. First results already show that in the enriched fallow with *I. edulis* 15 soil fauna groups were observed, 14 groups in the *A. mangium*, 12 groups in *S. paniculatum* and 15 groups in the 6-year-old fallow. In the enrichment with *I. edulis* the biggest density (168,111 individuals/m²) was observed, declining in the following sequence: 6-year-old fallow 136,636 individuals/m², *A. mangium* with 133,260 individuals/m², *S. paniculatum* (116,415 individuals/m²). The analysis of the different environments indicated a dominance by Acari in all four habitats studied (76.6%). Collembola is the second strongest group, with a density of 14.1%.

Key words: soil mesofauna, density, vertical distribution, improved secondary vegetation

RESUMO

O objetivo principal deste trabalho é o de monitorar áreas de capoeiras enriquecidas com leguminosas arbóreas de rápido crescimento, quanto a abundância e distribuição vertical de invertebrados do solo. O trabalho está sendo conduzido em Igarapé-Açu, em propriedade de pequeno produtor rural. Estão sendo utilizadas capoeiras enriquecidas com as espécies de leguminosas arbóreas, *Acacia mangium*, *Inga edulis*, e *Sclerolobium paniculatum*, no espaçamento 1mx2m e capoeira com seis anos de pousio, como controle. Os resultados mostram que nas capoeiras enriquecidas foram observados 15 grupos de animais do solo no *I. edulis*, 14 grupos na *A. mangium*, 12 grupos no *S. paniculatum* e 15 grupos na capoeira controle. A maior densidade de animais, foi observada na capoeira enriquecida com *I. edulis* com 168.111 ind/m², vindo a seguir capoeira controle com 136.636 ind/m², *A. mangium* com 133.260 ind/m², *S. paniculatum* com 116.415 ind/m². As análises da mesofauna dos diferentes ambientes indicaram a dominância do grupo Acari nas quatro áreas estudadas (média de 76,6%), seguindo do grupo Collembola com média de 14,1% da mesofauna encontrada.

ZUSAMMENFASSUNG

Hauptziel der vorliegenden Arbeit war die Untersuchung der Abundanz und der vertikalen Verteilung von Invertebraten im Boden auf Sekundärwaldflächen, die mit schnell-

wachsenden, baumartigen Leguminosen angereichert wurden. Die Versuchsflächen befanden sich auf dem Land von Kleinbauern im Munizip Igarapé-Açu im Nordosten des brasilianischen Bundesstaates Pará. Die folgende Flächen wurden untersucht: angereicherte Sekundärvegetation mit *Acacia mangium*, *Inga edulis* und *Sclerolobium paniculatum* (jew. Pflanzdichte 1 m x 2 m) sowie eine 6-jährige Sekundärvegetation ohne Anreicherung. Erste Ergebnisse zeigen, daß in den mit *I. edulis* angereicherten Flächen insgesamt 15 Invertebraten-Gruppen beobachtet wurden, in den Flächen mit *A. mangium* 14, mit *S. paniculatum* 12 und in der 6-jährigen Sekundärvegetation 15 Gruppen. Die Anreicherung mit *I. edulis* wies mit 168.111 Ind./m² die größte Individuendichte auf, gefolgt von der 6-jährigen Sekundärvegetation mit 136.636 Ind./m², *A. mangium* mit 133.260 Ind./m² und *S. paniculatum* mit 116.415 Ind./m². Die vorherrschende Gruppe in allen vier Flächen war Acari (76,6%), gefolgt von Collembola mit einem Anteil von 14,1%.

INTRODUCTION

Leguminous tree plantations have been showing quite satisfactory to recover degraded soils (Franco et al., 1992). Depending on the system and the impact type, the reactions of different fauna groups can increase, decrease or maintain the population size. Accelerated losses of organic matter and soil desegregation are related to modifications in edafic fauna populations (Lavelle et al., 1994). Thus, changes in the abundance and diversity of invertebrate species are constitute in a good indicator of changes in the system (Curry and Good, 1992 and Stork and Eggleton, 1992).

The 70% to 90% of vertical distribution of soil edafic fauna were found in a layer of vegetable detritus, which is the energy source of system (Bandeira, 1985 and Adis et al, 1987). Teixeira and Silva (1997) and Leitao and Teixeira (1995) observed that the acarid and colembola represented more than 75% and 11%, respectively, of the whole fauna identified in natural and cultivated systems.

The main goal of this work is to monitor the abundance and the vertical distribution of soil invertebrate in enriched secondary vegetation with fast growth leguminous tree.

MATERIAL AND METHODS

The evaluated areas were a 6-year-old fallow vegetation (capoeira) and an enriched fallow vegetation experiment carried out in a small holder area located at the municipality of Igarapé-Açu (State of Pará, Eastern Brazilian Amazon). The enriched secondary vegetation was composed by the fast growth leguminous tree *Acacia mangium*, *Inga edulis* and *Sclerolobium paniculatum*, planted at spacing 1 m x 2 m. Soil fauna was collected in litter and soil layer (0-5 cm and 5-10 cm). Abundance and vertical distribution were evaluated.

Soil samplings were done using metallic probe of 12.56 cm². The fauna was extracted through funnels of Berlese-Tulgreen, and formol at 1% as a collector liquid. The units of samples were left in the extractor during 72 hours and after the extraction, the animals were conserved in alcohol at 70% for later on they were identified and separated in taxonomic groups.

The similarity percentage (S%) was determined according to proposed by Southwood (1971), as mentioned by Lara (1979):

$$\% S = \Sigma S (\% a + \% b + \dots + \% n),$$

where a, b, ..., n are the smallest values of each group in confront of two communities.

RESULTS AND DISCUSSION

Different values of fauna diversity and density of individual were found in the studied treatments (Figure 1). Enriched capoeira with *I. edulis* presented 15 fauna taxonomic groups and fauna density (168,111 ind./m²). The control also showed 15 fauna taxonomic groups and density of 136,636 ind./m² and in the capoeira enriched with *A. mangium* 14 groups and 133,260 individuos/m² were found. The smallest fauna diversity (12 taxonomic groups) and fauna density (116,415 ind./m²) were present in *S. paniculatum* enriched fallow vegetation.

In litter were found 14 fauna taxonomic groups in *I. edulis* enriched fallow vegetation and control, and 11 and 10 in *A. mangium* and *S. Sclerolobium*, respectively. In 0-5 cm soil layer were observed 10, 6, 8 and 12 groups and in the layer 5-10 cm showed 9, 8, 8 and 8 groups respectively, in the enriched capoeiras with *I. edulis*, *A. mangium*, *S. paniculatum* and control (Figure 1).

The groups Pseudoscorpionida and Chilopoda were not found in none of the studied plots. Pellens et al. (1995) studying communities of soil fauna in leguminous tree plantations and native forest observed the absence of these predadores that habitually take refuge below of foliate rest. The Diptera and Isoptera groups were found only in control plots.

Acari and Collembola were the dominant groups, corresponding respectively at 76.6% and 14.1% of the whole found fauna. The enriched plot with *A. mangium* presented the largest densities of Acari. The largest occurrence of Collembola was observed in control plot and the smallest in enriched capoeira with *A. mangium*.

Comparing control fallow vegetation and enriched fallow with fast leguminous tree were verified the following similarity percentages: 88,38% with *I. edulis*, 86.22% with *A. mangium* and 80.4% with *S. paniculatum*.

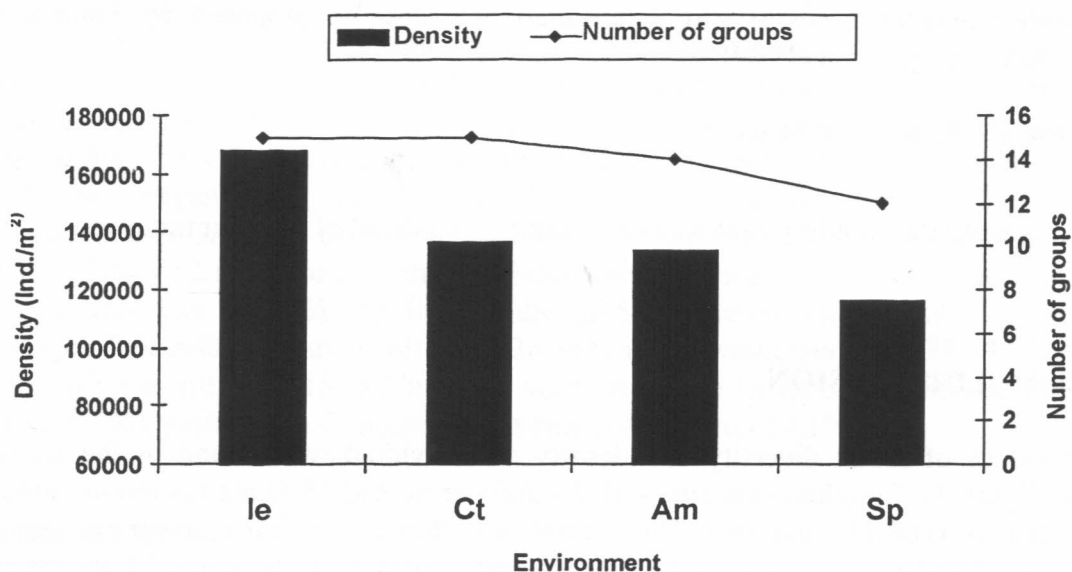


Figure 1: Individual density and number of groups found in control (Ct) and in enriched capoeira with *I. edulis* (Ie), *A. mangium* (Am) e *S. paniculatum* (Sp)

CONCLUSIONS

Based on the collected data, it was possible to conclude the following:

- Enriched fallow vegetation present diversity soil fauna groups and invertebrate density similar to that found in control;
- enriched fallow vegetation presented high soil mesofauna similarity compared to control fallow vegetation; and
- the largest concentration of soil invertebrate in enriched and no-enriched fallow vegetation occurs in litter layer.

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