

Microbial Biomass as Affect by Litter Quality and Fertilization on a Xanthic Ferrasol

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The soils of the Brazilian Amazon region are generally poor and acid. Xanthic Ferrasols are the predominant soils on "terra firme" ecosystems in this region. The topsoil organic matter is the main reserve of nutrients in these soils. In conversion of forests to agriculture by use of slash-and-burn soil preparing systems, the organic matter is almost completely destroyed. The restoration of biogeochemical cycles and nutrient fluxes is an important step to improve soil capacity for a sustainable agriculture system. Microbial biomass represents an important compartment of the nutrient fluxes. Therefore, we conducted a laboratory incubation to investigate the effects of litter from different species (*Theobroma grandiflorum*, *Bactris gasipaes*, *Bertholletia excelsa*, *Bixa orellana* and *Pueraria phaseoloides*) and fertilization with N and P on C, N and P in microbial biomass of the topsoil (0-5 cm) with high organic C contents and of an underlying horizon (10-15 cm) with low organic C contents of a Xanthic Ferrasol.

The soils used in this study were collected from a natural forest area. 150 g of soil were incubated with 246 mg of air-dried leaves or with N or P fertilizer (according to local recommendations) or both using four replicates per treatment. The incubation was conducted in controlled conditions during 78 days. Samples were collected after 15,

36, 50 and 78 days of incubation. The N, P and C in microbial biomass were determined by the fumigation-extraction method. Statistical analyses were done with ANOVA using a completely randomized design.

These preliminary data show that the microbial biomass was influenced by the type of soil (with large or little amounts of C), litter quality and fertilization. In general, the soil from the superficial soil layer had a higher level of C in the microbial biomass. This is expected because this soil had also higher level of soil organic matter. The effects of different litter applications and fertilization depended on soil C, as well. In the topsoil, the microbial biomass was not influenced by litter applications and fertilization. In the soil with little amounts of C, however, the litter application had a significant effect on C in microbial biomass. Soil microbial biomass was highest after application of *Pueraria phaseoloides* plus fertilization with N and P, which even reached values which were not significantly lower than those of the topsoil. The N and P analyses are presently carried out and will present during the workshop.

These preliminary results indicated the large potential of *Pueraria phaseoloides* to increase the microbial biomass and probably to accelerate nutrient fluxes through microbial biomass under very poor soil conditions.

Litter Quality Effects on Decomposition by Diplopodes of Central Amazonian Agroforestry Tree Species

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Few attempts have been made to investigate the role of single soil fauna species in controlled laboratory incubation to describe litter decomposition in tropical agroforestry systems. Since a few macrofaunal species can be largely responsible for weight loss, studying these might reveal some basic information about the macrofaunal influence on decomposition. Leaves of different tree-species were incubated in semi-microcosms above soil for 45 days. Leaf-litter enriched from seven species of interest for central

Amazonian agroforestry was incubated with three species of diplopods, *Pycnotropis sigma*, species A2 and A3 (not yet identified) and two control treatments (with and without litter) in a randomized complete block design with six replicates. The third diplopod species was used on three litter species only. Animals were replaced on death. 50 ml water was applied every four days. At the end of the experiment, litter and animal weights were determined, as well as total N in litter, animals and soil samples. Leaves

were additionally analyzed for water-soluble polyphenolics. Litter weight loss decreased in order *Bactris gasipaes* > *Bixa orellana* > *Pueraria phaseoloides* > *Paullinia cupana* var. *sorbilis* > *Bertholletia excelsa* > *Vismia cayennensis* > *Theobroma grandiflorum* without diplopods and with *Pycnotropis sigma*. Decomposition of *Bixa* was highest with abundance of A2 and A3. During incubation with A3

decomposition of *Paullinia* was less than *Bixa* and *Bertholletia* showed the lowest weight loss. All litter species decomposed more rapidly with than without diplopods. The weight loss was not correlated with initial polyphenol-to-N ratios of the leaves. Decomposition of *Bactris* leaves was mainly mitigated by microfauna and mechanical leaching.

Fate of Litter N as Affected by Diplopods Determined by ¹⁵N Enrichment in the Humid Tropics Seitz, D.¹ and Lehmann, J.^{1,2}

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Macrofauna can be largely responsible for weight loss of litter during decomposition, but the influence on nitrogen release of macrofaunal species in tropical agroforestry systems is not known. In this study ¹⁵N tracer was used to examine the nitrogen release from litter of seven plant species of interest to central Amazonian agroforestry in incubation with three species of diplopods. Prepared leaves enriched with ¹⁵N from *Bactris gasipaes*, *Bixa orellana*, *Pueraria phaseoloides*, *Paullinia cupana* var. *sorbilis*, *Bertholletia excelsa*, *Vismia cayennensis*, *Theobroma grandiflorum* were incubated in semi-microcosms above soil for 45 days in a randomized complete block design with six replicates. Treatments were: incubation with diplopod species *Pycnotropis sigma*, species A2 and A3 (not yet identified) and two control treatments (with and without litter). The third diplopod species was used on three litter

species only. 50 ml water was applied every four days and percolate was collected one day later. Samples were pooled to four samples for analyses of inorganic and organic N and one composite sample for ¹⁵N isotope analysis. At the end of the experiment after 6 weeks, litter and animal weights were determined, as well as total N and isotope ratios in litter, animals and soil samples. ¹⁵N accumulation in animals was roughly correlated with nitrogen uptake through litter consumption. Nitrogen leaching was highest in *Bactris* and *Pueraria* and did not correspond with ¹⁵N accumulation in animals. In incubation with *Bixa*, ¹⁵N contents in the soil corresponded with accumulation in the animals. Nitrogen release in *Bactris* was mainly mitigated by microfauna, while in *Bixa* most nitrogen was released by the animals during defecation.

Benthic Invertebrates Community in the Sinhá Mariana Lake, Pantanal of Mato Grosso, Brazil Butakka C.M.M.¹, Wantzen, K.M.² and Miyazaki, R.D.¹

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The present study was made at the lake "Baía" de Sinhá Mariana during the low water period (aug/98 to oct/98) and the high water period (jan/99 to mar/99). Sampling was made at three points of the litoral zone (I. Corixo Tarumã; II. Corixo do Mato; and IV. Rio Mutum) and at one point of the limnetic zone (III). Samples were taken monthly using a van Veen drag (0,0214 cm² area) in order to yield data of the benthic invertebrate community, granulometry, and organic matter content. Additionally, dissolved oxygen, pH, alkalinity, conductivity, depth and suspended matter content were measured. In order to test the correlation between the abiotic and biotic variables, the Spearman's Correlation Index was applied, for the ordination of the

sampling sites in correlation with the abiotic variables a Principal Component Analysis (PCA) was made, and a Detrended Correspondence Analysis was performed to ordinate the community data in correlation with the density data of the taxa. Benthic invertebrates had higher densities at the litoral sites than at the limnetic site. Three taxa dominated throughout all the stations and all the sampling period, being Nematoda, Oligochaeta and Ostracoda. However, there was an accentuated variation between the two seasons concerning the limnological and sedimentological variables. Some taxa occurred only during the low water period and other only during the high water period. Along with the raising of the water level, the electrical