Characterization of soil microbiological processes during different phases of the cultivation system (slash & burning) in the Bragantina zone of the State of Pará, Brazil
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In shifting cultivation systems secondary vegetation plays an important role as the fallow component in order to reestablish soil productivity. In many cases soil deteriorates and the fertility status decreases in the long run if the fallow period is shortened. This study aims at evaluating changes of soil microbiological properties during different phases of the cultivation system for a better understanding of metabolic processes governed by microorganisms and their importance in principal cycles of soil.

As a key factor microbial biomass is determined by fumigation-extraction method. Microbial activity is studied by measuring basal and glucose-induced respiration and the activity of soil-enzymes. In order to evaluate the role of micorrhiza fungi, a survey of its occurrence has been done. The study is done on farmers' land and in field-trials in Igarapé-Açu and Castanhal (110 and 80 km east of Belém respectively) and includes different ages of fallow vegetation and different cultivation systems.

First data show a strong effect of the age of the fallow vegetation and the investigated cultivation system on the activity of urease, acid phosphatase and cellulase (Fig. 1). The older the vegetation, the higher is the activity of these enzymes. In both the black pepper plantation and the cassava field the soils reveal lower activities of urease and acid phosphatase compared to soils from the secondary vegetation. The activity of dehydrogenase has not shown any trend.

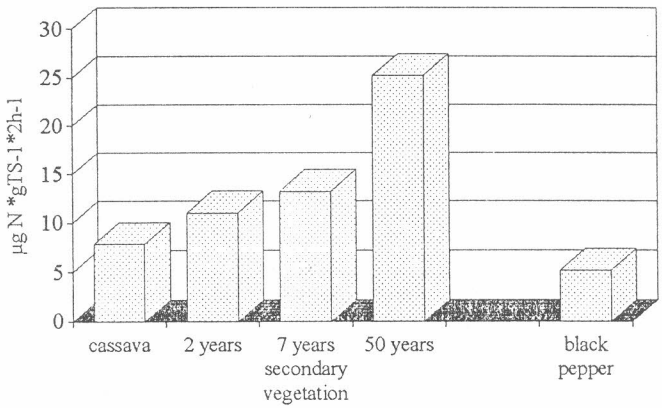

Fig. 1: Activity of urease in soil (0-10 cm) in different phases of the cultivation system and in a continuous cropping system.

Considering only the mechanism of the enzyme synthesis and how the metabolic activity of enzymes change (induction of enzymes by presence of usable substrates and the repression in the presence of the end product) may lead to the hypothesis that the lack of available NO_3^-, NH_4^+, $H_2PO_4^-$, HPO_4^{2-}-ions is the explanation for the higher activities of urease and acid phosphatase in the older secondary vegetation. The activity of cellulase under aerobic conditions seems to be effected more by fungi than by bacteria. This situation might be responsible for the higher enzyme activities in soils with older vegetation (pH-effect).

The first data set on the effect of slash & burn does not show clear tendencies. The lack of effect from burning might be explained by the fact that the soil samples, when taken only six days after the fire, and during this period there was no rain precipitation. In general the interpretation of soil enzyme activities at this point is almost speculative because other soil properties (e.g. the amount of microbial biomass and chemical soil characteristics), have not been considered.

As far as the evaluation of mycorrhizal fungi is concerned, the data show relatively high variation in spore populations among soil samples of the same treatment. Comparing the average, it does not show effects of burning on the spore population. This could be due to the fact that the temperature elevation only occurs on the surface of the soil. The spore population tends to decrease with the depth of the soil. A remarkable decrease in spore number was observed from soil samples collected in November 1992 to February 1993. The heavy rain season in state of Pará is from January to April. low light intensity and high water content of the soil could influence the sporulation of VAM. For a better understanding and interpretation of these results further information on chemical soil properties, species of fungi and root colonization must be collected.