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Nematofauna as indicator of soil N availability in mixed plantations? A case study from tropical forest of Eucalyptus and Acacia in Congo

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Nitrogen is a limiting factor for the growth of Eucalyptus plantations, particularly in subtropical areas characterized by very low soil fertility (e.g. degraded pastures). The association with N₂-fixing species such as *Acacia mangium* is an alternative for ecological intensification of these ecosystems. Enhancement of Eucalyptus trees growth may happen by direct transfer of N fixed by Acacia trees or indirectly through litter decomposition. Field assessments in Congo showed that the productivity of Eucalyptus trees in mixed plantations was significantly increased compared with Eucalyptus alone. Higher N contents in soil of mixed plantations explained such positive impact. In a microcosm experiment, we measured N mineralization in soil sampled from pure stands of Acacia, pure stands of Eucalyptus and from the mixed plantations. The results showed an accumulation of nitrate in the rhizosphere of Acacia. We found that the introduction of Acacia trees changed significantly the structure of the community of nematodes by increasing the proportion of bacterial-feeding nematodes. Similar results were obtained in mixed-plantations in Brazil and in France, suggesting that nematofauna could be a key indicator of N availability in soil. Microbial communities involved in nitrification were also studied by targeting AOA and AOB genes using the quantitative PCR method. An increase of the number of copies of AOA gene was observed in the rhizosphere of Acacia while AOB gene was difficult to detect. This suggests that Archae communities may play an important role in N cycling in soil of Eucalyptus plantations. Our results demonstrate that the introduction of Acacia in mixed plantations systems influences the N cycle in the soil and associated biological activities.

Keywords: nematofauna, mixed plantation, N cycle, tropical soil