2162 EFFECT OF DISTANCE AND DEPTH ON SOIL MICROBIAL BIOMASS, N MINERALIZATION AND GENETIC DIVERSITY OF RHIZOBIA UNDER *Acacia senegal* TREE

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The relations between plants and soil biota involve positive and negative feedbacks between soil organisms, their chemical environment, and plants. Then, the characterization of microbial community functioning and their diversity are important to understand these linkages. An experiment was conducted in a field system for two years (2005 and 2006) to investigate the effect of distance from tree stem on soil microbial biomass, N mineral content and the diversity of rhizobia associated to *Acacia senegal*. Soil samples were taken along transects (R_0, foot tree; $R_{/2}$, approximately 0.50 m distance from the stem; and R, approximately 1 m distance from the stem) and at different horizons: 0-25 cm, 25-50 cm and 50-75 cm of the rhizosphere of trees. Soils sampled during dry season and rainy season were incubated under laboratory conditions and *in situ*. For each sampling, nitrogen mineralization and total microbial biomass were analysed. *Acacia senegal* root nodulating bacteria diversity was assessed by PCR-RFLP of the intergenic spacer 16S-23S DNAr of strains trapped on roots of *A. senegal* seedlings from soils samples. Results showed a decrease of mineral nitrogen content and total microbial biomass according to the distance from tree trunk and the depth. The maximum of mineral nitrogen and total microbial biomass was found at the foot tree (R_0) and at 0-25 cm. Mineral nitrogen decreased during the wet season whereas total microbial biomass increased. The mineral nitrogen was in nitrate form (NO_3^-) during the dry season whereas at raining season it was in ammoniacal form (NH_4^+). Interestingly, results showed a great genetic diversity of rhizobia nodulating *A. senegal* with a high diversity at the foot of tree (R_0) and at 0-25 cm depth. Therefore, *A. senegal* trees seemed to have a positive influence on microbial density and diversity.

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2323 SOIL MICROBES AND SOIL MICROBIAL PROTEINS: INTERACTIONS WITH CLAY MINERALS

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Bacterial enumeration in soil environments estimates that the population may reach approximately 10^{10} g^{-1} of soil and comprise up to 90 % of the total soil microbial biomass. Bacteria are present in soils as single cells or multicell colonies and often strongly adsorb onto mineral surfaces such as sand and clay. The interactions of microbes and microbial biomolecules with these minerals have profound impacts on the physical, chemical and biological properties of soils. The objective of this work is to characterize the interaction of soil microbes and soil microbial proteins with montmorillonite and kaolinite clay minerals. Microbes were propagated from a light clay-loam soil collected from Carlow, Ireland and the microbial titre determined. Microbial proteins were isolated and the concentration evaluated using the Bradford assay. Quantified microbes and proteins were sorbed to montmorillonite and kaolinite and their equilibrium adsorption determined (initial concentration – equilibrium supernatant) as the number of cells and/or milligram of protein per gram of mineral. Clay mineral-complexes were characterized by X-ray diffraction (XRD), Scanning electron microscopy (SEM) and Fourier-transform infrared (FT-IR) spectroscopy. Montmorillonite and kaolinite adsorbed 3.71×10^{10} and 3.33×10^{10} cells/g, respectively. Equilibrium adsorption of proteins onto montmorillonite and kaolinite was determined at 920 mg/g and 728 mg/g, respectively. XRD showed that microbes and proteins intercalated the interlamellar region of montmorillonite resulting in montmorillonite-microbial and montmorillonite-protein complexes with 001 d-spacing of 16.1 and 15.3 Å, respectively compared with pure montmorillonite 001 d-spacing of 13.2 Å. SEM indicated that microbes and proteins also adsorb on montmorillonite surfaces. XRD spectra confirmed that microbes and proteins did not penetrate kaolinite, indicating that adsorption occurred primarily on external surfaces, as also suggested by SEM. FT-IR spectra were indicative of montmorillonite-microbial and –protein, and kaolinite-microbial and -protein complexes. Montmorillonite indicated a greater affinity for soil microbes and soil microbial proteins when compared with kaolinite. The implications of these interactions on the total contribution of proteins and other microbial constituents to soils are currently being considered using novel NMR approaches.

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