



Influence of Ectomycorrhiza on exudates of *Pinus sylvestris* (L.)

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1 Abstract

Influence of ectomycorrhiza on root exudates is very important for the mineralization processes in the soil. Because of normal growth and development, roots in the soil secrete large range of organic and inorganic substances. The objective of the research emphasizes on the Low Molecular Weight carboxylates accumulation in the soil and characterization of the possible LMW carboxylates in the soil solution. The nutrient sorption by the plants is by release of exudates in the form of LMW carboxylates, which in turn mobilize the required elements, and form organometallic complexes that are in a form suitable to be taken up by plants for metabolic purposes. Root exudates influence the rhizosphere soil making it conducive for the growth of the plants, in turn leading to the process of mineralization. Metabolic activities of microbial community are controlled by presence of exudates and the microbes may stimulate the quantities of nutrients entering the soil from the roots. Organometallic complexes formed by interaction between the cations present in rhizosphere and the root exudates can be studied by complex forming capacity of the LMW carboxylates produced by plants in relation to the reaction constants of the exudates complexes. For a better understanding of the characteristics of the root exudates, non-mycorrhized as well as mycorrhized plants are studied. To reduce the influences of the unknown processes occurring in the natural environment working under sterile conditions to much extent was desired. To achieve maximum concentration of the LMW carboxylates it was useful to increase the density of the roots per volume of the area for our pot experiments. Plastic mini suction tubes are used to collect the samples. The objective of this study is to analyze LMW carboxylates in a soil equilibrium solution and to calculate the major

cations bound as reduced organometallic complex. The types of exudates identified in our samples are Oxalate/Oxalic acid, L-malate/L-Malic acid, Citrate/Citric acid and Succinate/Succinic acid. To identifying possible organometallic complexes, free ion concentration of the above the LMW carboxylates is desired. Hence, for this purpose capillary electrophoresis/high performance liquid chromatography is employed for the analysis. The speciation of LMW carboxylates to form organometallic complexes of Ca, Mg, Mn, Al and K, are studied. To calculate the equilibrium complexes of the carboxylates chemical equilibrium model, Phreeqc- a geochemical modeling tool was used (Parkhurst, 1995). This information can be used to work out the ratios between the plant assimilated nutrient and the organometallic complexes so that the contribution of output to of total carbon by plant for reduction and assimilation of the cations for nutrition can be estimated depending on the plant nutrient content