P-832 P availability, fine root properties and functional mycorrhizal diversity across *Pinus pinaster* stands with different productivity in South-western France

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The *Pinus pinaster* forest in South-western France covers 0.9 million hectares, with mainly acidic, sandy, nutrient-poor spodosols. This forest produces the fifth of French wood and is characterized by a large variation in productivity. We aimed at linking these variations to the nutritional status of soils and a range of plant root parameters.

Twenty-seven sites were selected so as to cover a range of site productivity, phosphorus (P) and water availability levels. These include fertilizer trials and other monitoring sites both on humid and dry environments. Site productivity was estimated from a standard forest inventory operated in 2005. In April and November 2006 eight pairs of sample points were chosen in the tree lines and between the tree lines close to randomly distributed trees. Soil P status (Olsen P and total organic P), amount of fine roots, diversity and phosphatase activities of ectomycorrhizae (ECM) and their associated bacteria were determined in 15x8 cm soil cores.

Differences between sites were striking. Grouping samples according to sample position, fertilization regime, stand age or water availability showed that P forms were greater in April than November. Olsen P level was significantly larger only between the tree lines of annually fertilized plots, compared to all other plots. The measured root parameters, i.e. fine root length density (FRLD), specific root length (SRL), vitality of apices, mycorrhizal colonization degree and ECM phosphatase activities were significantly greater in November than April. Only SRL and vitality of apices increased as a response to P fertilization. On the contrary, P-solubilizing capacities of mycorrhizospheric bacteria were greater in control plots with no P fertilizer. ECM pNNPase activities were always measurable and tended to decrease as a response to fertilization. Multivariate statistical analyses of the data will be presented in order to draw the possible relationships between tree productivity, biotic and abiotic factors in the root environment.

P-828 The response specificity of oxalic acid exudation and acid phosphatase secretion with the internal plant P status in *Brachiaria* grasses

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The breeding of phosphorus (P) efficient genotypes adapted to low-input agricultural ecosystems has become a matter of priority. The elucidation of P efficiency mechanisms will contribute towards the design of appropriate selection criteria to permit the screening of genetic recombinants in the *Brachiaria* breeding program. Genotypic differences in P acquisition efficiency are related to adaptive changes in root morphology, biochemistry and physiology.

We investigated a possible link between the P nutritional status and physiological markers for P stress in *B. decumbens* (signalgrass) and *B. ruziziensis* (ruzigrass). Field studies indicated that signalgrass is better adapted than ruzigrass to acid soils. The contribution of both organic acid exudation and acid phosphatase secretion during the development of limiting plant P concentrations were examined. In addition, changes in biomass and root length production as well as root biomass allocation, acting as morphological markers for P deficiency, were studied.

The brachiariagrasses were grown hydroponically. In terms of phosphorus nutrition, the novel hydroxyapatite/dialysis pouch system which permits the pH-dependent release of phosphate from an apatite was implemented. Before each of three harvest times (3 weekly intervals), root exudates were collected.

Our results suggest that the temporal induction of oxalic acid exudation and acid phosphatase secretion are linked to decreases in internal plant P concentrations. Species differed with regard to the magnitude of the tissue P concentration required for the induction of these root-mediated rhizospheric mechanisms for P acquisition. Evidence will also be presented showing that the manifestation of these biochemical markers for phosphate stress preceded the appearance of P limited plant growth.

It is possible that oxalic acid exudation might provide a dual ecological solution to alleviate the effects of P deficiency and Al toxicity, two major co-existing soil constraints for *Brachiaria* pasture productivity. Acid phosphatases involved in the hydrolysis of organic P, is another important way for tropical plants to enhance P availability, particularly as a large proportion of soil P occurs in organic forms. Indeed, functional synergism between oxalic acid exudation and acid phosphatase secretion in brachiariagrasses for P acquisition cannot be excluded.