

Micro Biotec'13

PORTUGUESE CONGRESS OF
MICROBIOLOGY AND BIOTECHNOLOGY

6th - 8th December | Aveiro Portugal

Abstracts Book



Microbial Ecology

P171/F07

CROP ROTATION AND CROPPING PHASE IN RICE PADDIES AND THEIR RELATIONSHIP WITH VARIATIONS OF THE SOIL MICROBIAL COMMUNITIES

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The agricultural productivity and soil fertility are intrinsically associated with the soil microbial communities. The type of management and crops can influence the microbial communities in agriculture soils. Studies about microbial community structure and activity and the assessment of possible correlations with external factors may contribute to improve the knowledge on the role of microbiota in soils. Crop rotation consists on the sequential cultivation of at least two types of crop (e.g. legume-cereal) in the same area. In the present study, we analysed paddy soils subjected to a rotation of alfalfa (two years) and rice (two years). During the second half of the rotation cycle, *i.e.*, 1st and 2nd year of rice cropping, samples were collected before seeding, at the maximum tillering phase and after harvesting, and were characterized for physicochemical, biochemical and microbiological traits. Variations possibly due to the (i) phase of crop rotation and (ii) phase of annual rice cycle on the bacterial community structure and functional activity of these soils were assessed using multivariate analyses.

The results showed that the phase of crop rotation coincided with variations in the composition and structure of the soil bacterial community. In the 1st year of rice cultivation, the abundance of aerobic heterotrophs was positively correlated with lineages affiliated to *Rhizobiales*, *Rhodospirillales*, *Sphingomonadales*, *Flavobacteriales*, *Sphingobacteriales*, among others. In the 2nd year, the abundance of bacteria affiliated to *Bacteroidales*, *Anaerolineae* and *Chlorobi* was positively correlated with the soil carbon content. Variations on the microbial catabolic activity were in agreement with the variations in the community structure. Also the phase of the rice cropping cycle was related with variations in the microbial activity. Proteolytic activity and aerobic and anaerobic heterotrophs were predominant before rice seeding. After rice harvesting, the increase of cultivable diazotrophic microorganisms suggests a higher N₂ fixation. The results obtained suggest that polyphasic studies may shed some light on “cause-effect” relationships, which may be useful to improve agriculture practices.