



“Gheorghe Asachi” Technical University of Iasi, Romania



P19

CONNECTIONS BETWEEN RHIZOBACTERIAL COMMUNITIES OF REED SEDIMENTS AND LAND-USE IN ZHANGYE CITY AREA (GANSU PROVINCE, CHINA)

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Abstract

Zhangye is a Chinese city (Gansu province) of 1,200,000 inhabitants, located within a big oasis surrounded by Gobi desert and high arid mountains. As many other Chinese cities, Zhangye is characterized by a rapid urban growth, and strong industrial progress including mining, buildings, energy production, metallurgy, machinery assembly, transportation, tourism and agriculture. In recent years the water demand has been dramatically restricted due to the excessive water use in socio-economic systems. Moreover, the widespread environmental pollution has caused a significant decrease in water quality.

The city area is characterized by the widespread presence of *Phragmites australis* (Cav.) Trin (common reed), growing within the urban area, the industrial zone and the surrounding agricultural area. Furthermore an extended reed stand national park is located downstream Zhangye, in the northern territory. Reed stands are recognized to be resistant to the most normally-occurring disturbances, playing an important role for water saving and purification. *P. australis* root-associated bacteria, however, can broaden the positive effects of the phytoremediation, mineralizing organic molecules or sequestering heavy metals. Since bacterial communities are easily affected by even small changes of the microenvironment, we aimed to investigate the bacterial communities associated to *P. australis* rhizosphere in diverse territorial spots in Zhangye, correlating these data with its geographical, urban and social features.

Fifty-four samples of *P. australis* root-associated sediments were carefully chosen into flowing water of wastewaters treatment channels, as well as of industrial, urban and agricultural drainage channels. Microbiological analyses have been assessed by Denaturing Gel Gradient Electrophoresis (DGGE) and Automated Ribosomal Intergenic Spacer Analysis (ARISA). Chemical analyses of the concentration of heavy metals and nutrients have been done.

Highly polluted sediments were found among the industrial area, where abnormal concentrations of zinc, arsenic, cadmium and lead, in particular, have been monitored. Detrended Correspondence Analysis of the fingerprinting bacterial community patterns showed high similarity of the replicated samples within the same sample site. The rhizobacterial communities clustered accordingly with the local land use: samples from the highly polluted industrial area were well separated from the samples of the urban area characterized by an organic pollution. The samples from the agricultural suburbs, from the extensive reed park nearby the city and from the adjacent river clustered accordingly with the relative distance from the urban and industrial areas.
