

# MICRO BIOTEC'11

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## **Microbiotec11**

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root architecture. Three strains PNS-2, PNS-12 and PNS-13 were isolated from the rhizospheric region, characterized biochemically and further identified by 16S rRNA ribotyping. These isolates were screened for auxin production by Salkowski's method and further confirmed by thin layer and high performance liquid chromatography. The effect of these auxin producing strains on root architecture was evaluated for the model plant *Arabidopsis thaliana* by designing a sand system allowing visualization of root architecture up to the third level which was not possible *in situ*. Auxin producing rhizobacteria increased the primary root length significantly ( $P=0.05$ ) and changed the pattern of secondary roots by increasing their length and number as well. In the present study the sand system is a model system close to the natural environment to investigate root architecture of the plants without damaging delicate roots as compared to MS media or natural soil.

PS2: 70

### Influence of the sewage composition in the development of the microfauna in a bench-scale activated-sludge system.

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In an activated-sludge system, the efficiency of the wastewater treatment depends on the activity of the microorganisms inhabiting this artificial ecosystem. On the other hand, the microbial communities are largely determined by the physical-chemical and the operation conditions prevailing in the plant. The composition of the influent water is a non-negligible factor to take in account when operating a wastewater treatment plant (WWTP). Some industrial wastes promote the growth of particular bacteria, while easy degradable substrates and low organic contents are said to favour the filamentous microorganisms, altering the floc-forming to filamentous balance, thus endangering the performance of the system. However, only few data like these exist about the eukaryotic populations. The present work aimed at studying the development of the prokaryotic and eukaryotic populations and the plant performance of two bench-scale WWTP, comprising a bioreactor and a decanter, in a series of assays using different types of artificial sewage. These included glucose, peptone, a complex sewage of acetate, milk powder, urea and sucrose and finally a mixture of acetate and trace elements, the two latter with two different flow rates. Monitoring of the WWTP overall performance was performed through the determination of Chemical Oxygen Demand (COD), Total and Volatile Suspended Solids (TSS and VSS) and Biochemical Oxygen Demand (BOD<sub>5</sub>). The microbial communities, comprising Protozoa, metazoa and Filamentous Bacteria were monitored by microscopic analysis. Significant differences were observed in the performance of the WWTP concerning solids and organic matter removal efficiencies. Microscopic analysis also revealed the presence of different protozoa and metazoan populations in the aerated tanks. Among the most common protozoa were *Arcella sp.*, *Aspidisca sp.* and *Vorticella sp.* *Drepanomonas sp.* was identified only in the WWTP fed with glucose and *Spathidium sp.* when peptone was used. Concerning filamentous bacteria, *Beggiattona spp.* was the dominant taxon in the system fed with glucose, but when the systems were fed with peptone or with the complex mixture, *Sphaerotilus natans* dominated. Acetate plus trace elements favoured the co-dominance of *Sphaerotilus natans*, 021N Type and *Nostocoida limicola I*. The results add important information to the knowledge of how the composition of the sewage determines the microbiological communities in activated-sludge systems.

PS2: 71

### Microbial communities inhabiting a constructed wetland applied to tourism wastewater treatment

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Constructed wetlands (CWs) are man-made wastewater treatment systems that intent to mimic the conditions, mainly in terms of physicochemical and biological processes, of natural wetlands. They represent a low-technology treatment, enabling many times wastewater recycling and reuse. CWs structural components include, in general, a support media, macrophytes, water, microbes and fauna population. Two important groups of these microbial organisms are bacteria and fungi, including mycorrhiza; primarily because of their role in the assimilation, transformation, and recycling of chemical constituents present in various wastewaters. The aim of this study was to assess microbial community shifts over a full year operation on a CW treating wastewater coming from a Portuguese rural tourism unit (Paço de Calheiros, Ponte de Lima). This CW is vegetated by *Canna flaccida*, *Canna indica*, *Zantedeschia aethiopica*, *Watsonia borbonica* and *Agapanthus africanus* in an expanded clay substrate (Leca<sup>®</sup>M). Plant

roots were sampled from the inlet and outlet of the CW and microbial community profiles determined using PCR-DGGE. Species diversity were analysed and used to estimate microbial diversity and composition variation over a period of time. Tourism facilities are often characterized by great variations in wastewater quantity and quality over the year, affecting negatively the performance of conventional treatment systems. The use of CWs under this scenario still needs research and knowledge on microbial dynamics can be of great importance to the understanding of such systems.

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PS2: 72 ]

### Plant – microbe symbiosis for bioremediation of polyaromatic hydrocarbons in soil, an effective application of rhizosphere biology

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Total eight endophytic bacteria were isolated from the roots of *P. deltoides* growing in non contaminated sites at natural vegetation of Garhwal Himalayas, Uttarakhand, India. Out of these only SBER3 isolate was able to metabolize wide range polyaromatic hydrocarbons (PAH) and other hydrocarbon used in the study viz. anthracene, naphthalene, benzene, chrysene, benzene, toluene and xylene on minimal salt basal medium (MSB) as sole carbon and energy source. It was identified as *Bacillus* sp. on the basis of 16s rDNA sequence. Including this *Bacillus* sp. SBER3 also produced IAA and phosphate solubilization. Along with these traits SBER3 was also found with the ability to produce siderophore and ACC deaminase while, *Bacillus* sp. SBER3 also inhibited the fungal phytopathogen respectively. Microscopic examination under the influence of *Bacillus* sp. SBER3 revealed degeneration of mycelia fragment, abnormal swelling along with loss of structural integrity of the mycelia of fungus. However, mean growth rate and survival under varying osmotic stress regime were also evaluated under *vitro* condition. Interestingly, in solution condition *Bacillus* sp. SBER3 reduced appreciable amount i.e. 83.4 % and 75.1 % anthracene and naphthalene respectively after 6 days of incubation. Rhizoremediation potential of *Bacillus* sp. SBER3 was also demonstrated in hydrocarbon amended soil model system and it showed significant enhancement in shoot length, root length, root and shoot biomass including stem girth of *Populus* plant respective to control and concurrently decreased the concentration PAH in soil as estimated by HPLC analysis. Finally, a multipurpose bioinoculant was formulated by using *Bacillus* sp. SBER3 isolate in six different lignocellulosic solid carrier's material for proper bioculture dissemination in bioremediation along with growth enhancement and protection against deleterious pathogen of *P. deltoides* in PAH contaminated environment.