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RHIZOSPHERE MICROBIAL POPULATION IN SOME TREE MANGROVES OF BHITARKANIKA, ORISSA

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The rhizosphere soils of 10 different mangrove species were analysed for the ocurrence and population count of estuarine bacteria and fungi. Most of the soils were found to be enriched with gram positive bacteria and fungi like *Aspergillus* and *Stachybotrys*. Comparatively, estuarine bacteria was found more sensitive to salinity than the fungi where the later showed a wide range of distribution with respect to host mangrove tree species occurring at varied salinity gradients in the natural ecosystems.

Keywords : Bacteria, Fungi, Mangrove, Rhizosphere.

Introduction

Rhizosphere - effect i.e. the influence of plant roots on soil microorganisms largely determine the occurrence and distribution of microbial association with higher plant root systems. Very few reports are, however, available on rhizosphere fungi associated with the mangrove trees[1,2,3]. Mangroves, a salt tolerant plant communities of tropical and subtropical inter-tidal coastlines, play and important role in contributing organic matter to its associate biota as a result of degradation of leaf-litter by a variety of microorganisms[4].

Mangrove ecosystems of Bhitarkanika (20^0 4'-20^0 8N', 86^0 45' - 86^0 50' E), Orissa occupy a littoral habitat, characterised almost invariably by salt or brackish water and coastal silt exposed to daily tidal inundation with a continuously changing salinity and represented by tree species like *Avicennia, Aegiceras, Bruguiera, Ceriops, Excoecaria, Heritiera, Kandelia, Rhizophora* and *Sonneratia* species. However, there is no available data on the status of estuarine microorganisms associated with tree mangrove rhizosphere of Bhitarkanika mangrove ecosystems. Therefore, a preliminary study was made on rhizosphere soil of different mangrove tree seedlings growing in natural habitat of Bhitarkanika mangrove ecosystems to produce a base line data.

Materials and Methods

The rhizosphere soil samples were collected from 10 different mangrove tree species growing under varied salinity regiones in Bhitarkanika mangrove ecosystems of Orissa. High salt tolerant plants were represented by *Aegialitis rotundifolia, Avicennia alba, A. marina, Ceriops decandra, Kandelia candel* and *Phoenix palludosa*. The selected less salt tolerant host plants were *Aegiceras corniculatum, Bruguiera parviflora, Exococaria agallocha* and *Heritiera fome*. Serial dilution plate method was followed to isolate bacteria and fungi on nutrient agar (pH 7.2) and potato dextrose agar (pH 4.5) medium respectively. The total colonies were counted from the plates having 10^{-5} and 10^{-6} dilution for bacteria and , 10^{-4} and 10^{-5} dilution for the fungi. All microbial isolates were purified and identified according to the method of Aneja[5] and Malhotra and Aneja[6]. The gram staining technique was applied to distinguish bacterial isolates as positive and/or negative strains where as morphological and microscopical observations were made for the identification of fungal isolates. Simultaneously, pH of the rhizosphere soil sample was also recorded.

Results and Discussion

The pH of the mangrove rhizosphere soil was ranged from 7.08 to 7.84. A varied population of bacteria belonging to gram positive and / or gram negative was obtained. The population count was ranged from 1.0 x 10^9 per gram soil in *Aegialitis rotundifolia* to 163.0 x 10^9 in *Excoecaria agallocha*. It was revealed that most of the bacterial strains were gram positive and few of them were

Table 1. Microbial occurrence and population in rhizospere of some tree mangroves of Bhitarkanika, Orissa.

Mangrove Species	Soil pH	Bacterial population count per gm soil	Bacterial Types (no.)	Strain properites		Fungal population count per g soil	Types of fungi	Fungal group
				Gram +ve	Gram -ve			
Aegialitis rotundifolia	7.08	1.0×10^9	5	3	2	2.0×10^9	2	Pip, Asp
Aegiceras corniculatum	7.41	8.5×10^9	6	5	1	4.0×10^9	3	Sta, Muc, Cur
Avicennia alba	7.42	15.5×10^9	7	7	0	1.0×10^9	1	Pip
Avicennia marina	7.37	16.5×10^9	6	5	1	5.0×10^9	1	Sta
Bruguiera parviflora	7.31	30.5×10^9	5	5	0	1.0×10^9	2	Sta, Pes
Ceriops decandra	7.50	16.0×10^9	5	5	0	1.0×10^9	1	Asp
Excoecaria agallocha	7.81	163.0×10^9	2	2	0	4.0×10^9	1	Sta
Heritiera fomes	7.35	43.5×10^9	3	3	0	1.0×10^9	1	Asp
Kandelia candel	7.45	17.5×10^9	9	9	0	1.0×10^9	3	Sta Asp, Muc
Phoeonix palludosa	7.25	33.0×10^9	6	5	1	3.0×10^9	1	Asp

Asp = *Aspergillus*, Cur = *Curvularia*, Muc = *Mucor*, Pen = *Penicillium*, Pes = *Pestalotiopsis*, Pip = *Piptocephalis*, Sta = *Stachybotrys*

gram negative in nature (Table 1). Fungal population count of the rhizosphere soil ranged from $1.0x10^9$ to $5.0x10^9$ (Table 1). The highest fungal population was recorded in the rhizosphere soil of *Avicennia marina*. A total number of seven genera viz., *Aspergillus, Penicillium, Mucor, Curvularia, Pestalotiopsis, Piptocephalis*, and *Stachybotrys* was obtained in this study. *Aspergillus* and *Stachybotrys* were found as equally dominating fungi (with 50% occurrence) respectively. In the present study, bacteria was found more sensitive to salinity than the fungi. Highest bacterial population was visualised with the tree mangroves like *Excoecaria agallocha* grown in relatively high tide zones of low salinity. On the contrary, fungi showed wide range of salt tolerance. Lee[7] found that the salinity of seawater is one of the factors limiting the distribution of some fungi in the mangrove swamp of Hawaii island. He suggested that mangrove plant may play role in micro-fungal population as expressed both in density and in species composition and also postulated that the effect of root exude of host plant which could be selectively stimulatory for some fungi but selectively inhibitory for others. It is, therefore, suggested that further studies on biochemical analysis are prerequisite to understand the ecological status of microbial association with mangroves.

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