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Rhizosphere Mycoflora of Black Mangrove Seedling at Karachi Coast

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Abstract: The fungal species of rhizosphere of *Avicennia marina* was studied and results were evaluated in terms of occurrence, distribution and dominance. Species of *Aspergillus* and *Penecillium* were found to be more dominent constituents of the rhizosphere mycoflora. The rhizospheres examined revealed the preponderance population of Deuteromycotina and Ascomycotina whereas Mastgomycotina were poorly represented. The results of the study lead us to the conclusion that the mangrove swamp, specially the rhizosphere is a potential habitat for fungal inhabitation. The rhizosphere soils were found to favour the establishment of the fungal community, irrespective of varying salinity levels, perhaps due to their pronounced rhizosphere effects.

Key words: Rhizosphere mycoflora, black mangrove seedling

Introduction

Mangrove seedlings at sea view along the Karachi coast comprised of a distinct mangrove community dominated by *Avicennia marina* L. mangroves are one of the specialized ecosystem of tropical zone (Dwivedi *et al*., 1975) providing an interesting field for the study of fungi. The concept of rhizosphere was expressed as the zone of increased microbial activity. Qualitative as well as quantitative distribution between fungi of the rhizosphere and non-rhizosphere soil have been discussed in detail (Harley and Waid, 1955; Parkinson and Waid, 1960; Burges and Raw, 1967). Information available on the rhizosphere mycoflora of mangrove is scanty (Lee and Baker, 1973). The rhizosphere of mangrove plants due to high saline nature, high moisture contents and unique rhizosphere effects, provided an interesting ecological niche, for the study of the mycoflora and hence the present study.

Materials and Methods

Sampling sites: Regular monthly sampling of the rhizosphere soils were made from sampling station at sea view along the Karachi coast for a period of one year from January to December, 1997. The sampling station chosen for the present study was in a water way at a distance of 6 km from National Institute of Oceanography near Karachi coast.

Sampling and isolation: For the isolation of fungi from the rhizosphere soil, dilution plate technique (Johnson *et al*., 1959) was used. Soil adhering to the roots of these plants was consider as rhizosphere soil. Roots of *A. marina* were collected and placed in a sterile flask containing 100 ml sterilized distilled water and shaken for 5 minutes. The resulting rhizosphere suspensions were diluted in 10 fold increment from 10^2 and 10^3. One ml from each dilution was pipetted out into separate sterilized Petri dishes in which 20 ml of sterilized and luke warm Martin's Rose Bengal Agar (pH 7.0) was cooled. The Petri dishes incubated for a week at room temperature and fungal propagules per gm of rhizosphere soil and the average number of fungal species were assessed for each sample. The fungal isolates were then transferred, cultivated and identified to species level applying standard methods.

Results and Discussion

A qualitative and quantitative study of the mycoflora of rhizosphere of *A. marina* revealed a total 30 species assignable to 16 genera. Of the 30 species, 3 from Phycomycetes, 2 from Ascomycetes and the rest belong to Deuteromycetes. Of the total number of species isolated, ten belong to *Aspergillus* spp., formed from 60% of the total fungi. *Aspergillus flavus* was the most dominant species, contributing 34.5% of the total fungi and 56.6% of total *Aspergillus*. The second most frequently encountered genus was *Penicillium*, it includes 5 species and formed 19% of the total fungi (Table 1). Poor number of Phycomycetes in the mangrove habitat have been reported (Lee and Baker, 1973). Mehdi and Saifullah (1992), reported the occurrence of *Mucor*, *Pythium, Rhizopus* and *Syncephalastrum* from water samples of mangrove swamp at Korangi and Clifton. Overall observation of the results obtained in the present study revealed that the rhizopshere of *A. marina* was found to favour the development of soil microorganisms at all salinty levels (0.91-28.79%). This is evident from the large number of population recorded from the samples throughout the year. The ability of rhizosphere soil to stimulate fungal activity, irrespective of varying salinity levels, could be attributed to their pronounced rhizosphere effect. The importance of root excretions sloughed off root hairs and epidermal cells forming a source of food and energy for the microorganisms (Parkinson and Waid, 1960;

Table 1: Count/gm and No. of occurrence of each fungal species isolated from the rhizosphere soil of *A. marina* (January-December, 1996)

Species isolated	Jan	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total	No. of occurrence
Phycomycetes														
Mucor hiemalis	0	0	0	0	20	0	0	0	0	0	0	0	20	1
Syncephalastrum sp.	0	0	0	0	40	35	0	100	0	0	0	0	175	3
Pythium aphanidermatum	0	0	0	0	0	10	35	30	0	90	0	0	165	4
Ascomycetes														
Eurotium nudulans	0	0	0	0	0	60	75	80	70	70	0	0	355	5
Chaetomium globosum	0	0	0	0	0	60	75	80	70	70	0	0	355	5
Deuteromycetes														
Acremonium sp.	0	0	0	0	0	0	40	0	0	0	0	0	40	1
Alternaria maritima	0	0	0	30	40	28	45	0	0	0	0	0	143	4
Aspervillus candidus	0	0	0	0	0	0	0	0	0	0	0	90	90	1
A. flavus	0	0	105	0	0	138	570	800	912	806	600	0	3931	7
A. fumigatus	0	0	0	45	0	100	200	500	450	300	0	0	1595	6
A. nudulans	25	30	0	40	0	0	0	0	0	0	0	0	95	3
A. niger	108	0	0	0	0	0	30	35	80	0	90	0	343	5
A. ochraceus	60	0	0	0	0	0	50	60	48	0	0	0	218	4
A. oryzae	0	0	0	0	0	0	30	20	0	0	0	30	80	3
A. repens	0	0	0	0	0	30	0	40	0	0	30	0	100	3
A. restrictus	0	0	0	0	40	60	0	35	0	10	0	0	145	4
A. terreus	90	100	0	0	80	0	0	25	30	0	0	10	355	6
Aureobasidium pullulans	0	0	0	0	0	0	0	0	10	10	0	0	20	2
Botrytis cinerea	0	0	30	0	0	0	0	20	0	0	0	0	50	2
Cladosporium cladosporoides	0	0	0	0	0	0	0	10	20	0	0	0	30	2
Curvularia sp.	0	0	0	0	0	0	0	48	50	0	0	0	98	2
Fusarium oxysporum	0	0	0	0	10	0	0	10	100	80	60	0	260	5
F. isolani	0	0	0	0	0	0	0	5	78	90	0	0	173	3
Penicillium crysogenum	0	0	30	20	30	0	40	0	0	0	0	0	120	4
P. nigricans	0	0	0	0	0	0	300	200	500	212	80	100	1392	6
P. expensum	0	100	0	0	0	0	0	100	60	0	0	0	260	5
Penicillium sp.	0	0	0	35	40	0	0	60	100	0	0	0	235	4
Penicillium rubrum	0	0	200	112	85	0	0	0	0	0	0	0	397	3
Phoma sp.	0	0	0	0	0	0	20	30	30	80	0	60	220	5
Trichoderma viride	48	10	0	0	0	0	40	30	60	0	0	0	188	5
Total species	5	4	4	6	9	8	14	22	17	11	5	5	11393	
Count/gm	331	240	365	327	385	461	1475	2238	2643	1778	860	290		

Baker and Snyder, 1965) might be emphasized in this contest. The microbial stimulation in the rhizosphere soil, might also said to result from a slightly high oxygen concentration in the roots of mangrove submerged in aerobic mud, demonstrated that root maintain an oxygen concentration 15-18% through lenticel ventilation. This could contribute to an increased oxygen concentration by rhizosphere in turn stimulatory to microorganisms (Lee and Baker, 1973).

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