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## Intertidal Mycoflora of Indus Delta Mangroves

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**Abstract**

The fungal communities of *Avicennia marina* and *Rhizophora mucronata* were studied and results were evaluated in terms of occurrence distribution and dominance of fungal species. Species of *Alternaria marina*, *Aspergillus spp.*, *Chaetomium spp.*, *Cladosporium spp.*, *Fusarium spp.* and *Penicillium spp.*, were found to be the most constituent mycoflora of intertidal mud and water. The mangrove examined revealed a preponderance population of Deuteromycotina whereas Ascomycotina and Mastigomycotina were poorly represented. The results of the study lead us to the conclusion that mangrove swamp is a potential habitat for fungal inhabitation.

**Introduction**

The coast line of Pakistan is 550 miles long; 400 miles belonging to Baluchistan on the western side and 150 miles to the province Sind on the southern side. The entire coastline of Sind is studded with dense forests of mangrove. A number of rivers flow in Sind which fall on its coast line. The major one among them is Indus, which takes its origin in Himalayas. Its major spill way lies at Keti Bunder. Presently the mangroves grow on small islands of varying sizes all along the coast of Sind.

The role of mangrove as nursery areas for the larvae and Juveniles of many species of prawn, crabs, molluscs and fishes is well known. Thus mangroves serve as sanctuary and nutritional bank for the coastal ecosystem.

There is a trend to study mangrove as an ecosystem and as such all related living and non - living components are being considered. Fungi make a vary important part of the ecosystem along with other microbes of the biomass (Hyde, 1990 ; Hyde, 1992 ; Harrison *et al.*, 1994 ; Jones *et al.*, 1988), but unfortunately they have revealed very little information. Recently (Hyde, 1988 ; Hyde & Jones 1988; Köhlmeyer, 1985 ; Jones and Tan, 1987) described fungi growing on mangroves from different parts of the world. Fatima and Saifullah ( 1992) reported mangrove fungi of Karachi, but information of mycoflora of Indus delta mangrove remain so far non existent. The present study was therefore taken to fill in this important lacuna existing in the mangrove ecosystem study of the area.

**Materials and Methods**

**Location of sampling sites:** Regular monthly samples of *Avicennia marina* and *Rhizophora mucronata* were collected from Korangi creek and Sandspit for a period of one year (January to December, 1996). The sampling station chosen for the present study was in a water way at a distance of 30 Km from Karachi.

**Isolation of fungi:** The rhizoplane fungi were isolated by serial washing of the roots following Harley and Waids (1955) method. It was aimed to record fungi growing in a vegetative form which were expected when roots pieces

were plated. Pneumatophores of *Avicennia marina* and roots of *Rhizophora mucronata* were cut into one cm segments and ten such segments of each plant were shaken in a conical flask containing 100 ml of sterile distilled water for 5 minutes. The roots were transferred to another flask containing 100 ml distilled water and shaken for 5 minutes. This process was repeated until ten successive washes were completed. After these serial washings, the roots samples were blotted with sterile blotting papers and plated on Czepak's Dox Agar and Potato Daxtrose Agar supplemented with streptomycin and penicillin @ 20 units/ml to suppress bacterial growth. After 7 days of incubation at room temperature, fungi growing from the roots segments were recorded and identified to species level applying standard mycological methods.

**Results and Discussion**

**Rhizoplane mycoflora of *Avicennia marina* :** Twenty five species belonging to 15 genera were collected from the root surface of *Avicennia marina*. Of these two species belong to Mastigomycotina, three to Zygomycotina, one to Ascomycotina and the rest were the members of Deuteromycotina. *Chaetomium globosum*, *Aspergillus flavus* and *Penicillium brefeldianum* showed highest average percentage of occurrence, being 26.6, 30.7 and 32.1 respectively. *Chaetomium globosum*, *Penicillium brefeldianum* and *Aspergillus flavus* were isolated from 5, and 7 samples respectively. The lowest percentage of occurrence was exhibited by *Pythium spp.*, *Syncephalastrum recemosum*, *Geotrichum candidum*, and *Gleocladium sp.* being 5 percent. Maximum number of species recorded in August and September being 19 and 18 percent respectively while minimum recorded in December (Table 1).

**Rhizoplane mycoflora of *Rhizophora mucronata*:** Twenty one species, assignable to 12 genera were recorded. Out of these one belonged to Mastigomycotina, 3 and 2 to Zygomycotina and Ascomycotina respectively while rest were the members of Deuteromycotina (Table 2). *Fusarium culmorum* and *F. oxysporum* showed the highest percentage of occurrence, being 27.5 and 25.0 respectively.

Mehdi and Siddiqui: *Avicennia marina*, *Rhizophora mucronata*, Rhizoplane fungi, Indus Delta

Table 1: Monthly records of fungal species isolated from Rhizoplane of *A. marina* (Dec. - Jan. 1996) expressed as percentage frequency.

Species	Dec.	Jan.	Feb	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Average occurrence
<b>Mastigomycotina</b>													
<i>Pythium aphanidermatum</i>	0	0	0	0	0	0	0	0	5	0	0	0	5
<i>P. proliferum</i>	0	0	0	10	10	5	0	0	5	10	0	0	7.5
<b>Zygomycotina</b>													
<i>Mucor hiemalis</i>	0	5	5	10	10	20	25	0	0	10	0	0	11.2
<i>Rhizopus nigricans</i>	0	0	10	10	0	0	10	10	20	10	0	0	12.1
<i>S. racemosum</i>	5	0	0	0	0	0	0	0	0	0	0	0	11.6
<b>Ascomycotina</b>													
<i>Chaetomium spp.</i>	0	0	0	0	0	0	0	0	0	10	5	0	7.5
<i>C. globosum</i>	0	0	0	0	0	0	0	20	40	20	0	0	26.6
<b>Deuteromycotina</b>													
<i>Alternaria marina</i>	0	0	10	10	10	0	0	20	50	40	0	0	23.3
<i>Aspergillus flavus</i>	0	0	20	0	0	30	40	50	60	10	0	5	30.7
<i>A. fumigatus</i>	0	20	5	5	0	0	0	0	10	20	5	10	10.7
<i>A. nidulans</i>	0	0	5	5	10	10	0	0	5	10	6	5	7.0
<i>A. sulphurus</i>	0	10	0	0	0	0	20	30	20	0	5	6	15.1
<i>A. terreus</i>	0	10	0	0	0	0	0	0	10	10	15	0	11.2
<i>Cladosporium herbarum</i>	0	0	0	0	20	20	10	30	20	0	0	0	20.0
<i>C. oxysporum</i>	0	0	0	0	20	10	15	30	20	0	0	0	19.0
<i>Curvularia tuberculata</i>	0	10	10	0	0	0	0	0	0	0	0	0	10.0
<i>Fusarium culmorum</i>	0	0	5	5	10	10	0	0	0	0	0	0	7.5
<i>F. solani</i>	0	0	0	0	10	10	2	10	10	0	0	0	8.6
<i>Geotricum candidum</i>	0	0	0	0	0	0	0	0	5	5	0	0	5.0
<i>Gliocladium sp.</i>	5	6	4	0	0	0	0	0	0	0	0	0	5.0
<i>Penicillium sp.</i>	10	10	0	0	0	0	0	0	0	0	0	0	5.0
<i>P. brefeldianum</i>	0	0	0	0	0	0	0	0	10	10	10	0	10.0
<i>Trichoderma lignorum</i>	0	0	0	0	0	40	30	30	50	10	0	0	32.0
<i>T. viride</i>	0	0	0	0	0	15	15	10	10	20	20	0	15.0
<i>Pestalotia sp.</i>	0	0	0	0	0	15	20	30	40	0	0	0	26.2
Total species = 25	3	7	9	7	8	11	10	12	19	15	7	5	8.3

Table 2: Monthly records of fungal species isolated from rhizoplane of *R. Mucronata* (Dec. - Jan. 1996) expressed as percentage frequency.

Species	Dec.	Jan.	Feb	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Average occurrence
<b>Mastigomycotina</b>													
<i>Pythium aphanidermatum</i>	0	0	0	10	10	5	0	0	5	10	0	0	7.5
<b>Zygomycotina</b>													
<i>Phycomyces nitens</i>	10	0	0	0	0	0	0	0	10	20	0	5	11.2
<i>Rhizopus nigricans</i>	5	0	0	0	0	0	0	0	5	10	15	0	10.0
<i>Syncephalastrum resemosum</i>	0	0	0	0	0	0	5	0	20	30	5	0	15.0
<b>Ascomycotina</b>													
<i>Chaetomium olivaceum</i>	0	0	0	0	0	0	0	0	5	5	0	0	5.0
<i>C. globosum</i>	0	0	0	0	0	0	0	0	10	30	0	0	20.0
<b>Deuteromycotina</b>													
<i>Aspergillus flavus</i>	20	5	0	0	0	5	10	10	15	10	0	10	10.6
<i>A. fumigatus</i>	10	0	10	20	10	5	0	0	0	0	0	0	11.0
<i>A. niger</i>	5	10	20	30	30	25	10	20	50	60	5	5	22.5
<i>A. terreus</i>	5	15	10	5	5	10	5	30	40	50	30	5	17.0
<i>Cladosporium spp.</i>	0	10	10	10	20	30	10	10	15	10	10	0	10.6
<i>Fusarium culmorum</i>	0	0	0	0	0	0	0	0	20	30	40	20	27.5
<i>F. oxysporum</i>	0	0	0	0	0	0	0	10	20	40	50	5	25.0
<i>F. solani</i>	5	5	10	10	5	5	10	20	40	60	50	5	18.7
<i>Penicillium expansum</i>	0	0	0	0	0	0	0	5	20	20	30	0	18.7
<i>P. crysogenum</i>	0	0	0	0	0	0	0	0	10	5	5	0	6.6
<i>P. digitatum</i>	0	0	0	0	0	0	0	0	0	5	0	0	5.0
<i>Pestalotia sp.</i>	0	0	0	0	0	0	0	0	0	5	0	0	5.0
<i>Rhizoctonia sp.</i>	0	0	0	0	0	0	0	0	5	0	0	0	5.0
<i>Trichoderma sp.</i>	0	0	0	0	0	10	5	5	10	10	10	0	8.3
<i>T. viride</i>	0	0	0	0	0	0	0	0	10	5	0	5	6.0
Total species = 21	7	5	5	5	5	7	7	9	18	19	11	8	7.5

isolated from 4 and 5 samples respectively. *Aspergillus niger* and *A. trreus* recorded through out the sampling period. Species isolated ranged between 5 to 19. Maximum number of species were recorded in September and the minimum from January to April.

A comparison between the rhizoplane fungi of *Avicennia marina* and *Rhizophora mucronata* showed that they harbored diverse flora, with the exception of a few colonising on both. *Pythium aphanidermatum*, *Rhizopus nigricans*, *Syncephalastrum racemosum*, *Chaetomium globosum*, *Aspergillus flavus*, *A. fumigatus*, *A. trreus*, *Fusarium culmorum*, *F. solani*, *Trichoderma viride*, *Pestalotia* sp. were found colonising on both rhizoplanes. Lee and Baker (1973) reported that *Aspergillus* was totally absent in the rhizoplane of *Rhizophora mangle* and this statement was quite contrary with the present findings. They also noted an absence of Phycomycetous fungi form the rhizoplane of *Rhizophora mangle* growing in the swamp of Hawaii. But during the present study, few Phycomycetes were recorded, which have also recorded by many authors ( Venkatesan and Natarajan, 1985; Fatima and Saifullah, 1992). Most of the fungi, isolated from the root surface of *A. marina* and *R. mucronata* have been regarded as typical root surface fungi.

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