MANGROVE FUNGI OF KARACHI, PAKISTAN

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SUMMARY : Fourteen different taxa of fungi were isolated from different parts of black mangrove Avicennia marina growing in Korangi Creek and Clifton areas of Karachi. They were identified as Alternaria maritima, Aspergillus flavus, Aspergillus niger, A. sulfurus, Aureobasidium pullulans, Bispora sp., Botrytis sp., Cladosporium sp., Humicola sp., Mucor sp., Penicillium sp., Phoma sp., Pythium sp. and Rhizopus sp. The most diverse group of them all was Deuteromycotina and the most frequent and easily grown Zygomycotina.

Key words : Fungi, aspergillus niger, aspergillus flavus.

INTRODUCTION

Mangroves were once neglected plants, but now they are gaining great importance because of the recent realization of their economic impact on the fishery resources of the area. Infact, the entire shrimp fishery of Pakistan, with more than a billion rupees in hard currency, depend upon the food and refuge provided by these plants. The mangroves of Pakistan have long been over looked but now their studies have just started (15-17) and emphasis is being placed more on ecology. There is now a tendency to study mangroves as an ecosystem and as such all related living and non-living components are being considered. Fungi also make a very important part of the ecosystem along with other microbes in turnover of the biomass (6), but unfortunately, they have received very little attention. Recently Hyde and Jones (2, 3), Jones and Hyde (6), Jones and Kuthbutheen (7), Kohlmeyer (9) and Venkatesan and Natarajan (19, 20) described fungi growing on mangroves from different parts of the world but information of Manglicolous fungi of Pakistan remains so far non existent. The present study was therefore carried out to fill in this important lacuna existing in the mangroves ecosystem studies of the area.

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MATERIAL AND METHODS

Water samples, fresh leave, bark and seeds of the mangrove Avicennia marina were collected from a number of sites in Korangi Creek and Clifton area of Karachi, Pakistan (Figure 1) during the period July to September 199. Water samples were collected in sterile 150 ml screw cap flasks in replicates and the mangrove parts were placed in sterile polythene bags and either plated out immediately upon return to the laboratory or stored overnight in a cool incubation chamber at 4°C and the remainder at 18°C.

Isolation of black mangrove mycoflora

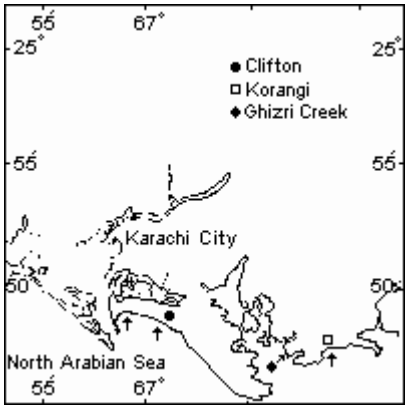
Bark and Seeds: Mangrove's bark and seeds were washed thoroughly in sterile sea water and cut into small pieces (2-3 mm^2). These were then washed in sterile sea water containing penicillin and streptomycin at the rate of 2000 units to 1000 ml to suppress bacterial growth and placed on sea water agar, or Vitamin B_1 agar to which 1.5 g/l penicillin G and 1.5 g/l streptomycin sulphate had already been added. The surface of the plates were flooded with sterile sea water and the plates were incubated at 20°C. After 24 hours the plates were examined microscopically and any developing colonies were aseptically removed and inoculated on to fresh agar plates. After several successive plating pure cultures were obtained.

Phylloplane mycoflora of leaf

Plating of Leaf Discs: The initial leaf fungal population was determined by punching out five discs of leaf tissue from the

leaves. The discs were cut out with a sterized cork borer of 5 mm diameter, washed in five changes of 15 ml sterile sea water and then placed aseptically on the surface on WA plates at the rate of one disc per dish. The total number of disc taken was 15. The cultures were incubated at 20°C in the dark and examined microscopically at two to three days intervals, over a period of four to five weeks. Any fungi appearing were sub-cultured on to plates of PDA, CDA and CMA to encourage growth and sporulation and thus allowing identification to be made.

Figure 1: Map of the area of study.



RESULTS AND DISCUSSION

In all seventeen different species of micro-fungi were isolated from the water and mangroves of the two seaside localities (Figure 1, Tables 1 and 2). They were all secondary marine fungi (10), that is basically terrestrial forms. The species composition was similar to that found in other estuarine waters (1,13). Like the Indian Manglicolous fungi, Deuteromycotina was also the most diverse group in the area (19, 20). However, it was a different case in Hawaii where Kohlmeyer and Kohlmeyer (11) found Ascomycotina the most dominant group. Zygomycotina was also the most easily grown group in culture. In general the species composition of the area was limited in number as compared to other areas (3, 7,11), and this discrepancy may be due to the limited range of methodology used and the sampling in the present area.

Some differences in terms of species composition were noted between the two localities studies. Thus, all the 14 species mentioned in Table 2 were present in Clifton are whereas only eight in Korangi area. The species that were exclusive to the former area were *Alternaria marina, Aureobasidium pullulans, Cladosporium sp., Humicola sp., Phoma sp.* and *Pythium sp.* Difference in species composition was also noted in different parts of mangroves. Thus maximum number of species were recorded on leaves whereas almost equal proportions from bark and seeds during the entire period of study in both places (Figures 2, 3, and 4). The difference parts with reference to locality. Thus, the leaves in Clifton areas allowed almost twice as many species to grow on them as in Korangi Creek area. Richness in species diversity in Clifton area may be due to the fact it is situated at the point of discharge of city's sewage and therefore is rich in organic matter.

Table 1: Micro-fungi isolated from water samples of Korangi Creek and Clifton (+ Indicates that a species was isolated at least once during the sampling period).

Fungal Species	Korangi Creek	Clifton
Alternaria maritima (Suth)	-	+
Aspergillus flavus Link	+	+
A. niger Vantieghem	+	-
A. sulphurus (Press.)		
Thom and Church	+	-
Aureobasidium pullulans	-	+
(Debary) Arnaud		
Bispora sp.	+	-
Botrytis sp.	+	+
Cladosporium sp.	-	+
Fusarium solani (Martius)	-	+
Appel and Wollen Weber		
Humicola sp.	-	+
Mucor sp.	+	-
Penicillium sp.	+	-
P. expansum Link Thom.	+	+
P. brefeldianum Dodge	+	+
Phoma sp.	-	+
Pythium sp.	-	+
Rhizopus sp.	+	+
Total number of species isolated	10	12

Table 2: Percentage frequency of fungal species isolated from leaf, bark and seed of black mangrove, collected from Korangi Creek and Clifton.

Fungal Species	JULY						AUGUST						SEPTEMBER					
	K			C			K			C			K			C		
	L	B	S	L	B	S	L	B	S	L	B	S	L	B	S	L	B	S
Alternaria maritima (Suth)	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aspergillus flavus Link	-	20	25	10	40	-	10	-	40	25	-	-	-	20	-	20	-	10
A. niger Vantieghem	20	-	-	-	-	-	25	10	20	20	20	-	30	20	10	10	-	-
A. sulphurus (Press.)	40	-	-	-	-	-	40	10	10	10	-	-	10	15	-	40	40	-
Thom and Church																		
Aureobasidium pullulans	-	-	-	40	-	-	-	-	-	50	-	-	-	-	-	60	30	-
(Debary) Arnaud	-																	
Bispora sp.	-	20	-	40	-	-	10	8	-	25	20	-	30	20	20	40	-	-
Botrytis sp.	50	40	-	50	-	-	10	15	-	-	-	10	10	-	40	35	-	-
Cladosporium sp.	-	-	-	35	-	-	-	-	-	10	10	-	-	-	-	60	-	-
Humicola sp.	-	-	-	20	-	-	-	-	-	-	-	20	-	-	-	-	-	20
Mucor sp.	20	-	-	30	-	20	40	-	30	22	-	-	10	-	-	20	10	15
Penicillium sp.	25	30	30	-	60	-	45	25	-	20	-	20	20	20	10	10	-	15
Phoma sp.	-	-	-	15	40	10	-	-	-	10	15	-	-	-	-	-	10	-
Pythium sp.	-	-	-	10	-	-	-	-	-	10	-	30	-	-	-	-	-	-
Rhizopus sp.	50	40	-	35	-	10	10	10	-	-	-	-	-	10	10	-	-	-
Total number of species isolated	6	5	2	11	3	3	8	6	4	10	4	4	6	6	5	9	4	4

K:Korangi Creek; C:Clifton; L:Leaf; B:Bark; S:Seed

Figure 2

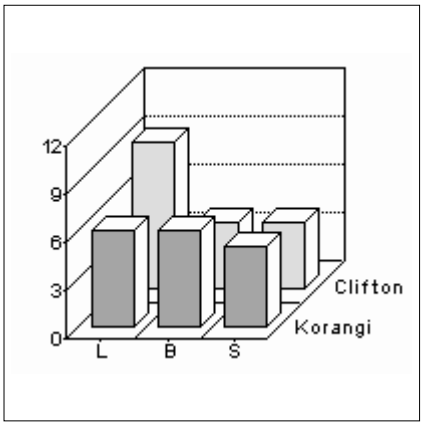


Figure 3

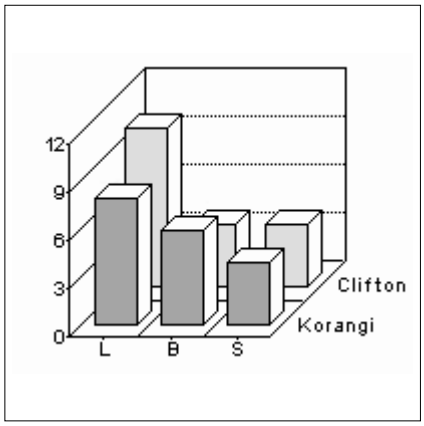
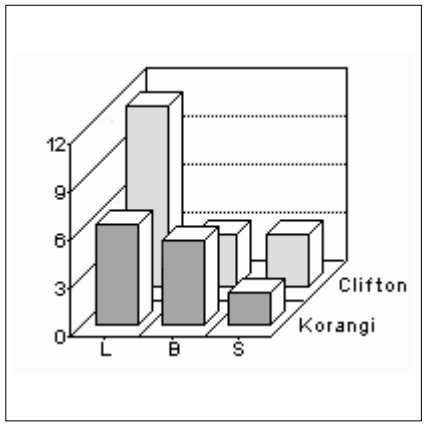


Figure 4



Figures 2, 3, 4: Relative composition of different species of mangrove fungi form Karachi during July (Figure 2), August (Figure 3) and September (Figure 4).

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