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# Diversity of fungi in mangrove ecosystem

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**ABSTRACT**: The present study was taken with an objective to asses the occurrence of fungi on leaves, bark and pneumatophores from the selected mangroves, fungi from soil and water was also recorded and physicochemical parameters of soil and water were noted. Maximum number of fungi was isolated from soil. Pneumatophores of *Avicennia marina* showed more fungal count than leaf and bark of other mangroves.*Aspergillus spp* were found to be dominant among the various fungal species isolated from the mangrove ecosystem.

**Key words:** Mangrove fungi, Soil, Water, Pneumatophore, Leaf, Bark

## Introduction

Mangroves are trees and shrubs from different botanical families which grow in the tidal zone of tropical and subtropical seas (Clough, 1982, Zuberer, 1976).Mangroves represent one of the most productive ecosystems in tropical environments and are characterized by efficient turn over of nutrients (Kothari, 2002).Presence of wide variety of organisms in mangroves is associated with the degradation of plant litter and this brings about the cycling of carbon and nitrogen in the system. Free living bacteria, fungi and yeasts have been reported to play a significant role in the formation of detritus (Von-Prahl, 1980).Fungi are vitally important to nutrient cycling in these habitats as they greatly facilitate the decomposition of mangrove material (Dittmar *et al.* 2006).Fungi also make a very important part of the ecosystem along with other microbes in turn over of the biomass (Jones, 1988)

## Materials and Methods

Samples were collected from mangrove rich area of Thazhekavu in Madakkara, Kannur, Kerala located at (Lattitude11$^0$05'39.2"N and Longitude75$^0$17'50.9"). Leaves, bark and pneumatophores (aerial breathing roots) of *Avicennia marina* , leaves and bark of *Excoecaria agallocha* and *Bruguiera cylindrica* were collected from the selected sites under aseptic condition. The samples were washed in sterile distill water and 1 cm pieces were dispersed in 100ml sterile aged sea water containing penicillin and streptomycin to suppress bacterial growth. By employing serial dilution and plating techniques the samples were plated on Potato Dextrose agar prepared in half strength sterile aged sea water with the addition of mixture of antibiotics. Soil samples were collected randomly under aseptic condition .Besides this water samples were also collected to isolate and enumerate the fungi. The plates were incubated at 28$\pm$ 2$^0$C for 6-7 days. Fungi developed after incubation was subcultured on to fresh plates of PDA plates. After several successive plating pure cultures were obtained. Fungal isolates isolated from the samples were identified by morphological, cultural and microscopic examinations. The water and sediment samples were collected separately to analyze the physicochemical parameters. The parameters such as pH, salinity, total dissolved solids (TDS) of water samples and pH, electrical conductivity (EC), Organic carbon (OC), N, P and K of sediment samples were also recorded.

## Results and Discussion

From all the 12 micro fungi isolated from the water, soil and different parts of the selected mangrove plants difference in species composition was noted. Maximum number of species were isolated from soil samples.11 different species were isolated from the soil. 8 fungal species were isolated from water sample. A total of 4 isolates were isolated from *Avicenna* leaf. These were identified into 4species and 4 genera. Bark samples yielded 4isolates which belonged to species and 3 genera.*Aspergillus spp* were found to be the dominant fungi. From the pneumatophore fungal species belonging to 4genera and 8species were recorded.*Avicennia* pneumatophore showed highest number of fungi when compared to other mangrove plant parts.

In case of *Excoecaria* leaf and bark total 5 and 1 fungi were isolated respectively .Bruguiera leaf showed the presence of 4 fungi in its leaf and 5 in bark. The microbial population colonizing leaf, bark and pneumatophore indicated the diversity of fungi in mangrove ecosystem.*Aspergillus spp* was found to e dominant followed by *Penicillium spp* and *Trichoderma spp.*

Physicochemical parameters of water and soil was also analyzed and recorded as in Table1 and 2. Mangrove fungi are known for their niche and substrate specificity. Based on the kind of mangrove substrata which includes bark, leaf, pneumatophore fungal preferences and succession may vary (Hyde *et al.*, 1995).

**Physicochemical analysis of water and soil**

Table 1

| Water sample | |
|---|---|
| pH | 7.1 |
| Salinity | 8.5 |
| Total dissolved salt | 10.5 |

Table 2

| Soil sample | |
|---|---|
| pH | 6.5 |
| EC | 0.401 |
| Organic carbon(Kg/ha) | 1.53 |
| Total Nitrogen(Kg/ha) | 0.153 |
| Phosphorous(Kg/ha) | 23.16 |
| Potassium(Kg/ha) | 147.4 |

Table 3: Fungal species isolated from leaf, bark & pneumatophore of selected Mangroves

| Fungi | Soil | Water | *Avicennia marina* | | | *Excoecaria agallocha* | | *Bruguiera cylindrica* | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | B | P | L | B | L | B |
| *Aspergillus niger* | + | + | - | - | + | - | - | + | + |
| *Aspergillus flavus* | + | + | - | + | + | + | + | + | + |
| *Aspergillus ochraceus* | + | + | - | - | + | - | - | - | - |
| *Aspergillus tamarii* | + | - | - | - | - | - | - | - | - |
| *Aspergillus fumigatus* | + | + | + | + | + | + | - | + | - |
| *Trichoderma harzianum* | + | + | + | - | + | + | - | + | + |
| *Penicillium spp* | + | + | + | + | + | + | - | - | + |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Trichoderma reesei* | + | + | - | - | + | - | - | - | + |
| *Penicillium citrinum* | + | - | - | - | + | - | - | - | - |
| *Penicillium roseopurpureum* | + | - | - | - | - | - | - | - | - |
| *Mucor spp* | + | + | + | - | - | + | - | - | - |
| *Botrytis spp* | - | - | - | + | - | - | - | - | - |
| Total no. of species | 11 | 8 | 4 | 4 | 8 | 5 | 1 | 4 | 5 |

[Leaf, B-Bark, P-Pneumatophore]

## Conclusion

Difference in species composition of fungi was observed from different parts of the selected mangrove plants indicating the diversity of fungal species in the mangrove ecosystem. The species composition and abundance of fungi may vary seasonally. The study proves Mangrove ecosystem as the ideal environment for diverse composition of fungal isolates.

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