Phyloplane mycoflora associated with Mangrove plant *Ceriops tagal* (Perr.)

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ABSTRACT

Mangrove trees are able to grow at salinities ranging from full sea water to fresh water, thus variety of fungal flora is present in this salinity gradient. Fungi help in decomposition of leaves and release of nutrients which are utilized by most of marine organisms. *Ceriops tagal* (Perr.) belongs to family rhizophoraceae is one of dominant mangrove plant at Ratnagiri coast. The present study aimed to study fungi associated with decomposing leaves of mangrove plant *Ceriops tagal*. The decomposing leaves of *Ceriops tagal* were collected from five different sites of Bhatye estuary (Kajvi river) Ratnagiri, Maharashtra. The decomposing leaves were collected in clean and sterile polythene bags and aseptically cut in to small pieces. For estimating fungi, the pieces were then placed on plates with Martin rose Bengal agar medium incorporated with an antibiotic mixture. Petri plates were incubated at room temperature (27±2 °C) for 2-6 days and the colonies were counted. *Total 17 species of fungi were identified out of which 9 fungi species belong to Aspergillus as A. niger*, *A. fumigates*, *A. aureoles*, *A. candidus*, *A. chevalier*, *A. flavus*, *A. glaucus*, *A. ochraceus* and *A. smithii*. Out of total sites Site 3 showed maximum fungal diversity while site 5 showed minimum fungal diversity. Considerable biodiversity of fungi was observed during decomposition of leaves of mangrove plant.

Key Words: *Ceriops tagal* (Perr.), diversity, fungi, leaves, mangrove.

INTRODUCTION

Mangroves are coastal wetland forests established at the intertidal zones of estuaries, backwaters, deltas, creeks, lagoons, marshes and mudflats of tropical and subtropical latitudes (Dickinson and Pugh, 1974). Approximately one fourth of the world's coastline is dominated by mangroves that are distributed in 112 countries and territories comprising a total area of about 181,000 km^2. Among the marine ecosystems, mangroves constitute the second most important ecosystem in productivity and sustained tertiary yield (Qasim and Wafar, 1990). These forests are of great ecological importance, social significance and economic value (Mandal and Naskar, 2008). Mangrove forests generate considerable amount of detritus such as leaf litter, woody debris and inflorescence and hence constitute an ideal environment for many detritus dependent fauna and microbes (Mumby *et al*, 2004). The Indian peninsula comprises approximately 7000 km^2 of mangroves, out of which 70, 18 and 12% exist at the east coast, Andaman and Nicobar Islands, and west coast respectively (Krishnamurthy *et al*, 1987).

Mangroves being detritus based ecosystems, substantial fungal populations are involved in detritus processing. Studies revealed that mangrove fungi are the second largest group among the marine fungi (Krishnamurthy *et al*, 1987). Heavy rainfall in the Western Ghats results in flushing freshwater and sediments to mangrove habitats and decrease in salinity. This facilitates colonization of freshwater fungi on mangrove substrates (Sridhar and Kaveriappa, 1988). Fungi help in decomposition of leaves and release of nutrients which are utilized by most of marine organisms. The microbial decomposition of mangrove leaves has been studied by Cundell *et al*, 1979, Raghukumar *et al,* 1994, Rajendran and Kathiresan, 2004).

The fungal activity results in mineralization of detritus and a decrease in C/N ratio (Blum *et al.* 1988). Although microbes play an important role in the cycling of nutrients in the mangrove ecosystem, very little information is available about the types of microbes associated with decomposing leaves. *Ceriops tagal* (Perr.) C.B. Robinson 1908 belongs to Family Rhizophoraceae is one of dominant mangrove plant at Ratnagiri coast. The present study aimed to study fungi associated with decomposing leaves of mangrove plant *Ceriops tagal*.

MATERIAL AND METHODS

The decomposing leaves of *Ceriops tagal* were collected from five different sites, 1-Near coconut research center Bhatye, 2- near Dr. B. A. M. University, research center, 3- Narayan Mali village, 4 – Gurumali village, 5- Karala village, of Bhatye estuary (Kajvi river) Ratnagiri, (M. S.) India,

in the month of Dec. 2011. The decomposing leaves were collected in clean and sterile polythene bags and aseptically cut in to small pieces.

These were then washed with sterilized seawater to remove debris on the leaves. Then they were dipped in 0.01 % HgCl2 solution for 3 min for surface-sterilization of the pieces. The pieces were then washed with sterilized seawater to remove all the traces of HgCl2 solution. For estimating fungi, the pieces were then placed on plates with Martin rose Bengal agar medium incorporated with an antibiotic mixture (chlorotetracycline- HCl10 %, chloramphenicol 2 % and streptomycin sulphate 2 %; Van Uden and Fell 1968) for suppressing bacterial growth in the media. Petri plates were incubated at room temperature (27±2 °C) for 2-6 days and the colonies were counted. Fungi were identified following the keys given by Ainsworth *et al*, (1973), Raper and Fennell (1987) and Mukadam (1997).

RESULTS AND DISCUSSION

All fungi associated with decomposing leaf of *Ceriops tagal are summarized in table 1. Total 17 species of fungi were identified out of which 9 fungi species belong to Aspergillus as A. niger*, *A. fumigates*, *A. aureoles*, *A. candidus*, *A. chevalier*, *A. flavus*, *A. glaucus*, *A. ochraceus* and *A. smithii*. Other fungi were *Fusarium oxysporum*, *Halosarphia fibrosa*, *Mucor sp*., *Ophiobolus littoralis*, *Penicillium notatum*, *Pontoporeia biturbinata and Rhizopus stolonifer*. Some fungi species were more frequent and found at all six sites as *Alternaria alternate*, *Aspergillus niger*, *Aspergillus candidus*, *Aspergillus flavus*, *Aspergillus glaucus* and *Penicillium notatum*. *Rhizopus stolonifer* was identified at only two sites. Out of total sites Site 3 showed maximum fungal diversity while site 5 showed minimum fungal diversity. Highest colonies were found in case of *Aspergillus flavus*.

Table 1. Total no. of colonies of fungi associated with decomposing leaf of mangrove plant *Ceriops tagal at different sites*

Fungi	Site 1	Site 2	Site 3	Site 4	Site 5
Alternaria alternata	4	3	5	8	6
Aspergillus niger	3	10	6	7	9
Aspergillus fumigatus	--	5	2	3	--
Aspergillus aureolus	3	--	1	3	--
Aspergillus candidus	7	3	5	8	5
Aspergillus chevalier	3	6	2	4	--
Aspergillus flavus	11	9	8	9	7
Aspergillus glaucus	3	8	5	7	4
Aspergillus ochraceus	5	--	4	--	3
Aspergillus smithii,	2	3	5	--	3
Fusarium oxysporum	1	3	--	2	2
Halosarphia fibrosa	--	3	2	5	--
Mucor sp.	2	4	4	--	2
Ophiobolus littoralis	--	2	2	1	--
Penicillium notatum	7	8	7	5	6
Pontoporeia biturbinata	5	7	4	--	5
Rhizopus stolonifer	--	--	--	2	1

The results are in accordance with Rajendran and Kathiresan (2007) who studied microbial flora associated with other mangrove plant *Avicennia marina* (Forsk.) Vierh., and *Rhizophora apiculata* Blume. The study shows great diversity of fungi related to decomposition of leaf litter of mangrove plants. Mohamed Salique (1989) recorded 23 species of fungi from the litter of *R. apiculata* and 19 species from *Bruguiera cylindrica*.

Most of the species encountered in the present study were terrestrial forms, as was also observed by other workers (Venkatesan, 1981; Miyoshi *et al*, 1985). The reason might be attributed to large scale transport of fungal spores from the land through freshwater inflow in to mangrove ecosystem. Several workers have already isolated mostly terrestrial species in other mangrove plant (Sivakumar and Kathiresan, 1990).

CONCLUSION

In this study considerable biodiversity of fungi was observed during decomposition of leaves of mangrove plant. *Aspergillus* was the dominant genus of fungi with nine species. The fungi diversity and population varies with site to site in some extent. Fungi are particularly important in the marine environment as decomposers of dead organic substrates (Kohlmeyer and Kohlmeyer, 1979). All these fungi play an important ecological role in nutrient cycle. Its activity results in production of protein-rich detritus that serves as food to fishes especially in detritus-based marine ecosystems like mangroves.

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