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Manglicolous Marine Fungi on *Avicennia* and *Rhizophora* along Kerala Coast (India)

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Abstract: Thirty-two manglicolous marine fungi belonging to 23 ascomycetes, 1 basidiomycete and 8 mitosporic fungi were observed from *Avicennia* and *Rhizophora* along Kerala coast, South India. Twelve species were found common on both hosts. The number of marine fungal species recorded on *Avicennia* was greater than *Rhizophora.* Fifteen species were found specific on *Avicennia* and five on *Rhizophora*. Furthermore, each host had its own most frequent, frequent, occasional and sporadic species.

Key words: Marine fungi · Wood samples · *Avicennia* · *Rhizophora*

INTRODUCTION

The mangrove ecosystem is a typical tropical and coastal vegetation, found in intertidal regions of deltas and backwater areas known for high organic matter production [1-3], which supports the nearby estuarine and offshore community by detritus transport [4]. As diverse vegetation exists in mangroves, it is considered as a major niche of fungal repository. Investigation on mycota of mangroves revealed that mangrove fungi are the second largest group among the marine fungi [5]. The marine fungi inhabiting on mangroves are called manglicolous marine fungi. The basis of mangrove trunk and pneumatophores are permanently or intermittently submerged, while the salt water will never reach the upper parts. Owing to this, terrestrial fungi and lichens are seen on the upper part of the trees and marine fungi on the lower part, with an overlap between marine fungi and terrestrial fungi in the middle [3-5].

The salinity of the mangrove habitat varies dramatically between dry and monsoon seasons. These changes influence the relative frequencies of occurrence of marine *vs.* terrestrial fungi and within two months of immersing litter in the mangrove swamp, marine fungi replaced terrestrial fungi due to increased salinity. This trend was partly reversed during monsoon season, when terrestrial fungi recolonized the substrates, presumably due to declining salinity [6].

Decomposition of organic material, mainly wood, by marine fungi has recently become a focal point of research [7]. In India studies on marine fungi occurring in mangrove ecosystem have been undertaken by various workers [8-14]. However, less research has been undertaken on the occurrence of manglicolous marine fungi on specific mangrove trees. Researchers studied the marine fungal communities on 8, 2, 5 and 4 mangrove genera respectively [15-24]. Inorder to gain a better insight of the occurrence of marine fungi on specific mangrove trees of Kerala, a study on the frequency of occurrence of manglicolous marine fungi on specific mangrove trees *i.e*. *Avicennia* and *Rhizophora* were undertaken..

MATERIALS AND METHODS

Collection and Treatment of Wood Samples: Decaying woody substrates of *Avicennia* and *Rhizophora* were collected from three mangrove forests of North Malabar region of Kerala (Kerala) namely Mahe and Telicherry during July 2006-September 2007. They were washed well, placed in sterile polythene bags and were brought to the laboratory. After the preliminary screening for marine fungi under stereomicroscope, the wood samples were incubated at room temperature. Periodical isolation of marine fungi from these wood samples was carried out for five months. Identifications of marine fungi were done using taxonomic keys by Kohlmeyer and Kohlmeyer [10]; Kohlmeyer and Volkmann Kohlmeyer, [11] Hyde and Sarma, [6] and Raveendran and Manimohan [24]. The marine fungi thus identified were tabulated and recorded (Table 1).

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Table 1: Manglicolous marine fungi isolated from *Avicennia* and *Rhizophora*

	Percent frequency of occurrence (FO)	
Name of fungi	*Avicennia*	*Rhizophora*
Ascomycetes		
Aigialus grandis Kohlm *et* Schatz	2.9	15.4
Aniptodera chesapeakensis Shearer *et* Miller	2.2	6.4
Aniptodera haispora Vrijmoed, Hyde *et* Jones	0.7	5.1
Aniptodera salsuginosa Nakagiri *et* Ito	5.9	
Ascocratera manglicola Kohlm	1.5	
Bathyascus tropicalis Kohlm	0.7	
Biatriospora marina Hyde *et* Borse	5.1	1.3
Dactylospora haliotrepha (Kohlm. *et* Kohlm) Hafellner	6.6	8.5
Halorosellina oceanica (Schatz) Whalley, Jones, Hyde *et* Laessoe	2.2	12.8
Halosarpheia hamata (Hohnk) Kohlm	2.9	
Halosarpheia marina (Cribb *et* Cribb) Kohlm	6.6	10.2
Halosarpheia minuta Leong	0.7	
Halosarpheia ratnagiriensis Patil *et* Borse		2.9
Halosarpheia retorquens. Shearer *et* Crane	2.2	
Lignincola longirostris (Cribb *et* Cribb) Kohlm	5.9	5.1
Lignincola tropica Kohlm	5.1	
Lulworthia grandispora Meyers		6.4
Lulworthia sp	1.5	
Marinosphaera mangrovei Hyde	2.2	
Salsuginea ramicola Hyde	2.9	
Savoryella lignicola Jones *et* Eaton	10.4	6.4
Savoryella paucispora (Cribb *et* Cribb) Koch		5.1
*Verruculina enalia (*Kohlm) Kohlm *et* Kohlm	5.9	8.9
Basidiomycete		
Halocyphina villosa Kohlm	2.9	
Mitosporic Fungi		
Cirrenalia basiminuta Raghukumar *et* Zainal	2.2	
Cirrenalia macrocephala(Kohlm.) Meyers	1.5	
Cirrenalia pygmea Kohlm	5.9	15.4
Periconia prolifica Anastasiou	4.4	14.1
Trichocladium constrictum Schmidt		5.1
Trichocladium alopallonellum (Meyers *et* Moore) Kohlm *et* V.kohlm	2.9	
Zalerion maritmum (Linder) Anastasiou	2.2	
Zalerion varium Anastasiou		1.2

FO is percent frequency of occurrence and RA is percent relative abundance

Presentation of Data:

- Percent frequency of occurrence (FO) = Number of isolates of a particular species divided by total number of wood samples supporting marine fungi X 100 On the basis of percentage occurrence, the marine fungi were classified as most frequent (occurring in > 15 % samples), frequent (in 10-15 % samples), occasional (in 5-10 % samples) and sporadic (in < 5 % samples).
- Percentage colonization = Number of samples supporting marine fungi divided by number of samples examined X 100.

RESULTS AND DISCUSSION

A total of 32 manglicolous marine fungi belonging to 23 ascomycetes, 1 basidiomycete and 8 mitosporic fungi were encountered. Interestingly only twelve species were found common on both host. The number of marine fungal species recorded on *Avicennia* was greater than *Rhizophora*.

Out of 160 samples of *Avicennia* sp examined, only 136 samples were found to support marine fungi. A total of 27 higher marine fungi were encountered including 20 ascomycetes 1 basidiomycete and 6 mitosporic fungi. In terms of percent frequency of occurrence *Savoryella*

lignicola (10.4%) was the most frequent species encountered. Eight species were frequently isolated. *Periconia prolifica* (4.4%) was occasionally obtained. Sixteen species were sporadic in their occurrence. The percentage colonization of marine fungi on *Avicennia* was 85%.

Out of 160 samples of *Rhizophora* sp examined, only 78 samples were found to support marine fungi. The total numbers of species isolated were seventeen, which include 13 ascomycetes and 4 mitosporic fungi. Among the most frequent species encountered from *Rhizophora, Aigialus grandis* (15.4%) and *Cirrenalia pygmea (*15.4%) showed maximum frequency of occurrence. Nine species were frequently obtained. Three species namely, *Biatriospora marina* (1.3%), *Halosarpheia ratnagiriensis* (2.9%) and *Zalerion varium* (1.2%) were sporadic in their occurrence. The percentage colonization of marine fungi on *Rhizophora* was 48.75%.

The mangrove ecosystem is an ideal environment for the growth and reproduction of fungi, a fact supported by the diversity of fungi encountered [22]. From the present study it is interesting to note that different plants harboured different mycota although growing in the same location. A comparison of the mycota isolated from *Avicennia* and *Rhizophora* revealed that in addition to species common on both host plants there were some fungi found only on a single host plant. Many species were recorded on any one host only. Thus fifteen species were recorded from only *Avicennia* and five from only *Rhizophora*. Furthermore, each had its own most frequent, frequent, occasional and sporadic species. Even when recorded on both hosts, their percentage occurrence was not the same.

Present data on the frequency of occurrence of marine fungi on *Avicennia* and *Rhizophora* is quiet distinct from earlier reports. Ravikumar and Vittal [19] reported *Lophiostoma mangrovei* and *Verruculina enalia* as the most frequent marine fungi from *Rhizophora* in Pichavaram. Borse *et al*, [1] recorded *Julella avicenniae* and *Aigialus parvus* as dominant species from *Avicennia* in Gujarat. Sarma *et al,* [21] observed that *Verruculina enalia*, *Cirrenalia pygmea* and *Rhizophila marina* in Godavari delta and *Verruculina enalia, Dactylospora haliotrepha* in Krishna delta as the most frequent marine fungi from *Rhizophora*. And *Verruculina enalia* and *Eutypa bathurstensis* were very frequent from *Avicennia* in Godavari and Krishna delta. While Raveendran and Manimohan (2007) recorded *Halocyphina villosa*, *Halosarpheia minuta, Aniptodera chesapeakensis*, *Marinosphaera mangrovei*, *Lulworthia grandispora* and *Savoryella lignicola* on *Avicennia* while *Halocyphina villosa*, *Halosarpheia marina*, *Lulworthia grandispora*, *Aniptodera chesapeakensis*, *Dactylospora haliotrepha* and *Aigialus parvus* on *Rhizophora* from Kerala. Reports are there that the ascomycetes were the most common taxonomic group in the mangrove species [22-25]. In the present study, more than 80% of the collected species were ascomycetes and indicates their importance in the mangrove habitat. The differences in the percentage colonization, species diversity and average number of fungi per sample in the present study and those reported from the literature could be attributed to several factors like physical and chemical parameters, age of host plant, origin and nature of substrata examined, presence or absence of bark, location of the mangrove site studied, limited number of samples examined and last but not the least, the incubation period of the wood sample in the laboratory [18-22].

The high percentage frequency of occurrence of marine fungi in the present study reflects the abundance and rich species diversity of manglicolous marine fungi in Kerala mangroves. Thorough collections from central and southern part of Kerala may undoubtly yield more species and extend our knowledge of the manglicolous marine fungi of Kerala.

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REFERENCES

1. Borse, B.D., D.J. Kelkar and A.C. Patil, 2000. Frequency of occurrence of marine fungi from Pirotan Island (Gujarat), India. Geobios., 27: 145-148.
2. Chinnaraj, S., 1994. Higher marine fungi from mangroves (Manglicolous fungi).In: Conservation of mangrove forest Genetic Resources-A Training Manual (eds. S.V. Deshmukh and V. Balaji) CRSARD, pp: 271-277.
3. Ananda, K. and K.R. Sridhar, 2004. Diversity of filamentous fungi on decomposing leaf and woody litter of mangrove forests in the south west coast of India. Curr. Sci., 87: 1431-1437.

4. Alias, S.A., A.J. Kuthubutheen and E.B.G. Jones, 1995. Frequency of occurrence of fungi on wood in Malaysian mangroves. Hydrobio., pp: 97-106.
5. Gayatri, R., Nambiar and K. Raveendran, 2008. Marine and manglicolous marine fungal diversity in coastal wetlands of Kerala. Seaweed Res. Utiln., 30: 55-61.
6. Hyde, K.D., 1988. Studies on the tropical marine fungi of Brunei. Bot. J. Linn. Soc., 98: 135-151.
7. Hyde, K.D., 1991. Fungal colonization of *R. apiculata* and *X. granatum* poles in Kampung Kapok mangrove, Brunei. Sydowia, 43: 31-38.
8. Hyde, K.D. and V.V. Sarma, 2000. Pictorial keys to higher marine fungi. Marine Mycology-A Practical Approach (eds. K.D. Hyde and S.B. Pointing) Fungal Diversity Press, Hong Kong, pp: 205-270.
9. Hyde, K.D., 1990. A comparison of the intertidal mycota of five mangrove tree species. Asian Mar. Biol., 7: 93-107.
10. Kohlmeyer, J.R. and E. Kohlmeyer, 1979. Marine mycology: the higher fungi, Academic Press, New York.
11. Kohlmeyer, J. and Volkmann Kohlmeyer, 1991. Illustrated key to the filamentous higher marine fungi. Bot. Mari., 34: 1-61.
12. Maria, G.L. and Sridhar, K.R., 2002. Richness and diversity of filamentous fungi on wood litter of mangroves along the west coast of India. Curr. Sci., 83: 1573-1580.
13. Jones, E.B.G. and S.A. Alias, 1977. Biodiversity of mangrove fungi. Biodiversity of Tropical Microfungi (eds. K.D. Hyde) Hong Kong: Hong Kong University Press, pp: 184-194.
14. Jones, E.B.G. and K.D. Hyde, 1988. Methods for the study of mangrove fungi. Mangrove Microbilogy: Role of microorganism in Nutrient Cycling of Mangrove Soils and Waters (eds. A.D. Agate, C.V. Subramanian and M. Vanucie) IJNDP/UNESCO: pp: 9-27.
15. Maria, G.L. and Sridhar, K.R., 2003. Diversity of filamentous fungi on woody litter of five mangrove plant species from south west coast of India. Fungal Divers, 14: 109-126.
16. Sridhar, K.R., 2005. Diversity of fungi in mangrove ecosystem. Microbial Diversity; current perspectives and potential applications (eds, T. Satyanarayanan and B.N. Johri) I.K. Intl. Pvt. Ltd., New Delhi. pp: 129-148.
17. Odum, W.E. and E.S. Heald, 1975. The detritus-based food webs of an estuarine mangrove community. In: Estuarine Research Vol.I. (ed. J.E. Cronin) Academic Press, New York. pp: 265-288.
18. Patil, S.D. and B.D. Borse, 1983. Marine fungi from Maharashtra (India) III-some fungi from mangroves. Ind. Bot. Reptr., 2: 56-058.
19. Ravikumar, D.R. and B.P.R. Vittal, 1991. A new species of *Bathyascus* from Indian mangroves. Mycol. Res., 95: 370-384.
20. Maria, G.L. and K.R. Sridhar, 2004. Fungal colonization of immersed wood in mangroves of the southwest coast of India. Can. J. Bot., 82: 1409-1418.
21. Sarma, V.V. and B.P.R. Vittal, 2001. Biodiversity of manglicolous fungi on selected plants in the Godavari and Krishna deltas, East Coast of India. Fungal Divers, 6: 115-130.
22. Sarma, V.V. and B.P.R. Vittal, 2000. Biodiversity of marine mangrove fungi on different substrata of *Rhizophora apiculata* and *Avicennia* sp from Godavari and Krishna deltas, east coast of India. Fungal Diver, 5: 23-41.
23. Maria, G.L. and K.R. Sridhar, 2005. Mangrove filamentous fungi-recent advances. Microbial diversity opportunities and challenges (eds, S.P. Gautam, A. Sharma, S. Sandhu and A.K. Pandey) Shree Publishers and Distributors, New Delhi, India. pp: 241-278 Ravikumar, D.R. and Vittal, B.P.R., 1996. Fungal diversity in the decomposing biomass of mangrove plant *Rhizophora* in Pichavaram estuary, east coast of India. Indian J. Mar. Sci., 25: 142-144.
24. Raveendran, K. and P. Manimohan, 2007. Marine fungi of Kerala-A preliminary floristic and ecological study. Malabar Natural Historical Society, Calicut, Kerala, India.
25. Sarma, V.V., K.D. Hyde and B.P.R. Vittal, 2001. Frequency of occurrence of mangrove fungi from the east coast of India. Hydrobio., 455: 41-53.