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Marine mycoflora in backwater ecosystem of Kerala, India

Gayatri R. Nambiar* and K. Raveendran

[1]Department of Post Graduate Studies and Research in Botany, Sir Syed College, Taliparamba, Kerala - 670 142, India

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Abstract: *Back water system of Kerala is well known for its fertility. Fungi play a vital role in detritus decomposition, nutrient cycling and energy flow in marine food web including backwater ecosystem. Present investigation on the diversity of marine fungi from two back waters of Kerala resulted in the isolation of 20 marine fungi. These include 11 Ascomycetes, 1 Basidiomycete and 8 Mitosporic fungi. In terms of percent frequency of occurrence the most common species obtained were Aniptodera chesapeakensis, Verruculina enalia, Savoryella lignicola and Clavatospora bulbosa. Ascochyta sp. was represented by only a single isolate.*

Key words: *Backwater, Marine fungi, Wood samples, Diversity, Backbone*
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Introduction

Kerala is a state with notable feature of backwater areas adjoining the sea line. The total area of Kerala back water is about 500 km^2 and is a crucified ecosystem of high fertility (Nair *et al.,* 1987). Dead leaf, woody debris, animal remains *etc.* constitute the main sources of organic matter in backwater environment, mostly produced *insitu* and some imported by perineal water bodies, the brackish water ecosystem. Microorganisms, like bacteria, fungi *etc.* have major role in the biodegradation of this organic matter.

During the rainy season (late May to September) the salinity of backwater ecosystem show drastic decline. This may facilitate the growth of fresh water fungi. Later, when the salinity gets increased in the post monsoon season, the detritus is colonized by an immense variety of marine fungi. Hence, backwater system supports a mixture of both fresh water and marine fungi.

Marine fungi are one such ecologically important microbiota which support the nutrient cycle. Fungi are the only multi-celled organisms that can digest cellulose and lignin, the two major components of wood. The mycelial form of most fungi are suitable for invasion of solid, bulky, partially deteriorate resource units. Early colonizers are believed to utilize the more readily available components of wood (non structural carbohydrates). There appears to be a succession of fungal fruiting structures which have been classified into early, intermediate and late colonizers (Tan *et al.,* 1989). While the intermediate and later colonizers probably utilize the structural carbohydrate and tannin in wood (Eaton and Hale, 1993). Wood has advantages as a substratum for studying fungal community dynamics since it can be examined directly and the relatively slow rates of change facilitate detailed analysis without risk of missing vital stages (Boddy, 1992). In India marine fungal studies were carried out by Becker and Kohlmeyer (1958), Prabhakaran *et al.* (1987), Borse (1988), Ravikumar and Vittal (1991), Borse *et al.* (2000), Prasannarai *et al.* (2000), Prasannarai and Sridhar (2001, 2003), Sarma and Vittal (2001), Maria and Sridhar (2002, 2005, 2006 a, b), Sridhar (2005), Gayatri *et al.* (2006, 2008), Raveendran and Manimohan (2007), Kamble *et al.* (2008), Gayatri and Raveendran (2008). Most of the work was carried out in beaches, mangrove ecosystem and deltas. However, marine fungi of backwater remained unexplored. Hence, the present study was undertaken. Current paper deals with the diversity of marine fungi inhabited in two back waters of Kerala.

* **Corresponding author:** grn_149@rediffmail.com

Materials and Methods

Collection and treatment of wood samples: Collections of wood materials were carried out from back waters of Chettuva and Kadalundi of Kerala in the month of June (monsoon), December (post- monsoon) 2006 and March (pre-monsoon) 2007. A total of 90 wood materials, mostly ranging from 3.5-7 x 1-1.5 cm were collected. They were washed well and 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 materials was carried out for six months. Identifications of marine fungi were done using taxonomic keys by Kohlmeyer and Kohlmeyer (1979), Kohlmeyer and Volkmann Kohlmeyer (1991), Hyde and Sarma (2000), Raveendran and Manimohan (2007).

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. Percent relative abundance (RA) = Number of isolates of a particular species obtained divided by total number of fungal isolates obtained from all the location X 100.

On the basis of percentage occurrence, the marine fungi were classified as common (>10%), frequent (5-10%), occasional (2-5%) and rare (< 2%).

Table – 1: List of marine fungi isolated from backwater

Name of fungi	Chettuva			Kadalundi			FO	RA
	Pm.	M.	Po.	Pm.	M.	Po.		
Ascomycetes								
Aigialus grandis Kohlm. *et* Schatz				+		+	4.67	3.23
Aniptodera chesapeakensis Shearer *et* Mill		+		+	+	+	12.5	8.60
Halosarpheia ratnagiriensis Patil *et* Borse	+		+				3.13	2.15
Leptosphaeria australiensis (Cribb *et* Cribb) Hughes						+	4.67	3.23
Lignincola tropica Kohlm	+	+	+		+		6.25	4.30
Marinosphaera mangrovei Hyde		+		+	+		4.67	3.23
Pleospora pelagica Johnson			+				6.25	4.30
Savoryella lignicola Jones *et* Eaton		+	+			+	10.94	7.53
Savoryella paucispora Cribb *et* Cribb) Koch	+	+	+	+		+	9.38	6.45
Salsuginea ramicola Hyde			+				7.81	5.38
Verruculina enalia (Kohlm.) Kohlm. *et* Volkm. Kohlm	+	+	+			+	12.5	8.60
Basidiomycete								
Halocyphina villosa Kohlm	+		+				9.38	6.45
Mitosporic fungi								
Ascochyta sp						+	1.56	1.06
Clavatospora bulbosa (Anast) Nakagiri *et* Tubaki	+	+	+				10.94	7.53
Cumulospora marina I. Schmidt		+					7.81	5.38
Dendryphiella salina (Sutherland) Pugh *et* Nicot					+		6.25	4.30
Periconia prolifica Anastasiou					+		3.13	2.15
Phoma sp	+		+	+	+	+	14.06	9.68
Trichocladium achrasporum (Meyers *et* Moore) Dixon	+		+				3.13	2.15
Clavatospora bulbosa (Anast) Nakagiri *et* Tubaki		+	+	+			6.25	4.30

Where FO is percent frequency of occurrence and RA is percent relative abundance, Pm = Pre monsoon, Po = Post-monsoon, M = Monsoon, + = Present

Results and Discussion

A total of 20 marine fungi were encountered in the present study (Table 1). This is represented by 11 Ascomycetes, 1 Basidiomycete and 8 Mitosporic fungi. Eight species were found to be common in both the backwater. They are *Aniptodera chesapeakensis, Lignincola tropica, Marinosphaera mangrovei, Savoryella lignicola, S. paucispora, Verruculina enalia, Periconia prolifica* and *Trichocladium achrasporum*. Kadalundi backwater (15) showed maximum marine fungal diversity than Chettuva (13).

In terms of percent frequency of occurrence the most common species obtained from backwater were *Phoma* sp*, Aniptodera chesapeakensis, Verruculina enalia, Savoryella lignicola* and *Clavatospora bulbosa*. Eight species namely *Lignincola tropica, Pleospora pelagica, Savoryella paucispora, Salsuginea ramicola, Halocyphina villosa, Cumilospora marina, Dendryphiella salina* and *Zalerion varium* were found frequently. Six species were occasionally encountered. *Ascochyta* sp was the only fungus recorded in less than 1% of the sample.

The observation that the great majority of the fungi collected during this study belonged to Ascomycota supported similar reports by several workers (Kohlmeyer and Kohlmeyer, 1987; Hyde and Jones, 1989; Hyde, 1988; Sarma and Vittal, 2001; Sarma *et al.,* 2001; Prasannarai and Sridhar, 2001; Gayatri *et al.,* 2006,2008; Raveendran and Manimohan, 2007).The present investigation also revealed that the biodiversity of higher marine fungi of back water of Kerala is similar to that of other coastal regions of India. However, the species diversity is poor. This could be attributed to limited number of samples examined. Although backwater are known for high fertility, such habitats are disappearing due to human interference like aquaculture, industrial development *etc.* Moreover, addition of pollutants to back water ecosystem may result in the depletion and even extinction of marine mycoflora, the backbone of marine environment.

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