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RESEARCH ARTICLE

Diversity and distribution of fungal communities in marine environment in Marakkanam, Tamil Nadu, East Coast of India

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Abstract: *The present study was confined to the diversity of fungi in Marakkanam. Water, sediment, and natural substrates of marine organisms were collected to isolate the fungi. All the collected samples were plated, incubated and the fungal colonies were identified. The baits samples were regularly observed under aseptic conditions using microscope. The water and sediment sample were collected separately and analysed for temperature, pH, dissolved oxygen, biological oxygen demand, chemical oxygen demand, salinity and total dissolved solids on water. A total of 40 fungal species were isolated and enumerated by plating, techniques. The physico-chemical parameters of water and sediment in all stations were analysed and correlated with fungal diversity and frqucency of occurrence of fungi were also analysed. From this investigation, we have concluded that the fungal biodiversity in marine ecosystem, Aspergillus and Penicillium was the common fungal genera among the isolated from the study period.*

Keywords: *Fungi, Marine environment, Diversity and distribution.*

1. INTRODUCTION

Biological diversity refers the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystem and ecological complexes of which they are part. Biodiversity encompasses all life forms, ecosystems and ecological processes and acknowledges the hierarchy at genetic, taxon and ecosystem level. Microbial diversity represents the largest untapped reservoir of biodiversity for potential discovery of new biotechnological products, including new pharmaceuticals, new enzymes, new special chemicals or new organisms that carryout novel process (Jensen and Fenical, 1994).

One third of fungal diversity of the globe exists in India. Out of 1.5 million of fungi, only 50% are identified and remaining 50% need to be identified. Unfortunately around 5 –10% of these fungi alone can be cultured artificially. The variety and galaxy of fungi and their natural beauty occupy prime place in the biological world and India has been the cradle for such fungi. Only a fraction of total fungal wealth has been subjected for scientific scrutiny and mycologists have to explore the unexplored and hidden wealth (Manoharachary et al., 2005). Marine fungi have the ability to grow at certain seawater concentrations (Johnson and Sparrow, 1961; Tubaki, 1969). It has been shown that marine fungi cannot be defined strictly on a physiological basis where as, a broad ecological definition names that the marine fungi of obligate types are those that grow and sporulate exclusively in a marine and estuarine habitat. Facultative forms are those from fresh water or terrestrial milieus able to grow in the marine environment (Kohlmeyer, 1974).

2. MATERIALS AND METHODS

Random sampling of water was carried out at various depths (within 0.5 m). Totally, 250 ml of water sample was collected in each station in sterilized glass container and then transferred to sterilize polythene bags and properly sealed.

As similar to the water sampling, soil sediments were also collected from the surface layer in each sampling station once in a month for the entire study period. The sediment samples were collected manually wearing hand gloves, transferred to sterile polythene bags and sealed properly.

Typical marine and mangrove fungi were isolated using Baiting technique. Wood samples were collected from the study area and studied for isolation of marine fungi. All these individual specimens were kept in sterile polythene bag and aerosal was created inside the bags by spraying with sterile seawater. The bags were tightly covered and kept under illumination and subsequently transferred to dark conditions. This was carried out for the entire study periods to observe the colonization of fungi on these different natural substrates.

3. PROCEDURE

The pH of the water samples from 5 sampling spots were adjusted to neutrality using 1 N acid/ 1N alkali. The water samples were filled in a BOD bottles without bubbling. 2 ml of manganous sulphate and 2 ml of alkaline iodide azide – solution were added to each water sample. The bottles were shaken upside down direction at least six times. The brown precipitate was allowed to precipitate. 2ml of concentrated sulphuric acid was added to each bottle and the stoppered bottles were shaken to dissolve the brown precipitate. 50 ml of the samples was taken in a flask and titrated with sodium thiosuphate solution, till the colour changes to pale straw. 2 drops of starch solutions was added which changes the colour of the content from pale to blue and titrated again until the due blue colour disappears.

4. RESULTS AND DISCUSSION

The fungi belonging to different genera which were isolated by plating and baiting techniques were enumerated with morphological and ecological descriptions. The system of classification was based on "**The Fifth Kingdom – Mycota (ed.) Kendrick (1992)** for the arrangement of genera under their respective orders and families(Tables 1.&1a). The genera and species within each family are arranged in alphabetical order.

Each taxon is briefly described by its binomial followed by morphology (diagnostic features), the technique by which the taxon was isolated and finally the sample (s) from which each taxon was isolated.

- Mucor sp.
- Rhizopus nigricans Ehrenberg
- Rhizopus oryzae Went and Gerlings
- Rhizopus stolonifer Ehrenberg
- Saccharomyces sp.
- Neurospora crassa Shear and Dodge
- Aspergillus flavus Link
- Aspergillus fumigatus Fresenius
- Trichoderma viride Pers ex Fries

5. SUMMARY AND CONCLUSION

The present study was confined to the diversity of fungi isolated from in Marakkanam, comprising of 1. Anumanthaikuppam (S1), 2. Vasavan kuppam(S2),3. Koonukedu(S3) ,Manjakuppam(S4) and Kilputhupattu (S5). Water, sediment, and natural substrates of marine organisms were collected to isolate the fungi. All the collected samples were plated, incubated and the fungal colonies were identified. The baits samples were regularly observed under aseptic conditions using microscope.

From this investigation, we have concluded that the fungal biodiversity in marine ecosystem, *Aspergillus* and *Penicillium* was the common fungal genera among the isolated from the study period. Fungi play an important role in decomposition of natural substrates in marine ecosystem. The fungi isolated from marine systems are mainly used in hydrocarbon degradation of aliphatic and aromatic compounds, enzyme technology, biochemical, agricultural, pharmaceutical, molecular biology and other applied research fields.

Table 1: Details of physico-chemical parameters of water in four stations.

Parameters	S1	S2	S3	S4	S5
Temperature (° C)	30	28	30	32	30
pH	7.5	8.0	8.1	7.9	8.0
Dissolved oxygen (mg/l)	16.1	17.2	17.8	18.3	18.1
Biological oxygen demand (mg/l)	1.06	0.48	0.08	1.10	0.96
Chemical oxygen demand (mg/l)	0.09	0.10	0.18	0.23	0.25
Salinity (%)	47	45	45	43	42
Total dissolved solids (mg/l)	1.0	0.3	0.20	0.10	0.20

Table 2: Fungi isolated from all the five sampling stations during the study period.

Name of the fungi	S1	S2	S3	S4	S5
Actinomucor sp.	-	-	+	-	+
Mucor sp.	-	+	-	-	-
Rhizopus oryzae	+	+	+	+	+
R. nigricans	+	+	+	+	+
R. stolonifer	-	-	-	-	
Saccharomyces sp. 1	-	-	-	-	-
Neurospora crassa	-	-	-	-	+
A. flavus	+	+	+	+	-
A. fumigatus	+	+	+	+	+
A. luchuensis	+	+	+	+	
A. niger	+	-	-	+	+
A. ochraceus	+	+	+	+	-
A. oryzae	+	+	+	+	+
A. quercinus	-	+	+	+	+
A. sulphureus	-	-	-	+	+
A. terreus	+	+	+	+	+
A.terricola	-	-	+	-	+
Pencillium citrinum	-	+	+	-	-
P. janthinellum	-	+	-	-	+
Penicillium sp.	+	-	-	-	+
Trichoderma viride	-	-	-	-	+
Verticillium luteo -album	-	-	+	-	+

(+) - Present; (–) - Absent.

Table 3: List of Fungi isolated from various mangrove substrate samples collected in the study area.

Name of the fungi	water	Sediment	Natural Substrates
Actinomucor sp.	+	-	-
Mucor sp.	-	+	+
Rhizopus oryzae	+	+	+
R. nigricans	+	+	-
R. stolonifer	-	-	-
Saccharomyces sp. 1	+	-	-
Neurospora crassa	-	+	+
A. flavus	+	-	-
A. fumigatus	+	-	-
A. luchuensis	+	+	+
A. niger	+	+	+
A. ochraceus	+	-	-
A. oryzae	+	+	+

(+) - Present; (–) - Absent.

Table 4: Frequency of occurrence isolated fungi by plating/baiting/direct observation during the study period.

Name of the fungi	**Frequency of occurrence (%)**
Actinomucor sp.	25
Mucor sp.	50
Rhizopus oryzae	50
R. nigricans	75
R. stolonifer	50
Saccharomyces sp. 1	25
Neurospora crassa	25
A. flavus	100
A. fumigatus	50
A. luchuensis	100
A. niger	100
A. ochraceus	75
A. oryzae	100
A. quercinus	100
A. sulphureus	100
A. terreus	100
C. lunata	100
C.richardiae	25
Drechslera sp	50
Periconia sp.	25
Fusarium moniliforme	100
F. oxysporum	50
F. semitectum	100
Fusarium sp.	100

FO - Frequency of Ocurrence.

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