Indian Journal of Marine Sciences
Vol. 35(4), December 2006, pp. 318-325

Fungal diversity on mangrove woody litter *Rhizophora mucronata* (Rhizophoraceae)

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Received 10 July 2006; revised 28 August 2006

This study provides the pattern of colonization and diversity of filamentous fungi on naturally deposited and deliberately introduced *Rhizophora mucronata* Lamk. wood during monsoon and summer in a mangrove of southwest India and compares overall occurrence with three species co-occurrence. The number of fungi ranged between 1 and 9 per naturally deposited wood and 1 and 8 per deliberately introduced wood. Out of 66 fungi recovered, naturally deposited wood showed higher fungi during monsoon (September, 2000) than summer (March, 2001) (48 vs. 24), so also among 40 fungi on wood showing co-occurrence of three fungi (21 vs. 18). Percent frequency of occurrence of fungi was not significantly different between wood types and seasons in overall occurrence and three species co-occurrence ($P > 0.05$). Among 17 core-group fungi (≥10 %), *Aigialus mangrovei, Cirrenalia pygmea, Lignincola laevis, Lulworthia grandispora, Passeriniella mangrovei, Trichocladium linderi, Tirispora* sp., *Zalerion maritimum* and *Z. varium* were highly dominant (≥20 %). On wood showing co-occurrence of three fungi, *A. mangrovei, Cirrenalia tropicalis, L. grandispora* and *T. linderi* were highly dominant core-group fungi. Even though *A. mangrovei, C. pygmea, C. tropicalis, Halosarpheia cincinnatula, L. grandispora, P. mangrovei, Verruculina enalia* and *Z. maritimum* are typical marine or mangrove fungi, they were core-group fungi on deliberately introduced wood in monsoon season indicates their high colonization activity on wood even under low salinity. Several terrestrial mitosporic fungi (*Alternaria, Arthrobotrys, Aspergillus, Penicillium, Phoma* and *Tetracrium*) were found particularly in monsoon season, but none of them belonged to core-group. Irrespective of wood types, overall fungal diversity and richness was highest in monsoon than in summer samples, while in wood showing co-occurrence of three fungi, it was high in naturally introduced wood of summer and deliberately introduced wood of monsoon. Issues related to core-group fungi, seasonal dominance, diversity and co-occurrence have been discussed.

[Key words: Mangrove, woody litter, *Rhizophora mucronata*, filamentous fungi, diversity, co-occurrence, monsoon, summer]

Introduction

Two important biological processes operating in the mangroves are the accumulation of energy in the form of litter products and its decomposition to facilitate transfer of energy to the higher trophic levels[1]. However, the proportion of woody litter entering the marine decomposer pathway is not clearly understood[2]. The deltaic east coast and backwater-estuarine west coast mangrove forests of peninsular India (6,700 km^2) offer ample opportunity for mycological investigations. Mangrove fungi are the intermediaries of energy flow between plant detritus and marine fauna. Mangrove woody litter has been considered as the scond important host for fungi after marine driftwood[3]. Besides typical mangrove or marine fungi, many freshwater, aero-aquatic and terrestrial fungi have been reported in mangrove habitats[4-7]. A few studies have been carried out to assess the fungal flora of specific mangrove woody litter[3,5-7]. Available literature on quantitative studies on fungal diversity and richness of the west coast of India are inadequate[5,6,8-10]. Therefore, the main aim of the current study is to understand the pattern of colonization, richness, diversity and co-occurrence of filamentous fungi on naturally deposited and deliberately introduced woody litter of *Rhizophora mucronata* Lamk. (Rhizophoraceae) in monsoon and summer seasons in Nethravathi, a backwater-estuarine mangrove of India. This study also examines the overall occurrence of fungi with three species co-occurrence on two types of woody litter in view of understanding the complexities of co-occurrence of mangrove fungi.

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Materials and Methods

Study area

Nethravathi mangrove located at the south west coast of India (12º50′00″ N, 74º50′00″ E) has been chosen for the study. Most prominent mangrove plant species are *Rhizophora mucronata* Lamk. (Rhizophoraceae) and *Avicennia officinalis* L. (Avicenniaceae). This mangrove has humid climate with wet period between June and November (southwest monsoon) and dry spell between December and May. The study area mainly consists of large groves of *R. mucronata* and the floor consists of decomposing woody detritus trapped amidst the stilt roots.

Substrate

Naturally decomposing *R. mucronata* woody litter trapped amidst roots of about 0.25 km^2 area were randomly sampled three months after initiation of monsoon (September, 2000) and summer (March, 2001). They were pooled and brought to the laboratory in sterile polythene bags for incubation and fungal assessment. One hundred wood samples of uniform diameter (1 cm) were selected and each wood was trimmed into 15 cm length for incubation. To introduce wood deliberately, easily breakable dried branches and twigs of *R. mucronata* above the high tide level were separated during February 2000. Selected wood were trimmed (diameter 1 cm; length 15 cm), air-dried and preserved in polythene bags until use. Five wood pieces were filled in each nylon mesh bags (25 × 10 cm; mesh size, 1 mm) and 25 bags were randomly introduced in about 0.25 km^2 area on tying to stilt roots at midtide level on the onset of monsoon up to three months (June-August, 2000) and in summer for three months (December, 2000-February, 2001).

Incubation and screening

Randomly sampled naturally deposited and deliberately introduced woody litter were screened for the presence of fungi within one week of sampling and re-incubated (25±2°C) individually on sterile sand bath wetted with dilute seawater (17 ‰) in sterile airtight polythene bags. Each wood was screened using stereomicroscope once in fortnight up to six months to detect the fungal structures. Sand bath was re-wetted with sterile distilled water after every observation. The fungi found on wood were identified based on taxonomic keys and descriptions[11-13].

Data analyses

Percent colonization frequency (CF) of each fungus on two wood types in monsoon and summer was estimated as:

$$\text{CF (\%)} = \frac{\text{Number of wood colonizeed by a specific fungus}}{\text{Total number of wood supporting sporulating fungi}} \times 100$$

The mean percent frequency (MF) of occurrence of fungi on two wood types in monsoon and summer was estimated as:

$$\text{MF (\%)} = \frac{\text{Total percent frequency of occurrence of all or core - group fungi}}{\text{Total number of fungi}}$$

Paired t-test was employed to ascertain the difference in fungal colonization between wood types (natural and introduced) and seasons (monsoon and summer)[14].

Diversity of fungi on naturally deposited and deliberately introduced wood in monsoon and summer was assessed employing Simpson (D') and Shannon (H') diversity indices and evenness (J')[15]:

$$D' = [I] \div [\sum (p_i)^2],$$

$$H' = -\sum (p_i \ln p_i),$$

$$J' = [H'] \div [H'_{max}]$$

where, p_i is the frequency of occurrence of species i contributes to the total frequency of occurrence; H'_{max} is the maximum value of diversity for the number of species present[16].

To compare the species richness among the unequal number of isolates of fungi on naturally deposited or deliberately introduced wood and during monsoon or summer, expected number of species [$E(s)$] was calculated based on rarefaction index[17]. Expected number of species in a random isolates obtained from a total of N isolations was calculated:

$$E(s) = \sum_{i=1}^{s} \left\{ 1 - \left[\binom{N - n_i}{n} \Big/ \binom{N}{n} \right] \right\}$$

where, n_i is the number of isolations of ith species

Results

Colonization

One hundred naturally deposited *R. mucronata* wood samples each collected during monsoon and summer seasons were assessed for fungal colonization. Among 125 wood samples each introduced during monsoon and summer, only 90 (monsoon) and 95 (summer) samples were available for fungal assessment. Figure 1 shows the number of fungi, which colonized the two wood types in monsoon and summer seasons. Naturally deposited wood sampled in summer colonized by maximum number of fungi (1-9 per wood), while monsoon season showed the maximum (1-8 per wood) in deliberately introduced wood. On naturally deposited wood, the co-occurrence of two species per wood was highest in monsoon (40 %) as well as summer (29 %) (Fig. 1), while in deliberately introduced wood three species co-occurred in monsoon (22 %) and two species co-occurred in summer (38 %). Percent frequency of occurrence of fungi on wood samples in monsoon and summer is shown in Table 1. Out of a total of 66 fungi belonging to 47 genera recovered, naturally deposited wood showed higher number of fungi than deliberately introduced wood (31-48 vs. 17-24), so also the wood sampled in monsoon than summer (31-48 vs. 17-24). Out of 40 fungi belonging to 27 genera on wood showing co-occurrence of three fungi, naturally deposited wood showed higher number of fungi than deliberately introduced wood (31 vs. 23), so also the wood sampled in monsoon than summer (19-21 vs. 14-18). Percent frequency of occurrence of fungi was not significantly different between wood types (P = 0.3-0.4) as well as seasons (P = 0.3-0.5) in overall occurrence and three species co-occurrence.

Aniptodera indica, Cirrenalia pygmea, Cirrenalia tropicalis, Halosarpheia cincinnatula, Lulworthia grandispora, Savoryella lignicola, Tirispora sp. and *Zalerion maritimum* were common to both wood types and seasons. *Passeriniella mangrovei, S. lignicola, Tricladium linderi* and *Z. maritimum* were monsoon dominant, while *C. pymea, Lignincola laevis, L. grandispora, Savoryella paucispora, Tirispora* sp., *Zelerion varium*, Ascomycete sp. 2 and Ascomycete sp. 3 were summer-dominant on naturally deposited wood. On deliberately introduced wood, *C. tropicalis, H. cincinnatula, Tirispora* sp. and *Verruculina enalia* were monsoon-dominant, while *Aigialus mangrovei, H. cincinnatula, L. grandispora,*

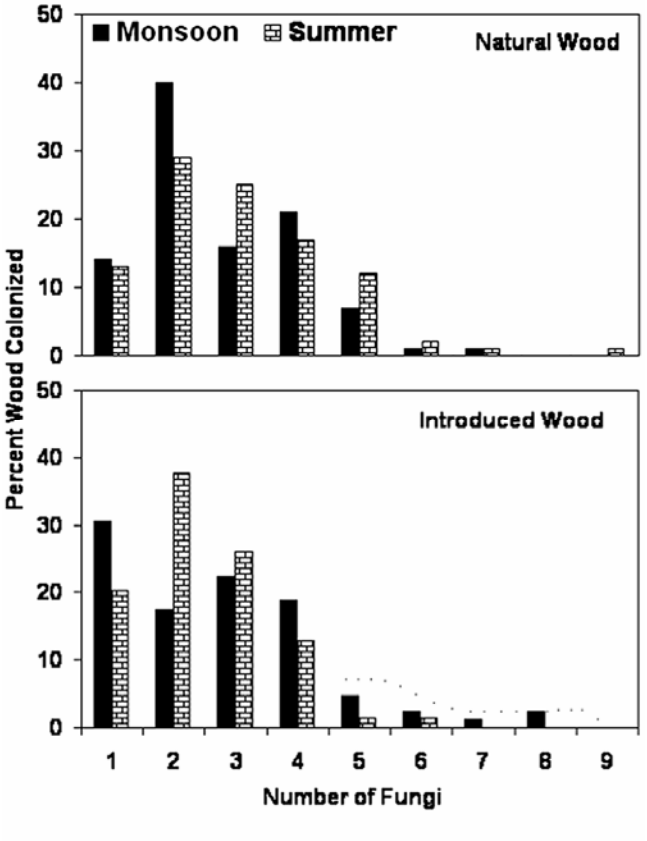

Fig. 1—Percent naturally deposited and deliberately introduced wood colonized by fungi during monsoon (September, 2000) and summer (March, 2001) season

P. mangrovei, C. pygmea and *Clavatospora bulbosa* were summer-dominant. On wood showing co-occurrence of three species, *C. pygmea, C. tropicals, L. grandispora, S. lignicola* and *Z. maritimum* were common to both wood types as well as seasons. *Lulworthia grandispora* and *T. linderi* and *Z. maritimum* were monsoon-dominant, while *C. pygmea* and *Z. varium* were summer-dominant on naturally deposited wood. On deliberately introduced wood, *Cirrenalia tropicalis* was monsoon-dominant, while *A. mangrovei, L. grandispora, P. mangrovei, Tirispora* sp., *C. pygmea* and *C. bulbosa* were summer-dominant.

Core-group fungi

Those fungi, which were ≥10 % frequent on wood, have been considered as 'core-group' fungi. Among 17 core-group fungi, eight and three species confined to naturally deposited and deliberately introduced wood respectively and five were common to both wood types (Table 1). Out of 11 core-group fungi on wood showing co-occurrence of three fungi, four and

Table 1—Colonization frequency (%) of fungi on woody litter of *Rhizophora mucronata* Lamk.
(values in parenthesis are co-occurrence of three species per wood) (core-group fungi indicated in boldface, ≥10 %)

Fungus	Naturally deposited wood		Deliberately introduced wood	
	Monsoon	Summer	Monsoon	Summer
Ascomycetes				
Aigialus mangrovei Borse		4	**18** (9)	**36** (**30**)
Aniptodera indica K. Ananda & K.R. Sridhar	2 (2)	9 (4)	5 (2)	5
Aniptodera mangrovei K.D. Hyde	1	(3)	1	
Antennospora quadricornuta (Cribb & J.W. Cribb) T.W. Johnson	1			
Caryosporella rhizosporae Kohlm.	2			
Ceriosporopsis sundica J. Koch & E.B.G. Jones	1			
Coronopapilla mangrovei (K.D. Hyde) Kohlm. & Volkm.-Kohlm.	1			
Durella sp.	6 (6)			
Halorosellinia oceanica Whalley, E.B.G. Jones, K.D. Hyde & Laessøe	1			
Halosarpheia cincinnatula Shearer & J.L. Crane	2	4 (1)	**18** (4)	**18** (**15**)
Halosarpheia ratnagiriensis S.D. Patil & Borse		5 (3)		
Hypoxylon sp.		1		
Kallichroma tethys (Kohlm. & E. Kohlm.) Kohlm. & Volkm.-Kohlm.	1	1		
Leptosphaeria australiensis (Cribb & J.W. Cribb) G.C. Hughes			2 (4)	
Leptosphaeria salvinii Catt.	1			
Lignincola laevis Höhnk	**12**	**43** (**11**)	4 (4)	
Lophiostoma mangrovei Kohlm. & Vittal	1			
Lulworthia grandispora Meyers	**40** (**21**)	**50** (**17**)	**26** (7)	**27** (**11**)
Lulworthia sp.		8 (1)		9 (2)
Passeriniella mangrovei G.L. Maria & K.R. Sridhar	**20** (2)		**14** (4)	**21** (**10**)
Savoryella lignicola E.B.G. Jones & R.A. Eaton	**18** (4)	2 (1)	5 (2)	3 (4)
Savoryella longispora E.B.G. Jones & K.D. Hyde		1		
Savoryella paucispora (Cribb & J.W. Cribb) J. Koch	2	**15** (5)	6 (2)	
Tirispora mandoviana Sarma & K.D. Hyde				2 (2)
***Tirispora* sp.**	9	**15** (7)	**23** (7)	**15** (**11**)
Verruculina enalia (Kohlm.) Kohlm. & Volkm.-Kohlm.	4 (2)		**16** (9)	8
Zopfiella sp.	5			
Ascomycete sp. 1	(2)		8 (5)	
Ascomycete sp. 2		**17** (7)		
Ascomycete sp. 3		**10** (3)	4	
Basidiomycete				
Halocyphina villosa Kohlm. & E. Kohlm.		3 (3)		
Mitosporic fungi				
Acremonium sp.	1	2		
Alternaria sp.	2 (2)			
Anguillospora marina Nakagiri & Tubaki	1			
Arthrobotrys oligospora Fresen.	1			
Aspergillus sp.			4	
Brachysporiella gayana Batista	3 (2)			
Cirrenalia pygmea Kohlm.	4 (2)	**48** (**12**)	**18** (7)	**35** (**10**)
Cirrenalia macrocephala (Kohlm.) Meyers & R.T. Moore	2	1		
Cirrenalia tropicalis Kohlm.	**11** (2)	**10** (4)	**55** (**20**)	**36** (**15**)
Clavatospora bulbosa (Anast.) Nakagiri & Tubaki			8 (7)	**15** (4)
Cumulospora marina Nakagiri & Tubaki			1	
Delortia palmicola Pat.	1 (2)			

….. *Contd.*

Table 1—Colonization frequency (%) of fungi on woody litter of *Rhizophora mucronata* Lamk.
(values in parenthesis are co-occurrence of three species per wood) (core-group fungi indicated in boldface, ≥10 %) ….. *Contd*.

Fungus	Naturally deposited wood		Deliberately introduced wood	
	Monsoon	Summer	Monsoon	Summer
Endophragmia alternata Tubaki & Saito	7 (4)		4	
Helicomyces roseus Link.	5 (4)			
Hansfordia sp.				2
Menispora ciliata Corda	2 (2)			
Monodictys pelagica (T.W. Johnson) E.B.G. Jones	1 (2)			
Monodictys putredinis (Wallr.) S. Hughes	2		1	
Penicillium sp. 1	2	1	4	
Penicillium sp. 2	2			
Phaeoisaria clematidis (Fuckel) Hughes	2			
Phoma sp.	4 (2)		1	
Sporoschima sp.	4		8 (2)	
Strachylidium bicolor Link.	4 (2)			
Taeniolella stricta (Corda) S. Hughes	1			
Tetracrium sp.	1			
Trichocladium achrasporum (Meyers & R.T. Moore) Dixon	2		5	5 (2)
Trichocladium linderi J.L. Crane & Shearer	**34** (**21**)	2 (1)	1	
Trichocladium melhae E.B.G. Jones, Abdel-Wahab & Vrijmoed			1	
Trichoderma sp.				2
Verticillium sp.	3 (2)			
Zalerion maritimum (Linder) Anast.	**26** (**13**)	7 (5)	4 (4)	9 (2)
Zalerion varium Anast.	5	**39** (**12**)	1	(4)
Anamorphic sp. 1	9		7 (2)	
Anamorphic sp. 2			5 (4)	
Total teleomorphs	20 (7)	16 (13)	14 (12)	10 (8)
Total anamorphs	28 (14)	8 (5)	17 (7)	7 (6)
Total fungi	48 (21)	24 (18)	31 (19)	17 (14)
Total core-group fungi	7 (3)	9 (4)	8 (1)	8 (7)

five fungi were confined to naturally deposited and deliberately introduced wood and two were common to both wood types. Mean percent frequency of occurrence of total fungi and core-group fungi is shown in Fig. 2. The mean percent frequency of total fungi (12.3-13.9) as well as core-group fungi (10.3-11.9) was highest in summer on both wood types, so also on wood showing co-occurrence of three fungi (total fungi, 5.4-13.9; core-group fungi, 2.9-11.9).

Diversity and richness

Diversity and species richness of fungi on two wood types have been given in Table 2. Simpson index was higher in monsoon than summer irrespective of wood types (0.921-0.0938 vs. 0.897-0.0905). This was also the case with Shannon index (4.216-4.598 vs. 3.634-3.678). In wood showing co-occurrence of three species, both Simpson (0.911 vs. 0.884) and Shannon (3.803 vs. 3.702) indices were high in summer, while on deliberately introduced wood, both indices were high in monsoon (0.920 and 3.991 vs. 0.899 and 3.486). Figure 3 shows the rarefaction curves of expected number of species against fungal isolates on wood types as well as seasons. The number of expected species in a random sample of 70 isolates was highest on naturally deposited wood sampled in monsoon than summer (22-27 vs. 15-17), so also on wood showing co-occurrence of three species (19-20 vs. 14-18).

Discussion

Colonization

Examination of woody litter in mangroves enriches the basic knowledge on fungal community and diversity as woody liter is persistent for a long duration. Fungal colonization on wood in mangrove

ecosystem is governed by many factors (e.g. chemical composition, presence/absence of bark, duration of immersion, fungal competition, water chemistry)[5,6,18-21]. Besides the mangrove characteristics, human interferences (e.g. deforestation, pollution) influence the fungal community and in turn their function in mangrove ecosystem. Randomly sampled woody litter of *R. mucronata* from east coast of India consists of 63 species[22], while only 50 species were found in a west coast mangrove[5]. The current study revealed the occurrence of a highest of 66 fungi on naturally deposited and deliberately introduced *R. mucronata* wood. Interestingly, mangrove fungi which were dominant in Gujarat and Maharashtra coasts (*Aigialus grandis, A. parvus, Dactylella haliotrspha, Julella avicenniae, Halocyphina villosa, Kallichroma tethys, L. grandispora, Massarina velatospora, periconia prolifica* and *V. enalia*)[8-10] were not dominant in present

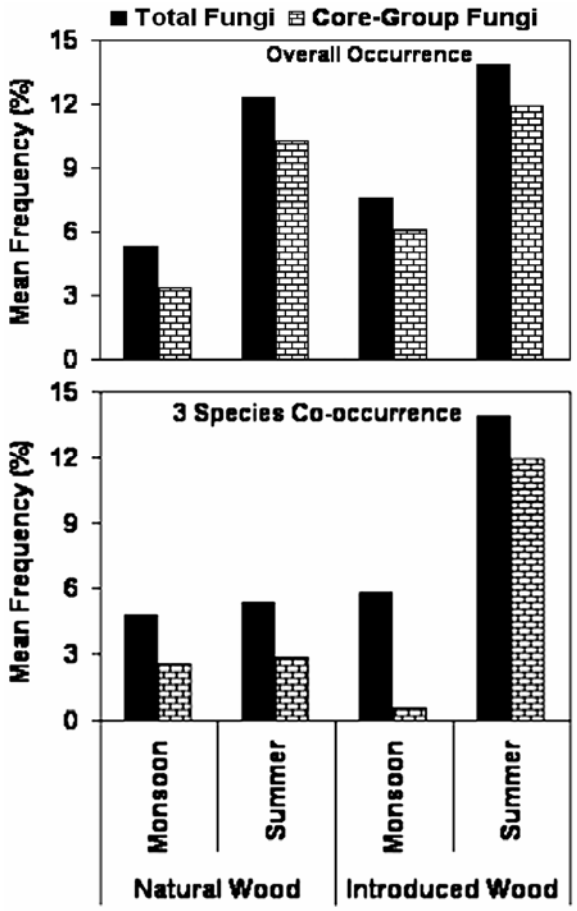

Fig. 2—Mean percent frequency of occurrence of total fungi and core-group fungi on naturally deposited wood and deliberately introduced wood during monsoon (September, 2000) and summer (March, 2001) season

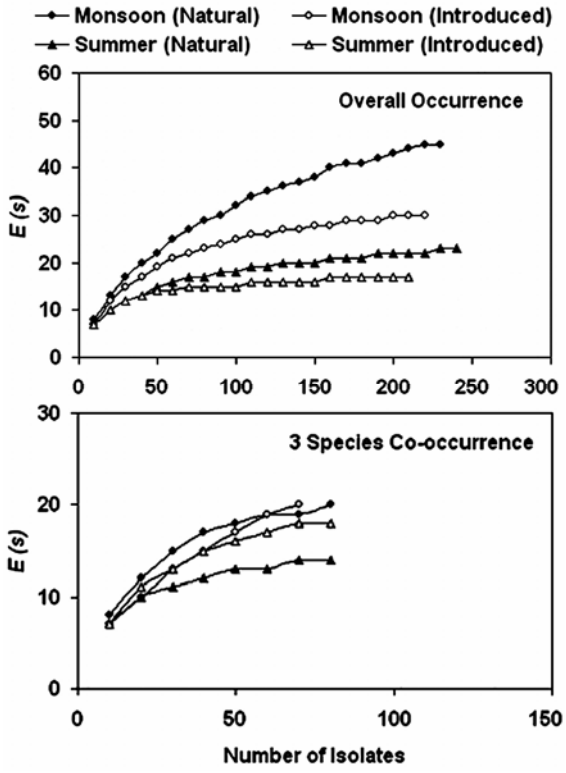

Fig. 3—Rarefaction curves of expected number of species [$E_{(s)}$] of overall occurrence and three species co-occurrence on naturally deposited and deliberately introduced wood in monsoon (September, 2000) and summer (March, 2001) seasons

Table 2—Diversity, evenness and species richness of fungi on woody litter of *Rhizophora mucronata* Lamk.
(values in parenthesis are co-occurrence of three species per wood)

Season	Diversity		Evenness		Species richness Expected $E_{(s,70)}$*
	Simpson	Shannon	Simpson	Shannon	
Naturally deposited wood					
Monsoon	0.938 (0.884)	4.598 (3.702)	0.954 (0.928)	0.823 (0.843)	27 (19)
Summer	0.897 (0.911)	3.678 (3.803)	0.933 (0.961)	0.802 (0.895)	17 (14)
Deliberately introduced wood					
Monsoon	0.921 (0.920)	4.216 (3.991)	0.951 (0.969)	0.843 (0.923)	22 (20)
Summer	0.905 (0.899)	3.634 (3.486)	0.961 (0.968)	0.889 (0.916)	15 (18)

*$E_{(s,70)}$, Expected number of species out of 70 random isolates

study except for *L. grandispora* and *V. enalia*. Similar feature was reflected in our earlier observation although woody litter of five plant species were screened during monsoon (October, 1999) and summer (March, 2000) seasons in a southwest mangrove[5]. This clearly indicates the shift in fungal dominance in mangroves between southwest and midwest mangroves of India. Core-group fungi (*A. mangrovei, C. pygmea, C. tropicalis, L. grandispora, Tirispora* and *V. enalia*) found on deliberately introduced *R. mucronata* wood in Udyavara mangrove in India[6] were also dominant in the current study. It is known that multispecies dominance was common at intermediate stage of wood decomposition[6,23]. As deliberately introduced wood showed the highest number of fungi within 2-3 months of submergence, *Rhizophora* wood may attain intermediate stage of decomposition within that duration.

Jones & Hyde[24] indicated the dominance of anamorphic fungi in the mangrove environment and ascomycetes in fully marine conditions. In naturally deposited and deliberately introduced wood in this study, anamorphic fungi dominated in monsoon than in summer, reflecting the influence of salinity on fungal population of woody debris. Although *A. mangrovei, C. pygmea, C. tropicalis, H. cincinnatula, L. grandispora, P. mangrovei, V. enalia* and *Z. maritimum* are typical marine or mangrove fungi, they belonged to core-group on deliberately introduced wood in monsoon season supporting the earlier studies in the west coast mangroves[5,6]. This clearly indicates that these fungi have the ability to colonize woody litter even under low salinity conditions. Several typical terrestrial anamorphic fungi (e.g. *Alternaria, Arthrobotrys, Aspergillus, Penicillium, Phoma*, *Tetracrium*) were found on wood particularly in monsoon season, but none of them were core-group. Terrestrial fungi were less common in both seasons on deliberately introduced wood. However, their role in mangrove habitat during long-term monsoon season (June-November) of the southwest coast of India cannot be ignored[5]. Wood showing co-occurrence of three species reflected more or less similar pattern like overall occurrence of fungi on *Rhizophora* wood. Approximately 50 % of fungal colonization, core-group fungi (except for monsoon introduced wood) and expected number of species were found in wood showing co-occurrence of three species. Core-group fungi in wood showing co-occurrence of three species did not drastically differ than overall fungal occurrence. Interestingly, terrestrial fungi were not seen on wood showing co-occurrence of three species in summer probably due to high salinity.

Tan *et al*.[25] demonstrated the inhibitory effect of *V. enalia* and *L. laevis* against co-cultured fungi on mangrove wood. Similarly, *Lulworthia* sp. has also been considered as an 'aggressive' fungus by Miller *et al*.[26]. The current study did not reflect such inhibition or aggressive feature of these fungi. Core-group fungus, *L. grandispora* was the most dominant species (26-50 %), followed by *L. laevis* (12-43 %) and *V. enalia* (16 %) on wood and coexisted with several fungi. This pattern also matches with earlier study on fungi associated mixed wood in Nethravathi mangrove[4]. Such fungal coexistence may be dependent on the kind of substrata as well as salinity of water in different seasons. It is possible that some of these core-group fungi dominate through initial colonization and with their enzymes transform the wood preferable to other fungi and promotes fungal succession. Colonization frequency of *L. grandispora* and *V. enalia* was consistent throughout in a seasonal survey of wood in Udyavara mangrove, India[6].

Diversity

Simpson and Shannon indices was highest in monsoon than summer irrespective of the wood types in our study indicates the dominance of both common and rare fungi on *Rhizophora* wood in Nethravathi mangrove during monsoon season. Similarly, naturally deposited and deliberately introduced wood of *R. mucronata* of Udyavara mangrove in India revealed the highest Simpson and Shannon diversity during monsoon season[5,6] reconfirms the results of the current study. In naturally deposited wood showing co-occurrence of three species, summer samples showed higher diversity than monsoon samples. Wood showing three species co-occurrence may facilitate understanding the diversity, fungal interactions and decomposition more precisely in the field or in laboratory microcosm studies.

Conclusion

In the southwest mangrove of Nethravathi, 66 species of fungi were recovered on screening naturally deposited and deliberately introduced woody litter of *Rhizophora mucronata*. *Aigialus mangrovei, Cirrenalia pygmea, Lignincola laevis, Lulworthia grandispora, Passeriniella mangrovei, Trichocladium linderi, Tirispora* sp., *Zalerion maritimum* and *Z. varium* were highly dominant (≥20 %). Fungal diversity as well as richness was highest in monsoon

than summer season. The core-group (≥10 %) fungal community structure on woody debris clearly differs between the mangroves of midwest and southwest coast of India. Typical mangrove or marine fungi (*A. mangrovei, C. pygmea, C. tropicalis, Halosarpheia cincinnatula, L. grandispora, P. mangrovei, Verruculina enalia* and *Z. maritimum*) belonged to core-group fungi on deliberately introduced wood in monsoon reveals their ability to colonize woody litter under low salinity. Terrestrial anamorphic fungi (*Alternaria, Arthrobotrys, Aspergillus, Penicillium, Phoma*, *Tetracrium*) were found in monsoon season, but none of them were dominant. Although *L. laevis, L. grandispora* and *V. enalia* were referred to as aggressive species inhibiting colonization of other fungi on wood, they were dominant in Nethravathi mangrove and coexisted with several fungi. Future investigations need to address the importance of core-group fungi in mangrove wood decomposition, pattern of co-occurrence and competition. Model laboratory microcosm studies on wood colonized by three fungi may reveal precise pattern of fungal diversity, role in interaction and decomposition in mangrove habitats, which may pave the way to understand the complexity of co-occurrence of more than three species.

Acknowledgement

Authors are grateful to Mangalore University for permission to carry out this study at the Department of Biosciences. One of the authors (GLM), thanks the Principal, St. Agnes College, Mangalore for approval of study leave under University Grants Commission's Faculty Improvement Programme, New Delhi. We appreciate referees comments, which helped to improve the manuscript substantially.

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