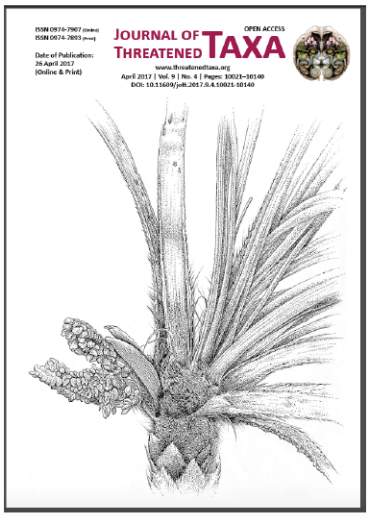

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Short Communication

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Host specificity of some wood-decaying fungi in moist deciduous forests of Kerala, India

A. Muhammed Iqbal [1], Kattany Vidyasagaran [2] & Narayan Ganesh [3]

[1,2] College of Forestry Kerala Agricultural University, Vellanikkara Thrissur, Kerala 680656, India
[3] Sree Krishna College, Calicut University, Guruvayur, Thrissur, Kerala 680602, India
[1] iqbalptpm@gmail.com (corresponding author), [2] vidyasagaran.k@kau.in, [3] pnganeshskc@rediffmail.com

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Abstract: The low diversity tropical forest is dominated by host specialized wood decaying fungi (Hymenochaetales, Polyporales) with narrow host range. To understand whether or not wood decaying fungi in a highly diverse tropical moist deciduous forest have any kind of host specialization, sporophores of 22 species of wood decaying fungi were recorded on 17 tree species in three seasons viz., pre monsoon, monsoon and post monsoon from the moist deciduous forests of Peechi-Vazhani Wildlife Sanctuary, Kerala, India. Only two of the 22 species with three or more records showed signs of host specialization. In the case of other fungi, the number of host tree species increased with increasing number of occupied or colonized logs. The findings support the assumption that most of the wood decaying fungi have broad host ranges in highly diverse forest types in the tropics.

Keywords: Host specialization, Hymenochaetales, Polyporales, Peechi-Vazhani Wildlife Sanctuary, sporophores.

In theory, the greater variety of different wood resources found in species rich forests should provide a greater number of ecological niches for fungal species. In tropical forests tree diversity are known to be high, and it has been suggested that this diversity may in turn support high fungal diversity (Lodge & Cantrell 1995). The relationship between plant diversity and fungal diversity, however, may not be linear. As host diversity increases, opportunities for specialization may diminish because the probability of successful colonization decreases as hosts become increasingly rare (Ferrer & Gilbert 2003). May (1991) has put forward that more-diverse tropical forests may support less host specificity than less-diverse forests due to the low density of individual hosts and this creates limitation on colonization of suitable substrates by host-specific fungal populations. A study on the assemblage of wood decaying fungi in a less diverse tropical forest (Caribbean mangrove forest) showed the dominance of host-specialized species and out of the total fungal species collected 88% were host specific, each with a strong preference for a different mangrove host species (Gilbert & Sousa 2002). Studies undertaken in different regions of the Western Ghats were unable to arrive at a scientific decision on host specialization of wood decaying fungi due to the lack of statistical interpretation of results (Mohanan 1994; Imrose et al. 2005; Vishal et al. 2012; Ranadive et al. 2012). This underlines the need for application of statistical tools on the interpretation of field observations of wood decaying in different seasons. The aim of this study is to explore the host ranges and host specificity of wood decaying fungi in a tropical moist deciduous forest (Iqbal et al. 2016a,b, 2017) through a survey based on observations of sporocarps (fruiting bodies) across different seasons.

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Materials and Methods

Study Area

Peechi-Vazhani Wildlife Sanctuary (PVWS) lies within the geographical extremes of 10°26'–10°40'N and 76°15'–76°28'E, covering an area of 125km² in Thrissur District, Kerala (Fig. 1). Annual average precipitation in the sanctuary is 3000mm and is situated at an altitude of 45–900 m. As per Champion & Seth (1986), the forest type that the PVWS consists of, nearly 80% is moist deciduous forest, 15% is evergreen and semi-evergreen and the remaining 5% is under teak and soft wood plantations.

Survey, Collection and Identification of wood decaying fungi

The survey was conducted during January 2012–October 2014 in PVWS, Kerala for collection of wood decaying fungi. Three permanent fixed size sample plots of 100m×100m were established in three different locations, viz., Vellani, Mannamangalam and Olakkara sections of the sanctuary as per the methodology of earlier fungal studies (Yamashita et al. 2010; Mohanan 2011). Also subplots of 10x10 m were fixed in each permanent plot for detailed analysis. The sample plots were visited during pre-monsoon (January–May), monsoon (June–September) and post monsoon (October–December) periods for the documentation of wood decaying fungi. A total area of 30,000m² was surveyed during each season. Additional collections of wood decaying fungi were also made along transects other than the permanent plots (off plots) in the study area. The polypore specimens collected from the study area were kept in paper bags and brought to the lab. The specimens were properly air dried or oven dried and stored in polythene zip-cover under less humid condition. The identification key provided by Bakshi (1971) and Leelavathy & Ganesh (2000) were used for the identification of polypores. The micro-morphological characteristics of the polypores were drawn with the help of camera lucida. Some of the specimens were compared with those in the Herbaria at Kerala Forest Research Institute, Peechi. All the specimens collected during the study period were catalogued and kept in the refrigerator in the Department of Forest Management and Utilization, College of Forestry at Kerala Agricultural University. After proper nomenclature and identification, the current names of the identified polypores were accessed from the website: www.mycobank.org (accessed on 15 January 2015). The host preference of wood decaying fungi have been analysed by the presence or absence of polypore species on each substrate and all sporophores of the same species on a log were treated as a single occurrence, irrespective of the number of sporophores (Lindblad 2000). Also

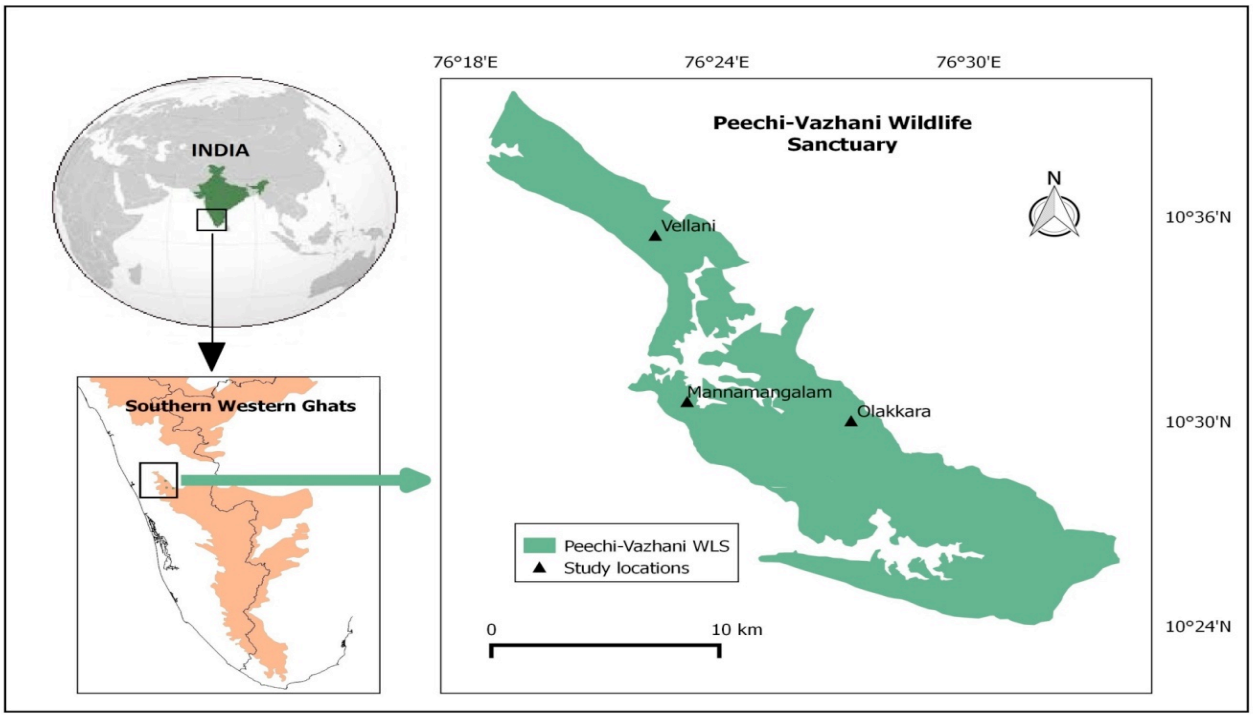

Figure 1. Location map of the study area in Peechi-Vazhani Wildlife Sanctuary

if there were several clusters, they were treated as a single occurrence. The number of fungal individuals was not estimated. Fungal species having more than 50% occurrence on a particular host have also been considered for detailed analysis. Linear regression was done using the statistical software PAST3.04. In order to understand the relationship between the number of wood decaying fungi and the number of host tree species, a linear regression of natural logarithm (Ln) of number of host tree species against Ln of number of occurrence of fungi was analyzed. Data was transformed into a natural logarithm so as to make the distributions close to normal and to avoid disproportionate influence of any abundant species. The location map of PVWS was prepared using Q-GIS version 2.0.

Results and Discussion

A total of 22 fungal species on 17 host tree species have been recorded and out of this 12 species showed a possible preference for a tree host (Table 1; Images 1–22).

The total number of occurrences of each fungal species on host species were listed (Table 2). Out of the 22 species, *C. sanguinaria* and *C. telfairii* were found only once and the host specificity of these two species must be considered as unknown.

The plot of a linear regression of natural logarithm (Ln) of the number of host tree species against Ln of the number of occurrence of fungi (Fig. 2) showed that the overall number of host tree species increased linearly with the number of occurrence of fungi. The relationship was significant (R^2 = 0.592, P < 0.0001). In the graph, three species, viz., *Polyporus amygdalinus*, *Fuscoporia senex* and *Fulvifomes nilgheriensis*, were found to deviate from the regression line.

Here, a total of 12 fungi species showed a possible preference for a tree host as defined by having more than 50% of their occurrences on a single tree species. Among these *Polyporus amygdalinus* was observed in single host in two seasons, a number of occurrences that do not allow for the conclusion about the host specificity. Thus only two species out of 20 fungi species (i.e., 10%) with three or more occurrences can be considered as host specialists. Host specialists *Fuscoporia senex* and *Fulvifomes nilgheriensis* preferred *Xylia xylocarpa* (Mimosoideae). The reason could be that coarse woody debris of *Xylia xylocarpa* was likely to be abundant on the forest floors and has high population densities in the sanctuary (Jayanarayanan 2001). Moreover, *Xylia xylocarpa* were moderately heavy to heavy (Anoop 2005) and the specific gravity from 0.61– 0.74 respectively (Bhat et al. 1990). The tree species that have a specific gravity more than 0.80 showed some kind of resistance towards decaying fungi (Takahashi & Kishima 1973). The specialist fungi species sampled in the moist deciduous forests are specialists for tree species of that forest type, at the same time these species were described in the literature as being from evergreen, semi-evergreen and plantations (Yamashita et al. 2010; Leelavathy & Ganesh 2000). Within the local community context, there is strong support for specialization for

Table 1. Tree host species with number of polypore fungal species and number of fungi with preference for this host tree (>50% of occurrences on this host tree)

	Host tree species	No. of polypore fungi species	Preference
1	*Albizia odoratissima* (L.f.) Benth.	2	1
2	*Bombax ceiba* L.	1	0
3	*Bridelia retusa* (L.) A.Juss.	1	0
4	*Getonia floribunda* Roxb.	1	0
5	*Cassia fistula* L.	1	0
6	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	1	0
7	*Dalbergia latifolia* Roxb.	1	0
8	*Dillenia pentagyna* Roxb.	6	1
9	*Grewia tiliifolia* Vahl	8	1
10	*Lannea coromandelica* (Houtt.) Merr.	1	0
11	*Macaranga peltata* (Roxb.) Müll. Arg.	2	0
12	*Melia dubia* Cav.	1	0
13	*Terminalia bellirica* (Gaertn.) Roxb.	1	0
14	*Terminalia elliptica* Willd.	7	1
15	*Terminalia paniculata* Roth	13	4
16	*Trewia nudiflora* L.	5	1
17	*Xylia xylocarpa* (Roxb.) Taub.	10	3

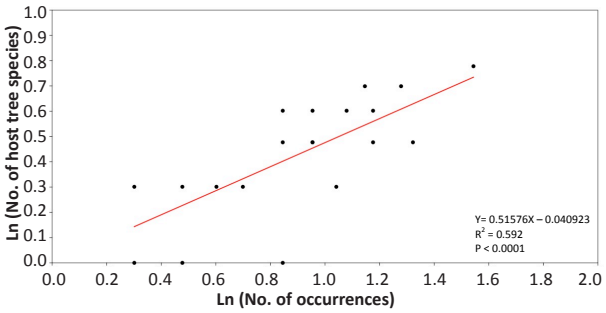

Figure 2. Increase in number of polypore fungi in moist deciduous forests of Peechi-Vazhani Wildlife Sanctuary with increase in number of host trees species.

Table 2. Fungal species with number of occurrences and number of host tree species

Image No.	Fungal species	No. of host tree species	No. of occurrence of polypore fungi
1	*Coriolopsis sanguinaria* (Klotzsch) Teng	1	1
2	*Coriolopsis telfairii* (Klotzsch) Ryvarden	1	1
3	*Daedalea flavida* Lév.	6	35
4	*Earliella scabrosa* (Pers.) Gilb. & Ryvarden	4	7
5	*Fomitopsis feei* (Fr.) Kreisel	4	15
6	*Fulvifomes nilgheriensis* (Mont.) Bondartseva & S. Herrera	1	7
7	*Phellinus gilvus* (Schwein.) Pat.	3	15
8	*Fuscoporia senex* (Nees & Mont.) Imazeki	1	3
9	*Ganoderma lucidum* (Curtis.) P. Karst.	2	3
10	*Hexagonia tenuis* (Hook.) Fr.	3	9
11	*Melanoporia nigra* (Berk.) Murrill	2	5
12	*Microporellus obovatus* (Jungh.) Ryvarden	3	9
13	*Microporus affinis* (Blume & T. Nees) Kuntze.	3	21
14	*Microporus xanthopus* (Fr.) Kuntze.	5	19
15	*Nigroporus vinosus* (Berk.) Murrill	3	7
16	*Tropicoporus dependens* (Murill) L.W. Zhou, Y.C. Dai & Viasák	2	11
17	*Polyporus arcularius* (Batsch) Fr.	2	2
18	*Polyporus grammocephalus* Berk.	5	14
19	*Polyporus amygdalinus* Berk. & Ravenel	1	2
20	*Trametes cingulata* Berk.	2	4
21	*Trametes cotonea* (Pat.) Ryvarden	4	9
22	*Trametes hirsuta* (Wulfen) Pilát	4	12

trees of that particular forest type and a strong pattern of host preference was not seen in the high-diversity tropical forests but was very strong in the low-diversity temperate forests (Gilbert & Sousa 2002). Remarkably similar patterns of host specialization in tropical forests as a function of local host density and fungi have been observed (Lindblad 2000) and host specificity of *Phellinus* species belonging to Hymenochaetaceae was also observed from the tropical forests of Brazil (Drechsler-santos et al. 2010). In central India, the maximum number of fungi were recorded on high diversity sal trees (71) followed by teak (33) and saja (22) (Verma et al. 2008). The present study carried out during different seasons could collect both annual and perennial fungal species and used the overall relative abundances for testing the host specificity. The distribution and ecological impacts of plant-associated fungi is determined in a large part by their degree of specificity for that particular host species or environmental conditions (Gilbert et al. 2008). The results helped to distinguish specialized and non-specialized fungi with their functional role in moist deciduous forests of the Western Ghats. A wider study with several forest types is needed to confirm that lack of host-specificity is the major ecological strategy for wood decaying fungi in the tropics.

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Image 1. *Coriolopsis sanguinaria*

Image 2. *Coriolopsis telfarii*

Image 3. *Daedalea flavida*

Image 4. *Earliella sacbrosa*

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Image 19. *Trametes cingulata*

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Image 21. *Trametes hirsuta*

Image 22. *Tropicoporus dependens*

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