

# DIVERSITY OF LITTER DEGRADING MICROFUNGI FROM THE FORESTS OF WESTERN GHATS, INDIA

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## ABSTRACT

The forests of Western Ghats, are a treasure house for new and interesting fungi. Tropical forests produce a large amount of litter which is a favoured source of nutrient for fungal colonization. Fungi are the major degraders of plant litter which is basically composed of cellulose and lignin. Plant litter is divided into leaf litter, branch litter, bark litter, fruit litter, flower litter and seed litter. Litter fungi play a major role in carbon and nitrogen cycling in forest ecosystem. In an attempt to document the biodiversity of litter fungi of the region, litter samples were collected from different places in Goa and some parts of Karnataka, Kerala, Tamilnadu and Maharashtra. The fungi were isolated and cultured by direct isolation, moist chamber incubation and particle filtration methods. In all, 230 litter fungi belonging to 164 genera of hyphomycetes, ascomycetes and coelomycetes were isolated. These included several rare and interesting species in the monotypic genera like *Bibanasiella*, *Cheiromycesopsis*, *Esdipatilia*, *Gliophragma*, *Megacapitula*, *Morrisiella*, *Paradictyoarthrinium*, *Pseudogliophragma* and *Venustosynnema*. New species belonging to *Dendryphiopsis*, *Digitoramispora*, *Natarajania*, *Spondylocradiopsis*, *Stauriella*, *Tetraploa* and *Vamsapriya* have been recorded. The study further deals with the distribution of the fungi in the Western Ghats region of Goa.

**Keywords:** Litter fungi, Biodiversity, Distribution

## INTRODUCTION

Western Ghats range, one of the mega biodiversity hotspots, is a treasure house for several new and interesting fungi (Bhat, 2010). Tropical forests produce a large amount of litter which is a favoured source of nutrient for fungal colonization. Generally, litter is divided into leaf litter, branch litter, bark litter, fruit litter, flower litter and seed litter. Fungi are the major degraders of plant litter which is composed of basically cellulose and lignin and play a major role in carbon and nitrogen cycling in forest ecosystem (Johanna, 2009).

Fungi play an important role in leaf litter decomposition due to their ability to break down the lignocellulose matrix, which other organisms are unable to digest.

Several studies have been made on the ecology of tropical forest litter fungi. Subramanian and Vittal (1979, 1980) studied the fungi colonizing litter of *Atlantia monophyla* and *Gymnosporia emaginata* from Madras. There have been a series of such studies of saprobic fungal succession on the plants pertaining to various ecosystems. Some examples are those of Manoharachary *et al.*, (1976) on *Cassia glauca*, Sudha (1978) on *Glycosmis* and *Ixora*, Mehrotra and Aneja (1979) on *Chenopodium album*, Vittal and Sukumaran (1981) on *Cymbopogon flexuosus*, Sankaran (1993) on *Paraserianthes falcataria*, *Eucalyptus tereticornis* and *Tectona grandis*, Tiwari *et al.*, (1994) on *Ananas comosus* and *Srivastava et al.*, (1998) on *Saccharum officinarum*). Miriam and Bhat (2000) isolated 54 fungi, while studying the diversity and abundance of microfungi on decaying leaf litter of *Ficus benghalensis*. Ramesh and Chalannavar (2000) studied the fungal colonization of *Achras sapota* and *Swietenia mahagoni* leaf litter and recorded 18 species of fungi belonging to 16 genera from *Achras sapota* and 17 species belonging to 15 genera from *Swietenia mahagoni*. Shanthi and Vittal (2010) studied the diversity of microfungi associated with litter of *Pavetta indica* from Tambaram, Chennai, India, and recorded 54 fungal species belonging to 40 genera.

## MATERIALS AND METHODS

### Sampling

Collection trips were conducted to several places in Goa and some parts of Karnataka, Kerala, Tamilnadu and Maharashtra and different fungal substrates were gathered from diverse habitats. The samples were brought to the laboratory in plastic bags and subjected to direct, moist chamber incubation, single spore and particle plating isolation methods (Bhat, 2010).

### Isolation of Fungi

The samples were examined for associated fungi. Some of the specimens which did not show sporulating structures were subjected to moist chamber incubation so as to enable the fungi to grow and sporulate (Hawksworth, 1974). Single spores or fungal spore masses were picked up with the help of sterilized needle under a stereoscope and the fungi were cultured (Wang and Wen, 1997). The litter samples were also subjected to particle plating method (Bills and Polishook, 1994). The litter was thoroughly washed under running tap water followed by sterile distill water and ground into fine particles. The pulverized sample was filtered through two superimposed metal sieves of mesh size of 250 and 100  $\mu\text{m}$ . The particles trapped in the lower sieve, those between 100 and 250  $\mu\text{m}$  size were washed repeatedly with sterile distilled water and plated on 2% potato

dextrose agar or any suitable medium with antibiotics. The plates were incubated at 22-25°C. Colonies originating from each particle were individually and aseptically transferred to fresh plate.

## Characterization and Identification of Fungi

Fungi with sporulating structures were observed under a compound microscope for detailed diagnostic features which aided in their identification. Sporulating structures such as conidiophores and conidia in case of hyphomycetes, pycnidia, conidiogenous cells and conidia in case of coelomycetes and ascocarp, asci and ascospores in ascomycetes were considered as diagnostic features in the identification of fungi. Using appropriate references (Carmichael *et al.*, 1980; Ellis, 1971, 1976; Matsushima 1975), the isolates were identified and assigned to respective genera and species. Illustrations of fungi with all morphological details were made under different magnifications using a camera lucida drawing tube and photomicrographs were taken using an Olympus DP12 digital camera fitted to an Olympus BX41 microscope.

## RESULTS

A total of 470 taxa assignable to 230 fungi were recovered from different litter samples collected from 18 places in Goa, 3 localities in Karnataka, 2 in Kerala, 2 in Tamilnadu and 2 in Maharashtra. A total of 164 genera were recovered of which 136 fungi were identified up to species level. The remaining remained as undetermined taxa. This study yielded the isolation of several novel taxa which included one new genus (*Natarajania*) and 7 new species (*Dendryphiopsis goanensis* (Pratibha *et al.*, 2010), *Digitoramispora tambdisurlensis* (Pratibha *et al.*, 2009), *Natarajania indica* (Pratibha and Bhat, 2005), *Spondylocladiopsis aseptata* (Pratibha *et al.*, 2009), *Stauriella indica* (Pratibha *et al.*, 2010), *Tetraploa circinata* (Pratibha and Bhat, 2008) and *Vamsapriya mahabaleshwarsensis* (Pratibha and Bhat, 2008), (Table 1, Figs. 1-7). Six species of the monotypic genera, viz. *Bibanasiella*, *Cheiromycepopsis*, *Esdipatilia*, *Gliophragma*, *Megacapitula*, *Morrisiella*, *Paradictyoarthrinium*, *Pseudogliophragma* and *Venustosynnema* were isolated during the course of the study (Table 2, Figs. 8-16). Some rare and interesting fungi such as *Bahusandhika indica*, *Cancellidium applanatum*, *Costantinella palmicola*, *Cryptophialoidea secunda*, *Dicranidion fragile*, *Dictyoarthrinium sacchari*, *Gangliostilbe indica*, *Gangliostilbe malabarica*, *Hyphodiscosia jaipurensis*, *Kostermansinda magna*, *Moorella speciosa*, *Phialosporastilbe setosa*, *Physalidiella elegans*, *Piricaudiopsis elegans*, *Polyscytalum fecundissimum*, *Sadasivania girisa*, *Shrungabeeja vadirajensis* and *Spegazzinia deightonii* were isolated (Table 3, Figs. 17-35). Besides many common litter fungi were also recovered (Table 4, Figs. 36-65).

**Table 1: Novel fungi isolated**

Sl. No.	Fungi	Place of collection	Substrate
1	<i>Dendryphiosis goanensis</i> sp. nov.	Mashem	Branch litter
2	<i>Digitoramispora tambdisurlensis</i> sp. nov.	Tamdi Surla	Branch litter
3	<i>Natarajania indica</i> gen. et sp. nov.	Netravali	Leaf litter
4	<i>Spondylocyadiopsis aseptata</i> sp. nov.	Calicat	Leaf litter
5	<i>Stauriella indica</i> sp. nov.	Mashem	Palm spathe litter
6	<i>Tetraploa circinata</i> sp. nov.	Mahabaleshwar	Branch litter
7	<i>Vamsapriya mahabaleshwarensis</i> sp. nov.	Mahabaleshwar	Branch litter

**Table 2: Species isolated from monotypic genera**

Sl. No.	Fungi	Place of collection	Substrate
1	<i>Bibanasiella ramispora</i>	Amboli	Branch litter
2	<i>Cheiromyciopsis verrucosa</i>	Kathlekan	Bark litter
3	<i>Esdipatilia indica</i>	Netravali	Branch litter
4	<i>Gliophragma setosum</i>	Mahabaleshwar	Leaf litter
5	<i>Morrisiella indica</i>	Agastimalai	Leaf litter
6	<i>Megacapitula villosa</i>	Banastari	Branch litter
7	<i>Paradictyoarthrinium diffractum</i>	Mashem	Branch litter
8	<i>Pseudogliophragma indica</i>	Valpai	Branch litter
9	<i>Venustosynnema ciliata</i>	Valpai	Branch litter

**Table 3: Rare and interesting species**

Sl. No.	Fungi	Place of collection	Substrate
1	<i>Bahusandhika indica</i>	Mashem	Palm spathe litter
2	<i>Brachiosphaera tropicalis</i>	Satre	Branch litter
3	<i>Cancellidium applanatum</i>	Amboli	Branch litter
4	<i>Costantinella palmicola</i>	Tamdi Surla	Palm spathe litter
5	<i>Cryptophialoidea secunda</i>	Kathlekan	Leaf litter
6	<i>Dicranidion fragile</i>	Bondla	Branch litter
7	<i>Dictyoarthrinium sacchari</i>	Mashem	Palm spathe litter
8	<i>Gangliostilbe indica</i>	Bondla	Branch litter
9	<i>Gangliostilbe malabarica</i>	Tamdi Surla	Palm spathe litter
10	<i>Hyphodiscosia jaipurensis</i>	Mashem	Leaf litter

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Sl. No.	Fungi	Place of collection	Substrate
11	<i>Kostermansinda magna</i>	Tamdi Surla	Palm spathe litter
13	<i>Moorella speciosa</i>	Mashem	Branch litter
14	<i>Phialosporastilbe setosa</i>	Calicat	Branch litter
15	<i>Physalidiella elegans</i>	Banastari	Branch litter
16	<i>Piricaudiopsis elegans</i>	Yana	Branch litter
17	<i>Polyscytalum fecundissimum</i>	Bondla	Leaf litter
18	<i>Sadasivania girisa</i>	Mudumalai	Branch litter
19	<i>Shrungabeeja vadirajensis</i>	Calicat	Branch litter
20	<i>Spegazzinia deightonii</i>	Chandreshwar	Leaf litter

**Table 4: Some commonly isolated litter fungi**

Sl. No.	Fungi	Place of collection	Substrate
1	<i>Acrodictys globulosa</i>	Yana	Branch litter
2	<i>Acrodictys sacchari</i>	Calicat	Branch litter
3	<i>Acrodictys</i> sp.	Ooty Bot. garden	Bark litter
4	<i>Acrogenospora sphaerocephala</i>	Tamdi Surla	Palm spathe litter
5	<i>Acrostalagmus luteoalbus</i>	Vaiguinim Valley	Palm spathe litter
6	<i>Alternaria alternata</i>	Yana	Leaf litter
7	<i>Alternaria</i> sp.	Yana	Leaf litter
8	<i>Amerosymmodula</i> sp.	Amboli	Branch litter
9	<i>Anaselenosporella</i> sp.	Bondla	Branch litter
10	<i>Ardhachandra crystaspora</i>	Mashem	Leaf litter
11	<i>Arthrimum phaeospermum</i>	Yana	Branch litter
12	<i>Bactrodesmium longispora</i>	Netravali	Bark litter
13	<i>Bactrodesmium leonense</i>	Mashem	Branch litter
14	<i>Bahusutrabeeja dwaya</i>	Kathlekan	Bark litter
15	<i>Beltrania rhombica</i>	Yana	Leaf litter
16	<i>Beltraniella odinae</i>	Chorla	Leaf litter
17	<i>Berkleasmium</i> sp.	Mashem	Palm spathe litter
18	<i>Berkleasmium leonense</i>	Netravali	Branch litter
19	<i>Berkleasmium typhae</i>	Bondla	Branch litter
20	<i>Bispora</i> sp.	Bondla	Branch litter
21	<i>Bisporomyces chlamydozporis</i>	Surla	Branch litter

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Sl. No.	Fungi	Place of collection	Substrate
22	<i>Botrydiplodea theobromae</i>	Yana	Branch litter
23	<i>Botryosporium</i> sp.	Goa Uni. Campus	Branch litter
24	<i>Brachisporiellagayana</i>	Bondla	Branch litter
25	<i>Calosphaeria</i> sp.	Mashem	Branch litter
26	<i>Camposporium</i> sp.	Netravali	Palm spathe litter
27	<i>Canalisporium caribens</i>	Valpai	Branch litter
28	<i>Catenularia myriocarpa</i>	Yana	Leaf litter
29	<i>Catenularia</i> sp.	Bondla	Branch litter
30	<i>Ceratocladium</i> sp.	Siddhanath hill	Branch litter
31	<i>Chaetomium</i> sp.	Ooty bot.garden	Branch litter
32	<i>Chaetopsina fulva</i>	Yana	Leaf litter
33	<i>Chalara aurea</i>	Valpoi	Leaf litter
34	<i>Chalara</i> sp.	Ooty Bot. Garden	Branch litter
35	<i>Choanephora</i> sp.1	Mashem	Flower litter
36	<i>Choanophora</i> sp.2	Banastari	Flower litter
37	<i>Circinotrichum</i> sp.	Yana	Branch litter
38	<i>Cladosporium cladsporoides</i>	Calicat	Branch litter
39	<i>Colletotrichum</i> sp.	Mashem	Leaf litter
40	<i>Cordana</i> sp.	Netravali	Branch litter
41	<i>Corynespora casiicola</i>	Yana	Branch litter
42	<i>Corynespora</i> sp.1	Yana	Leaf litter
43	<i>Corynespora</i> sp.2	Tamdi Surla	Palm spathe litter
44	<i>Costantinella</i> sp.	Mashem	Branch litter
45	<i>Craspedodidymum</i> sp.1	Surla	Branch litter
46	<i>Craspedodidymum</i> sp.2	Valpai	Branch litter
47	<i>Cryptophiale kakombensis</i>	Surla	Leaf litter
48	<i>Cryptophiale apicalis</i>	Netravali	Branch litter
49	<i>Cryptophiale</i> sp.1	Kathlekan	Bark litter
50	<i>Cryptophiale</i> sp.2	Kathlekan	Bark litter
51	<i>Cryptophiale</i> sp. 3	Agastimalai	Leaf litter
52	<i>Curvularia lunata</i>	Netravali	Branch litter
53	<i>Curvulariopsis</i> sp.	Mashem	Branch litter
54	<i>Cylindrocarpon curtum</i>	Yana	Leaf litter
55	<i>Cylindrocarpon</i> sp.	Yana	Leaf litter
56	<i>Cylindrocladium</i> sp.1	Bondla	Bark litter

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Sl. No.	Fungi	Place of collection	Substrate
57	<i>Cylindrocladium</i> sp.2	Tamdi Surla	Branch litter
58	<i>Dactylaria</i> sp.	Yana	Branch litter
59	<i>Deightonella torulosa</i>	Yana	Branch litter
60	<i>Dendryphion comosum</i>	Ooty bot. garden	Branch litter
61	<i>Dendryphiopsis atra</i>	Ooty Bot.Garden	Bark litter
62	<i>Diatrype</i> sp.	Doodhsagar	Bark litter
63	<i>Dictyochoaeta assamica</i>	Yana	Leaf litter
64	<i>Dictyochoaeta tropicalis</i>	Yana	Leaf litter
65	<i>Dictyochoaeta</i> sp.	Doodhsagar	Branch litter
66	<i>Dictyosporium elegans</i>	Yana	Leaf litter
67	<i>Dreschlera australiensis</i>	Chandreshwar	Branch litter
68	<i>Dreschlera hawaiiensis</i>	Valpai	Branch litter
69	<i>Dwayamala</i> sp.	Bondla	Bark litter
70	<i>Edmundmasonia pulchra</i>	Ooty bot. garden	Bark litter
71	<i>Emericella nidulans</i>	Goa Uni.Campus	Leaf litter
72	<i>Endocalyx melanoxanthus</i>	Mashem	Palm spathe litter
73	<i>Endophragmia hyalospora</i>	Yana	Leaf litter
74	<i>Excipularia narsapurensis</i>	Chandreshwar	Branch litter
75	<i>Exerticlava vasiformis</i>	Calicat	Branch litter
76	<i>Exerticlava</i> sp.	Mashem	Branch litter
77	<i>Geniculosporium</i> sp.	Yana	Branch litter
78	<i>Gliocladiopsis sagarensis</i>	Tamdi Surla	Palm spathe litter
79	<i>Gliomastix murorum</i>	Mashem	Branch litter
80	<i>Gonatobotryum fuscum</i>	Amboli	Branch litter
81	<i>Gonatobotryum apiculatum</i>	Vaiginim valley	Bark litter
82	<i>Gonytrichum caesium</i>	Surla	Leaf litter
83	<i>Gyrothrix podosperma</i>	Agastimalai	Leaf litter
84	<i>Hansfordia</i> sp.	Netravali	Leaf litter
85	<i>Haplographium</i> sp.	Amboli	Branch litter
86	<i>Harzia acremonioides</i>	Yana	Branch litter
87	<i>Helicoma</i> sp.1	Mashem	Palm spathe litter
88	<i>Helicoma</i> sp.2	Banastari	Palm spathe litter
89	<i>Helicoma</i> sp.3	Mudumalai	Bamboo litter
90	<i>Helicomycetes</i> sp.1	Yana	Branch litter
91	<i>Helicomycetes</i> sp. 2	Netravali	Branch litter
92	<i>Helicosporium</i> sp.1	Ooty bot. garden	Branch litter

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Sl. No.	Fungi	Place of collection	Substrate
93	<i>Helicosporium</i> sp.2	Netravali	Branch litter
94	<i>Helicosporium</i> sp.3	Chorla	Branch litter
95	<i>Helminthosporium</i> sp.1	Tamdi Surla	Palm spathe litter
96	<i>Helminthosporium</i> sp.2	Doodhsagar	Branch litter
97	<i>Hemicorynespora deightonii</i>	Netravali	Palm spathe litter
98	<i>Hemicorynespora mitrata</i>	Amboli	Branch litter
99	<i>Hermatomyces tucumanensis</i>	Tamdi Surla	Branch litter
100	<i>Hermatomyces</i> sp.	Valpoi	Branch litter
101	<i>Hypoxylon</i> sp.	Yana	Branch litter
102	<i>Idriella lunata</i>	Yana	Branch litter
103	<i>Intercalarispora</i> sp.	Kathlekan	Bark litter
104	<i>Kionochaeta ramifera</i>	Agastimalai	Leaf litter
105	<i>Lacellinopsis spiralis</i>	Yana	Branch litter
106	<i>Lauriomyces</i> sp.	Kathlekan	Leaf litter
107	<i>Mariannaea elegans</i>	Yana	Branch litter
108	<i>Memnoniella</i> sp.	Mashem	Branch litter
109	<i>Menisporopsis pleioisetosa</i>	Doodhsagar	Leaf litter
110	<i>Menisporopsis theobromae</i>	Doodhsagar	Leaf litter
111	<i>Minimidochium setosum</i>	Surla	Leaf litter
112	<i>Monodictys putredinis</i>	Yana	Branch litter
113	<i>Monodictys</i> sp.	Calicat	Branch litter
114	<i>Monotosporella</i> sp.	Valpoi	Branch litter
115	<i>Moorella speciosa</i>	Mashem	Branch litter
116	<i>Mortierella</i> sp.	Netravali	Branch litter
117	<i>Mucor</i> sp.	Yana	Leaf litter
118	<i>Myrothecium masonii</i>	Yana	Branch litter
119	<i>Myrothecium roridum</i>	Yana	Leaf litter
120	<i>Nigrospora sphaerica</i>	Chandreshwar	Branch litter
121	<i>Nodulisporium</i> sp.1	Calicat	Branch litter
122	<i>Nodulisporium</i> sp.2	Surla	Branch litter
123	<i>Nodulisporium</i> sp.3	Netravali	Branch litter
124	<i>Oideodendron</i> sp.	Calicat	Branch litter
125	<i>Ophiostoma</i> sp.	Chorla	Branch litter
126	<i>Periconia atropurpurea</i>	Yana	Leaf litter
127	<i>Periconia byssoides</i>	Calicat	Leaf litter
128	<i>Periconia lateralis</i>	Yana	Branch litter

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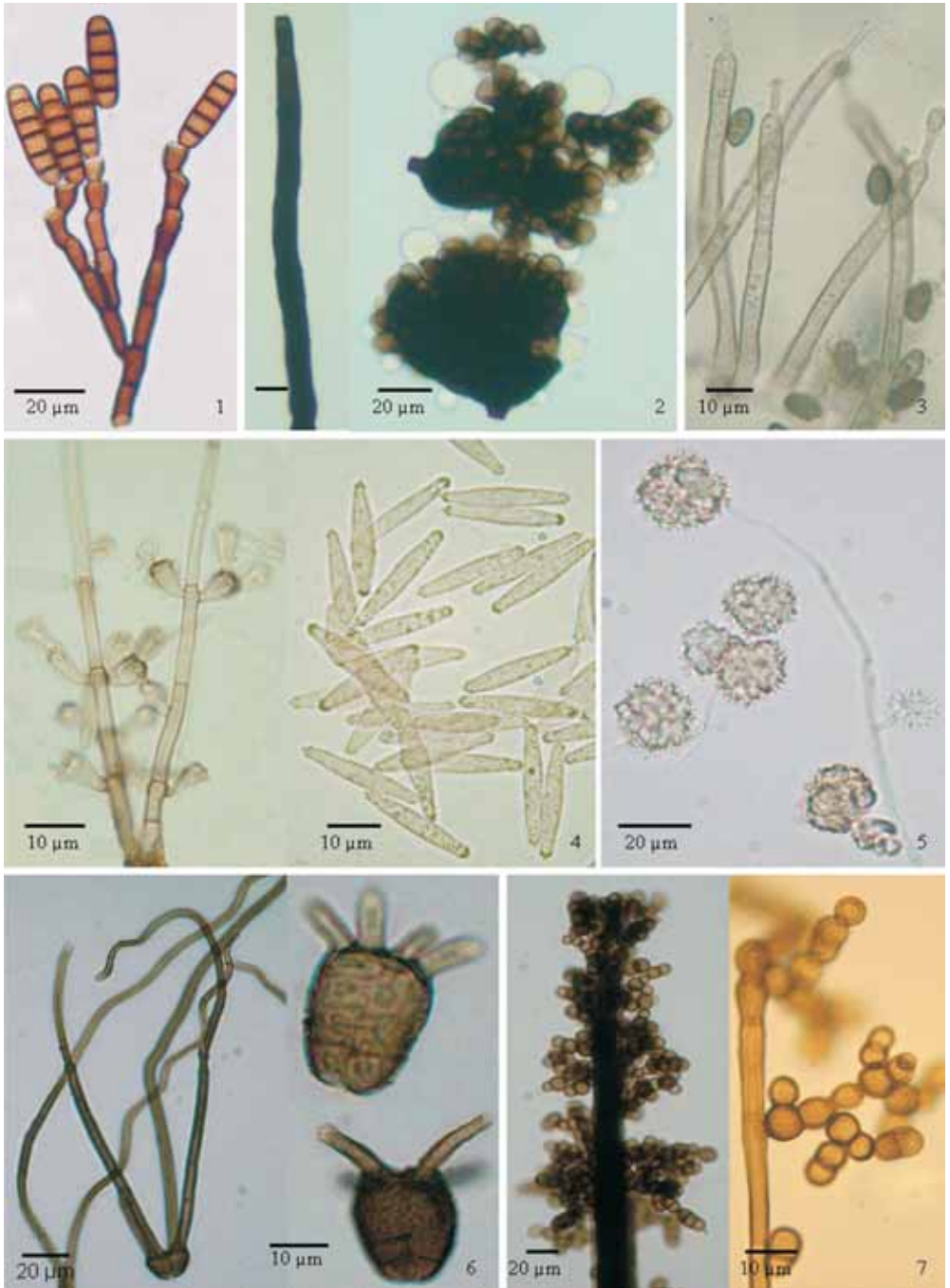
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Sl. No.	Fungi	Place of collection	Substrate
129	<i>Pesotum sp.</i>	Mashem	Leaf litter
130	<i>Phaeoisaria sp.1</i>	Yana	Branch litter
131	<i>Phaeoisaria sp.2</i>	Tamdi Surla	Branch litter
132	<i>Phalangispora constricta</i>	Bondla	Leaf litter
133	<i>Phialocephala sp.</i>	Valpai	Branch litter
134	<i>Phialophora fastigiata</i>	Netravali	Branch litter
135	<i>Physalidiopsis sp.</i>	Netravali	Bark litter
136	<i>Piricauda cichinensis</i>	Calicat	Branch litter
137	<i>Pithomyces elisii</i>	Valpai	Branch litter
138	<i>Pithomyces flavus</i>	Doodhsagar	Palm spathe litter
139	<i>Pithomyces subramanii</i>	Banastari	Branch litter
140	<i>Pithomyces sp.1</i>	Yana	Leaf litter
141	<i>Pithomyces sp.2</i>	Amboli	Branch litter
142	<i>Pleurophragmium simplex</i>	Valpai	Branch litter
143	<i>Pleurophragmium sp.</i>	Chorla	Branch litter
144	<i>Plurothecium sp.</i>	Netravali	Branch litter
145	<i>Podosporium rigidum</i>	Bondla	Branch litter
146	<i>Pyricularia sp.</i>	Yana	Branch litter
147	<i>Scopulariopsis sp.</i>	Shirgao	Palm spathe litter
148	<i>Selenoidriella sp.</i>	Amboli	Branch litter
149	<i>Selenosporella curvispora</i>	Yana	Leaf litter
150	<i>Speiropsis pedatospora</i>	Yana	Leaf litter
151	<i>Speiropsis simplex</i>	Amboli	Leaf litter
152	<i>Speiropsis sp.</i>	Chandreshwar	Leaf litter
153	<i>Sporidesmiella claviformis</i>	Bondla	Branch litter
154	<i>Sporidesmium cookei</i>	Valpai	Branch litter
155	<i>Sporidesmium macrurum</i>	Mudumalai	Bark litter
156	<i>Sporidesmium leptosporum</i>	Netravali	Branch litter
157	<i>Sporidesmium tropicale</i>	Yana	Branch litter
158	<i>Sporidesmium sp.</i>	Amboli	Branch litter
159	<i>Sporoschisma mirabile</i>	Mashem	Branch litter
160	<i>Sporoschisma uniseptatum</i>	Doodhsagar	Branch litter
161	<i>Stachybotrys nilgirica</i>	Satre	Branch litter
162	<i>Stachybotrys sp.</i>	Mudumalai	Leaf litter
163	<i>Stachylidium bicolor</i>	Valpai	Branch litter
164	<i>Stellomyces kendrickii</i>	Tamdi Surla	Bark litter

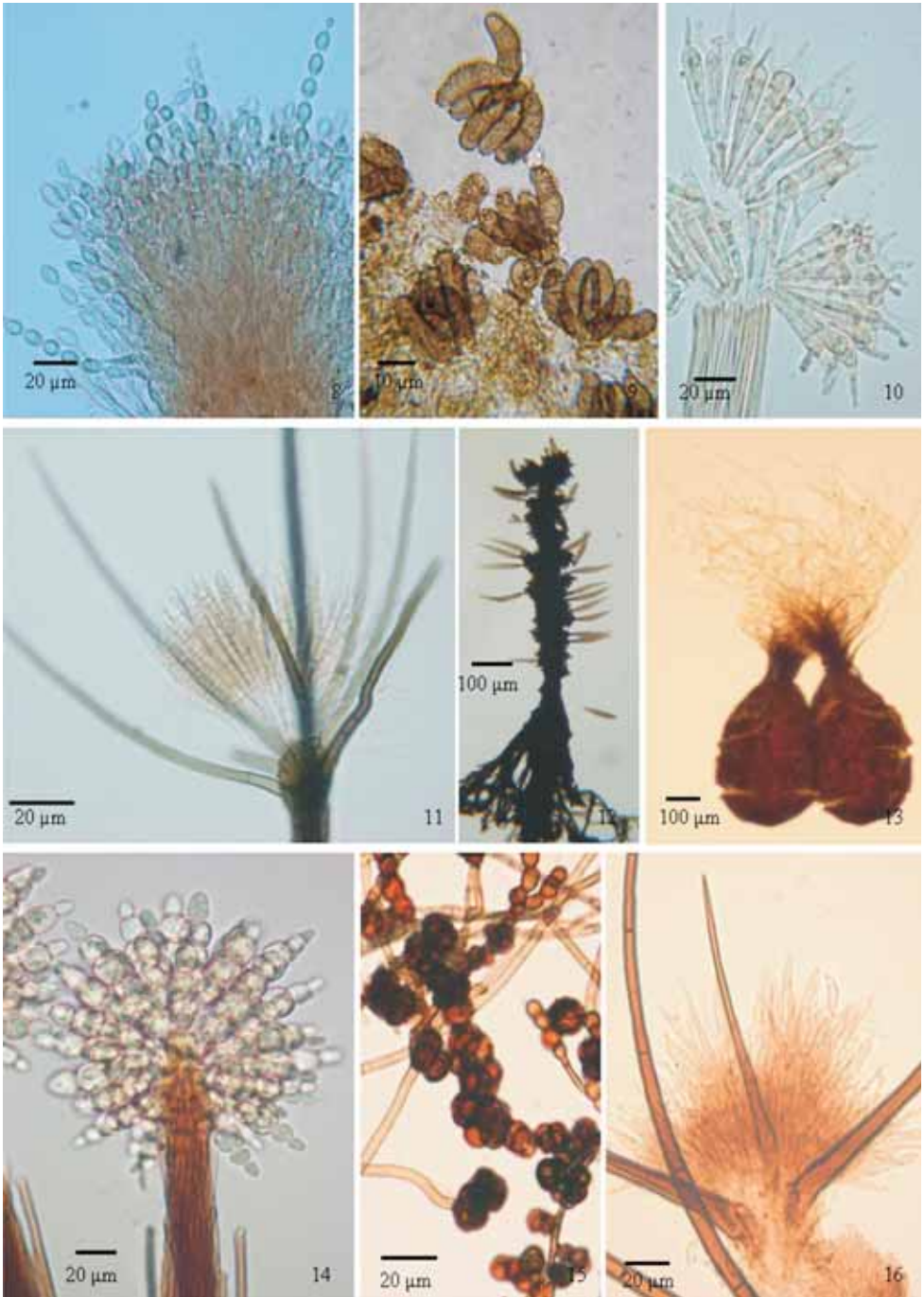
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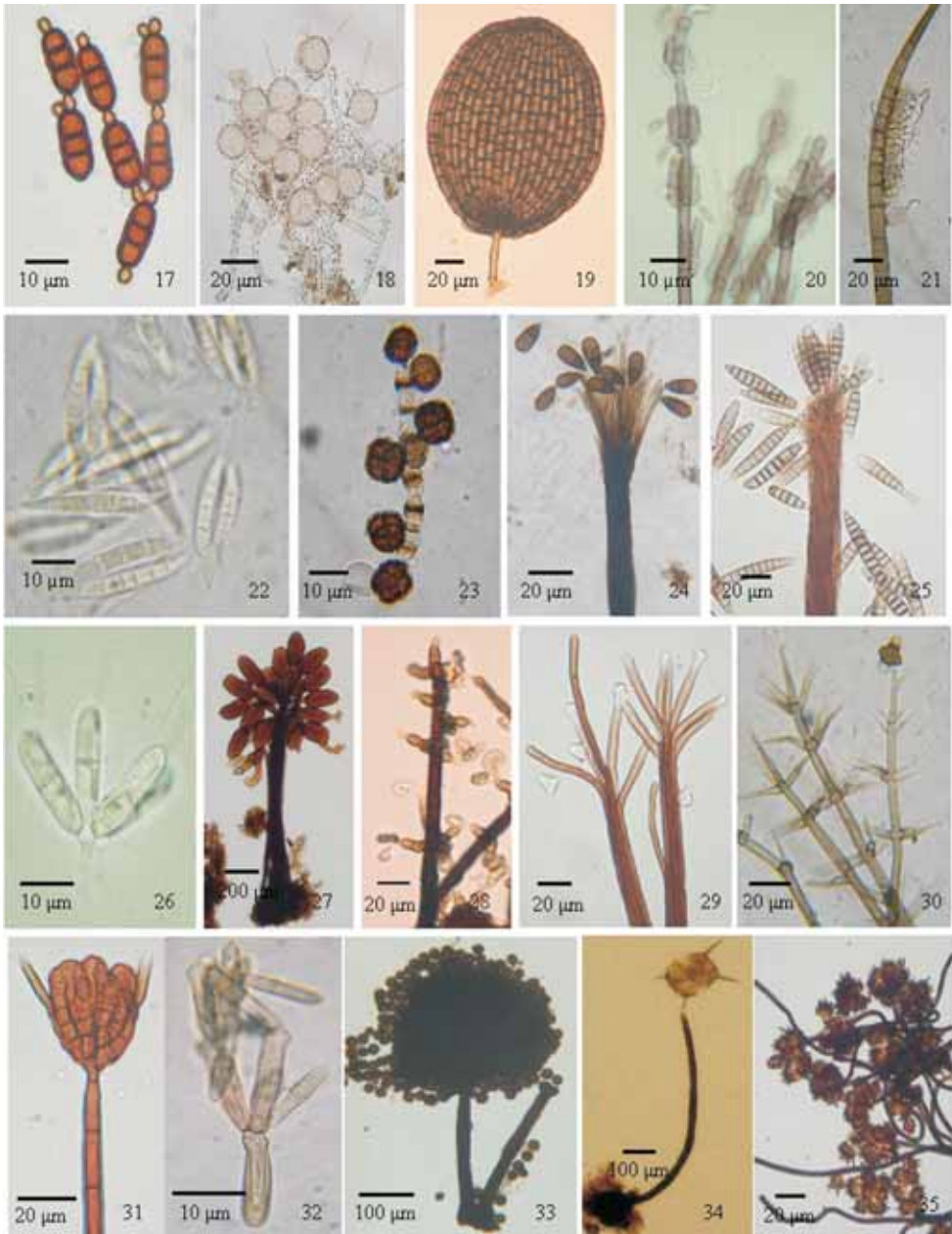
Sl. No.	Fungi	Place of collection	Substrate
165	<i>Stromatographium stromaticum</i>	Netravali	Branch litter
166	<i>Subramaniomyces sp.</i>	Kathlekan	Leaf litter
167	<i>Sympodiella sp.</i>	Calicat	Leaf litter
168	<i>Sympodioplanus sp.</i>	Bondla	Branch litter
169	<i>Taeniolella stilbospora</i>	Kathlekan	Bark litter
170	<i>Taeniolella sp.</i>	Agastyamalai	Branch litter
171	<i>Tetraploa aristata</i>	Yana	Branch litter
172	<i>Thozetella nivea</i>	Yana	Leaf litter
173	<i>Thozetella toklaensis</i>	Tamdi Surla	Palm spathe litter
174	<i>Thozetella sp.</i>	Netravali	Bark litter
175	<i>Torula herbarum</i>	Yana	Branch litter
176	<i>Trichobotrys effusa</i>	Yana	Branch litter
177	<i>Trichoderma sp.</i>	Amboli	Branch litter
178	<i>Trichothecium roseum</i>	Agastimalai	Leaf litter
179	<i>Uberispora sp.</i>	Tamdi Surla	Dead twig
180	<i>Vanakripa gigaspora</i>	Tamdi Surla	Palm spathe litter
181	<i>Vanakripa parva</i>	Calicat	Branch litter
182	<i>Vanakripa sp.</i>	Amboli	Branch litter
183	<i>Vermiculariopsiella sp.</i>	Yana	Leaf litter
184	<i>Veronaea botryosa</i>	Mashem	Branch litter
185	<i>Verticillium sp.</i>	Banastari	Branch litter
186	<i>Virgariella atra</i>	Tamdi Surla	Branch litter
187	<i>Virgatospora echinofibrosa</i>	Puttur	Branch litter
188	<i>Volutella sp.</i>	Chorla	Branch litter
189	<i>Weisneriomyces javanicus</i>	Mashem	Leaf litter
190	<i>Xenosporium africanum</i>	Valpoi	Branch litter
191	<i>Xenosporium ovatum</i>	Mashem	Branch litter
192	<i>Xenosporium sp.</i>	Tamdi Surla	Branch litter
193	<i>Xylaria sp.</i>	Yana	Branch litter
194	<i>Zygosporium masonii</i>	Cotigao	Leaf litter
195	<i>Zygosporium oscheoides</i>	Yana	Branch litter
196	<i>Zygosporium sp.</i>	Yana	Leaf litter



**Fig. 1:** Fungi described as new to science: 1. *Dendryphiosis goanensis*, 2. *Digitoramispora tambdisurlensis*, 3. *Natarajania indica*, 4. *Spondylocладиopsis aseptata*, 5. *Stauriella indica*, 6. *Tetraploa circinata*, 7. *Vamsapriya mahabaleshwarensis*



**Fig. 2:** Species from monotypic genera: 8. *Bibanasiella ramispora*, 9. *Cheiromyiciopsis verrucosa*, 10. *Esdipatilia indica*, 11. *Gliophragma setosum*, 12. *Morrisiella indica*, 13. *Megacapitula villosa*, 14. *Paradictyoarthrinium diffractum*, 15. *Pseudogliophragma indica*, 16. *Venustosynnema ciliata*



**Fig. 3:** Rare and interesting fungi: 17. *Bahusandhika indica*, 18. *Brachiosphaera tropicalis*, 19. *Cancellidium applanatum*, 20. *Costantinella palmicola*, 21. *Cryptophialoidea secunda*, 22. *Dicranidion fragile*, 23. *Dictyoarthrinium sacchari*, 24. *Gangliostilbe indica*, 25. *Gangliostilbe malabarica*, 26. *Hyphodiscosia jaipurensis*, 27. *Kostermansinda magna*, 28. *Moorella speciosa*, 29. *Phialosporastilbe setosa*, 30. *Physalidiella elegans*, 31. *Piricaudiopsis elegans*, 32. *Polyscytalum fecundissimum*, 33. *Sadasivania girisa*, 34. *Shrungabeeja vadirajensis*, 35. *Spegazzinia deightonii*

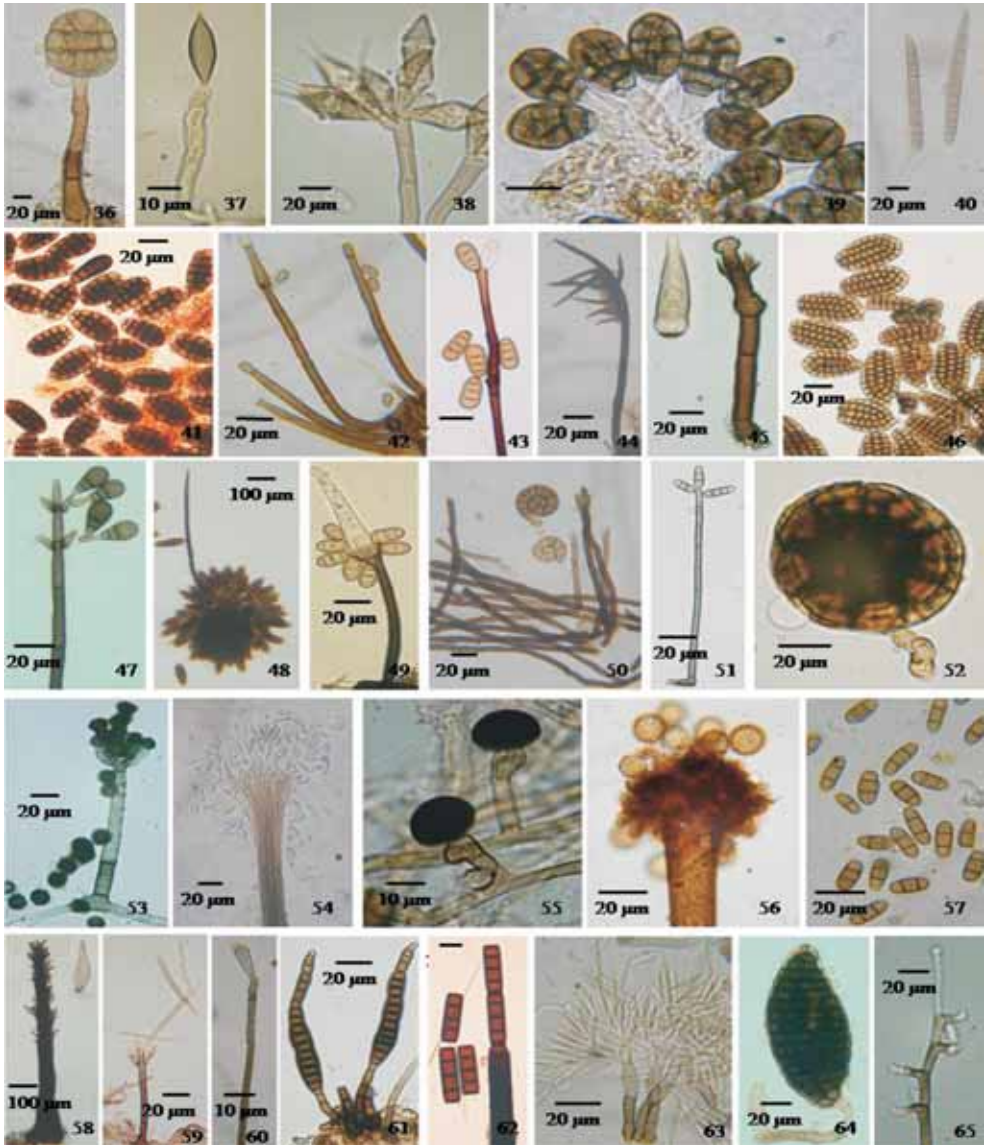
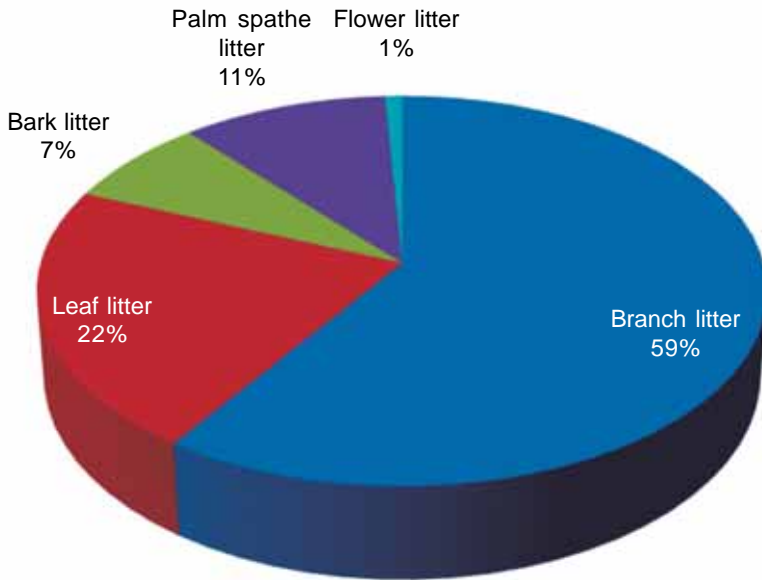


Fig. 4: Commonly isolated litter fungi: 36. *Acrodictys globulosa*, 37. *Ardhachandra crustaspora*, 38. *Beltrania rhombic*, 39. *Berkleasmium typhae*, 40. *Camposporium* sp., 41. *Canalisporium caribens*, 42. *Catenularia myriocarpa*, 43. *Cordana* sp., 44. *Cryptophiale apicalis*, 45. *Deightoniella torulosa*, 46. *Dictyosporium elegans*, 47. *Edmundmasonia pulchra*, 48. *Excipularia narsapurensis*, 49. *Exerticlava vasiformis*, 50. *Helicoma* sp., 51. *Helminthosporium* sp., 52. *Hermatomyces tucumanensis*, 53. *Memnoniella* sp., 54. *Menisporopsis pleiosetosa*, 55. *Nigrospora sphaerica*, 56. *Periconia byssoides*, 57. *Pithomyces* sp., 58. *Podosporium rigidum*, 59. *Speiopsis simplex*, 60. *Sporidesmiella claviformis*, 61. *Sporidesmium* sp., 62. *Sporoschisma mirabile*, 63. *Subramaniomyces* sp., 64. *Xenosporium ovatum*, 65. *Zygosporium masonii*



**Fig. 5: Number of fungi (percent) isolated from different substrates**

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