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Diversity of microfungi in the forests of Western Ghats in Goa and surrounding regions

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Abstract
This paper presents a concise picture of the diversity of microfungi, largely of Hyphomycetes, in the forests of Western Ghats in Goa and neighbouring regions in Maharastra and Karnataka, India. Commenced in 1993-94, various habitats of and substrates from the Western Ghats, viz., aquatic and terrestrial leaf litter, dead insects, endophytes, extremophiles, phylloplanes, herbivore dung, salt pans, soil, wood bark and logs, perishable foods, etc. have been surveyed for microfungi. Several isolation techniques, viz. direct isolation, isolation following moist-chamber incubation, aquatic spore induction and endophytes through 3-step sterilization and litter particle-plating methods, were used to recover the fungi from the substrates. In all, 556 species in 312 genera of fungi have been documented. A sizable number of these are available in live culture form at the Goa University culture collection facility. With this 1½ decade-long mycological survey, it can now be noted that Goa is one of the fairly well-documented provinces in India for microfungi.

Key words: Biodiversity; Endophytes; Entomogenous; Foliicolous; Hyphomycetes; Isolation techniques; Tropical forests.

Introduction
Moist deciduous, wet-evergreen and shola forests of the Western Ghats in southern India are known to harbour a vast variety of flowering plants, ferns, mosses, algae, fungi and lichens (Pascal, 1989). Several distinct endemic elements have been reported from the region. The state of Goa accommodates a sizable portion of the central Western Ghats.

Aquatic, arboreal and terrestrial fungi largely depend on fallen and decaying plant substrates for sustenance (Kendrick, 1992; Hawksworth, 2001). Initiated in 1992-93, systematic survey of the fungi found growing on varied plant substrates such as fallen, decaying leaf litter, endophytes, phylloplane, freshwater aquatics, air, insects and herbivore dung, etc. was made in the forests of Western Ghats in Goa and surrounding areas with an aim to document the microfungal diversity of the region (Bhat, 2000). Besides, substrates in the saltpans and mangroves of the coastal belts of Goa have also been surveyed for

fungi. The results obtained so far were amazing. Besides the common, an exceedingly large number of rare, interesting and new fungi were recovered. Several of these were brought into culture and maintained in a sustainable manner in an *ex situ* culture repository established in the Department of Botany, Goa University, since 1998. The fungi were diagnosed down to species level based on conventional morphological parameters and this paper gives an overview of the microfungal generic diversity in the region.

Methods

Substrates of different kinds, gathered from aquatic, arboreal and terrestrial habitats, were considered as source material or samples for isolation of fungi. The samples from aquatic habitats included freshwater foam containing fungal propagules, submerged decaying leaf litter and live roots extended into stream water. Arboreal habitat offered interesting substrates such as litter from bird nests, rain water from stem flow, fresh leaves and phylloplane surfaces. Fallen, dead and decaying leaves, twigs, wood bark, nuts, fruits, dead insects, herbivore dung and soil constituted the substrates from terrestrial habitat. The substrates used for isolation of fungi are listed in the Table 1.

Table 1. Habitats surveyed and substrates screened for fungi.

Substrates Habitat	Herbivor dung	Plant litter	Ins-ects	Fresh plant parts	Infected plant parts	Soil	Freshwater
Aquatic	-	+	-	+ (roots)	-	-	+
Arboreal	-	+	-	+ (leaves, stem)	+	-	-
Terrestrial	+	+	+	+ (roots)	-	+	-

In most cases, the samples brought to the laboratory were immediately processed for isolation of fungi. Sometimes, when too many samples were accumulated, part of them was maintained in cold store until processed. The methods used for isolation of fungi were mainly based on the kind of substrates considered for investigation (Table 2).

Table 2. Isolation techniques followed for recovery of fungi.

Substrates Isolation methods	Herbivore dung	Plant litter	Insects	Fresh plant parts	Infected plant parts	Soil	Aqua tic foam
Direct isolation	+	+	+	-	+	-	+
Moist	+	+	-	-	+	-	-

chamber incubation							
Particle plating	+	+	+	-	-	-	-
3-step sterilization	-	-	-	+	-	-	-
Foam plating technique	-	-	-	-	-	-	+
Soil dilution technique	-	-	-	-	-	+	-

The methods are briefly explained and illustrated below:

1. Direct isolation from plant litter:
The sample, say a decaying leaf, nut or bark, was scanned under a stereomicroscope to locate a fungal colony. A small portion of the fungal material was picked by a fine-tipped needle and placed in distilled water or lactophenol mountant and examined under a microscope. The detailed study of morpho-taxonomic characteristics of the fungus was done using a light-transmitted microscope.

2. Recovery following moist chamber incubation (Fig. 1):

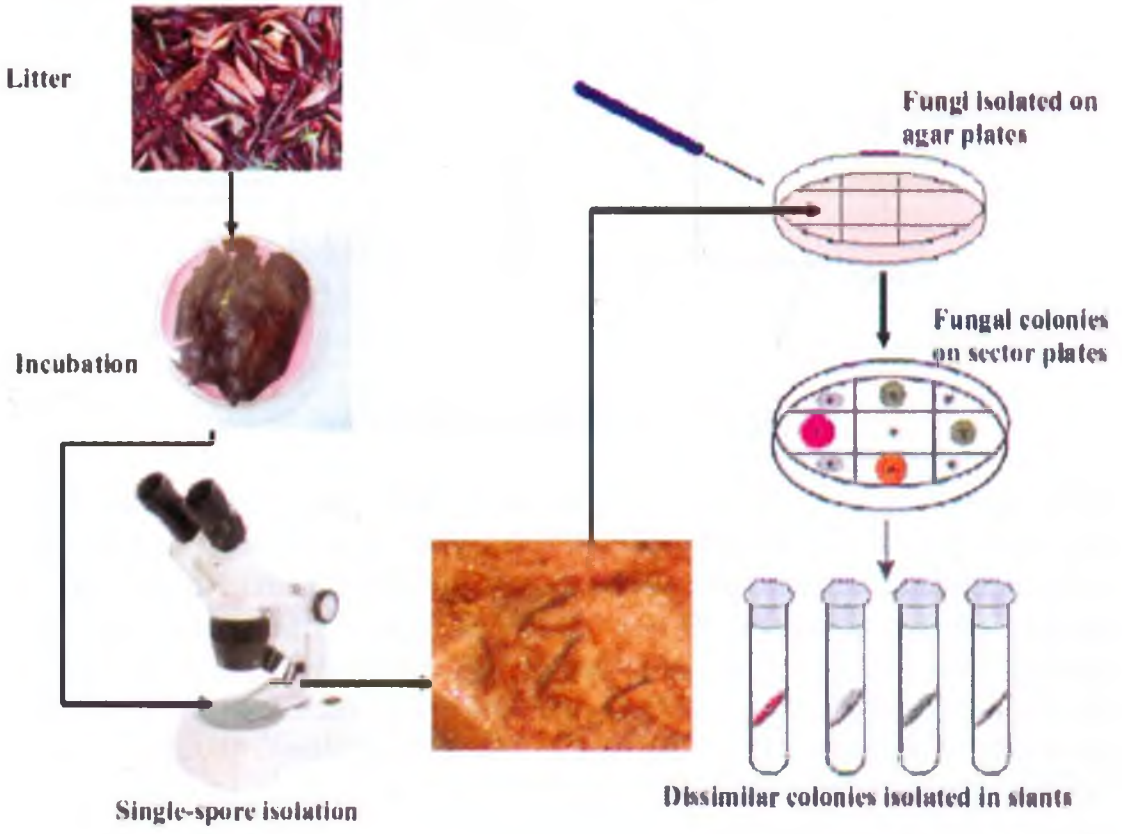

Fig 1. Moist chamber incubation technique

A thin layer of absorbent cotton superimposed by a circular piece of blotting paper was placed in a Petri plate (20 cm diam) and drenched with distilled water. Four micro-slides were placed on the filter paper. The plates were sterilized at 121°C and 15lbs/cm^3 pressure in an autoclave for 20 min. The sample was thoroughly washed in sterile distilled water, placed in the sterile moist plates and incubated at room temperature. Beginning on the 3rd day, the incubated samples were scanned daily under a stereomicroscope for growth of the fungi. The fungal colony was picked up and mounted on a slide containing a drop of distilled water or lactophenol for microscopic examination.

3. Isolation by particle-plating (Fig 2):

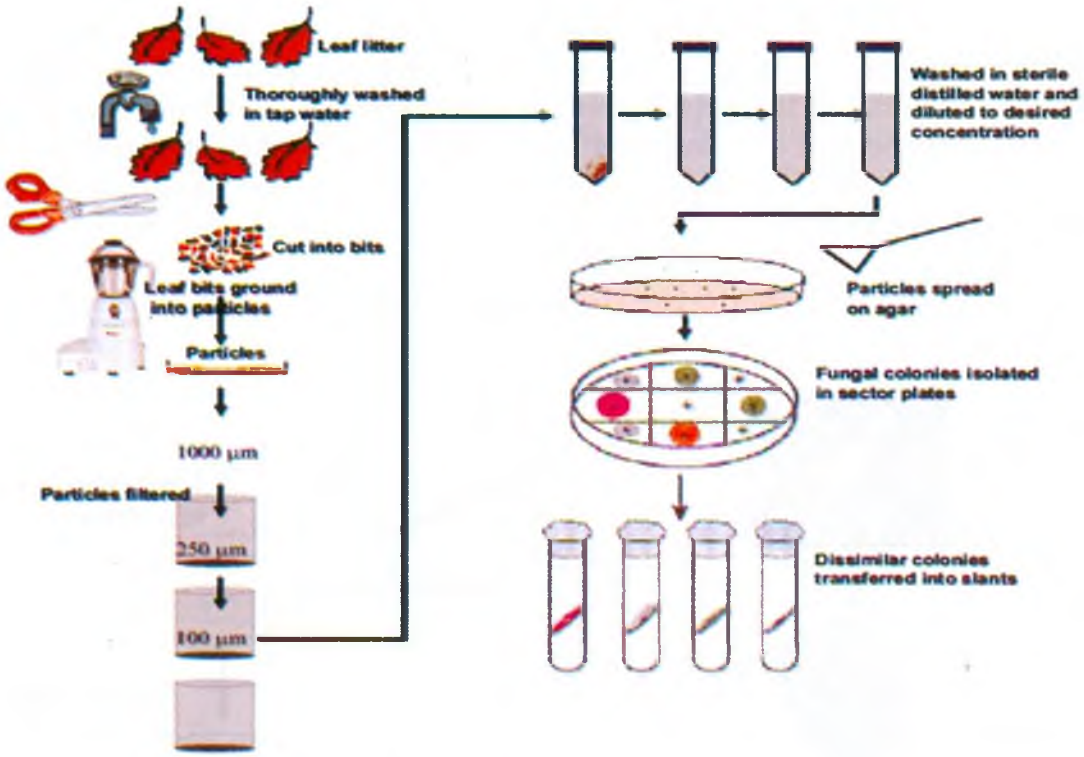

Fig 2. Particle plating technique

Decaying leaves, twigs or bark was cut into small pieces and ground to fine particles in an electric blender. The particles were filtered through three super-imposed metal sieves with mesh size of 1000 µm, 250 µm and 100 µm. The fine particles of size between 100 and 250 µm trapped in the lower sieve were repeatedly washed in sterile distilled water, diluted to suitable concentration and plated on malt extract agar (MEA) medium incorporated with a mixture of antibiotics (Bacitracin 0.02 g, Neomycin 0.02 g, Penicillin G 0.02 g, Polymixin 0.02 g, Streptomycin 0.02 g and Tetramycin 0.04 g dissolved in 10 ml of distilled water and added to 1 L of MEA medium). The fungal hypha arising

from the particles was aseptically and individually transferred into fresh MEA slants (Bills and Polishook, 1994).
Not all but some of the fungi sporulated in culture on several days/weeks of incubation. These were examined under the microscope and identified.

4. Isolation of aquatic fungi by foam plating technique (Fig. 3):

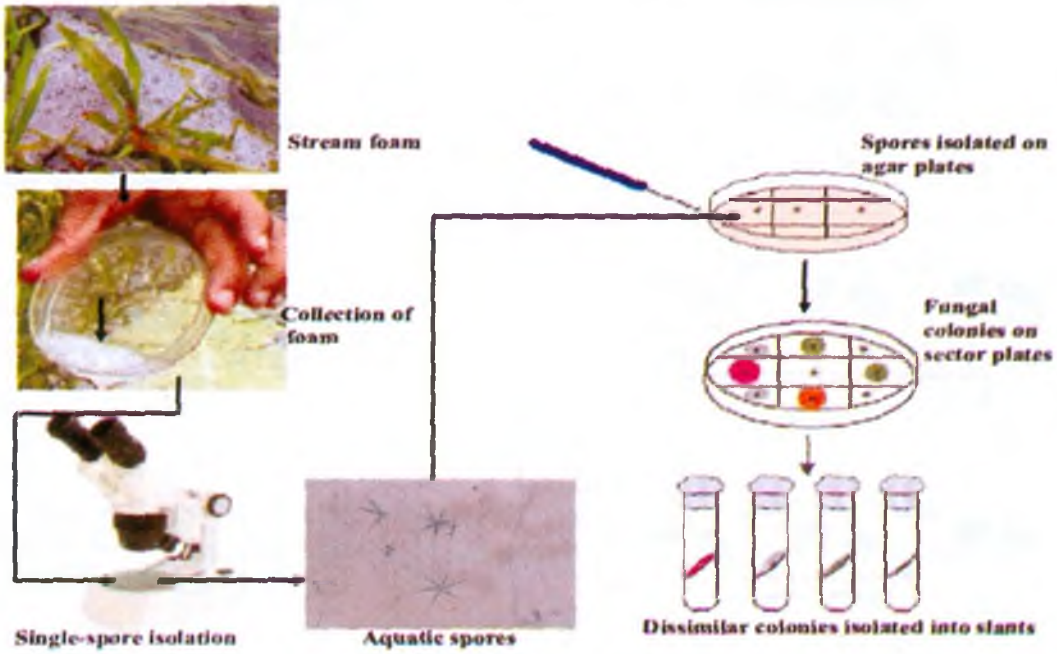

Fig. 3. Foam plating technique

Naturally occurring surface foam, presumably laden with a heavy load of aquatic fungal spores, from clean running freshwater stream was scooped out into a glass jar and thinly spread over antibiotic-incorporated malt extract agar (MEA) plates. After a few hours of incubation spores germinate. The germinating spores/conidia were singularly and aseptically picked up and transferred into fresh MEA slants.
When natural foam was not available, a few decaying leaves were gathered from the stream-bed and placed in glass jars, containing each 1 leaf in 500 ml distilled water. A constant flow of air was introduced into the jar using a fish-aerator. The agitation of water column induced fungal sporulation. Foam bubbles accumulated on the surface contained conidia and these were scooped and used for single-spore isolation. A sizeable collection of microfungi were brought into pure culture using this technique (Ingold, 1975).

5. Three-step sterilization for endophytes (Fig. 4):
The sample, fresh leaf or twig, after washing with sterile distilled water, was surface sterilized, first with 70% ethanol (1 min), followed by 4% Sodium hypochlorite (3 mins) and finally with 70% ethanol (30 secs) again. The plant tissue was than thoroughly washed thrice in sterile distilled water. The surface

sterilized leaf tissue was cut into pieces of 0.5 cm^2, plated on 2% MEA medium and incubated at 25°C up to 14 days. The fungal colonies emerging out of the tissue bits were transferred onto fresh plates. The plates were maintained until the cultures sporulated in the medium (Petrini, 1986).

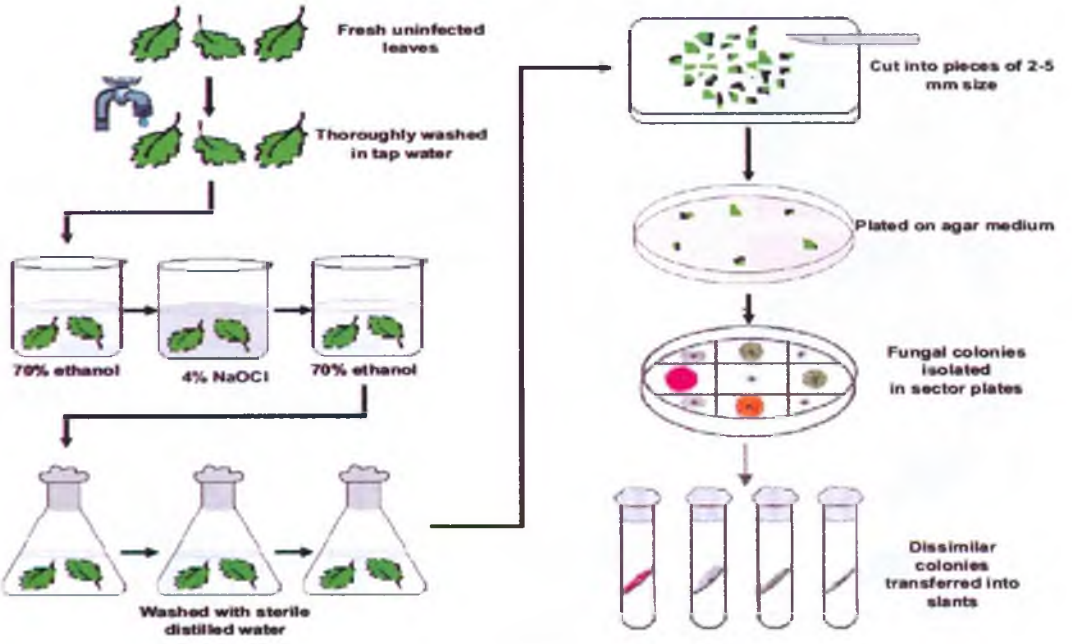

Fig 4. 3-step sterilization technique

6. Recovery of entomogenous fungi:

The dead or moribund insects of any kind found adhering to the leaf surface were carefully picked up from the substrate and plated on antibiotic-embedded agar medium. The fungal colonies emerging out of the insect tissue were isolated aseptically and transferred onto fresh plates. The plates were maintained until the cultures sporulated well in the medium.

7. Isolation of phylloplane or foliicolous fungi:

The infected leaves, directly or after incubation in a moist chamber, were scanned under stereomicroscope and a sterile needle was allowed to touch the spore-producing part, conidiophore, ascocarp or pycnidium, of the growing fungus. Several spores get attached to the loop due to tenacity. A drop of sterile distilled water was taken on a clean flame-sterilized slide and a loop load of spore mass was placed in it. The soaked spores were spread on a Petri plate containing 2% MEA medium. On subsequent days, as and when individual spores germinate, a small block of agar with mycelium was cut and transferred on to an agar slant to maintain a pure culture of the fungus.

Results

The data presented here (Table 3) is based on the results obtained from systematic studies on fungi carried out by a number of students who did these as part of their masterate or doctoral programme under the guidance of the senior author since 1993 (Coelho, 1998; Colgaonkar, 2001; Divkar, 1993; D'souza, 2002; D'souza & Bhat, 2001a, 2001b, 2002a, 2002b; Gawas, 2004; Gawas & Bhat, 2005; Jacob, 1996, 2000; Jacob & Bhat, 1997, 2000, 2000a; Jalmi, 2006; Kalekar, 2003; Keshava Prasad, 2003; Keshavaprasad & Bhat, 2002a, 2002b; Keshavaprasad *et al.*, 2004; Nair, 1998; 2002; Nair & Bhat, 2001; 2002; Pednekar, 2003; Prabhugaonkar, 2005; Pratibha and Bhat, 2006; Pratibha *et al.*, 2005; Ramaswamy, 2006; Rodrigues, 1993; Sawal, 1996; Soosamma *et al.*, 2001; Vengurlekar, 1997; Yadav, 2006).

In all, 556 species in 312 genera of microfungi have been documented. Of these, 62% are available in live form in the culture collection facility at Department of Botany, Goa University. The following are the new genera of hyphomycetes described during this floristic study: *Bharatheeya* D'Souza & Bhat (2002), *Ceeveesubramaniomyces* Pratibha & Bhat (2004), *Kumbhamaya* M. Jacob & D. J. Bhat (2000), *Natarajania* Pratibha & Bhat (2005) and *Vamsapriya* Gawas & Bhat (2005). Twenty-one new species of fungi were described. With this 1½ decade-long mycological survey, Goa can be considered as one of the fairly well-documented provinces in India, for microfungi.

Table 3. Genera of fungi encountered on different substrates, during the study:

Genera of Fungi	Substrates scanned						
	A	B	C	D	E	F	G
Absidia Tiegh.	1	1	-	-	-	-	-
Acremoniula G. Arnaud ex Cif.	-	1	-	-	-	1	-
Acremonium Link	-	4	3	-	2	2	-
Acroconidiellina M.B. Ellis	-	-	-	-	1	-	-
Acrodictys M.B. Ellis	-	4	-	-	-	-	-
Acrogenospora M.B. Ellis	-	2	-	-	-	-	-
Acrophialophora Edward	-	-	-	-	1	-	-
Actinocladium Ehrenb.	-	1	-	-	-	-	-
Actinomucor Schostak.	2	-	-	-	-	-	-
Agarwalomyces R.K. Verma & Kamal	1	-	-	-	-	-	-
Aigialus Kohlm. & S. Schatz	-	1	-	-	-	-	-
Alatospora Ingold	-	-	-	-	-	-	3
Alternaria Nees	-	5	-	3	5	3	-
Ambrosiella Brader	-	1	-	-	-	-	-
Anguillospora Ingold	-	-	-	-	-	-	6
Anulosporium Sherb.	-	-	-	-	-	-	1
Aquaphila Goh, K.D.Hyde & W.H. Ho	-	2	-	-	-	-	-
Ardhachandra Subram. & Sudha	-	2	-	-	1	-	1

Arenariomyces Höhnk	-	2	-	-	-	-	-
Arthrinium Kunze	-	1	-	-	-	-	-
Arthrobotrys Corda	-	2	-	-	-	-	-
Arthrobotryum Ces.	-	1	-	-	-	-	-
Articulospora Ingold	-	-	-	-	-	-	1
Arxiella Papendorf	-	1	-	1	-	-	-
Aschersonia Mont.	-	-	5	-	-	-	-
Ascobolus Pers.	2	-	-	-	-	-	-
Aspergillus P. Micheli ex Link	4	9	10	3	2	12	-
Asterina Lév.	-	-	-	-	1	-	-
Bacillispora Sv. Nilsson	-	1	-	-	-	-	-
Bahupaathra Subram. & Lodha	1	-	-	-	-	-	-
Bahusakala Subram.	-	1	-	-	-	-	-
Bahusutrabeeja Subram. & Bhat	-	4	-	-	2	-	-
Beltrania Penz.	-	6	1	1	1	1	2
Beltraniella Subram.	-	4	-	2	1	1	1
Bharatheeya D'Souza & Bhat	-	2	-	-	-	-	-
Botryosporium Corda	-	1	-	-	-	-	-
Botrysphaeria Ces. & De Not.	-	-	-	-	1	-	-
Brachysporiella Bat.	-	1	-	-	-	-	-
Camposporium Harkn.	-	2	-	-	-	-	2
Campylospora Ranzoni	-	2	-	-	-	-	1
Canalisporium Nawawi & Kuthub.	-	2	-	-	-	-	-
Candelabrum Beverw.	-	1	-	-	-	-	-
Catenularia Grove	-	1	-	-	-	-	-
Ceeveesubramaniomyces Pratibha & Bhat	-	-	-	-	1	-	-
Centrospora Neerg.	-	1		-	-	-	-
Cephaliophora Thaxt.	3	-	-	-	-	-	-
Ceratosporella Höhn.	-	-	-	-	1	-	-
Ceratosporium Schwein.	-	1	-	-	-	-	-
Cercophora Fuckel	2	-	-	-	-	-	-
Cercospora Fresen.	-	2	-	2	20	1	-
Chaetendophragmia Matsush.	-	2	-	-	-	-	1
Chaetomella Fuckel	-	-	1	-	1	-	1
Chaetomium Kunze	5	1	-	1	-	1	1
Chaetopsina Rambelli	-	-	-	-	1	-	-
Chaetospermum Sacc.	-	-	-	-	-	-	1
Chalara (Corda) Rabenh.	-	1	-	-	3	-	-
Chlamydomyces Bainier	-	2	-	-	-	1	-
Chloridium Link	-	1	-	-	-	-	-
Choanephora Curr.	-	-	-	-	1	-	-
Chrysosporium Corda	-	1	-	-	-	-	-
Circinella Tiegh. & G. Le Monn.	4	-	-	-	-	-	-
Circinotrichum Nees	-	2	-	-	-	-	-

Cirrenalia Meyers & R.T. Moore	-	1	-	-	-	-	-
Cladosporium Link	1	4	5	2	2	2	-
Clavariopsis De Wild.	-	-	-	-	-	-	1
Clavatospora Sv. Nilsson ex Marvanová & Sv. Nilsson	-	-	-	-	-	-	2
Codinaea Maire	-	-	-	-	-	-	2
Coemansia Tiegh. & G. Le Monn.	1	-	-	-	-	-	-
Colletotrichum Corda	-	-	-	2	5	-	1
Condylospora Nawawi	-	1	-	-	-	-	1
Conidiobolus Bref.	-	-	2	-	-	-	-
Conioscypha Höhn.	-	1	-	-	-	-	-
Coniothyrium Corda	-	1	-	-	-	-	-
Cordana Preuss	-	1	-	-	1	-	-
Corynespora Güssow	-	3	-	-	11	-	2
Craspedodidymum Hol.-Jech.	-	2	-	-	-	-	-
Cunninghamella Matr.	-	1	-	-	-	-	-
Curvularia Boedijn	4	9	2	1	5	3	1
Cylindrocarpon Wollenw.	-	4	-	-	1	1	2
Cylindrocladiopsis J.M. Yen	-	1	-	-	-	-	-
Cylindrocladium Morgan	-	2	2	2	1	1	2
Cylindrotrichum Bonord.	-	5	-	-	2	-	-
Dactylaria Sacc.	-	2	-	1	-	-	-
Dactylella Grove	-	1	-	-	1	-	-
Deightoniella S. Hughes	-	1	-	-	1	-	-
Dematophora R. Hartig	-	1	-	-	1	-	-
Dendrospora Ingold	-	-	-	-	-	-	2
Dendrosporium Plakidas & Edgerton ex J.L. Crane	-	1	-	1	-	-	1
Dendrostilbella Höhn.	-	1	-	-	-	-	-
Dendryphiopsis S. Hughes	-	1	-	-	-	-	-
Denticularia Deighton	-	-	-	-	1	-	-
Dichotomophthoropsis M.B. Ellis	-	-	-	1	-	-	-
Dictyoarthrinium S. Hughes	-	1	-	-	-	-	-
Dictyochaeta Speg.	-	4	-	1	-	-	1
Dictyosporium Corda	-	2	-	1	1	-	-
Dicyma Boulanger	-	1	-	-	-	-	-
Didymella Sacc.	-	1	-	-	-	-	-
Didymobotryum Sacc.	-	2	-	-	-	-	-
Didymosphaeria Fuckel	-	1	-	-	-	-	-
Diplocladiella G. Arnaud ex M.B. Ellis	-	1	-	-	-	-	2
Diplococcium Grove	-	-	-	-	1	-	-
Diploospora Grove	-	1	-	-	-	-	-
Dischloridium B. Sutton	-	1	-	-	1	-	-
Doratomyces Corda	4	1	-	-	1	-	-

Drechslera S. Ito	-	4	-	-	3	-	-
Echinopodospora B.M. Robison	-	-	-	-	-	1	-
Echinosphaeria A.N. Mill. & Huhndorf	-	-	-	1	-	-	-
Edmundmasonia Subram.	-	1	-	-	-	-	-
Eladia G. Sm.	-	1	-	-	-	2	-
Elegantimyces Goh, K.M. Tsui & K.D. Hyde	-	1	-	-	-	-	-
Emericella Berk.	-	-	-	-	-	1	1
Emericellopsis J.F.H. Beyma	-	-	-	-	-	1	-
Endophragmia Duvernoy & Maire	-	3	-	-	-	-	-
Epicoccum Link	-	2	-	-	-	-	-
Esdipatilia Phadke	-	1	-	-	-	-	-
Eupenicillium F. Ludw.	-	-	-	-	-	1	-
Excipularia Sacc.	-	-	-	-	1	-	-
Exosporium Link	-	1	-	-	-	-	-
Exserticlava S. Hughes	-	1	-	-	-	-	-
Flabellospora Alas	-	1	-	-	-	-	2
Flagellospora Ingold,	-	-	-	-	-	-	2
Fulvia Cif.	-	1	-	-	-	-	-
Fusariella Sacc.	-	4	-	-	1	-	-
Fusarium Link	3	8	10	3	9	11	-
Fusichalara S. Hughes & Nag Raj	-	1	-	-	-	-	-
Gangliostilbe Subram. & Vittal	-	1	-	-	-	-	-
Geotrichum Link	-	-	-	-	1	-	-
Gibberella Sacc.	-	1	-	-	1	-	-
Gibellula Cavara	-	-	1	-	-	-	-
Gilmaniella G.L. Barron	-	1	-	-	-	1	-
Gliocephalis Matr.	1	-	-	-	-	-	-
Gliocladiopsis S.B. Saksena	-	-	2	-	-	-	-
Gliocladium Corda	-	2	3	-	-	-	-
Gliomastix Guég.	-	3	-	1	-	-	-
Glomerella Spauld. & H. Schrenk	-	4	-	-	-	-	-
Gonatobotryum Sacc.	-	2	-	2	2	-	-
Gonatophragmium Deighton	-	-	-	-	1	-	-
Gonytrichum Nees & T. Nees	-	2	-	1	-	-	-
Graphium Corda	2	1	-	-	-	-	-
Guignardia Viala & Ravaz	-	1	-	-	1	-	-
Hansfordia S. Hughes	-	1	-	-	1	-	-
Haplographium Berk. & Broome	1	-	-	-	-	-	-
Helicoma Corda	-	2	-	-	-	-	-
Helicomyces Link	-	3	-	-	-	-	2
Helicosporium Nees	-	3	-	-	-	-	3
Helicostylum Corda	2	-	-	-	-	-	-
Helminthosporium Link	-	4	-	-	-	-	-

Hemicorynespora M.B. Ellis	-	1	-	-	-	-	-
Hermatomyces Speg.	-	1	-	-	1	-	-
Heteroconium Petr.	-	2	-	-	-	-	-
Hirsutella Pat.	-	-	2	-	-	-	-
Humicola Traaen	-	2	-	-	-	-	-
Hymenoscyphus Gray	-	-	-	-	-	-	1
Hyphodiscosia Lodha & K.R.C. Reddy	-	1	-	-	-	-	-
Hypocrella Sacc.	-	-	1	-	-	-	-
Hypoxylon Bull.	-	2	-	-	-	-	-
Idriella P.E. Nelson & S. Wilh.	-	13	-	4	-	5	1
Ingoldiella D.E. Shaw	-	1	-	-	-	-	2
Isaria Fr.	1	-	-	-	1	-	-
Isthmotricladia Matsush.	-	2	-	-	-	-	2
Iyengarina Subram.	-	1	-	-	-	-	-
Janetia M.B. Ellis	-	-	-	-	1	-	-
Kramasamuha Subram. & Vittal	-	1	-	-	1	-	-
Kumbhamaya M. Jacob & D.J. Bhat	-	3	-	3	-	-	-
Kylindria DiCosmo, S.M. Berch & W.B. Kendr.	-	2	-	1	-	-	-
Lacellinopsis Subram.	-	1	-	-	-	-	-
Lasiodiplodia Ellis & Everh.	-	3	-	-	1	-	-
Lateriramulosa Matsush.	-	1	-	-	-	-	-
Lemonniera De Wild.	-	1	-	-	-	-	2
Leptosphaeria Ces. & De Not.	-	2	-	-	-	-	-
Lunulospora Ingold	-	1	-	-	-	-	2
Mariannaea G. Arnaud ex Samson	-	1	-	-	-	-	-
Melanocephala S. Hughes	-	1	-	-	-	-	-
Melanographium Sacc.	-	1	-	-	-	-	-
Melanospora Corda	1	-	-	-	-	-	-
Meliola Fr.	-	-	-	-	2	-	-
Memnoniella S. Hughes	2	3	-	-	1	2	-
Menisporopsis S. Hughes	-	-	-	-	1	-	1
Microascus Zukal	-	1	-	-	-	-	-
Microsporum Gruby	1	-	-	-	-	-	-
Miladina Svrček	-	-	-	-	-	-	2
Mirandina G. Arnaud ex Matsush.	-	1	-	-	-	-	-
Monodictys S. Hughes	-	6	-	-	2	-	-
Moorella P. Rag. Rao & D. Rao	-	1	-	-	-	-	-
Morrisographium M. Morelet	-	2	-	-	-	-	-
Mortierella Coem.	-	1	-	-	-	1	-
Mucor Fresen.	5	4	-	-	-	3	-
Mycoleptodiscus Ostaz.	-	2	-	-	-	-	3
Mycovellosiella Rangel	-	1	-	-	1	-	-
Myrothecium Tode	3	-	-	1	3	-	-

Nakataea Hara	-	1	-	-	-	-	-
Natarajenia Pratibha & Bhat	-	1	-	-	-	-	-
Nawawia Marvanová,	-	1	-	-	-	-	1
Nectria (Fr.) Fr.	-	3	-	-	-	-	1
Neottiosporella Höhn. ex Falck	-	1	-	-	-	-	-
Nigrospora Zimm.	-	3	-	2	2	2	-
Nodulisporium Preuss	-	5	-	1	-	-	-
Ophionectria Sacc.	-	1	-	-	-	-	-
Paecilomyces Bainier	-	3	8	-	-	2	-
Parahelminthosporium Subram. & Bhat	-	1	-	-	-	-	-
Parodiella Speg.	-	-	-	-	1	-	-
Passalora Fr.	-	-	-	-	5	-	-
Penicillium Link	6	3	10	2	4	7	-
Periconia Tode	1	4	-	-	3	-	1
Periconiella Sacc.	-	2	-	-	2	-	-
Pestalotiopsis Steyaert	-	3	-	1	2	1	2
Phaeoisaria Höhn.	2	2	-	-	1	-	-
Phaeoramularia Munt.-Cvetk.	-	-	-	-	1	-	-
Phaeotrichoconis Subram.	-	1	-	-	1	-	-
Phalangispora Nawawi & J. Webster	-	2	-	-	1	-	2
Phialocephala W.B. Kendr.	-	2	-	-	-	-	-
Phialomyces P.C. Misra & P.H.B. Talbot	-	1	-	-	-	-	-
Phialophorophoma Linder	-	1	-	-	-	-	-
Phoma Sacc.	-	2	-	-	2	-	-
Phyllachora Nitschke ex Fuckel	-	-	-	-	2	-	-
Pilobolus Tode	2	-	-	-	-	-	-
Piptocephalis de Bary	3	-	-	-	-	-	-
Piricauda Bubák	-	1	-	-	-	-	-
Pithomyces Berk. & Broome	1	3	-	1	3	1	1
Pleurophragmium Costantin	-	2	-	-	-	-	-
Pleurothecium Höhn.	-	2	1	-	-	-	-
Podonectria Petch	-	-	1	-	-	-	-
Podospora Ces.	4	-	-	-	-	-	-
Podosporium Schwein.	-	2	-	-	-	-	-
Poitrasia P.M. Kirk	-	-	-	-	-	-	1
Polychaeton (Pers.) Lév.	-	-	-	-	2	-	-
Polyschema H.P. Upadhyay	-	2	-	-	-	-	-
Pseudobotrytis Krzemien. & Badura	-	2	-	-	-	1	-
Pseudocercospora Speg.	-	-	-	-	18	-	-
Pseudocercosporella Deighton	-	-	-	-	2	-	-
Pseudophaeoramularia U. Braun	-	-	-	-	1	-	-
Pseudospiropes M.B. Ellis	-	-	-	-	1	-	-
Pteroconium Sacc. ex Grove	-	1	-	-	-	-	-
Pyricularia Sacc.	-	2	-	-	1	-	-

Pyriculariopsis M.B. Ellis	-	-	-	-	1	-	-
Ramaraomyces N.K. Rao, Manohar. & Goos	-	1	-	-	-	-	-
Ramichloridium Stahel ex de Hoog	-	1	-	-	-	-	-
Raperia Subram. & Rajendran	-	1	-	-	-	-	-
Rhinocladiella Nannf.	-	1	-	-	-	-	-
Rhizopus Ehrenb.	3	-	-	-	2	1	-
Robillarda Sacc.	-	-	-	1	-	-	2
Saccardaea Cavara	-	1	-	-	-	-	-
Saccobolus Boud.	2	-	-	-	-	-	-
Sarcinella Sacc.	-	-	-	-	1	-	-
Savoryella E.B.G. Jones & R.A. Eaton	-	1	-	-	-	-	-
Sclerographium Berk.	-	1	-	-	-	-	-
Scolecobasidium E.V. Abbott	-	4	-	3	1	-	-
Scutisporus K. Ando & Tubaki	-	-	-	-	-	-	1
Scytalidium Pesante	-	1	-	-	-	-	-
Seimatosporium Corda	-	1	-	1	1	-	2
Selenodriella R.F. Castañeda & W.B. Kendr.	-	1	-	-	-	-	-
Selenosporium Corda	-	1	-	-	-	-	-
Septonema Corda	-	1	-	-	-	-	-
Septoria Sacc.	-	-	-	-	1	-	-
Sesquicillium W. Gams	-	-	-	1	1	-	-
Sirosporium Bubák & Serebrian.	-	-	-	-	1	-	-
Solosympodiella Matsush.	-	1	-	-	-	-	-
Sopagraha Subram. & Sudha	-	1	-	-	-	-	-
Sordaria Ces. & De Not.	1	-	-	-	-	-	-
Sorocybe Fr.	-	2	-	-	-	-	-
Spadicoides S. Hughes	-	2	-	-	-	-	-
Spegazzinia Sacc.	-	1	-	-	-	-	1
Speiropsis Tubaki	-	2	-	-	-	-	2
Spiralum J.L. Mulder	-	-	-	-	1	-	-
Spiropes Cif.	-	-	-	-	2	-	-
Sporidesmiopsis Subram. & Bhat	-	1	-	-	-	-	-
Sporidesmium Link	-	7	-	-	4	-	-
Sporormiella Ellis & Everh.	2	-	-	-	-	-	-
Sporoschisma Berk. & Broome	-	4	-	-	-	-	-
Stachybotrys Corda	2	3	-	2	2	-	-
Stachylidium Link	-	1	-	-	-	-	-
Stellomyces Morgan-Jones, R.C. Sinclair & Eicker	-	1	-	-	-	-	-
Stemonitis Gled.	-	2	-	-	-	-	-
Stemphylium Wallr.	-	-	-	-	1	-	-
Stenella Syd.	-	-	-	-	4	-	-

Stigmina Sacc.	-	-	-	-	1	-	-
Stilbella Lindau	-	1	-	-	-	-	-
Stilbum Tode	-	-	-	-	1	-	-
Subulispora Tubaki	-	1	-	-	-	-	1
Sympodiella W.B. Kendr.	-	1	-	-	-	-	-
Syncephalastrum J. Schröt.	-	-	-	-	1	-	-
Tetrachaetum Ingold	-	1	-	-	-	-	-
Tetraploa Berk. & Broome	1	1	-	-	-	-	1
Tetraposporium S. Hughes	-	1	-	-	-	-	-
Thamnidium Link,	1	-	-	-	-	-	-
Thozetella Kuntze	-	3	-	-	-	-	-
Tomenticola Deighton	-	-	-	-	1	-	-
Torula Pers.	-	3	-	-	1	-	-
Trematostoma (Sacc.) Shear,	-	1	-	-	-	-	-
Trichobotrys Penz. & Sacc.	-	4	-	-	-	-	-
Trichoderma Pers.	2	2	1	-	1	2	-
Trichothecium Link	2	2	-	-	2	-	-
Tricladium Ingold	-	2	-	1	-	1	4
Trinacrium Riess	-	3	-	-	-	-	-
Tripospermum Speg.	-	2	-	-	-	-	1
Triscelophorus Ingold	-	1	-	-	-	-	3
Tritirachium Limber	-	2	-	-	-	-	-
Tubercularia Tode	-	2	-	-	1	-	-
Vamsapriya Gawas & Bhat	-	1	-	-	-	-	-
Vanakripa Bhat, W.B. Kendr. & Nag Raj	-	2	-	-	-	-	-
Varicosporium W. Kegel	-	-	-	-	-	-	2
Vermiculariopsiella Bender,	-	5	-	7	5	-	1
Vermispora Deighton & Piroz.	-	1	-	-	-	-	-
Veronaea Cif. & Montemart.	-	3	-	-	-	-	-
Verticillium Nees	-	1	-	-	1	-	1
Virgaria Nees	-	-	-	-	-	-	1
Virgatospora Finley	-	2	-	1	-	-	-
Volutella Fr.	1	1	-	-	-	-	-
Wardomyces F.T. Brooks & Hansf.	-	1	-	-	1	-	-
Wiesneriomyces Koord.	-	1	-	1	-	1	1
Xylaria Hill ex Schrank,	-	1	-	-	-	-	1
Zalerion R.T. Moore & Meyers	-	1	-	-	-	-	-
Zygosporium Mont.	-	4	-	-	3	-	-

A=Dung, B=Plant litter, C=insects, D=fresh plant parts (Endophytes), E=infected plant parts (Foliicolous), F= soil, G=freshwater

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