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Host diversity of genus *Phellinus* from world

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ABSTRACT

Phellinus is a genus of fungi belonging to the family Hymenochaetaceae from order Aphyllophorales. *Phellinus* spp. causing white rot of various kinds in live standing or dead gymnospermic and angiospermic wood occurs worldwide. A total number of 427 records (310 species, 06 sub-species, 42 varieties and 69 formas) of *Phellinus* are reported worldwide so far. The current study was based on thorough world literature survey for the host range of *Phellinus* species. About 91 plant families shows infection of *Phellinus* spp. Amongst all the families, genera of Fabaceae are found to be most susceptible, followed by Rosaceae, Myrtaceae, Cupressaceae, Caesalpiniaceae, Ericaceae, Euphorbiaceae, Lauraceae, Meliaceae, Pinaceae, Rubiaceae, Arecaceae, Fagaceae and Oleaceae are also amongst the most frequently infected families. *Quercus* is the most frequent host of *Phellinus*.

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Introduction

Phellinus is a member of family Hymenochaetaceae. The members of Hymenochaetaceae form a cosmopolitan group of wood inhabiting fungi, capable of utilizing components of wood cell walls for their growth and reproduction. Wood is composed of the structural polymer cellulose, lignin, and hemicellulose. However, there is considerable variation, which is particularly evident in the heartwood of living trees in which a wide array of non-structural extraneous materials are deposited, as the maturing cells die.

Species of *Phellinus* decay heartwood and causes root rot and cankers of live standing trees and destroy slash and other woody residues. Tree diseases have been generally referred to as negative influence in the forest environment. No other class of forest diseases cause more timber damage than root and heart decays. Species of *Phellinus* are probably responsible for more timber loss than any other genus of wood destroying fungi. (Larsen & Cobb-Pouille, 1971)

Species of *Phellinus* are parasitic, perthophytic and/or saprobic causing white rot that degrade both lignin and cellulose (Rabba 1994, Vaidya 1993, 1990, 1991). They dwell on a wide variety of angiosperms and/or gymnosperms (Wagner & Fischer 2002) causing heart rot disease in live standing trees.

Fruit bodies of *Phellinus* are pileate to resupinate, perennial, rarely annual, pileus dark brown to black in species with a crust, more rarely pale ochraceous, hirsute to glabrous, often sulcate now and then radially cracked in older fruit bodies, pores variable, but mostly small, tubes usually stratified, context thin and dense. Hyphal system dimitic, generative hyphae usually hyaline, thin-walled and narrow, more rarely wider and pale golden brown, setal hyphae, tramal setae or hymenial setae absent or present, spores of variable shapes, hyaline to rusty brown, thin-walled to thick-walled, mostly IKI negative, dextrinoid in a few species. All species are on dead wood. Cosmopolitan genus with numerous species, which in many groups can be difficult to separate. There is a problem when it comes to the colour of the spores. In some species they start as pale yellow, but with maturity they become more rusty brown,

this is especially distinct when section is taken in the outer part of the tubes and from the old and stuffed parts of the tubes. In the latter part, frequently the spores will be more thick walled, larger and more deeply coloured than in the former part. In other species, the coloration seems to be a rather specific character (Quelet, 1886).

Observations and result

Table -1, Table -2 and Table -3 shows host range of *Phellinus* and family wise distribution of *Phellinus* respectively as noted from thorough literature survey.

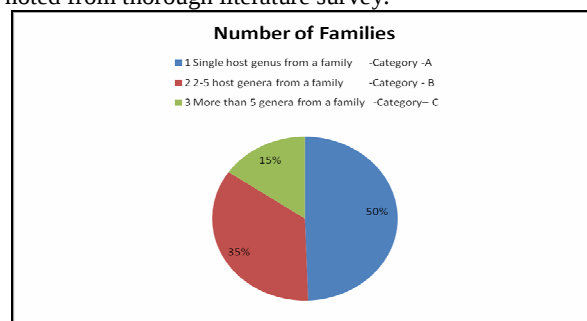


Fig. 1. Host distribution percentage based on Table-5

Discussion

It was clearly observed that *Phellinus* has a wide host range. The total 287 host genera are observed from world (Angiosperms and Gymnosperms). The dominating genera amongst the host diversity are *Quercus*, *Abies*, *Betula*, *Prunus*, *Pinus*, *Salix*, *Acacia*, *Alnus*, *Mangifera*, *Picea*, *Populus*, *Acer*, *Artocarpus*, *Larix*, *Albizia* and *Juglans* (Table -2).

Fabaceae has the maximum no. of genera (32) are infected by *Phellinus*, followed by Rosaceae (22), Myrtaceae (13), Cupressaceae (10), Caesalpiniaceae (8), Ericaceae (8), Euphorbiaceae (8), Lauraceae (8), Meliaceae (8), Pinaceae (7) and Rubiaceae (7) (Table -3).

It can be stated that dominant families infected by *Phellinus* seem to be Fabaceae, Rosaceae, Myrtaceae, Cupressaceae and Caesalpiniaceae (Table -3).

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Table- 1: Family wise distribution of *Phellinus* hosts and infection incidence. (Larsen & Cobb-Pouille 1971, Wagner & Fischer 2002)

Sr. No.	Family	No. of Genera	Genera	Infection incidence
1	Adoxaceae	2	<i>Sambucus</i> <i>Viburnum</i>	3 3
2	Vitaceae	1	<i>Vitis vinifera</i>	1
3	Anacardiaceae	5	<i>Astronium</i> <i>Mangifera</i> <i>Pistacia</i> <i>Rhus</i> <i>Schinopsis</i>	1 28 5 6 1
4	Antherospermataceae	1	<i>Laurelia</i>	1
5	Apocynaceae	2	<i>Carissa</i> <i>Wrightia</i>	1 2
6	Araliaceae	1	<i>Kalopanax</i>	1
7	Arecaceae (Calamoideae) (Coryphoideae)	6	<i>Areca</i> <i>Calamus</i> <i>Caryota</i> <i>Cocos</i> <i>Elaeis</i> <i>Phoenix</i>	11 1 1 2 1 11
8	Aquifoliaceae	1	<i>Ilex</i>	1
9	Asparagaceae	1	<i>Dracaena</i>	1
10	Asteraceae	3	<i>Baccharis</i> <i>Cassinia</i> <i>Olearia</i>	1 1 1
11	Avicenniaceae	1	<i>Avicinia</i>	2
12	Berberidaceae	1	<i>Berberis</i>	1
13	Betulaceae	5	<i>Alnus</i> <i>Betula</i> <i>Carpinus</i> <i>Corylus</i> <i>Ostrya</i>	29 33 2 3 6
14	Bignoniaceae	3	<i>Chilopsis</i> <i>Heterophragma</i> <i>Tabebuia</i>	2 2 2
15	Bombacaceae	1	<i>Eriodendron</i>	1
16	Burseraceae	3	<i>Bursera</i> <i>Canarium</i> <i>Garuga</i>	1 1 2
17	Buxaceae	1	<i>Buxus</i>	1
18	Cactaceae	3	<i>Carnegiea</i> <i>Cereus</i> <i>Opuntia</i>	2 1 3
19	Caesalpiniaceae	8	<i>Bauhinia</i> <i>Caesalpinia</i> <i>Cassia</i> <i>Delonix</i> <i>Peltophorum</i> <i>Poinciana</i> <i>Saraca</i> <i>Tamarindus</i>	1 5 10 15 7 1 1 14
20	Calophyllaceae	1	<i>Calophyllum</i>	1
21	Cannabaceae	1	<i>Celtis</i>	5
22	Caprifoliaceae	2	<i>Lonicera</i> <i>Symphoricarpos.</i>	5 1
23	Carpodetaceae	1	<i>Carpodetus</i>	1
24	Casuarinaceae	1	<i>Casuarina</i>	13
25	Celastraceae	4	<i>Canotia</i> <i>Cassine</i> <i>Elaeodendron</i> <i>Euonymus</i>	2 2 1 3
26	Cistaceae	2	<i>Cistus</i> <i>Helianthemum</i>	3 3
27	Clusiaceae	5	<i>Allanblackia</i> <i>Callophyllum</i> <i>Clusia</i> <i>Garcinea</i> <i>Mesua</i>	1 1 1 4 1
28	Combretaceae	3	<i>Anogeissus</i> <i>Lumnitzera</i> <i>Terminalia</i>	4 1 11
29	Coriariaceae	1	<i>Cariaria</i>	2
30	Cornaceae	1	<i>Cornus</i>	13

31	Corynocarpaceae	1	<i>Corynocarpus</i>	1
32	Cunoniaceae	2	<i>Weinmannia</i> <i>Eucryphia</i>	7 1
33	Cupressaceae (Cupressoideae) (Sequoioideae)	10	<i>Austrocedrus</i> <i>Calocedrus</i> <i>Chamaecyparis</i> <i>Cupressus</i> <i>Cypresses</i> <i>Juniperus</i> <i>Libocedrus</i> <i>Sequoia</i> <i>Taxodium</i> <i>Thuja</i>	1 1 6 3 1 5 4 1 2 15
34	Dilleniaceae	1	<i>Dillenia</i>	1
35	Dipterocarpaceae	4	<i>Balanocarpus</i> <i>Dipterocarpus</i> <i>Hopea</i> <i>Shorea</i>	1 1 1 8
36	Ebenaceae	1	<i>Diospyros</i>	1
37	Elaeagnaceae	2	<i>Eleagnus</i> <i>Hippophae</i>	1 1
38	Elaeocarpaceae	1	<i>Aristotelia</i>	1
39	Ephedraceae	1	<i>Ephedra</i>	2
40	Ericaceae	8	<i>Arbutus</i> <i>Arctostaphylos</i> <i>Calluna</i> <i>Erica</i> <i>Gaultheria</i> <i>Lyonia</i> <i>Rhododendron</i> <i>Vaccinium</i>	12 4 1 3 1 1 3 2
41	Euphorbiaceae	8	<i>Aleurites</i> <i>Bridelia</i> <i>Dimorphocalyx</i> <i>Drypetus</i> <i>Euphorbia</i> <i>Hevea</i> <i>Macaranga</i> <i>Mallotus</i>	1 2 2 1 1 2 1 5
42	Fabaceae	32	<i>Acacia</i> <i>Albizia</i> <i>Butea</i> <i>Caragana</i> <i>Cassia</i> <i>Ceasalpinia</i> <i>Ceasalpinia</i> <i>Ceratonia</i> <i>Cercidium</i> <i>Cercis</i> <i>Cytisus</i> <i>Dalbergia</i> <i>Derris</i> <i>Desmodium</i> <i>Dialium</i> <i>Dorycnium</i> <i>Erythrina</i> <i>Erythrophleum</i> <i>Gleditsia</i> <i>Gliricidia</i> <i>Olneya</i> <i>Pericopsis</i> <i>Piptadenia</i> <i>Pithecolobium</i> <i>Pongamia</i> <i>Prosopis</i> <i>Pterocarpus</i> <i>Robinia</i> <i>Robinia</i> <i>Spartium</i> <i>Ulex</i> <i>Xylia</i>	30 21 2 1 1 1 1 3 2 3 1 15 4 2 1 1 2 3 15 2 2 1 1 4 14 2 9 6 3 4 1
43	Fagaceae	6	<i>Castanea</i> <i>Castanopsis</i> <i>Cyclobalanopsis</i> <i>Fagus</i> <i>Lithocarpus</i> <i>Quercus</i>	5 6 1 8 2 57
44	Fouquieriaceae	1	<i>Fouquieria</i>	2
45	Grossulariaceae	1	<i>Ribes</i>	1
46	Hamamelidaceae	1	<i>Parrotia</i>	3
47	Hydrangeaceae	1	<i>Viburnum</i>	2

48	Juglandaceae	2	<i>Carya ovate</i> <i>Juglans</i>	1 19
49	Lamiaceae	1	<i>Vitex</i>	2
50	Lauraceae	8	<i>Actinodaphne</i> <i>Alseodaphne</i> <i>Beilschmiedia</i> <i>Cinnamomum</i> <i>Laurus</i> <i>Ocotea</i> <i>Persea</i> <i>Umbellularia</i>	3 1 7 4 3 2 2 2
51	Lecythidiaceae	1	<i>Mammea</i>	2
52	Lythraceae	2	<i>Lagerstroemia</i> <i>Punica</i>	3 3
53	Magnoliaceae	2	<i>Liriodendron</i> <i>Talauma</i>	1 1
54	Malvaceae (Tilioideae)	2	<i>Thespesia</i> <i>Tilia</i>	5 3
55	Marattiaceae	1	<i>Danaea</i>	1
56	Melastomataceae	1	<i>Memecylon</i>	8
57	Meliaceae	8	<i>Aglaia</i> <i>Azadirachta</i> <i>Chukrasia</i> <i>Carapa</i> <i>Dysoxylum</i> <i>Melia</i> <i>Swietenia</i> <i>Toona</i>	1 7 12 1 3 1 11 1
58	Menispermaceae	1	<i>Cocculus</i>	2
59	Moraceae	5	<i>Artocarpus</i> <i>Broussonetia</i> <i>Ficus</i> <i>Maclura</i> <i>Morus</i>	22 2 9 1 7
60	Myricaceae	1	<i>Myrica</i>	1
61	Myrtaceae	13	<i>Blepharocalyx</i> <i>Caryophyllus</i> <i>Eucalyptus</i> <i>Eugenia</i> <i>Kunzea</i> <i>Melaleuca</i> <i>Metrosideros</i> <i>Myrceugenella</i> <i>Myrtus</i> <i>Psidium</i> <i>Rhodamnia</i> <i>Syzygium</i> <i>Tristania</i>	1 1 10 6 1 3 2 1 3 1 1 7 2
62	Nothofagaceae	1	<i>Nothofagus</i>	4
63	Olaceae	1	<i>Scorodocarpus</i>	2
64	Olecaceae	6	<i>Chionanthus</i> <i>Fraxinus</i> <i>Nestegis</i> <i>Olea</i> <i>Phillyrea</i> <i>Syringa</i>	1 18 1 7 3 5
65	Pinaceae	7	<i>Abies</i> <i>Cedrus</i> <i>Larix</i> <i>Picea</i> <i>Pinus</i> <i>Pseudotsuga</i> <i>Tsuga</i>	37 6 22 28 31 18 16
66	Pittosporaceae	1	<i>Pittosporum</i>	4
67	Platanaceae	1	<i>Platanus</i>	10
68	Poaceae	1	<i>Bambusa</i>	8
69	Podocarpaceae	4	<i>Dacrydium</i> <i>Phyllocladus</i> <i>Podocarpus</i> <i>Saxegothaea</i>	1 2 5 1
70	Polygonaceae	2	<i>Calligonum</i> <i>Coccoloba</i>	1 1
71	Proteaceae	3	<i>Cardwellia</i> <i>Embothrium</i> <i>Grevillea</i>	1 4
72	Rhamnaceae	1	<i>Rhamnus</i>	8
73	Rhizophoraceae	2	<i>Bruguiera</i> <i>Rhizophora</i>	1 3

74	Rosaceae	22	<i>Adenostoma</i> <i>Amelanchier</i> <i>Cerasus</i> <i>Cercocarpus</i> <i>Cotoneaster</i> <i>Cowania</i> <i>Crataegus</i> <i>Cydonia</i> <i>Holodiscus</i> <i>Malus</i> <i>Physocarpus</i> <i>Polylepis</i> <i>Prunus</i> <i>Pyrus</i> <i>Raphiolepis</i> <i>Rosa</i> <i>Rubus</i> <i>Sorbus</i> <i>Sorbus</i> <i>Spirea</i> <i>Stuhlmannii</i> <i>Vauquelinia</i>	1 1 1 3 1 2 7 3 1 8 1 2 32 13 1 4 1 1 1 1 1 2
75	Rubiaceae	7	<i>Anthocephalus</i> <i>Cinchona</i> <i>Coffea</i> <i>Mitragyna</i> <i>Pavetta</i> <i>Psychotria</i> <i>Timonius</i>	2 2 3 1 2 1 1
76	Rutaceae	2	<i>Citrus</i> <i>Glycosmis</i>	5 1
77	Salicaceae	2	<i>Populus</i> <i>Salix</i>	28 31
78	Salvadoraceae	1	<i>Salvadora</i>	1
79	Schisandraceae	1	<i>Illicium</i>	1
80	Sapindaceae	5	<i>Acer</i> <i>Allophylus</i> <i>Aesculus</i> <i>Dodonaea</i> <i>Schleichera</i>	24 1 4 1 2
81	Sapotaceae	2	<i>Mimusops</i> <i>Xantolis</i>	2 1
82	Sterculiaceae	2	<i>Pterospermum</i> <i>Sterculia</i>	1 1
83	Symplocaceae	1	<i>Symplocos</i>	1
84	Taxaceae	1	<i>Taxus</i>	6
85	Theaceae	3	<i>Camellia</i> <i>Schima</i> <i>Thea</i>	2 2 1
86	Tiliaceae	1	<i>Grewia</i>	2
87	Ulmaceae	3	<i>Hemiptelia</i> <i>Ulmus</i> <i>Zelkova</i>	1 9 1
88	Urticaceae	1	<i>Cecropia</i>	1
89	Verbenaceae	1	<i>Tectona</i>	5
90	Vitaceae	1	<i>Vitis</i>	4
91	Zygophyllaceae	1	<i>Larrea</i>	2
92	Unknown host	-	-	275

Table -2: Dominantly infected genera amongst the host diversity of *Phellinus*

Family	Genus	Total infection incidence of Genus
1. Fagaceae	<i>Quercus</i>	57
2. Pinaceae	<i>Abies</i>	37
3. Betulaceae	<i>Betula</i>	33
4. Rosaceae	<i>Prunus</i>	32
5. Pinaceae	<i>Pinus</i>	31
6. Salicaceae	<i>Salix</i>	31
7. Fabaceae	<i>Acacia</i>	30
8. Betulaceae	<i>Alnus</i>	29
9. Anacardiaceae	<i>Mangifera</i>	28
10. Pinaceae	<i>Picea</i>	28
11. Salicaceae	<i>Populus</i>	28
12. Sapindaceae	<i>Acer</i>	24
13. Moraceae	<i>Artocarpus</i>	22
14. Pinaceae	<i>Larix</i>	22
15. Fabaceae	<i>Albizia</i>	21

Table -3: Family wise dominance in susceptibility to the disease

Family	Total infected genera
1. Fabaceae	32
2. Rosaceae	22
3. Myrtaceae	13
4. Cupressaceae	10
5. Caesalpiniaceae	8
6. Ericaceae	8
7. Euphorbiaceae	8
8. Lauraceae	8
9. Meliaceae	8
10. Pinaceae	7
11. Rubiaceae	7

Table-4: Family wise Dominant infection incidence

Family	Total infection Incidence
1. Fabaceae	159
2. Pinaceae	158
3. Rosaceae	88
4. Fagaceae	79
5. Betulaceae	73
6. Salicaceae	59
7. Caesalpiniaceae	54
8. Anacardiaceae	41
9. Moraceae	41
10. Cupressaceae	39
11. Myrtaceae	39

Table- 5: Categories of plants infected by *Phellinus*

Category	Number of Families	Host Distribution (%)
1. Single host genus from a family -Category -A	45	49.45
2. 2-5 host genera from a family -Category - B	32	35.16
3. More than 5 genera from a family -Category- C	14	15.38

The host plants were categorised into three groups, single host genus from a family- Category-(A), two to five host genera from a family Category- (B) and more than five genera from a family Category- (C) (Table -5). 49.45% of infection within families is that from Category-A, Category-B show 35.16% infection and Category-C show 15.38% infection respectively (Fig. 1).

As far as host species range of *Phellinus* from India is concerned, the most frequently attacked host is *Mangifera* following *Acacia*, *Artocarpus* and *Albizia*.

The outcome of this survey could be helpful in forest pathology and medicinal research point of view in future.

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