

Original Research Article

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## Survey of Wood-Decaying Fungi from Vaijapur Taluka, Aurangabad (M.S.) India

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### ABSTRACT

#### Keywords

Vaijapur, Macro-fungi, Microscopic, Flavodon flavus, Schizophyllum commune

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The survey and collection of wood-decaying fungi were carried from Vaijapur Taluka, Aurangabad (M.S.) India. Thirty-seven wood-decaying fungi were collected from July 2016 to November 2019 after a regular interval, 20 to 25 days after heavy rainfall. From that eleven different genus and twelve species of macro-fungi were identified according to morphological and microscopic features. Based on observations the *Auricularia mesenterica*, *Flavodon flavus*, *Phellinus badius* and *Schizophyllum commune* are dominating macrofungi while *Cellulariella acuta*, *Daldinia concentric*, *Funalia floccosa*, *Ganoderma lucidum*, *Leucocoprinus cepistipes*, *Phellinus gilvus*, *Trametes cingulata* and *Xylaria polymorpha* were rarely observed macro-fungi.

### Introduction

The survey and collection of wood-decaying fungi were carried out from different areas of Vaijapur Taluka in Aurangabad District of Maharashtra State, India. It is located between the latitude of 19°40' to 20°15' North and longitude of 74°35' to 75°00' East, covering of area approximately 1510.5 sq. km on the western margin of Deccan Plateau. A primary function of fungi in any ecosystem is the depolymerization of important plant

biopolymers such as cellulose, hemicelluloses, and lignin. This function is very critical for utilization of C, H, and N as well as an elemental release during decomposition and formation of soil and in this way, the wood-decaying fungi are the likely candidates for the important function category. The wood-inhabiting members of wood-decaying macro-fungi are from a cosmopolitan group and are capable of utilizing components of wood cell walls for their growth and reproduction. Although, all wood basically is composed of

the structural polymers cellulose, lignin, and hemicelluloses there is a considerable variable that is particularly evident in the heartwood of the living trees in which a wide array of non-structural materials are deposited as the maturing cells die. (Hills, 1962; Rowe & Conner, 1978; Scheffer & Cowling, 1966). Cellulose is the most consistent of structural components varying minimally between wood species.

Lignin and hemicelluloses however vary both in composition and amount not only between hardwoods and conifers but also among the hardwood (Timell, 1967).

Wood decaying fungi are grouped into two categories, i.e. white rot fungi and brown rot fungi, white rot which degrade lignin and cellulose is partially degraded and brown rot degrade cellulose and lignin is left as brown residue, the ability of white rot fungi and brown rot fungi that degrade all principle components of wood is important for carbon flux of ecosystem (Leonowicz *et al.*, 1999; Baldrian and Gabriel 2003).

Anjali Roy and De Asit (1996) manual entitled "Polyporaceae of India" was based on studies on fungi belonging to the family Polyporaceae collected from different parts of India during the preceding 40 years. Sharma (1995) on Hymenochaetaceae of India. Bhosale *et al.*, (2010) on taxonomy and diversity of *Ganoderma* from Western Parts of Maharashtra. Ranadive *et al.*, (2011) on the checklist given complete Aphyllorphales diversity data from Western Ghats of Maharashtra state India. Hakimi *et al.*, (2013) on resupinate Aphyllorphales of India. Ranadive *et al.*, (2012) on host distribution of *Phellinus* from India. Mali *et al.*, (2016) on taxonomy and diversity of trametes from Marathwada. Chouse and Mali (2020) on the diversity of Aphyllorphales from Latur district, Maharashtra.

## Materials and Methods

The present investigation, the survey, and collection of thirty-seven macrofungi were done 20 to 25 days after heavy rainfall during the month July to November from 2016 to 2019. The fresh fruiting bodies/basidiome of macrofungi were morphologically characterized in the field with a hand lens and photographed at the site, collected specimens were kept in a brown paper packet noting host, the color of basidiome, locality, and date of the collection according to Gilbertson and Ryvardeen (1986). All specimens were sun-dried and microscopic observations were done under 100X Magnification (Olympus CX 41) in laboratory by freehand thin section cutting of basidiome with the help of sharp razor blades, stained and studied in 10% KOH, Cotton Blue, and Melzer's reagent.

## Results and Discussion

*Auricularia mesenterica* (Dicks) Per, Mycol. Eur. (Erlanga) 1:97 (1822).

Basidiome resupinate to pileate, 0.5–17 × 0.5–11.2 cm, loosely attached laterally and sometimes by a very short stalk, elastic, ear like shaped, gelatinous, occur in imbricate clusters extending over an area of several centimeters, sterile surface, hairy, zoned, with grey, yellowish-brown to the olivaceous band. Hymenium smooth to slightly wrinkled, light brown to purplish brown with a whitish bloom. Hairs thick-walled, up to 0.5 mm long. Basidia cylindrical, hyaline, 3-septate, 45–65 × 5–55 µm with 1–3 sterigmata, lateral, 3–11 × 1–12 µm. Spore hyaline, reniform to allantoids, 12–14 × 5–5.5 µm, guttulate.

## Specimens examined

Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Karanjgoan; 19°56'15"N, 74°55'04"E; alt 510 m; on the

wood logs of *Mangifera indica* L.; 06/10/2016; Gore Vijay (GVU/MVP – 501).

*Cellulariella acuta* (Berk) Zmitr. & Malysheva, Index Fungorum 180: 1 (2014)

Basidiome annual, solitary or in groups, bracket-like, broadly attached with a contracted base. Pileus 6.2–10.3 × 5.4–9.1 × 1.2–2.6 cm. semicircular to fan-shaped, concentrically zonate, wrinkled, grayish–white to pale yellow to light orange. Margin entire, acute, wavy, undulating, fertile. Pores surface poroid to maize-like, yellowish–white to pale orange. Context up to 10mm wide, homogeneous, dense, pale yellow to ochraceous. Tube up to 20 mm long, corky and tough when dry, color similar to the flesh. Hyphal system trimitic, Generative hyphae hyaline and with clamps, 1.5–3 µm wide. Skeletal hyphae straight, thin-walled and pale yellowish up to 6 µm wide, cystidia proper absent. Spores 7–8 × 2–3.5 µm, cylindrical, thin-walled smooth, colorless.

### **Specimens examined**

Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Hadas Pimpalgaon; 19°55'49"N, 74°57'28"E; alt 508 m; on logs of *Mangifera indica* L.; 07/11/2019; Gore Vijay (GVU/MVP – 773)

*Daldinia concentrica* (Bolton) Ces. & De Not. Comm. Soc. crittog. Ital. 1 (fasc. 4): 197 (1863).

Basidiome appear as hard hemispherical to variously shaped cushions up to 4.3 cm diameter, annual, reddish-brown to purplish brown, soon changes to black. The outer surface is smooth, somewhat shiny, dotted with minute pores formed by the ostiole of the perithecia. In a vertical section, basidiome show distinct concentric zoning of their fibrous hyphal tissues caused by the regions of

thick-walled hyphae alternating with the less thick region. Perithecia are crowded in a single layer just below the outer crust, immersed in stomatal tissue, possess a conical neck. Asci within the perithecium immersed in mucilage, cylindrical, 80–150 × 8–12 µm, with a long stalk. Ascospores uniseriate, elliptical to inequilateral, opaque at maturity, 12–16.5 × 6–9.5 µm; conidia ovate to ellipsoid, olive green, 6–8 × 4–5 µm.

### **Specimens examined**

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Hadas Pimpalgaon; 19°55'48"N, 74°57'29"E; alt 507 m; on wood logs of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 06/10/2016; Gore Vijay (GVU/MVP – 492)

*Flavodon flavus* (Klotzsch) Ryvarde, Norw. JI Bot. 20(1): 3 (1973)

Basidiome small to large-sized, annual, resupinate to pileate, thin, leathery. Pileus tomentose, with concentric zonation, dull, concentrically ridged, grayish–yellow to brownish orange, 0.5–10.2 × 0.5–8.7 × 0.2–0.5 cm. Pore surface grayish–yellow to yellowish-brown, poroid near margin, round to angular, becomes hynoid towards center, pores 1–2 per mm.

Context up to 3mm thick grayish–yellow, homogenous to duplexed, upper tomentum separated from the context by a thin layer. Tube 1–5 mm long, dissepiments thin, entire to more or less lacerate with maturity. Hyphal system dimitic.

Generative hyphae hyaline, thin to slightly thick-walled, simple septate, branched, 1.5 – 3 µm wide. Skeletal hyphae pale yellowish–brown in KOH, thick-walled, sparingly branched, 2 – 6 µm wide. Cystidia occur as skeletal hyphal projection, thick-walled,

encrusted at the tip,  $10-32 \times 6-11 \mu\text{m}$ . Basidia  $24 - 28 \times 6 - 9 \mu\text{m}$ , clavate, hyaline, thin-walled, with 4-sterigmata. Spore hyaline, elliptic, smooth, thin-walled  $6-7 \times 3-4 \mu\text{m}$ .

### **Specimens examined**

INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Hadas Pimpalgaon;  $19^{\circ}55'45''\text{N}$ ,  $74^{\circ}57'08''\text{E}$ ; alt 506 m; on living tree on the main trunk of *Leucaena leucocephala* (Lam.) de Wit; 06/10/2016; Gore Vijay (GVU/MVP – 498).

*Funalia floccosa* (Jung.) Zmitr. & Malysheva, Mikol. Fitopatol. 47(6): 375 (2013)

Basidiome annual, pileate, sessile or laterally fused or connate and elongated, frequently with decurrent pore layer, up to 40 mm wide and 150 mm long in fused fruit bodies, up to 10 mm thick at the base; margin entire, crenulate, lobed or dentate, undulating and sharp; pileus ochraceous to deep hazel brown, frequently greyish brown, hirsute to tomentose, even, hispid at the base tomentum may become agglutinated to erect protuberances, distinctly to indistinctly zonate, somewhat radially striate; pore surface greyish brown with a distinct bluish-ashy grey tint which is typical for this species, in old specimens more tobacco to grayish brown, pores round to angular, entire 2-4 per mm, elongated radially, dentate or splint in old fruit bodies; tubes concolorous with pore surface, trama dark brown, trama and the tubewalls are contrasting, up to 6 mm deep; context distinctly duplex, lower part dense, tobacco brown, shiny fibrous when sectioned, up to 4 mm thick, upper part looser and floccose, more greyish brown, two parts are separated by a thin black line, trama and context black in KOH. Hyphal system trimitic, Generative hyphae hyaline, thin-walled, with clamps,  $1.5-3 \mu\text{m}$  wide, often collapsed and

distorted. Skeletal hyphae abundant, yellow to almost golden, thick-walled,  $2.5-6 \mu\text{m}$  wide, binding hyphae thin-walled to slightly thick-walled,  $1.5-4 \mu\text{m}$ , hyaline to yellowish, with numerous relatively short tapering branches; cystidia and other sterile elements absent; basidia clavate, 4-sterigmate,  $20-28 \times 5-6 \mu\text{m}$ , with a basal clamp; spores cylindrical, hyaline, smooth, thin-walled,  $8.5-12 \times 2.5-4 \mu\text{m}$ .

### **Specimens examined**

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Karanjaon;  $19^{\circ}56'16''\text{N}$ ,  $74^{\circ}55'04''\text{E}$ ; alt 510 m; on wood logs of *Zizyphus mauritiana* Lam.; 07/11/2019; Gore Vijay (GVU/MVP – 774).

*Ganoderma lucidum* (Curtis) P. Karst., Revue mycol., Toulouse 3(no. 9): 17 (1881)

Basidiome annual, laterally to centrally stipitate. Pileus reniform to dimidiate, corky,  $14.6 \times 12.3 \times 1.7-3.1 \text{ cm}$ , sulcate, zonate, shiny, reddish-brown to brown, Margin obtuse, smooth, sterile, pale to pale brown to dull white, Pore surface poroid, pores 4-5 per mm, round cream to reddish grey. Tubes 2-11 mm long, light brown.

Context 5 – 20 mm thick, duplexed, light brown upper part, reddish-brown lower part, dissepiments thick. Stipe  $5-9 \times 1.1-2.3 \text{ cm}$ , violet brown to reddish brown Hyphal system trimitic. Generative hyphae hyaline, septate with clamps, branched,  $3-4.5 \mu\text{m}$  wide. Skeletal hyphae thick-walled, pale brown arboriform,  $3-4.5 \mu\text{m}$ .

Binding hyphae colourless, lumen not visible,  $1-2 \mu\text{m}$  wide. Spores ovoid or truncate, bitunicate, exospores hyaline, smooth, endospore echinulate, brownish,  $8.5-11.5 \times 5.5-7 \mu\text{m}$ .

### **Specimens examined**

INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Dahegoan Bor; 19°55'44"N, 74°53'56"E; alt 516 m; on wood logs of *Acacia nilotica* (L.) Delile; 06/10/2016; Gore Vijay (GVU/MVP – 505).

*Leucocoprinus cepistipes* (Sowerby) Pat. [as 'cepaestipes'], J. Bot., Paris 3: 336 (1889)

Basidiome small to medium-sized. Pileus 2–6.4 cm diameter, at first ovoid then conical, obtusely umbonate, finally campanulate or expanded, surface pure white with pale pink tints, cream color at the disk, covered by loose granular-furfuraceous squamules which are removed by weathering, plicate striate towards the margin. Lamellae free, white or cream, thin up to 6 mm wide, crowded. Stipe 4–7.8 × 0.3–2 cm, cylindric, equal above, becoming inflated fusiform towards the base (6–20 mm) hollow, surface white, cream or slightly pinkish. Annulus membranous, white, soon fragmenting, attached to the middle zone of the stipe.

Context thin, whitish, soft. Spores 8–10 × 5–6 µm, short ovoid, lacking a suprahilar depression, with a small but distinct germ-pore truncating the apex, hyaline, dextrinoid, with a complex wall. Basidia 16–18 × 5–6 µm, inflated clavate, bearing 4 sterigmata. Lamella-edge sterile with crowded cheilocystidia. Cheilocystidia 19–24 × 10.5–12 µm, very variable in shape but often clavate and nearly always with a mucronate, frequently constricted apex, thin-walled, hyaline. Pleurocystidia absent. Pileal surface an epicutis of loose chains of hyaline, thin-walled hyphae, individual elements 2–90 × 5–32 µm, sometimes forming erect, loose fascicles, producing squamulose which may include dermatocystidioid elements similar to the cheilocystidia.

### **Specimens examined**

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Hadas Pimpalgaon; 19°55'49"N, 74°57'28"E; alt 507 m; on wood logs of *Ficus benghalensis* L.; 06/10/2016; Gore Vijay (GVU/MVP – 495).

*Phellinus badius* (Cooke) G. Cunn., Bull. N.Z. Dept. Sci. Industr. Res. 164: 273 (1965).

Basidiome perennial, sessile, half-shaped to unguulate or appearing somewhat pendent, easily detachable from the host, hard woody, 11.2 × 7.6 × 4.4 cm. Pilear surface is yellowish-brown when young, soon brownish-black, glabrous, rimose. Margin obtuse, paler than the pilear surface, sterile. Pore surface dark brown to reddish-brown, glancing. Tubes ferruginous brown, paler than pore surface, stratified distinctly, up to 3 mm deep in each layer, pores 4 – 6 per mm, dissepiments thick. Context bright, lustrous, yellowish-brown corky when fresh, hard on drying, up to 31 mm thick. The faintly zonate, granular core of dull yellowish-brown mycelium with a patch of white mycelium, hard glossy granules scattered throughout. Hyphal system dimitic, Generative hyphae hyaline to pale yellow, simple septate, moderately branched, 3–4 µm wide. Skeletal hyphae thick-walled, 4–5 µm wide; hymenial setae absent or very rarely present in older species, ventricose, 14–25 × 4–8 µm, dark reddish brown. Basidia broadly clavate, 11–14 × 6–7 µm, 4-sterigmate. Spores broadly ellipsoid to subglobose, moderately thick-walled, 6.5–7.5 × 6–6.5 µm, yellowish-brown, dark reddish-brown.

### **Specimens examined**

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Dahegoan Bor; 19°55'44"N, 74°53'56"E; alt 516 m; on a living tree on the main trunk of *Acacia nilotica* (L.)

Delile; 06/10/2016; Gore Vijay (GVU/MVP – 504).

*Phellinus gilvus* (Schwein.) Pat., Essai Tax. Hyménomyc. (Lons-le-Saunier): 82 (1900).

Basidiome annual to perennial, imbricate to rarely single, sessile to effuse reflexed, to flabelliform, corky, hard and brittle on drying, attached with a broad base. Pileus 2.4–9.7 × 1.8–6.9 × 0.4–1.6 cm. golden brown to dark yellowish–brown, lighter toward the margin, azonate to weakly zonate, finely velutinate, either glabrous, strigose to radiate-striate. Margin yellowish-brown thin, to ratherly thick, acute, lobed. Pore surface yellowish–brown to dark brown to reddish–brown, smooth, shiny, pores 5–6 per mm, round and regular. Tube reddish brown 2–4 mm deep. Context bright yellow to pale reddish-brown, homogenous, 1–6 mm thick. Hyphal system dimitic, Generative hyphae pale yellow to yellowish–brown, simple septate, branched, 3 – 4 μ m wide. Skeletal hyphae dark brown, thick-walled 3–5 μ m. Hymenial setae thick-walled, dark brown, abundant, 22.5 – 35 × 5 – 10 μ m. Basidia 5–11 × 4–6 μ m, clavate, hyaline with 4 sterigmata. Spores sub-globose to ellipsoid, 4–6 × 2.5–3.5 μ m, yellowish to pale brown, thin-walled, smooth.

### Specimens examined

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Shivrai; 19°55'35"N, 74°50'49"E; alt 519 m; on wood logs of *Acacia nilotica* (L.) Delile; 07/10/2016; Gore Vijay (GVU/MVP – 510).

*Schizophyllum commune* Fr. [as 'Schizophyllum communis'], Observ. mycol. (Havniae) 1: 103 (1815)

Basidiome small-sized, annual, Pileus 0.5–4.6 cm diameter, thin, flabelliform, laterally attached by a small base; surface pale to dark

grayish brown, villose lobed. Margin lobed, often deeply incised. Hymenophore falsely lamellate, separating along the lamella-edge in dry condition so that the two surfaces become recurved. Stipe absent, sometimes attachment by a lateral extension of the pileal margin. Context thin, up to 1.4 mm thick, brownish, non-gelatinized, of thick-walled, uninflated hyphae, 2.5–6 μ m diameter, with clamp-connection. Spore print white, although salmon pink and glutinous in culture. Hyphal system monometric, hyphae thin to thick-walled not inflating, septate with clamps. Spore 3–6 × 1.2–2 μ m, allantoids, cylindric, hyaline, thin-walled, smooth. Basidia 15–20 × 4–6 μ m, narrowly clavate, bearing four sterigmata. Cystida absent, Subhymenial layer interwoven, up to 10 μ m wide. Pileal surface a trichodermium of hyaline to brownish hairs, 3–4 μ m diameter, with thickened wall, often encrusted with granules.

### Specimens examined

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Shivrai; 19°55'23"N, 74°50'18"E; alt 519 m; on wood logs of *Acacia nilotica* (L.) Delile; 07/10/2016; Gore Vijay (GVU/MVP – 508).

*Trametes cingulata* Berk., Hooker's J. Bot. Kew Gard. Misc. 6: 164 (1854)

Basidiome annual to perennial, dimidiate, solitary to imbricate, hard, thin, corky, sessile. Pileus grayish–white to ochraceous becoming grayish to sooty black, dull, glabrous, concentrically ridged to radially wrinkle, 2.1–8.9 × 1.8–5.2 × 0.5–0.8 cm. Pore surface cream to ochraceous, smooth, pores 4–7 per mm, round and regular, fairly thick-walled.

Margin thin, wavy, white to ochraceous. Context cream to ochraceous, homogenous, up to 5 mm thick. Tubes up to 3 mm deep. Dissepiments thin.

Plate.1

Photo plate 1



*Auricularia mesenterica* (Dicks)  
Per



*Cellulariella acuta* (Berk) Zmitr. &  
Malysheva



*Daldinia concentrica* (Bolton) Ces.  
& De Not



*Flavodon flavus* (Klotzsch)  
Ryvardeen



*Funalia floccosa* (Jungh.) Zmitr. &  
Malysheva



*Ganoderma lucidum* (Curtis) P.  
Karst



*Leucocoprinus cepistipes*  
(Sowerby) Pat



*Phellinus badius* (Cooke) G. Cunn



*Phellinus gilvus* (Schwein.) Pat



*Schizophyllum commune* Fr



*Trametes cingulata* Berk



*Xylaria polymorpha* (Pers.) Grev

Hyphal system trimitic, Generative hyphae hyaline, thin-walled, septate with clamp, 1.5–3 µm wide. Skeletal hyphae hyaline, thick-walled, unbranched, narrow 3–5 µm wide.

Binding hyphae thick-walled to almost solid, hyaline to yellowish, 1–3 µm wide. Basidia clavate, thin-walled, 16–22 × 4–6 µm. Spores ellipsoid, thin-walled, smooth hyaline, 4 – 5.5 × 3–3.5 µm. in KOH.

### **Specimens examined**

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Dahegoan Bor; 19°55'44"N, 74°53'56"E; alt 516 m; on wood logs of *Acacia nilotica* (L.) Delile; 06/10/2016; Gore Vijay (GVU/MVP – 503).

*Xylaria polymorpha* (Pers.) Grev., Fl. Edin.: 355 (1824)

Basidiome annual, in groups, clavate to cylindrical clavate to irregularly shaped with pointed to rounded apex, leathery, chalky white when fresh, turning grayish white to grayish-black, charcoal black, brittle when old. Fertile surface 0.9 – 6 × 1.8– 2.7 cm, papillate with black dots. Stipe 0.4–4 cm long, sterile. Context 4–20 mm wide, homogeneous.

Perithecia 0.5–1 mm wide, asci numerous, cylindrical, sliptate, 8-spores, 150–230 × 6–14 µm. Ascospores smooth, brown to dark brown, cylindrical, with rounded to acute end, 20–28 × 5–7 µm.

### **Specimens examined**

India; Maharashtra, Marathwada, Aurangabad district, Taluka Vaijapur, Hadas Pimpalgaon; 19°55'49"N, 74°57'28"E; alt 507 m; on the wood log of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 06/10/2016; Gore Vijay (GVU/MVP – 496).

Survey and collection of wood decaying macrofungi was conducted during July 2016 to November 2019 from different sites of Vaijapur Taluka, Aurangabad (M.S.) India. Thirty seven specimen of macrofungi collected, from that eleven different types of genus and twelve species were studied (Photo Plate 1) which belongs to Division Ascomycota and Basidiomycota. From above discussion it is concluded that *Auricularia mesenterica*, *Flavodon flavus*, *Phellinus badius* and *Schizophyllum commune* are dominating macrofungi and *Cellulariella acuta*, *Daldinia concentric*, *Funalia floccosa*, *Ganoderma lucidum*, *Leucocoprinus cepistipes*, *Phellinus gilvus*, *Trametes cingulata* and *Xylaria polymorpha* are seen rare macrofungi, which belongs to six hosts *Acacia nilotica*, *Ficus benghalensis*, *Leucaena leucocephala*, *Zizyphus mauritiana*, *Senna siamea* and *Mangifera indica*.

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