

## Taxonomic characterization and diversity of wood inhabiting Polypores from Chennai

Kezhocuyi Kezo, G. Sugantha, Lakleiphi Tallanao and K. Malarvizhi\*

Centre for Advanced Studies in Botany, University of Madras, Guindy Campus, Chennai- 600025, Tamil Nadu, India.

\*Corresponding author Email: malar.kaliyaperumal@gmail.com

(Submitted on May 29, 2019; Accepted on June 27, 2019)

### ABSTRACT

Eleven polypore species, *Ganoderma philippii*, *G. resinaceum*, *Lenzites elegans*, *Microporus xanthopus*, *Polyporus grammocephalus*, *P. alveolaris*, *Pycnoporus sanguineus*, *Rigidoporus lineatus*, *Trametes lactinea*, *T. pubescens* and *T. trogii* belonging to three families of order Polyporales are described on the basis of specimens collected from three localities of Chennai (Tamil Nadu, India). Of these, eight species namely *Ganoderma philippii*, *Microporus xanthopus*, *Polyporus alveolaris*, *Pycnoporus sanguineus*, *Rigidoporus lineatus*, *Trametes lactinea*, *T. pubescens* and *T. trogii* are described from the study area for the first time.

**Keywords:** Polyporales, polypores, white rot, taxonomy, diversity,

### INTRODUCTION

Polypores play a vital role in preserving the earth's biosphere because of their ability to decay wood that brings about the subsequent interaction between all life (Johansson *et al.*, 2007). These fungi have been classified under different groups from time to time based on morphotaxonomic and molecular characters (Ryvarden and Gilbertson, 1993; 1994; Binder *et al.*, 2005; Kirk *et al.*, 2001; 2008).

*Polyporales*, the major order of polypores, was proposed by Gäumann (1926) with ten families grouped together on the basis of morphological features. Binder *et al.* (2013) and Justo *et al.* (2017) recognised 41 families within order *Polyporales*. However, as per Mycobank (2019) there are 77 families listed under this order. As per Kirk *et al.* (2008) about 1800 species have been described under *Polyporales*. The members of this order are peculiar in having resupinate to effused reflexed to pileate basidiocarps (Binder *et al.*, 2005). The hyphal anatomy, ranges from monomitic to dimittic to trimitic (Gilbertson and Ryvarden, 1986).

The taxonomic studies on polypores from Tamil Nadu were initiated by Sundaramani and Madurajan (1925). It was followed by the significant contributions by Natarajan and Kolandavelu (1985), Selvam *et al.*, (2012), Malarvizhi (2014) and Priyamvada *et al.*, (2017). The review of literature motivated the authors to explore the diversity of *Polyporales* in and around Chennai. The present paper is an attempt for the morpho-taxonomic characterization of polypores of order *Polyporales* in the metropolitan city, Chennai.

Several collection trips were carried out for the collection of polypore basidiomata in three localities of Chennai, namely Guindy, Adyar and Tambarum during the month of November to January in 2015- 2017. These basidiomata were worked out following the standard techniques and the dried specimens were deposited in Herbarium, Centre for Advanced studies in Botany, University of Madras, Chennai, Tamil Nadu, India. The colour standards followed were as per Kornerup and Wanscher (1978).

### RESULTS AND DISCUSSIONS

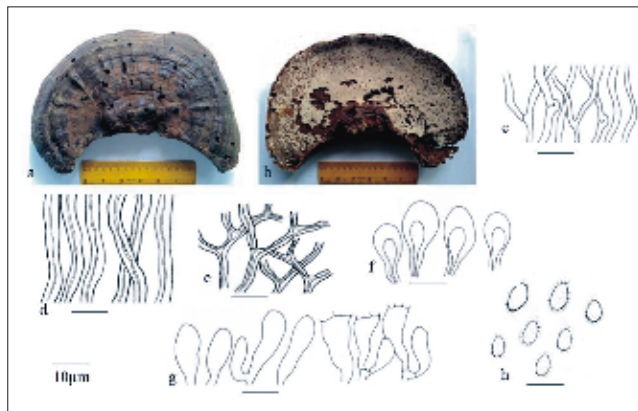
A total of 24 polypore specimens collected from the study area were worked out and have been grouped into 11 species spread over 6 genera belonging to 3 families namely

*Ganodermataceae* (*Ganoderma*), *Meripilaceae* (*Rigidoporus*) and *Polyporaceae* (*Lenzites*, *Microporus*, *Polyporus*, *Pycnoporus* and *Trametes*) of order *Polyporales*.

### Morphotaxonomic characterization

*Ganoderma philippii* (Bres. & Henn. ex Sacc.) Bres. Iconogr. Mycol. **21**: tab. 1014, 1932. - *Fomes philippii* Bres. & Henn. ex Sacc., *Sylloge Fungorum* **9**: 180, 1891. **Fig. 1**

**Basidiomata** annual, pileate, solitary, applanate, non-laccate, broadly attached, corky to woody when fresh, hardening on drying; pilei up to 12 × 17 × 5 cm (length × breadth × thickness). **Pilear surface** zonate, brownish grey (5F2) to light brown (6D8) to brown (6E4) to dark brown (7F4, 7F6) to brownish grey (5D2) when fresh, somewhat darkening on drying. **Pore surface** grey (7E1) to brownish orange (5C5) to pale orange (5A3) to light brown (7D5); pores round to angular, 3-5 per mm. **Context** homogenous, brown (6E4) to dark brown (7F67), up to 1.5 cm in thickness. **Pore tubes** dark brown (7F67), more than 1 mm in depth. **Margins** acute, orange white (5A2) to dark brown (7F4), up to 2 mm in thickness. **Hyphal system** trimitic; generative hyphae hyaline, thick-walled, clamped, branched, up to 5.2 µm in width; skeletal hyphae hyaline, unbranched, thick-walled, rarely encrusted, up to 3.9 µm in width; binding hyphae branched, thick-walled, up to 2.9 µm in width. **Pilocystidia** clavate, 18-32 × 6-12 µm. **Basidia** clavate, 2 - 4 sterigmate, with a basal clamp, 11.5 - 25.3 × 2.3 - 4.6 µm. **Basidiospores**



**Fig. 1** *Ganoderma philippii*: a. Basidiomata, b. Pore Surface, c. Generative hyphae, d. Skeletal hyphae, e. Binding hyphae, f. Pilocystidia, g. Basidioles and Basidia, h. Basidiospores.

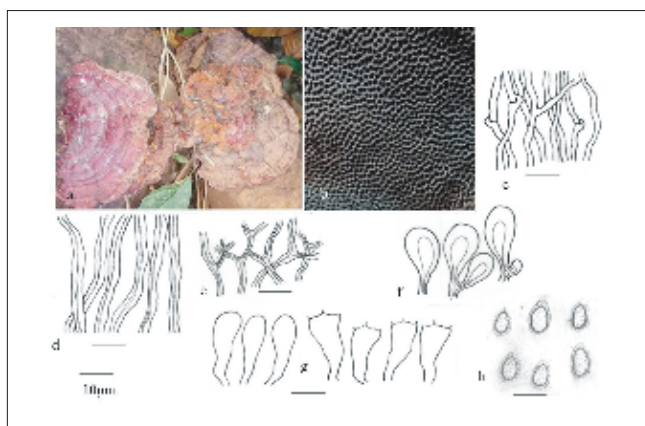
broadly-ellipsoid, brown, thick-walled, truncate at the apex, (4.6-) 4.8 - 9.2 (-10.4) × (4.1-) 4.6 - 6.4 (-6.9)  $\mu\text{m}$ , Q=1.2; exospore thin, subhyaline, smooth; endospore thick, brown, echinulate; cyanophilous (CN<sup>+</sup>), inamyloid (IKI<sup>-</sup>).

**Specimen examined:** India, Tamil Nadu, Chennai, Guindy (13°00'34"E, 80°14'15"N), MLCASB277, 12.09.2016, Kezhocuyi Kezo; University of Madras, 13°00'35"E, 80°14'16"N, MLCASB279, 12.09.2016, Kezhocuyi Kezo; Guindy, 13°00'04"N, 80°14'25"E, MLCASB347, 13.10.2017, Laklephi Tallanao.

**Remarks:** *Ganoderma philippii* is characterized by applanate basidiomata with non-laccate abhymenial surface, homogenous context and broadly-ellipsoid basidiospores. The species has been earlier reported from Maharashtra (Bhosle *et al.*, 2010), West Bengal (Sharma, 2012), Uttarakhand (Singh *et al.*, 2014). It is the first report from the study area.

*Ganoderma resinaceum* Boud., *Bulletin de la Société Mycologique de France* 5: 72, 1889. **Fig. 2**

**Basidiomata** annual, pileate, sub-stipitate, broadly-attached, corky when fresh, becoming hard on drying; pilei up to 10 × 6 × 2 cm. **Pilear surface** azonate, violet brown (10F4, 11F8) when fresh, dark brown (9F8) on drying. **Pore** surface greyish orange (5B3) to orange white (5A2) to brown (7E7) to reddish brown (8E8); pores round to angular, somewhat irregular, 2-3 per mm. **Context** duplex, light brown near abhymenial surface, brown near tube layer, up to 9 mm in thickness, dark brown in KOH. **Pore tubes** light brown (5D7), up to 1 cm in depth. **Margins** acute, wavy, abhymenial margins reddish brown (8E8), hymenial margins pale orange (5A3) to brownish orange (5C5), up to 3 mm in thickness. **Hyphal system** trimitic; generative hyphae hyaline, thick-walled, branched, clamped, up to 5.2  $\mu\text{m}$  in width; skeletal hyphae unbranched, thick-walled, rarely septate, up to 5.2  $\mu\text{m}$  in width; binding hyphae irregularly branched, up to 4.4  $\mu\text{m}$  in width. **Pilocystidia** clavate, apically encrusted, 25 - 42.5 × 7.5 - 12.5  $\mu\text{m}$ . **Basidia** clavate, 4-sterigmate, with a basal clamp, 11.5 - 25.3 × 2.3 - 4.6  $\mu\text{m}$ . **Basidiospores** ellipsoid, brown, thick-walled, truncate at the apex, (6.9-) 7.4 - 9.2 (-9.4) × (4.6-)



**Fig. 2** *Ganoderma resinaceum*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. skeletal hyphae, e. binding hyphae, f. Pilocystidia, g. Basidioles & Basidia, h. Basidiospores.

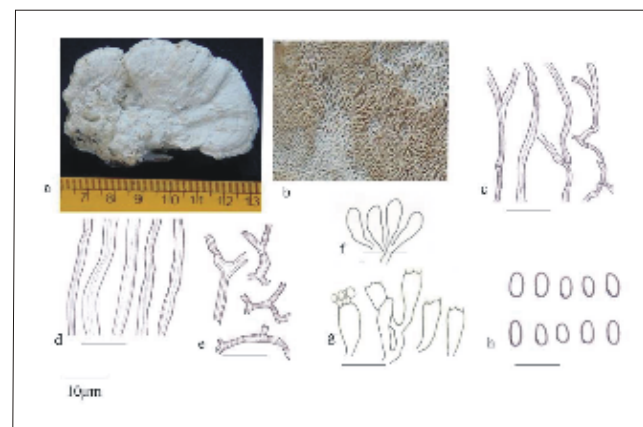
5.1- 6.9 (-9.2)  $\mu\text{m}$ , Q=1.4; exospore thin, subhyaline, smooth; endospore thick, brown, echinulate; CN<sup>+</sup>, IKI<sup>-</sup>

**Specimen examined:** India, Tamil Nadu, Chennai, Tambarum, 12°55'11"N, 80°07'14"E; 12°55'12"N, 80°07'14"E; 12°55'11"N, 80°07'15"E, MLCASB161, MLCASB168, MLCASB192, 13.10.2015, Tenzing Sangmo; Guindy, 13°00'35"E, 80°14'16"N, MLCASB278, 12.09.2016, Kezhocuyi Kezo.

**Remarks:** The presence of annual, pileate, solitary, basidiomata with pilocystidia and palisade end cells on the pilear surface and brown thick-walled, ellipsoid basidiospores are the key characters of *Ganoderma resinaceum*. This species is also known from Himachal Pradesh (Dhanda 1977; Kaur 2013), Jammu and Kashmir (Dhanda 1977), Maharashtra (Foroutan and Vaidya 2007; Ranadive *et al.*, 2011; Ranadive 2013), Uttarakhand (Sharma 2000; 2012, Singh 2016), West Bengal (Sharma 2000; 2012), Punjab and Chandigarh (Kaur *et al.*, 2017 and Brar *et al.*, 2018) and Tamil Nadu (Malarvizhi, 2014).

*Lenzites elegans* (Spreng.) Pat., *Essai taxonomique sur les familles et les genres des Hyménomycètes*: 89, 1900. -*Daedalea elegans* Spreng., *Kongliga Svenska Vetenskaps akademien Handlingar Ser. 3, 8*: 51, 1820. **Fig. 3**

**Basidiomata** perennial, sessile, laterally attached, flabelliform or circular, corky and flexible when fresh, rigid on drying; pilei up to 8 cm × 10 cm × 3 cm. **Pilear surface** zonate, finely tomentose, slightly uneven, white (4A1) to grey (4B1) when fresh, fairly unchanged on drying. **Pores** round to angular to lamellate, 1-2 per mm, radially split, up to 2 mm wide, lamellate portion up to 20-25 per cm when measured tangentially. **Context** homogenous, white (4A1), up to 8 mm thick near the base, leathery when dry. **Pore tubes** orange red (8B8), up to 20 mm in depth. **Margins** acute, even or lobed, white (4A1) on both pilear and pore surface, up to 3 mm in thickness. **Hyphal system** trimitic; generative hyphae hyaline, thin-walled, clamped, up to 4  $\mu\text{m}$  in width; skeletal hyphae dominating, light-yellowish, thick-walled, up to 6  $\mu\text{m}$  in width; binding hyphae hyaline, thick-walled, irregularly branched, up to 3.5  $\mu\text{m}$  in width, **Cystidia** and other sterile elements absent. **Basidia** clavate, 4-sterigmate, with a basal



**Fig. 3.** *Lenzites elegans*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Skeletal hyphae, e. Binding hyphae, f. Basidioles, g. Basidia, h. Basidiospores.

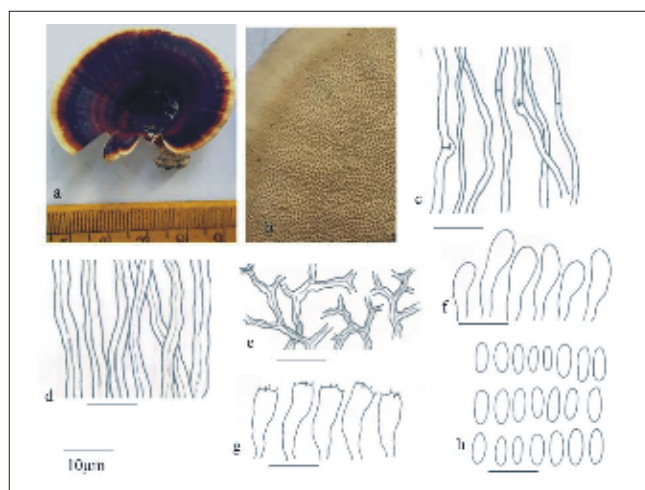
clamp, 17-22 × 5-8 μm. **Basidiospores** ellipsoid, hyaline, smooth, thin-walled, (4-) 4.2-5.8 (-6) × 2-4 μm, Q = 1.52, CN<sup>+</sup>, Amyloid (IK<sup>+</sup>).

**Specimen examined:** India, Tamil Nadu, Chennai, Guindy, 13°00'05"N 80°14'26"E, MLCASB008, 31.10.2015, Kezhocuyi Kezo; Guindy, 13°00'37"N 80°14'17"E, MLCASB358, 31.10.2015, Kezhocuyi Kezo; Guindy, 13°00'05"N 80°14'26"E, MLCASB347, 13.10.2017, Lakleiphi Tallanao.

**Remarks:** *Lenzites elegans* is characterized by their poroid to lamellate hymenophore and has been earlier reported from Himachal Pradesh (Sharma, 2000; 2012; Kaur, 2013), Kerala (Mohanan, 2011), Uttarakhand (Bagchee *et al.*, 1954; Thind *et al.*, 1957), West Bengal (Bakshi, 1971), Tamil Nadu (Priyamvada *et al.*, 2017).

*Microporus xanthopus* (Fr.) Kuntze, *Revisio generum plantarum* 3 (2): 494, 1898. - *Polyporus xanthopus* Fr., *Observationes mycologicae* 2: 255, 1818. **Fig. 4**

**Basidiomata** annual, pileate, solitary, centrally stipitate, infundibuliform, sometimes two or more basidiocarps grow together; pilei up to 6 × 5 × 0.3 cm. **Pilear surface** glabrous, glossy, concentrically zonate with alternating shades of brown (6C4, 6D6 and 7D6), thickening towards the centre.. **Pore surface** white (4A1) when fresh, grey (4B1) on drying; pores angular to circular, minute, almost invisible to the naked eye, 7-9 per mm. **Context** homogenous, white, up to 1 mm in thickness, tissues turning dark black in KOH. **Pore tubes** white (4A1), up to 2 mm in depth. **Margins** wavy to lobed, up to 2 mm in thickness. **Stipe** somewhat round, brown (7D6), glabrous, covered with a thin light cuticle, up to 6 cm × 0.6 cm, expanding to a disk-like base which is up to 1 cm in width. **Hyphal system** trimitic; generative hyphae branched, thin-walled, clamped, up to 3 μm in width; skeletal hyphae dominant in context as well as trama, thick-walled, up to 6 μm in width; binding hyphae torturous, thick-walled, frequently branched, up to 3 μm in width. **Cystidia** and other sterile elements absent. **Basidia** clavate, 4-sterigmate, with a basal



**Fig. 4.** *Microporus xanthopus*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Skeletal hyphae, e. Binding hyphae, f. Basidioles, g. Basidia, h. Basidiospores.

clamp, 12 - 18 × 4.5 - 5.5 μm. **Basidiospores** cylindrical, hyaline, (5-) 5.2 - 7.4 (-7.6) × (2.1-) 2.4 - 3.1 (-3.3) μm, Q = 2.2, CN<sup>+</sup>, IK<sup>-</sup>.

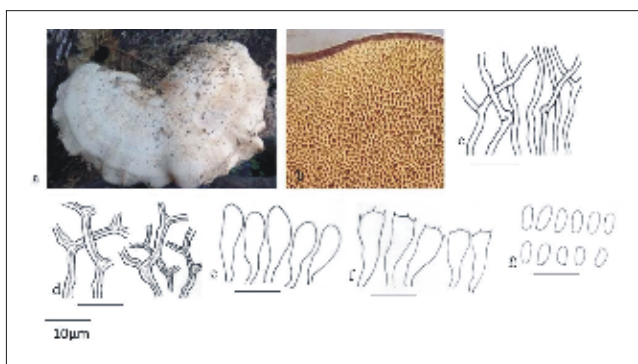
**Specimen examined:** India, Tamil Nadu, Chennai, Guindy 12°59'50"N 80°14'27"E, MLCASB247, 17.12.2015, Kezhocuyi Kezo.

**Remarks:** *Microporus xanthopus* is recognized by its infundibuliform basidiocarps with a glossy and concentrically zonate pileus; brown, glabrous stipe with disk like base and minute pores. It has been earlier reported from Andhra Pradesh (Sharma, 2012), Assam (Ashwani *et al.*, 2013; Bhattacharjee *et al.*, 2015), Kerala (Leelavathy and Ganesh, 2000; Mohanan 2011) and Meghalaya (Sharma, 2012; Bhattacharjee *et al.*, 2015). It is the first report from the study area.

*Polyporus grammocephalus* Berk., *London Journal of Botany* 1(3): 148, 1842. **Fig. 5**

**Basidiomata** annual, solitary, pileate, dimidiate, flabelliform, laterally attached with a stipe like contracted base; pilei up to 8 cm × 5.5 cm × 0.6 cm. **Pilear surface** glabrous, with numerous fine radial lines, light orange (5A4) when fresh, turning brownish orange (5A3) on drying. **Pore surface** brownish orange (5A3) both when fresh and on drying; pores round to angular, 3-5 per mm. **Context** homogenous, brownish orange (5A3), up to 3 mm in thickness. **Pore tubes** brownish orange (5A3), up to 2 mm in depth. **Margins** acute, light orange (5A4) both on pilear and pore surface, up to 1 mm thick. **Stipe** usually absent, but a short stipe like base present which is up to 6 mm in diameter. **Hyphal system** dimitic; generative hyphae hyaline, clamped, thin-walled, up to 4.8 μm in width; binding hyphae thick-walled, abundant, up to 6 μm in width. **Cystidia** and other sterile elements absent. **Basidia** clavate, 4-sterigmate, with a basal clamp, 15 - 22.7 × 5.5 - 8.2 μm. **Basidiospores** ellipsoid, smooth, thin-walled, (4.8-) 5 - 6.5 (-6.9) × (2.2) 2.6 - 3.1 (-3.4) μm, CN<sup>+</sup>, IK<sup>-</sup>, Q = 1.9.

**Specimen examined:** India, Tamil Nadu, Chennai, Guindy 13°00'37"N 80°14'17"E, MLCASB190, 31.10.2015, Tenzing Sangmo; Guindy, 13°00'05"N 80°14'26"E, MLCASB221, MLCASB239, 31.10.2015, Kezhocuyi Kezo; Guindy (13°00'33"E, 80°14'17"N), 12.09.2016, Kezhocuyi Kezo;



**Fig. 5.** *Polyporus grammocephalus*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Binding hyphae, e. Basidioles, f. Basidia, g. Basidiospores.



MLCASB341, India, Tamil Nadu, Chennai, Guindy, 13°00'33"E, 80°14'26"N, MLCASB261, 12.09.2016, A. Arockia Mahimai Jayaseelan; Guindy, 13°00'05"N 80°14'26"E, MLCASB347, 13.10.2017, Lakleiphi Tallanao.

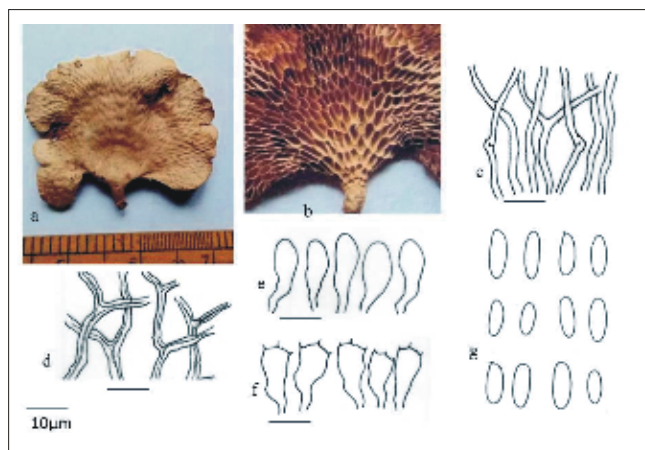
**Remarks:** *Polyporus gramocephalus* is unique in having solitary, flabelliform pilei with a narrower constricting attachment, comparatively small-sized pores and dimitic hyphal system. It has been earlier reported from Himachal Pradesh (Sharma, 2000; 2012; Kaur, 2013), Kerala (Leelavathy and Ganesh, 2000), Madhya Pradesh (Roy and De, 1996), Maharashtra (Roy and De, 1996; Ranadive *et al.*, 2011), Punjab (Dargan *et al.*, 2006), Uttarakhand (Dhanda, 1977; Roy and De, 1996; Sharma, 2000, 2012), West Bengal (Roy and De, 1996), Tamil Nadu (Kumar and Kumar, 2017).

*Polyporus alveolaris* (DC.) Bondartsev & Singer, *Annales Mycologici* 39 (1): 58, 1941. - *Merulius alveolaris* DC., *Flore française* 6: 43, 1815. **Fig. 6**

**Basidiomata** annual, pileate, sessile to stipitate, circular to dimidiate; pilei up to 7 cm × 6 cm × 0.3 cm. **Pilear surface** smooth, azonate, yellowish white (4A2) when fresh, turning light yellow (4A4) on drying. **Pore surface** greyish orange (5B3) when fresh, almost unchanged on drying; pores regular, polygonal, usually 1 per mm. **Context** homogenous, light yellow (4A4), up to 1mm in thickness. **Pore tubes** greyish orange (5B3), up to 2 mm in depth. **Margins** thin, acute, yellow (4A4) on the pilear surface, yellowish white (4A2) on the pore surface. **Hyphal system** dimitic; generative hyphae hyaline, thin-walled, clamped, up to 4.8 µm in width; binding hyphae thick-walled, aseptate, much branched, up to 5.2 µm in width. **Cystidia** and other sterile elements absent. **Basidia** clavate, 4-sterigmate, with a basal clamp, 19.5 - 29 × 7 - 9.2 µm. **Basidiospores** cylindrical, hyaline, smooth, (9.2-) 9.5 - 13.8 (-14.2) × (4-) 4.5 - 5.1 (-5.4) µm, CN<sup>+</sup>, IK<sup>-</sup>, Q = 2.7.

**Specimen examined:** India, Tamil Nadu, Chennai district, Guindy, 13°00'04"N 80°14'26"E, MLCASB220, 31.10.2015, Kezhocuyi Kezo.

**Remarks:** *Polyporus alveolaris* is easily identifiable by its circular to dimidiate basidiocarp with large polygonal pores



**Fig. 6.** *Polyporus alveolaris*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Binding hyphae, e. Basidioles, f. Basidia, g. Basidiospores.

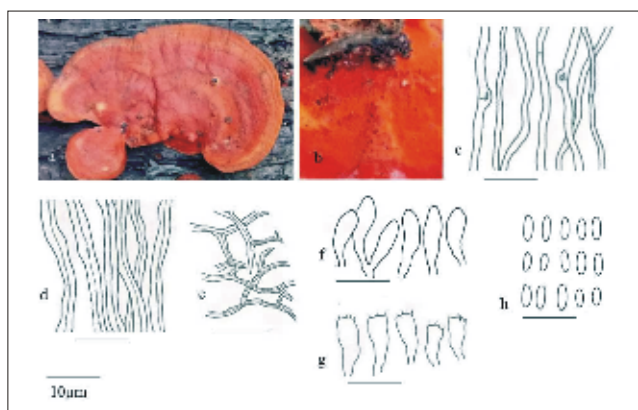
and is earlier reported from Arunachal Pradesh (Sharma, 2000; 2012), Himachal Pradesh (Kaur, 2013), Meghalaya (Sharma, 2000; 2012) West Bengal (Roy and De, 1996). It is the first report from the study area.

*Pycnoporus sanguineus* (L.) Murrill, *Bulletin of the Torrey Botanical Club* 31(8): 421, 1904. - *Boletus sanguineus* L., *Species Plantarum*: 1646, 1763. **Fig. 7**

**Basidiomata** annual, pileate, sessile, broadly attached, attenuate at the base, flabelliform, imbricate, rarely overlapping, leathery when fresh, rigid on drying; pilei up to 8 cm × 5 cm × 4 mm. **Pilear surface** coraceous, broadly zonate, reddish orange (7B8) to brownish orange (7C8) when fresh, vivid red (10A8) to brownish red (8C8) on drying. **Pore surface** flame scarlet (7A8) when young, becoming copper red (7C8) to orange red (8B8) with age; pores angular to circular, 4-7 per mm. **Context** homogenous, reddish orange (7B8), hard near attachment, leathery near margins, up to 3 mm in thickness, dark black in KOH. **Pore tubes** orange red (8B8), up to 1 mm in depth. **Margins** acute, thin, brownish red (8C8) on both pilear and pore surface. **Hyphal system** trimitic; generative hyphae thin- to thick-walled, clamped, branched, up to 5 µm in width; skeletal hyphae dominating, thick-walled, up to 6 µm in width; binding hyphae thick-walled, frequently branched, up to 5 µm in width. **Basidia** clavate, 4-sterigmate, with basal clamp, 12 - 15 × 4 - 5 µm. **Basidiospores** cylindrical, hyaline, (4.7-) 5.1-6.4 (-7.3) × (-2.2) 2.4 - 2.8 (-3) µm, weakly CN<sup>+</sup>, IK<sup>-</sup>, Q = 2.

**Specimen examined:** India, Tamil Nadu, Chennai, Guindy, 12°59'50"N 80°14'27"E, MLCASB233, 31.10.2015, Kezhocuyi Kezo; Adyar, 13°00'37"N 80°15'48"E, MLCASB022, 31.10.2015, Kezhocuyi Kezo.

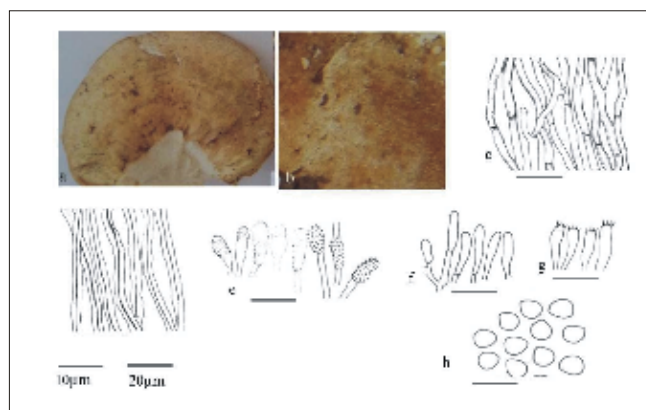
**Remarks:** *Pycnoporus sanguineus* has been characterized by reddish orange to brownish orange basidiocarp and is differentiated from *P. cinnabarinus* by the presence of thinner basidiocarp and larger pore size (Sharma, 2012). The earlier reports of this species are from Kerala (Leelavathy and Ganesh, 2000; Mohanan 2011), Meghalaya, Mizoram (Bhattacharjee *et al.*, 2015), Uttarakhand (Sharma, 2012), Tamil Nadu (Selvam *et al.*, 2012). It is the first report from the study area.



**Fig. 7** *Pycnoporus sanguineus*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Skeletal hyphae, e. Binding hyphae, f. Basidioles, g. Basidia, h. Basidiospores.

***Rigidoporus lineatus*** (Pers.) Ryvardeen, *Norwegian Journal of Botany* **19**: 236, 1972. - *Polyporus lineatus* Pers., *Botanique (Nagpur)* **5**: 174, 1827. **Fig. 8**

**Basidiomata** annual, pileate, sessile, solitary to imbricate, dimidiate, brittle and hard when dry; pilei up to 3 cm × 2 cm × 10 mm. **Pilear surface** concentrically zonate, pale orange (5A3) when fresh, turning to greyish orange (5B5) on drying. **Pore surface** pale orange (5A3) when fresh, turning to brownish orange (5C5) on drying; pores round to angular, 6-7 per mm. **Context** homogenous, pale yellow (4A3), up to 2 mm in thickness. **Pore tubes** yellowish white (4A2), radially fibrous, up to 3 mm in depth. **Margins** acute, greyish orange (5B5) on pilear surface, pale orange (5A3) on pore surface, up to 5 mm in thickness. **Hyphal system** monomitic; generative hyphae hyaline, thin- to thick-walled, simple-septate, moderately branched, up to 8 μm in width. **Cystidia** rare, club-shaped, thick-walled, coarsely encrusted, 35.4 - 42.8 × 7.8 - 12.6 μm. **Basidia** clavate, 4-sterigmate, without basal clamp, 11.5 - 12.6 × 4.1 - 4.6 μm. **Basidiospores** cylindrical, hyaline, smooth, thin-walled, (4.1-) 4.3 - 4.6 (-5) × (2.3-) 2.5 - 2.9 (-3.4) μm, CN<sup>+</sup>, IK<sup>-</sup>.



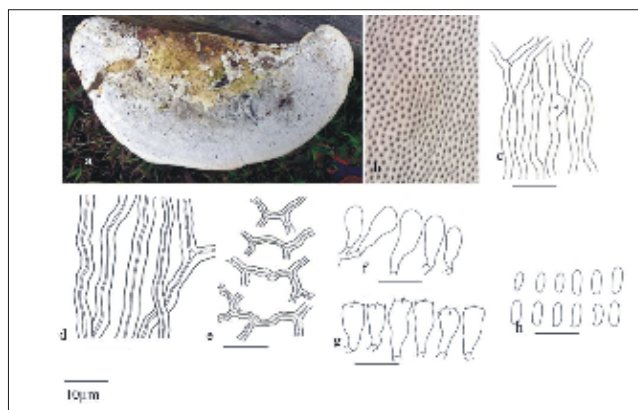
**Fig. 8** *Rigidoporus lineatus*: a. Basidiomata, b. Pore surface, c. Thin walled generative hyphae, d. Thick walled generative hyphae, e. Encrusted cystidia, f. Basidioles, g. Basidia, h. Basidiospores.

**Specimen examined:** India, Tamil Nadu, Chennai, Guindy, 13°00'04"N 80°14'26"E, MLCASB349, 13.10.2017, Lakleiphi Tallanao.

**Remarks:** The dimidiate basidiocarps that become hard and rigid on drying and larger encrusted cystidia are the key characters of *Rigidoporus lineatus*. This species has been earlier reported from Kerala (Leelavathy and Ganesh, 2000), Uttarakhand and Meghalaya (Sharma, 2012). It is the first report from Chennai.

***Trametes lactinea*** (Berk.) Sacc., *Sylloge Fungorum* **6**: 343, 1888. - *Polyporus lactineus* Berk., *Annals and Magazine of Natural History* **10**: 373, 1843. **Fig. 9**

**Basidiomata** annual, pileate, broadly attached, solitary, applanate, dimidiate, semicircular, corky when fresh, woody on drying; pilei up to 16 cm × 12 cm × 3.3 cm. **Pilear surface** azonate, becoming warted with age, white (4A1) when fresh,



**Fig. 9** *Trametes lactinea*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Skeletal hyphae, e. Binding hyphae, f. Basidioles, g. Basidia, h. Basidiospores.

greyish white (4A2) on drying. **Pore surface** white (4A1) when fresh, changing to greyish white (4A2) on drying; pores round to angular, 2-3 per mm. **Context** homogenous, white (4A1), up to 13 mm in thickness, weakly darkening in KOH. **Pore tubes** white (4A1), up to 2 cm in depth. **Margins** acute, white (4A1), up to 2 mm in thickness. **Hyphal system** trimitic; generative hyphae hyaline, clamped, thin-walled, up to 4 μm in width; skeletal hyphae dominating, pale-yellow, thick-walled, up to 6 μm in width; binding hyphae rather abundant, thick-walled, coralloid branching, up to 4 μm in width. **Cystidia** and other sterile elements absent. **Basidia** clavate, 4-sterigmate, with a basal clamp, 14 - 16 × 5.2 - 5.8 μm. **Basidiospores** cylindrical, thin-walled, (5-) 5.5 - 7.2 (-7.5) × (2.1-) 2.3 - 2.6 (-2.8) μm, CN<sup>+</sup>, IK<sup>-</sup>, Q=2.3.

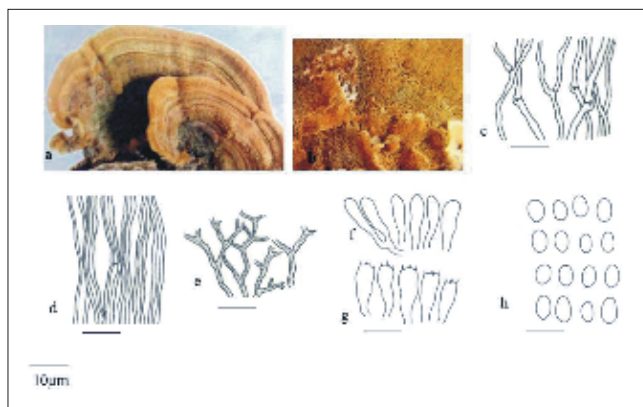
**Specimen examined:** India, Tamil Nadu, Chennai, Guindy, 13°00'05"N 80°14'26"E, MLCASB351, 31.10.2015, Kezhocuyi Kezo.

**Remarks:** *Trametes lactinea* is characterized by white applanate, larger basidiocarps with somewhat warted pilear surface. The species was earlier reported from Himachal Pradesh (Dhanda, 1977), Kerala (Leelavathy and Ganesh, 2000), Maharashtra (Ranadive, 2013), Uttarakhand (Roy and De, 1996, Sharma, 2012), West Bengal (Banerjee, 1947; Roy and De, 1996). It is the first report from the study area.

***Trametes pubescens*** (Schumach.) Pilát, *Atlas Champ. Eur., Polypor.*, **B**: 268, 1939. - *Boletus pubescens* Schumach., *Enumeratio Plantarum, in Partibus Saellandiae Septentrionalis et Orientalis Crescentium* **2**: 384, 1803 **Fig. 10**

**Basidiomata** annual, pileate, broadly attached, solitary; pilei up to 8 cm × 7 cm × 8 mm. **Pilear surface** faintly zonate, sulcate, tomentose, becoming hispid with age, brownish orange (5C5) to light brownish (6D6) when fresh, brownish orange (5C5) to dark brown (6F6) on drying. **Pore surface** brownish orange (5C5) when fresh, oak brown (5D6) on drying; pores round to angular, 4-5 per mm. **Context duplex**, brownish orange (5C5), dense towards the pore surface and brown (6F6) loose towards the pilear surface, without black line below the tomentum, up to 2 mm in thickness. **Pore tubes** oak brown (5D6), up to 5 mm in depth. **Margins** acute, golden





**Fig. 10** *Trametes pubescens*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Skeletal hyphae, e. Binding hyphae, f. Basidioles, g. Basidia, h. Basidiospores.

brown (5D7) on both pilear and pore surface, up to 2 mm in thickness. **Hyphal system** trimitic; generative hyphae thin-walled, clamped, up to 5 µm in width; skeletal hyphae thick-walled, abundant, up to 8 µm in width; binding hyphae thick-walled, much-branched, up to 4 µm in width. **Cystidia** and other sterile elements absent. **Basidia** clavate, 4-sterigmate, with a basal clamp, 10 - 15 × 4.6 - 5.7 µm. **Basidiospores** cylindrical, hyaline, (4.6-) 5.7 - 6.9 (-7.2) × (1.8-) 2.1 - 2.3 (-2.5) µm, CN<sup>+</sup>, IK<sup>-</sup>, Q = 2.3

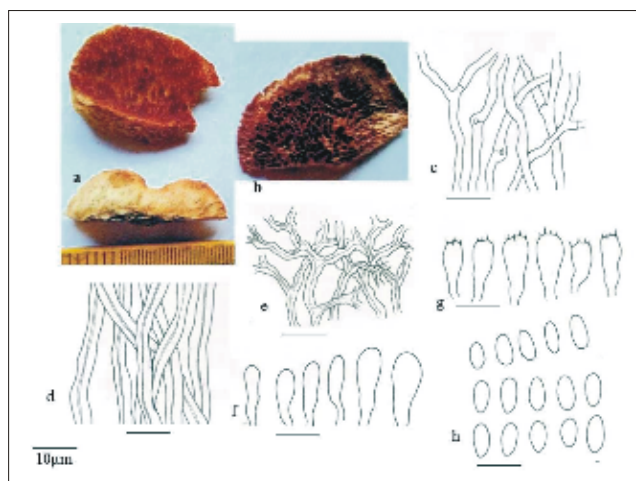
**Specimen examined:** India, Tamil Nadu, Chennai, Guindy, 13°00'07" N 80°14'24"E, MLCASB344, 13.10.2017, Lakleiphi.

**Remarks:** *Trametes pubescens* is identified in the field on the basis of faintly zonate, tomentose pilear surface, duplex context without distinct black line and smaller pores. The species is described earlier from Andhra Pradesh (Sharma, 2012), Kerala (Mohanan 2011), Uttarakhand (Sharma, 2012). It is the first report from the study area.

*Trametes trogii* Berk. in *Trog. Verz. Schweiz. Schw. Suppl.* 2: 52, 1850. **Fig. 11**

**Basidiomata** annual, pileate, broadly attached, solitary, semicircular, applanate to convex; pilei up to 8 cm × 3 cm × 15 mm. **Pilear surface** tomentose, azonate, yellowish white (4A2) when fresh, brownish orange (5C5) on drying. **Pore surface** brownish yellow (5C8) both when fresh and on drying; pores round to angular, 1-2 per mm. **Context** duplex, brownish orange towards pilear surface, yellowish white (4A2) towards the pore surface, without distinct black line, up to 3 cm in thickness. **Pore tubes** brownish yellow (5C8), up to 1 cm in depth. **Margins** acute, brownish orange (5C5), up to 6 mm in thickness. **Hyphal system** trimitic; generative hyphae hyaline, thin-walled, clamped, up to 2.5 µm in width; skeletal hyphae dominating, thick-walled, up to 5.2 µm in width; binding hyphae abundant, tortuous, intertwined, up to 4.5 µm in width. **Cystidia** and other sterile elements absent. **Basidia** clavate, 4-sterigmate, with a basal clamp, 14 - 17.5 × 5.5-6 µm. **Basidiospores** cylindrical, thin-walled, hyaline, (7-) 7.5 - 8.7 (-9.1) × (2.5-) 3 - 3.5 (-3.7) µm, CN<sup>+</sup>, IK<sup>-</sup>, Q = 2.5.

**Specimen examined:** India, Tamil Nadu, Chennai, Guindy,



**Fig. 11** *Trametes trogii*: a. Basidiomata, b. Pore surface, c. Generative hyphae, d. Skeletal hyphae, e. Binding hyphae, f. Basidioles, g. Basidia, h. Basidiospores.

13°00'33"E, 80°14'16"N, MLCASB341, 12.09.2016, Kezhocuyi Kezo.

**Remarks:** *Trametes trogii* has comparatively thicker pilei with yellowish white to brownish orange, tomentose pilear surface, duplex context which is without black line and larger pores. It has been earlier reported from Himachal Pradesh (Sharma, 2012; Kaur, 2013), Uttarakhand (Sharma, 2012), Maharashtra (Ranadive, 2013). It is the first report from the study area.

#### ACKNOWLEDGEMENT

The authors are thankful to Prof. N. Mathivanan, Director, CAS in Botany, University of Madras, Chennai for the encouragement and laboratory facilities.

#### REFERENCES

- Ashwani T., Kumar R., Pandey S. 2013. Diversity and frequency of macrofungi associated with wet ever green tropical forest in Assam, India. *Biodiversitas* 14(2): 73-78
- Bagchee, K.D., Puri, Y.N. And Bakshi, B.K. 1954. Principal diseases and decays of Oaks and other hard woods in India II. *Indian Phytopathol.* 7: 18-42.
- Bakshi, B.K. 1971. *Indian Polyporaceae (on trees and timber)*. Indian Council of Agricultural Research, New Delhi, India.
- Banerjee, S.N. 1947. Fungus flora of Calcutta and Suburbs I. *Bull. Bot. Soc. Bengal* 1: 37-54.
- Bhattacharjee, J., Bhattacharjee, B., Tapas, P., Kumar, A. 2015. Diversity of mushrooms in Indo-Bangladesh region of North-East India. *J. Andaman Sci. Assoc.* 19(1):75-82.
- Bhosle, S.R., Ranadive, K., Bapat, G., Garad, S., Deshpande, G. And Vaidya, J.G. 2010. Taxonomy and diversity of *Ganoderma* from the Western parts of Maharashtra (India). *Mycosphere* 1(3): 249-262

- Binder, M., Hibbett, D.S., Larsson, K.H., Larsson, E., Langer, E. And Langer, G. 2005. The phylogenetic distribution of resupinate forms across the major clades of mushroom-forming fungi (Homobasidiomycetes). *Syst. Biodivers.* **3** (2):113-157.
- Binder, M., Justo, A., Riley, R., Salamov, A., López-Giráldez, F., Sjökvist, E., Copeland, A., Foster, B., Sun, H., Larsson, E., Larsson, K.H., Townsend, J., Grigoriev, I.V. and Hibbett, D.S. 2013. Phylogenetic and phylogenomic overview of the Polyporales. *Mycologia* **105**: 1350 - 1373.
- Brar, K. J., Kaur, R., Kaur, G., Singh, A.P. and Dhingra, G.S. 2018. Taxonomic notes on the genus *Ganoderma* from Union Territory of Chandigarh. *Kavaka* **51**: 35-48.
- Dargan, J.S., Lalji, K. and Singh, A.P. 2006. Mycoflora associated with *Bauhinia purpurea* Linn. *Bionature* **26**(1): 33-38
- Dhanda, R.S. 1977. *Studies on Polyporaceae of North Western Himalayas*. Ph.D. Thesis, Panjab University, Chandigarh.
- Foroutan, A. and Vaidya, J.G. 2007. Records of new species of *Ganoderma* in Maharashtra. *India. Asian J. Plant Sci.* **6**: 913-919
- Gäumann, E. 1926. *Vergleichende Morphologie der Pilze*. Fischer, Jena. 503.
- Gilbertson, R. L. and Ryvarden, L. 1986. *North American Polypores*, vol. 1, Fungi flora, Oslo.
- Johansson, T., Gibb, H., Hjaltén, J., Pettersson, R., Hilszczanski, J., Alinvi, O., Ball, J. P. and Danell, K. 2007. The effects of substrate manipulation and forest management on predators of saproxylic beetles. *Fot. Ecol. Manage.* **242**: 518-529.
- Justo, A., Miettinen, O., Floudas, D., Ortiz-Santana, B., Sjökvist, E., Lindner, D., Nakasone, K., Niemelä, T., Larsson, K.H., Ryvarden, L. and Hibbett, D.S. 2017. A revised family-level classification of the Polyporales (Basidiomycota). *Fungal boil.* **121**: 798-824.
- Kaur, H. 2013. *Systematics of pileate poroid Agaricomycetes of Himachal Pradesh*. Ph.D. Hesis. Punjabi University, Patiala, India.
- Kaur, G., Singh, A.P. and Dhingra, G.S. 2017. Diversity of genus *Ganoderma* in Punjab (India). *Mycobiota* **7**: 25-49.
- Kirk, P.M., Cannon, P.F., David, J.C. and Stalpers, J.A. 2001. *Dictionary of the Fungi* (9th Ed.), Wallingford Oxon, UK, 655 pp.
- Kirk, P. M. Sutton, B.C. and Pegler, D.N. 2008. *Dictionary of the Fungi* (10th Ed.), Wallingford Oxon, UK, 771pp.
- Kornerup, A. and Wanscher, J. H. 1978. *Methuen's Hand book of Colours*. 3<sup>rd</sup> Ed. Methuen and Co ltd. London.
- Kumar, M. and Kumar, S. 2017. Standardization of Substrate for Spawn Production of Wild Common Edible Mushroom *Polyporus gramocephalus*. *J. Acad. Ind. Res.* **6**(1) 13-16.
- Leelavathy, K. M. and Ganesh, P.N. 2000. *Polyporaceae of Kerala*. Daya Publishing House, Delhi, 165 pp.
- Malarvizhi, K. 2014. Phylogenetic relationships of *Ganoderma* species based on Mitochondrial and nuclear DNA sequences from Tamil Nadu. *Proceedings of the 8th International Conference on Mushroom Biology and Mushroom Products* : 113-121.
- Mohanan, C. 2011. *Macrofungi of Kerala*. Kerala Forest Research Institute, Hand Book #27, Kerala, India, pp. 597.
- Mycobank 2019. <http://www.mycobank.org/2019>.
- Natarajan, K. And Kolandavelu, K. 1985. Resupinate Aphyllophorales from South India-I. *Kavaka* **12**:71-76.
- Priyamvada, H., Akila, M., Singh, R.K., Ravikrishna, R., Verma, R.S., Philip, L., Marathe, R.R., Sahu, L.K., Sudheer, K.P. and Gunthe, S.S. 2017. Terrestrial Macrofungal Diversity from the tropical dry evergreen biome of Southern India and its potential role in Aerobiology. *PLoS ONE* **12**(1): <https://doi.org/10.1371/journal.pone.0169333>
- Ranadive, K.R., Vaidya, J.G., Jite, P.K., Ranade, V.D., Bhosle, S.R., Rabba, A.S., Hakimi, M., Deshpande, G.S., Rathod, M.M., Foroutan, A., Kaur, M., Naik-Vaidya, C.D., Bapat, G.S. and Lamrood, P. 2011. Checklist of Aphyllophorales from the Western Ghats of Maharashtra State, India. *Mycosphere* **2**: 91-114.
- Ranadive, K.R. 2013. An overview of Aphyllophorales (wood rotting fungi) from India. *Inter. J. Curr. Microbiol. Appl. Sci.* **2** (12): 112-139.
- Roy, A. and De, A. 1996. *Polyporaceae of India*. International Book Distributor, Dehradun 248001, India, pp. 207-210.
- Ryvarden, L. and Gilbertson, R.L. 1993. *European polypores Part 1. Synop. Fungorum* **6**: 1-387.
- Ryvarden, L. and Gilbertson, R.L. 1994. *European polypores Part 2. Synop. Fungorum* **7**: 388-743.
- Selvam, K., ShanmugaPriya, M., Sivaraj, C. and Arungandhi, K. 2012. Identification and screening of wood rot fungi from Western Ghats area of South India, *Int. J. Chemtech Res.* **4**: 379-388.
- Sharma, J. R. 2000. *Era of Indian Polypores*. Botanical Survey of India, Calcutta 1188.
- Sharma, J. R. 2012. *Aphyllophorales of Himalaya: Auriscalpiaceae-Tremellodendropsis*. Botanical

- Survey of India, MOEF, Govt. India. Calcutta. 590 pp.
- Singh, R. 2016. *Taxonomic studies, biochemical analysis and evaluation of CNS activities of some species of Ganoderma from Uttarakhand*. Ph.D. Thesis. Punjabi University, Patiala, India.
- Singh, R., Dhingra, G.S. and Shri, R. 2014. A comparative study of taxonomy, physicochemical parameters, and chemical constituents of *Ganoderma lucidum* and *G. philippii* from Uttarakhand. *India. Turk. J. Bot.* **38**: 186-196.
- Sundaramani, S. and Madurajan, D. 1925. *Some Polyporaceae of Madras Presidency*. Madras Agricultural Department - Year Book. 6975pp.
- Thind, K.S., Bindra, P.S. and Chatrath, M.S. 1957. The Polyporaceae of the Mussoorie hills- III. *Res. Bull. Panjab Univ.* **129**: 471-483.