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Record of New Species of *Ganoderma* in Maharashtra India

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Abstract: Thirty four species of *Ganoderma* out of 100 samples from more than 20 different hosts were obtained in the present study. The species were identified on the basis of external and internal morphology of specimens. The results indicated that 20 species including *G. africanum*, *G. amazonense*, *G. boninense*, *G. chalceum* var. *pleiotrichum*, *G. concinnum*, *G. dejongi*, *G. donkii*, *G. fulvellum*, *G. lobatoideum*, *G. lobatum*, *G. luteicinctum*, *G. microsporum*, *G. mirabile*, *G. ostreatum*, *G. pfeifferi*, *G. pseudoboletus*, *G. trengganuense*, *G. trulliforme*, *G. vanheurnii* and *G. williamsianum* are new to India.

Key words: Phellinus, mushroom, canker rot, heart rot, maharashtra

INTRODUCTION

The genus *Ganoderma* with the type species *G. lucidum* was established by Karsten in 1881.

Taxonomical studies of the genus *Ganoderma* had been extensively done throughout the world (Bazzalo and Wright, 1982; Buchanan and Wilkie, 1995; Coleman, 1927; Corner, 1947, 1983; Gottlieb and Wright, 1999a, b; Moncalvo and Ryvarden, 1997; Murill, 1902, 1903; Ryvarden, 2000; Smith and Sivasithamparam, 2000; Stalpers, 1978; Steyaert, 1967a, b, 1972, 1980).

There are 322 species listed in the CABI Bioscience Fungus names database. The database of Stalpers and Stegehuis available on CBS Website lists 316 names in *Ganoderma* (http://www.punjabenvironment.com/bd_listhtm).

In India Bakshi (1971) contributed to study of this genus. He prepared a key to Indian species. Bilgrami *et al.* (1991) recorded seven species. Bhosle and Vaidya (2006) added ten new species to the Indian list of *Ganoderma* species. Twenty species are recorded for the first time from India in the present study.

The aim of present investigation was to study of *Ganoderma* species, which are the Root Rot Pathogens and cause responsible damages to trees in the forest, in park and in orban sitting every year in Maharashtra state of India.

MATERIALS AND METHODS

The present study was carried out during 2004-2006 in Maharashtra state of India.

Ganoderma samples were collected in the sexual stages on different hosts like: *Azadirchta indica*, *Delonix regia*, *Tamarindus indica*, etc., from various regions of Maharashtra state like Anjrne Baneshwar, Dapoli-Dabhol road, etc. The specimens were examined for external and internal morphology.

For external morphology the material was observed for colour, texture, type of attachment to host, pore morphology, dissepiments character; margin, hymenial and pileal surface of basidiocarp.

For internal morphology, thin hand sections were taken from fruiting body passing through hymenium, which was done by chopping method. Semi-permanent slides prepared in lactoglycerine were maintained by sealing with nail polish for amyloid and non-amyloid reaction, spores were treated with Melzer's reagent (chloral iodine solution), which turns blue. For Xanthocronic reaction 10% KOH solution was used (Beneke, 1958).

The slides were observed under Bausch and Lomb compound microscope having a combination of 10x eyepiece and 10x, 45x and oil immersion (i.e., 100x), objectives.

Photographs were taken using digital camera. Measurements of hyphae, basidia cystidia, setae, spores, cutis element etc. were taken using objective micrometer or calibrated ocular. Dimension of microscopic characters are given in micrometer (μm) eyepiece.

RESULTS AND DISCUSSION

Thirty four species of *Ganoderma* were identified in the present study (Table 1). Among them 20 species are new to Maharashtra India.

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Table 1: *Ganoderma* species, their host, collection location and code

Species	Host	Location	Code
G. africanum	*Delonix regia*, unknown tree	Pune University, Anjrine,	GA 94, GA 419
G. amazonense	*Tectona grandis*	Karad	GA 149
G. boninense	*Delonix regia*	Pune University	GA 97
G. chalceum	*Areca catechu, Azadirchta indica, Pogamia pinnata, Tamarindus indica*	Guhaghar, Anjrne, Baneshwar, Pune University	GA 338, GA 395, GA 128, GA 82,
G. chalceum var. *pleiotrichum*	*Tectona grandis, Tamarindus indica*	Pune University, Kondhona	GA 79, GA 116
G. concinnum	*Dalbergia sisso*	Pune University	GA 88
G. dejongii	*Ficus benjamina, Mangifera indica*	Shriverdhan, Dapoli-Harne road	GA 182, GA 360.
G. donkii	*Areca catechu*	Dapoli-Harnae Road	GA 362
G. fulvellum	*Artocarpus integrifolia, Areca catechu*	Anjrine, Dabhol	GA 378, GA 357
G. lipsiense	*Areca catechu, Casuarina equisetifolia*	Anjrne, poultry trainee center-Pune	GA 378, GA 7
G. lobatoideum	*Delonix regia*	Pune University	GA 377
G. lobatum	*Areca catechu, Delonix regia*	Anjrne, Pune University	GA 93,GA 378
G. lucidum	*Dalbergia melanoxylon, Caesalpinia coriaria*	Pune University, Thamhini	GA 74, GA 160
G. luteicinctum	*Swietenia mahogany, Delonix regia*	Empresspark-Pune, Shinvardhan	GA 8, GA 178.
G. microsporum	*Artocarpus integrifolia*	Dopoli	GA 220
G. mirabile	*Ficus bengalensis, Delonix regia* on stump and *Areca catechu*	Dopoli, Koyna, Anjrne	GA 60, GA 250, GA 417
G. multicornum	*Delonix regia*	Pune University	GA 44
G. orbiformum	*Delonix regia*	Pune University	GA 90
G. ostreatum	*Mangifera indica* (dead tree), *Mangifera indica*	Singhgad, Anjrne	GA 111, GA 428
G. pfeifferi	*Mangifera indica*	Anjrne	GA 416
G. philippi	*Mangifera indica*, Unknown dead tree	Anjrne, Dabhol	GA 351, GA 409
G. praelongum	*Areca catechu,*	Anjrine	GA372
G. pseudoboletus	*Cocos nucifera*	Guhaghar	GA 330
G. resinaceum	*Delonix regia*	Pune University	GA 36
G. sessiliforme	Unknown	Pune University	GA 325
G. stipitatum	*Tamarindus indica, Delonix regia*, Unknown	Empress park-Pune, Pune University, Anjrne	GA 10, GA 94, GA 419
G. subincrustatum	*Dalbergia melanoxylon*	Empress park-Pune	GA 12
G. testaceum	*Atrocarpus integrifolia*	Guhaghar	GA 333
G. tornatum	*Artocarpus integrifolia, Cocos nucifera, Gliricidia sepium.*	Dapoli-Harnae Road, Empress park-Pune, Dapoli-dabhol road.	GA 185, GA 187, GA 45
G. trengganuense	*Dalbergia melanoxylon*	Empress park-Pune	GA 11
G. trulliforme	*Delonix regia*, on dead tree of *Ficus* sp.	Lonawala, Dapoli	GA 42, GA 210
G. vanheurnii	*Ficus benjamina, Tamarindus indica*	PuneUniversity-Pune, Shinvardhan.	GA 376, GA 84
G. williamsianum	*Areca catechu*	Dapoli-dabhol road	GA 334
G. zonatum	*Areca catechu*	Guhaghar	GA 335

An artificial key was prepared, to distinguish the collected species. For the segregation and assignment of correct taxonomic identity to the samples, keys of different authors viz., Bakshi (1971), Ryvarden and Johansen (1980), Steyaert (1972, 1980), Gilberston and Ryvarden (1986), Gottlieb and Wright (1999a, b) and Ryvarden (1995, 2000) were used.

1'. Pileus non laccate, generally astipitate…… 2
1. Pileus laccate, stipitate…… 13
2. Cutis anamixodermis type…… 3
2'. Cutis other than anamixodermis type …… 9
3. Pore 3 mm^{-1}…… 4
3'. Pore ≥4 mm^{-1}…… 5
4. Context 10-12 mm thick, reddish brown … *G. lobatum*
4'. Context 3 mm thick, brown …… *G. lobatoideum*
5. Pore 4 mm^{-1}…….. 6
5'. Pore ≥5 mm^{-1}…… 7
6. Spore ovoid, basidiocarp semsem-circular, por greyish…… *G. donkii*
6'. Spore subglobose, basidiocaep flabelliform …… *G. testaceum*
7. Spore colour dark brown…… *G. dejongii*
7'. Spore colour yellowish …… 8
8. Spore colour yellow brown, pore 6 mm^{-1} angular …… *G. fulvellum*
8'. Spore colour yellow, pore 5-6 mm^{-1}, rounded …… *G. williamsianum*
9. Cutis trichodermis type …… 10
9'. Cutis non trichodermis type …… 12
10. Max. tube size ≤10 mm, context dark brown …… *G. vanheurnii*
10'. Max. tube size ≥10 mm, context redish brown … … 11
11. Max. tube size 12 mm, tube dirty black…… *G. tornatum*
11'. Max. tube size 13 mm, tube light brown…… *G. lipsiense*
12. Cutis formed by somewhat clavate hyphal endings, pore light-Brown, 4-5 mm^{-1} …… *G. amazonense*
12'. Cutis somewhat similar to anamixoderm type, pore creamish, 6 mm^{-1}…… *G. philippi*

13. Hyphal system dimitic…… 14
13'. Hyphal system trimitic…… 19
14. Hymenodermis claviform…… …… 15
14'. Hymenodermis diverticulate or pedunculate…… 17
15. Spore brown…… *G. concinnum*
15'. Spore yellow…… 16
16. Spore oval, tube 10 mm, light brown…… *G. trengganuense*
16'. Spore oblong-ellipsoid, tube 3 mm, creamish…… *G. resinaceum*
17. Hymenodermis diverticulate…… 18
17'. Hymenodermis pedunculate…… *G. stipitatum*
18. Cutis size 40-46×9-12 μm, grey brown…… *G. orbiforum*
18'. Cutis size 20-30×8.3-9 μm …… *G. praelongum*
19. Hymenodermis claviform…… 20
19'. Hymenodermis diverticulate or pedunculate ….. 31
20. Spore subglobose…… 21
20'. Spore other shape…… 23
21. Spore ≤8 μm…… *G. microsporum*
21'. Spore ≥8 μm…… 22
22. Tube size 10 mm…… *G. africanum*
22'. Tube size 6 mm …… *G. resinaceum*
23. Spore ellipsoid…… 24
23'. Spore oval or obovate…… 27
24. Max. tube size 3 mm…… *G. pseudoboletus*
24'. Max. tube size ≥3 mm …… 25
25. Tube size 8 mm …… *G. zonatum*
25'. Tube size 5 mm…… 26
26. Tube colour grey brown, tube length 5 mm…… *G. ostreatum*
26'. Tube colour creamish, tube length 2 mm …… *G. luteicinctum*
27. Spore dark brown…… 28
27'. Spore other colour …… 29
28. Spore length ≥9 μm, pore 5 mm^{-1}…… *G. pfeifferi*
28'. Spore length ≥11 μm, pore 5 mm^{-1}…… *G. mirabile*
29. Spore rugose…… *G. lucidum*
29'. Spore smooth…… 30
30. Context 2 mm, spore slightly brownish…… *G. chalceum* var. *pleiotrichum*
30'. Context 15-20 mm, spore yellowish brown …… *G. chalceum*
31. Hymenodermis divertriculated …… *G. multicornum*
31'. Hymenodermis pedunculate …… 32
32. Spore length ≥13 μm …… *G. trulliforme*
32'. Spore length ≤13 μm ……33
33. Spore globose, context 3-4 mm, light brown…… *G. sessiliforme*
33'. Spore oval, context 3 mm, chocolate brown…… *G. subincrustatum*

Description of new species

***Ganoderma africanum* (Lloyd) Doidge *Protologue Bothalia* 5: 511. 1950.**

Basidiocarp: Laccate, annual, sessile, imbricate, laterally, woody, flabelliform 18×12×5 cm. Upper surface: concave, 5 concentric zones, waved, brittle, sulcate, rugoses, brown. Margin: lobed, sterile, rounded, brown, 3 mm thick. Pore surface: creamish. Pore: 5 mm^{-1}, angular. Tube: 10-12 mm long, brown. Context: 7 mm thick, brown in colour. Cutis type: Cutis hymenoderm vera claviform type, formed by hyphae arranged in a trichodermis. Hyphal system: Trimitic, Generative hyphae: 2.6 μm, Skeletal hyphae: 3.21-4.28 μm, Binding hyphae: 5.36-7.14 μm, Basidiospores: Truncate, 11-12.5×7.1-8 μm, smooth, subglobose and dark brown. Spore index: 1.2-1.18.

***Ganodema amazonense* Weir, Bull. U. S. Dept. Agric. 1380: 84.1926.**

Basidiocarp: Non laccate, sessile, thin, hard, rigid, alone or imbricate, laterally concrescent. Pileus: grayish to brown, smooth, concentrically zonate. Margin: Thin to obtuse, lobate, white near ending. Tube: 6-10 mm long. Dirty brown; Pores: 4-5 mm minut, light brown. Context: Corky, slightly brown near the tube 2-4 mm wide. Cutis type: Cutis formed by somewhat clavate hyphal endings, difficult to assign to any of the established cutis definitions. Hyphal system: Trimitic, Generative hyphae: 3 μm, Skeletal hyphae: 2.5 μm, Binding hyphae: 3.21-4.36 μm. Basdidiospores: Ovoid to ellipsoid, brown, 6-8.9×4.2-7.1 μm. Spore index: 1.41-1.25.

***Ganodera boninense* Pat., Bull. Soc. Mycol. Fr. 5: 72. 1889.**

Basidiocarp: Laccate, annual, dimidiate to stipitate, sub ungulate, concentrically finely costulate, imbricate, centric, corky, Irregular, 28.66-49.98×5.36-7.14×3 cm. Upper surface: Concave, 5 concentric zone, waved, brittle, sulcate, rugose, light brown. Margin: lobed, sterile, sharp, creamish, 1 mm thick. Pore surface: creamish. Pore: 5 mm^{-1}, angular. Tube: 6 mm long, grey brown. Context: 2 mm thick, dark brown in colour. Cutis type: Cutis formed by diverticulate, somewhat clavate hyphal endings. Hyphal system: Trimitic, Generative hyphae: 3 μm, Skeletal hyphae: 2.5-4.28 μm, Binding hyphae: 3.21-5.36 μm. Basidiospore: Smooth, subglobose, dark brown, 8.5-10.8×5.3-7.1 μm. Spore index: 1.5-1.58.

***Ganodera chalceum* var. *pleiotrichum* Corner. Beih. 75:132. 1983.**

Basidiocarp: Laccate, annual, sessile, imbricate, ecentric, corky, Irregular, 20×16×5 cm. Upper surface: concave, laccate, 3 concentric zone, waved, flexible, sulcate, rugose,

red brown. Margin: lobed, sterile, rounded, brown, 3 mm thick. Pore surface: creamish. Pore: 5 mm^{-1}, angular. Tube: 4 mm long, grey brown. Context: 2 mm thick, dark brown in colour. Cutis type: Cutis formed by hymenodermis type claviform. Hyphal system: Trimitic, Generative hyphae: 3.5 μm, Skeletal hyphae: 3.57-4.36 μm, branches throughout the tissue. The branches sometimes short, ending in binding process Binding hyphae: 4.28-3.36 μm. Basidiospores: Ovoid, truncate at maturity, smooth, slightly brownish, 9.1-11.9×7-9.1 μm. Spore index: 1.39-1.42.

Ganodera concinnum **Ryvarden, Mycologia 92 (1): 180-191. 2000.**

Basidiocarp: Laccate, annual, laterlay stipitate, solitary, ecentric, woody-corky, Irregular, 5×4×4 cm. Upper surface: Concave, waved, flexible, sulcate, tuberous, red brown. Margin: entired, sterile, rounded, pale brown, 6 mm thick. Pore surface: grey. Pore: 6 mm^{-1}, angular. Tube: Pale brown, 18 mm long. Context: 10 mm thick, brown in colour. Cutis type: Cutis clavate, smooth, yellowish brown, thick walled, 30-45×9-14 μm. Hyphal system: Dimitic, Generative hyphae: 2.5 μm, Skeletal hyphae: 3.57-5.36 μm, Basidiospores: Oval, slightly truncate, smooth, brown, 13.14-14×7.2-7.6 μm. Spore index: 1.82-1.84.

Ganoderma dejongii **Stey., Persoonia 7: 74. 1972.**

Basidiocarp: Non laccate, annual, sessile, latraly woody, dimidiate, semi circular, about 15 cm in diam. Upper surface: Applanet. Margin: thick, lobed, brown in growing specimens white. Context: 3-4 mm thick brown in colour. Tube: 9 mm long, gray brown. Pores: 5-7 mm^{-1}, round. Cutis type: Cutis anamixodermis type, made up mostly of subparallel, brown hyphae, loosely intermixed. Hyphal system: Dimitic, Generative hyphae: 2.5 μm, Skeletal hyphae: 3.57-5.36 μm. Basidiospores: Ovoid, truncate at maturity, smooth, dark brown, 7.1-7.9×5-5.5 μm. Spore index: 1.42-1.44.

Ganoderma donkii **Steyart Persoonia 7: 55. 1972.**

Basidiocarp: Non laccate, annule, sessile, semi-circular, triquetrous, 10-10.75 cm in diamiter, 4-5 cm thick at base. Upper surface: Flat, concentrically zoned, waved, sulcate, rugose brown. Margin: Lobed, round brown, 2 mm thick. Tubes: 12-15 mm long, concolorous with the context. Pores: 4-5 mm^{-1} grayish, round. Context: 10 mm thick, brown. Horny deposits following the direction of hyphae. Cutis type: Cutis anamixodermiformis, hyphal extremities closely interwoven, hard. Basidiospores: Ovoid, truncate at maturity, smooth, slightly brownish, 6.1-8.9×3.6-7.1 μm. Spore index: 1.25-1.7.

Ganoderma fulvellum **Bres., Bull. Soc. Mycol. Fr. 5: 69. 1889.**

Basidiocarp: Non laccate, annual, sessile, imbricate, laterally, woody, dimidiate, 18×11×3.5 cm. Upper surface: flat, 5 concentric zones, waved, brittle, sulcate, rugoses, brown. Margin: lobed, sterile, rounded, brown, 2 mm thick. Pore surface: creamish. Pore: 6 mm^{-1}, yellow, sub angular. Tube: 13 mm long, brown. Context: 5 mm thick, brown in colour. Cutis type: Cutis formed by hyphae arranged in a trichodermis. Hyphal system: Trimitic, Generative hyphae: not seen, Skeletal hyphae: 5-7 μm, slightly branched and mass of hyaline branched, thin walled hyphae which give rise to the ultimate elements with swollen apices and thickened walls. Binding hyphae: 1.8-2 μm Basidiospores: truncate, 8.7-9.8×6.2-7.1 μm, smooth, oval and yellow brown. Spore index: 1.09-1.41.

Ganoderma lobatoideum **Stey., Bull. Jard. Bot. Nat. Belg. 50: 168. 1980.**

Basidiocarp: Non laccate, annual, sessile, solitary, ecentric, woody, semicicular 20×15×2.5.5 cm. Upper surface: flat, 5 concentric zone, waved, flexible, sulcate, rugoses, brown. Margin: entired, sterile, rounded, brown, 3 mm thick. Pore surface: creamish. Pore: 5 mm^{-1}, round. Tube: 5 mm long, brown. Context: 3 mm thick, brown in colour. Cutis type: Cutis anamixodermis. Hyphal system: Dimitic, Generative hyphae: 2.5 μm, Skeletal hypae: 3-3.6 μm. Basidiospores: Truncate, smooth, oval to subglobose, 7-8.5×4-5 μm, light brown in colour. Spore index: 1.7-1.75.

Ganoderma lobatum **(schw) Atk., Ann. Mycol. 6: 190. 1908.**

Basidiocarp: Non-laccate, lobed, sessile, flabelliform 10 cm in radius, concentrically sulcate. Upper surface: Non-lacate, reddish brown, zonation inconspicuous. Margin: Round to subacute, lobate, white to grayish colour. Hyminal surface: Yellowish pink grey towards the margin. Context: Reddish brown and becoming darker near the tubes. 10-12 mm long. Tube: Dark reddish brown 4 mm long. Pores: 3-4 mm^{-1} anguler. Cutis type: Cutis Anamixodermis type with clavate elements, blackish brown, shiny, underlaid of a brownish yellow zone with a dark brown layer thick, parallel to the cutis below the latter. Hyphal: hyaline, thin walled, nodose-septate, frequently branched, 2-6 μm diameters. Basidiospores: Oval, truncate, smooth, brown, 7.6-9×5.2-7 μm. Spore index: 1.28-1.42.

Ganoderma luteicinctum **Corner Beih. 75: 159. 1983.**

Basidiocarp: Laccate, annual, sessile, solitary, laterally, corky, Irregular, 5×3.5×3 cm. Upper surface: concave,

waved, brittle, umbonate, rugose, brown. Margin: Entired, sterile, rounded yellow, 4 mm thick. Pore surface: creamish. Pore: 5 mm^{-1}, angular. Tube: 5 mm long, creamish. Context: 2 mm thick, dark brown in colour Cutis type: Hymenodermis claviform type. Hyphal system: Trimitic, Generative hyphae: 2-4 μm, clampt dissepiments with skeletals. Skeletal hyphae: 5-6 μm, unbranched throughout the flesh and ending in a simple flagelliform process, Binding hyphae: 3.45-4.25 μm. Basidispores: 8-9.5×5.4-6 μm. Spore index: 1.48-1.58.

Ganodera microsporum **Hesu., Mycotaxon 35: 36. 1989.**
Basidiocarp: Laccate, annual, stipitate, dimidiate, solitary, laterally, corky, irregular, 6×4×2 cm. Upper surface: concave, 2 concentric zone, waved, flexible, sulcate, rugoses, brown. Margin: entired, sterile, sharp, creamish, 1 mm thick. Pore surface: Creamish. Pore: 4 mm^{-1}, angular. Tube: 2 mm long, yellow. Context: 1.2 mm thick, brown in colour. Cutis type: Hymenodermis composed of thick walled claviform elements originated from the end of the skeletal hypae. Cutis 5.2-9.54×85-93 μm, Hyphal system: Generative hyphae: clampt, thin walled, hyaline, with septa restricted to clamps, sparingly branched, 1-2 μm in diam. Skeletal hyphae: Aseptate, thick walled, 3.57-4.28 μm in diam, Binding hyphae: 4.28-5.36 μm. Basidiophore: Oval to sub globose, yellow, 7.1-8×4.2-5 μm. Spore index: 1.2.

Ganoderma mirabile **(Lioyd) Humph., Mycol. 30: 332. 1938.**
Basidiocarp: Lacate, annual, stipitate, solitary, ecentric, corky, Irregular, 8×6.5×0.6 cm. Upper surface: flat, waved, flexible, sulcate, rugose, red brown. Margin: entired, sterile, sharp, red brown-creamish, 1 mm thick. Pore surface: pale brown. Pore: 5 mm^{-1}, angular. Tube: 10 mm long, creamish. Context: 1 mm thick, light brown in colour. Cutis type: Anamixodermis with clavate elements. Hyphal system: Trimitic, Generative hyphae: 2.5 μm, Skeletal hyphae: 2.5-4.28 μm, Binding hyphae: 4.28-5.36 μm. Basidiospores: Truncate oval, dark brown, 11-12.5×7-8.5 μm. Spore index: 1.4-1.6.

Ganoderma ostreatum **Laz., Rev. Real Acad. Ciencias Exact. Nat. Madr., 14: 110. 1916.**
Basidiocarp: Lacctate, annual, sessile, solitary, laterally, corky, Irregular, 11.5×8×2 cm. Upper surface: concave, waved, flexible, sulcate, rugose, dark brown. Margin: lobed, sterile, sharp, brown, 1 mm thick. Pore surface: creamish. Pore: 5 mm^{-1}, angular. Tube: 5 mm long, grey brown. Context: 2 mm thick, dark brown in colour. Cutis type: Hyminodermis claviform, composed of thick golden walled. Claviform elements originating from the ends of skeletal hyphae, with narrow lamina and blunt ends, arranged in a palisades-like hymenium. These elements are covered by a thick layer of a lacquer-like substance. Hyphal system: Trimitic. Generative hyphae: 2.5 μm, Skeletal hyphae: 3.57-4.28 μm, arboriform, aseptate, clamp long, scantily branched, branches with limited growth at distal end, with thick golden walls. Binding hyphae: 2-3 μm diameter profusely branched, tortuous, of limited growth. Basidiospores: Truncate, smooth, ellipsoid, light brown, 9.5×6.5 μm. Spore index: 1.43.

Ganoderma pfeifferi **Bres., Bull. Soc. Mycol. Fr. 5: 70. 1889.**
Basidiocarp: Lacate, annual, sessile, solitary, laterally, woody, flabelliform, 10.5×7.5×0.8 cm. Upper surface: concave, laccate, waved, flexible, sulcate, rugoses, brown. Margin: entired, sterile, sharp, brown, 1 mm thick. Pore surface: creamish. Pore: 4 mm^{-1}, angular. Tube: 4 mm long, brown. Context: 2 mm thick, brown in colour. Cutis type: Cutis claviform. Hyphal system: Dimitic, Generative hyphae: 2.3 μm, Skeletal hyphae: 3.57-5.36 μm with branches ending in flagelliform processes. Surface of pileus with the skeletal hyphae and binding processes with generative hypae. Basidiospores: Truncate, oval, dark brown, 9-11×8-10 μm. Spore index: 1.1-1.12.

Ganoderma pseudoboletus **(Jacquin) Murrill. Bull. Torrey Bot. Club. 29: 602. 1902.**
Basidiocarp: Laccate, trimitic, annual, sessile, imbricate, laterally, woody, irregular, 11×5.5×9 cm. Upper surface: flat, 5 concentric zone, waved, brittle, sulcate, rugoses, dark brown. Margin: entired, sterile, rounded, brown, 3 mm thick. Pore surface: brown. Pore: 4 mm^{-1}, angular. Tube: 3 mm long, brown. Context: 7 mm thick, brown in colour. Cutis type: Hyrnenodennis, claviform, cuticular cells thin walled, produced by inflation of nodes septate hyphae, at first with contents standing in phloxin, after removing phloxin, closely compacted and interwoven with fiberhyphae and staghorn hyphae to form pseudoparenchymatous layer. Hyphal system: Trimitic, Generative hyphae: 3.1 μm, Skeletal hyphae: 3.57-5.36 μm in diameter, thick walled, Binding hyphae: 4.28-5.07 μm in diameter. Basidiospores: Truncate, ellipsoid, smooth, brown, 9-1×5-6.7 μm. Spore index: 1.73-1.8.

Ganoderma trengganuense **Corner. Beih. 75: 141. 1983.**
Basidiocarp: Laccate, annual, sessile, imbricate, laterally, corky, crustose, Irregular, 19×17×4 cm. Upper surface: convex, 4 concentric zone, lacate, waved, brittle, sulcate, rugose, dark brown. Margin: lobed, sterile, sharp, layered, cream, 2.5 mm thick. Pore surface: cream. Pore: angular, 5 mm^{-1} Tube: 10 mm long, light brown. Context: 3 mm thick, chocolate colour.

Cutis type: Cutis Claviform. Hyphal system: Dimitic without flagelliform binding processes, not encrusted closely interwoven. Generative hyphae: 2.6 μm, Skeletal hyphae: 3.57-4.28 μm, walls 0.5-1 μm thick, with intercalary cells and narrow branches near the distal end. Branches continuing as skeletal cells without septation. Basiodiospores: Oval, yellow, 11-12×8.5-9.9 μm. Spore index: 1.20-1.29.

***Ganoderma trulliforme* Steyaert. Persoonia 7 (1): 85. 1972.**

Basidiocarp: Laccate, annual, sessile, solitary, lateral, corky, Irregular, 6.5×3.8×1.8 cm. Upper surface: flat, lacte, waved, flexible, sulcate, rugose, red brown. Margin: entired, sterile, sharp, light brown, >1 mm thick. Pore surface: light brown. Pore: rounded, 6 mm^{-1}. Tube: 5 mm long, creamish. Context: 2 mm thick, light brown in colour. Cutis type: Hymemniodermiis form with spheropedunculate elements. Hyphal system: Trimitic, Generative hyphae: 3.1 μm, Skeletal hyphae: 2.5-3.57 μm, Binding hyphae: 3.5-5.3 μm. Basidiospores: Truncate, smooth, oval, light brown, 11-13×7-9 μm. Spore index: 1.4-1.57.

***Ganoderma vanheurnii* Steyaert. Persoonia 7: 69. 1972.**

Basidiocarp: Non lacate, sessile, annual, solitary, ungulate, up to 5 cm diameter, 1.5-2.0 cm in thick. Upper surface: Convex, dull brown to red brown, shallow concentric grooves. Margin: generally thick rounded, yellow to grayish. Tube: up to 10 mm long, grayish to brown. Pores: 4-6 mm^{-1} angular. Context: thin 2 mm in thick dark brown in colour. Cutis type: Cutis anamixodermis type, horny, thick, dissepiments. Hyphal system: Trimitic, with hyaline, thin walled, clamped generatives, with septa restricted to clamps, Skeletal hyphae: long with a thick, golden wall, without clamps. Binding hyphae: bovista type, without clamps, aseptate, with branches, 1-3 μm. Basidiospores: Oval to sub globose, truncate at maturity, smooth, light brown, 10.1-11.9×5.2-6. Spore index: 1.9-1.98.

***Ganoderma williamsianum* Murr., Bull. Torrey Bot. Club 34: 478. 1907.**

Basidiocarp: Non laccate, annule, sessile, semi circula, laterally woody, dimidiate, irreguler, up to 15 cm diamiter. 15 to 60 mm thick. Upper surface: Dull brown or hairy brown, with many narrow grooves. Margin: Thin, brown, 2 mm thick. Tubes: 6-12 mm long, one layered, brown. Pores: 5-6 mm^{-1} and rounded. Context: very thin, 2-3 mm thick, brown. Cutis type: Cutis anamixodermis type. Basidiospores: Ovoid, truncate at maturity, smooth, yellow, 5.36-7.8×4.2-6.1 μm. Spore index: 1.25-1.29.

Morphological characters of reproductive stage such as laccate and non-laccate, type of basidiocarp (stipitate/sessile, imbricate, concave, number of concentric zones, etc.), Margin shape (lobed, fertile/sterile, rounded/acute) and colour (brown, etc.), Pore (colour, Pore mm^{-1}, angular/rounded), Hyphal system (trimitic/dimitic), Tube size and colour, Contex, Cutis type and spore characters where consider for identification of the species in the present study, which are confirmative with the species of the *Ganoderma* described by authors in the references viz., Bakshi (1971), Corner (1983), Elliott and Broschat (2001), Gilberston and Ryvarden (1986), Gottlieb and Wright (1999a, b), Lloyd (1915) Monoclavo and Ryvarden (1997), Ryvarden and Calonge (1976) Ryvarden and Johansen (1980), Ryvarden (1995, 2000), Stalpers (1978) and Steyaert (1972, 1980).

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