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## Taxonomic notes on the genus *Ganoderma* from Union Territory of Chandigarh

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### ABSTRACT

Sixteen species of the genus *Ganoderma* P. Karst. i.e. *Ganoderma australe* (Fr.) Pat., *G. brownii* (Murrill) Gilb., *G. capense* (Lloyd) Teng, *G. chaliceum* (Cooke) Steyaert, *G. chenghaiense* J.D. Zhao, *G. crebrostriatum* J.D. Zhao & L.W. Hsu, *G. donkii* Steyaert, *G. elegantum* Ryvarden, *G. lipsiense* (Batsch) G.F. Atk., *G. lobatum* (Schwein.) G.F. Atk., *G. lucidum* (Curtis) P. Karst., *G. mediosinense* J.D. Zhao, *G. ramosissimum* J.D. Zhao, *G. resinaceum* Boud., *G. stipitatum* (Murrill) Murrill and *G. zonatum* Murrill, have been described and illustrated on the basis of specimen collected from different localities of Union Territory of Chandigarh during the monsoon season in 2016. Among the taxa, *G. capense* is a new record for India, where as *G. brownii*, *G. chaliceum*, *G. chenghaiense*, *G. donkii*, *G. elegantum*, *G. stipitatum* and *G. zonatum* are described for the first time from the study area. A key to the species of *Ganoderma* recorded in this study has been provided.

**Keywords:** Basidiomycota, Agaricomycetes, Polypores, white rot, bracket fungi

### INTRODUCTION

*Ganoderma* P. Karst. (*Ganodermataceae*, *Polyporales*) is one of the largest polypore genus characterised by prominent, bracket-like, stipitate or sessile, annual or perennial basidiocarps with laccate (varnished) or non-laccate (dull) abhymenial surface. The hymenial surface is poroid, with variable shape and size of the pores. The genus is typical in having trimitic hyphal system with clamped generative hyphae, skeleto-binding hyphae and binding hyphae; fairly shorter, basally clamped, tetra-sterigmate basidia and ellipsoid to ovoid, acyanophilous, inamyloid basidiospores with truncate apex and usually with hyaline, two-layered basidiospore wall (thin exospore and coloured, thicker and echinulate endospore). Some of the species like *Ganoderma colossus*, *G. subamboinense* and *G. weberianum*, are peculiar in having asexual spores (chlamydospores) (Douanala-Meli and Langer, 2009; Hong and Jung, 2004). Karsten (1881) introduced the genus *Ganoderma* with *Polyporus lucidus* as the type. The members of the genus *Ganoderma* usually grow in association with coniferous as well as deciduous trees/wood as parasites or saprophytes and have been reported to cause root rot or butt rot. Besides its role in wood rot, the basidiocarps have also been reported to be used in traditional medicinal system (Bishop *et al.*, 2015). The estimated number of *Ganoderma* species ranges from 250 to >400 (Moncalvo *et al.*, 1995; Richter *et al.*, 2015; Mycobank, 2018). To date, 61 species of *Ganoderma* have been recorded from India. It is worth mentioning that only eight species of the genus have so far been recorded from Union Territory of Chandigarh by earlier workers (Dhanda, 1977; Kaur, 2017; Kaur *et al.*, 2017).

### OBSERVATIONS

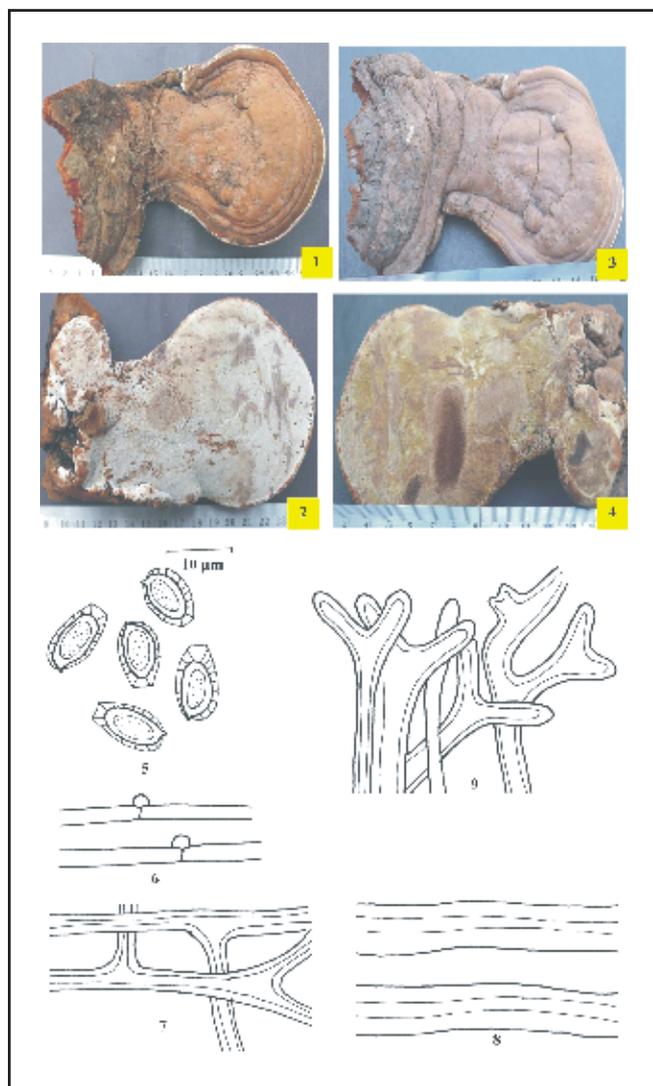
Sixteen species of the genus *Ganoderma*, based on collections made from the different localities of Union Territory of Chandigarh during the monsoon season in 2016 have been described and illustrated.

**1. *Ganoderma australe*** (Fr.) Pat., *Bulletin de la Société Mycologique de France* 5: 71, 1889. *Polyporus australis* Fr., *Elenchus Fungorum* 1: 108, 1828. **Figs. 1-9**

**Basidiocarp** annual, pileate, sessile, pilei up to 9×12×2 cm, solitary, dimidiate, corky to woody; abhymenial surface non-laccate, fairly zonate near the margins, sulcate, fairly cracked on drying, greyish brown to brown when fresh, reddish brown on drying; hymenial surface poroid, reddish grey to greyish brown when fresh, greyish brown on drying; pores angular, 3-4/mm; dissepiments up to 35 µm thick; context up to 15 mm thick, homogeneous, reddish brown; pore tubes up to 5 mm long, brownish; margins obtuse, abhymenial margins reddish grey, hymenial margins concolorous, sterile up to 3 mm on the hymenial facet. **Pilear crust** anamixodermis; hard, formed of thin-walled generative hyphae, thick-walled, aseptate, branched or unbranched, brown skeletal hyphae and branched, thick-walled, aseptate, light-brown binding hyphae. **Generative hyphae** up to 3.5 µm wide, branched, septate, clamped, thin-walled; skeleto-binding hyphae up to 7.5 µm wide, aseptate, brown, thick-walled; binding hyphae up to 3.7 µm wide, distantly branched, aseptate, light-brown, thick-walled. **Basidia** not observed. **Basidiospores** 9.8-11.8 × 6.2-6.8 µm, ellipsoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, Udyog Path, opposite to gate # 3 of Panjab University, on the trunk of *Acacia nilotica*, Gurpreet 8512(PUN), October 6, 2013.

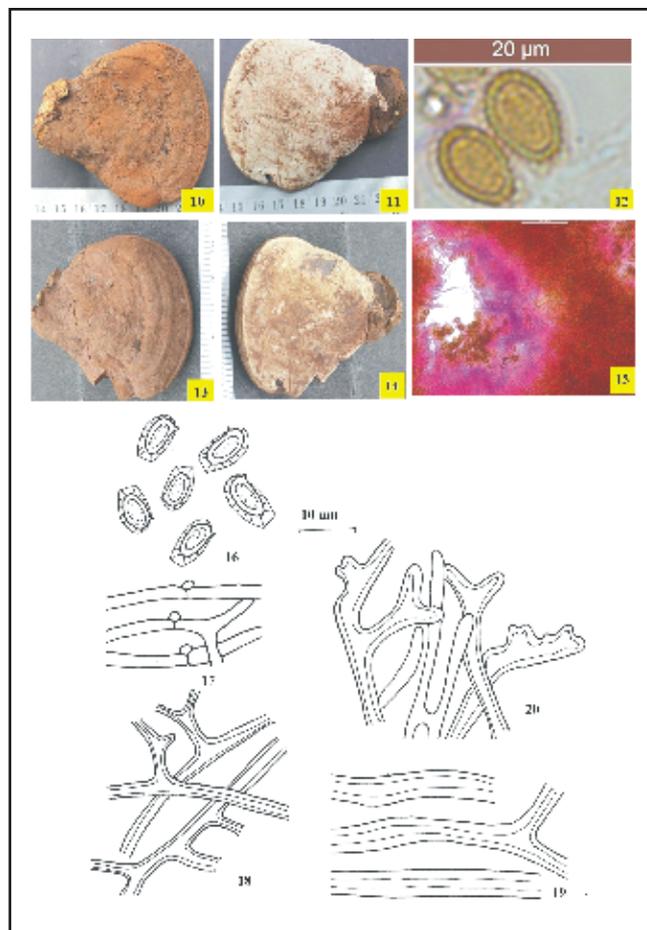
**Remarks:** *G. australe* is characteristic in having non-laccate basidiocarp with anamixodermis pilear crust. It has been earlier described/listed from Maharashtra, West Bengal, Kerala, Himachal Pradesh and Union Territory of Chandigarh (Bakshi, 1971; Sharma and Ghosh, 1989; Leelavathy and Ganesh, 2000; Sharma, 2000, 2012; Prasher and Ashok, 2013; Kaur, 2013; Ranadive, 2013; Kaur, 2017; Kaur *et al.*, 2017).



**Figs. 1-9:** *Ganoderma australe*. Fresh basidiocarp showing 1. Abhymenial surface; 2. Hymenial surface; Dried basidiocarp showing 3. Abhymenial surface; 4. Hymenial surface; 5. Basidiospores; 6. Generative hyphae; 7. Binding hyphae; 8. Skeleto-binding hyphae; 9. Cuticular elements.

**2. *Ganoderma brownii*** (Murrill) Gilb., *Mycologia* **53**: 505, 1962. *Elfvigia brownii* Murrill, *Western Polypores* **5**: 29, 1915. **Figs. 10-20**

**Basidiocarp** perennial, pileate, sessile, solitary, pilei up to 6×8×1 cm, applanate; abhymenial surface non-laccate, sulcate, indistinctly zonate towards the margins, greyish red to dull red when fresh, reddish brown on drying; hymenial surface poroid, brownish white to yellowish white when fresh, orange white on drying; pores round to angular, 4-5/mm; dissepiments up to 30 µm thick; context up to 4 mm thick, homogeneous, brown; pore tubes up to 6 mm long, light-brown; margins obtuse, abhymenial margins greyish red, hymenial margins brownish grey to reddish grey, sterile up to 3 mm on hymenial facet. **Pilear crust** anamixodermis; dark brown, hard, formed of subhyaline, thin-walled generative hyphae, thick-walled

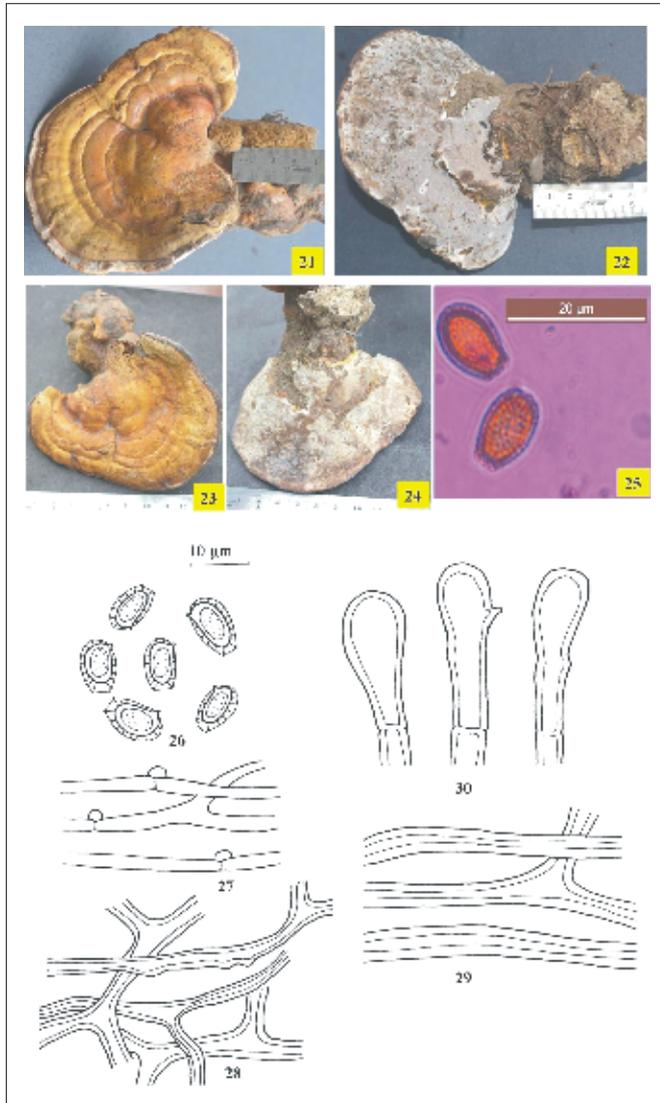


**Figs. 10-20:** *Ganoderma brownii*. Fresh basidiocarp showing 10. Abhymenial surface; 11. Hymenial surface; 12. Photomicrograph showing basidiospores; Dried basidiocarp showing 13. Hymenial surface; 14. Abhymenial surface; 15. Photomicrograph showing cross section through pore tube showing basidiospores and dissepiments; 16. Basidiospores; 17. Generative hyphae; 18. Binding hyphae; 19. Skeleto-binding hyphae; 20.

skeletal hyphae and much branched binding hyphae with irregular to sub-cylindrical branches. **Generative hyphae** up to 3.5 µm wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 6.5 µm wide, branched, aseptate, brown, thick-walled; binding hyphae up to 4.3 µm wide, much branched, aseptate, thick-walled. **Basidia** not observed. **Basidiospores** 8.5-11.5 × 5.6-6.2 µm, ellipsoid to ovoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, opposite to Panjab University gate # 3, at the base of dried angiospermous tree, J. Brar and G. S. Dhingra 8565(PUN), August 5, 2016.

**Remarks:** *G. brownii* differs from *G. australe* in having perennial, basidiocarps and ellipsoid to ovoid basidiospores. Kaur (2013) described *G. brownii* for the first time from India on the basis of collections made from Himachal Pradesh followed by Singh (2016) from Uttarakhand. Present report is



**Figs. 21-30: *Ganoderma capense*.** Fresh Basidiocarp showing 21. Abhymenial surface; 22. Hymenial surface; Dried basidiocarp showing 23. Abhymenial surface; 24. Hymenial surface; 25. Photomicrograph showing basidiospores; 26. Basidiospores; 27. Generative hyphae; 28. Binding hyphae; 29. Skeleto-binding hyphae; 30. Cuticular elements.

the first one from the study area.

**3. *Ganoderma capense*** (Lloyd) Teng, Zhong Guo De Zhen Jun, *Fungi of China*: 760, 1963. *Polyporus capensis* Lloyd, *Mycol., Writ.* **5** (Letter 63): 10, 1916. **Figs. 21-30**

**Basidiocarp** annual, pileate, sessile to substipitate, imbricate, pilei up to 10.5×10×1 cm, broadly attached; abhymenial surface laccate, faintly zonate, sulcate, light orange to greyish orange to reddish white when fresh, brownish orange to light brown on drying; hymenial surface poroid, reddish grey when fresh, reddish brown on drying; pores round, 4-5/mm; dissepiments up to 42 µm thick; context up to 7 mm thick, homogeneous, dark brown, fibrous, soft; pore tubes up to 3 mm long, pale brown;

margins obtuse, fairly wavy to irregular, abhymenial margins greyish white when fresh, violet brown on drying, hymenial margins reddish grey when fresh and light brown on drying, sterile up to 2 mm on hymenial facet. **Pilear crust** hymeniodermis; cuticular elements 24-30×9.3-10.5 µm, cylindrical, fairly dilated at the tip, smooth, thick-walled, brown. **Generative hyphae** up to 2.5 µm wide, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 5 µm wide, distantly branched, aseptate, brown, thick-walled; binding hyphae up to 3.1 µm, much branched, aseptate, subhyaline, thick-walled. **Basidia** not observed. **Basidiospores** 8.5-10.5 × 4.8-6.2 µm, ellipsoid to ovoid, inamyloid, acyanophilous, truncate at apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimens examined:** India, Union Territory of Chandigarh, Sector 19B, at the base of *Ficus religiosa*, J. Brar and G. S. Dhingra 8566(PUN), August 15, 2016; at the base of *Ficus religiosa*, J. Brar and G. S. Dhingra 8590(PUN), August 15, 2016

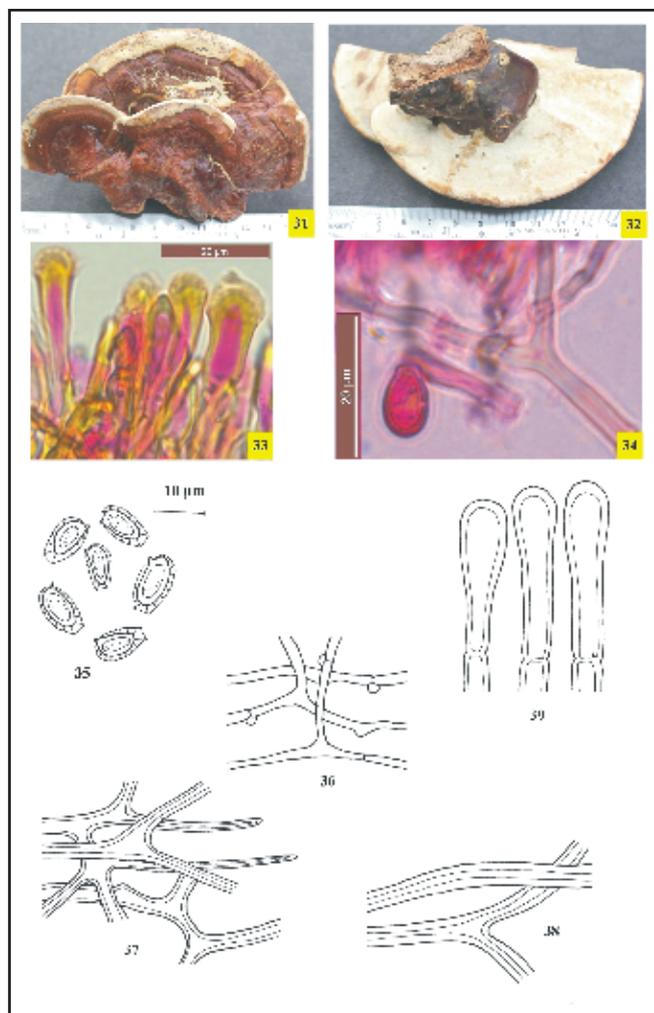
**Remarks:** *G. capense* is characterized by sessile to substipitate, faintly zonate, laccate basidiocarps with homogeneous, brown context and hymeniodermis pilear crust and is known from South Africa and China (Zhao, 1989). It is the first report of *G. capense* from India.

**4. *Ganoderma chalconeum*** (Cooke) Steyaert, *Bulletin du Jardin Botanique National de Belgique* **37**(4): 481, 1967. *Polyporus chalconeum* Cooke, *Transactions of the Botanical Society of Edinburgh* **13**: 135, 1879. **Figs. 31-39**

**Basidiocarp** annual, pileate, substipitate, imbricate, pilei up to 13.5×8.5×1 cm, corky; abhymenial surface laccate, zonate towards margins, sulcate, reddish brown when fresh, not changing much on dryings; hymenial surface poroid, orange white to reddish white when fresh, not changing much on drying, pores round to angular, 3-4/mm; dissepiments up to 53 µm thick; context up to 7 mm thick, fibrous, duplex, dark brown zone near the pore tubes and pale brown near the abhymenial surface; pore tubes up to 3 mm long, greyish brown; margins obtuse, reddish white on abhymenial and hymenial facet, sterile up to 5 mm on hymenial facet; stipe short, up to 4.5×6.5 cm, laccate, violet brown. **Pilear crust** hymeniodermis; cuticular elements 30-35.9×8.6-9.9 µm, sub-cylindrical, fairly dilated at the tip, smooth, brown, thick-walled. **Generative hyphae** up to 2.5 µm wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 5µm wide, distally branched, aseptate, brown, thick-walled; binding hyphae up to 3.5µm wide, much branched, aseptate, subhyaline, thick-walled. **Basidia** not observed. **Basidiospores** 9.3-12.5 × 5-6.8µm, ellipsoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, Sector 18D park, at the base of dried angiospermous tree, J. Brar and G. S. Dhingra 8567(PUN), August 15, 2016.

**Remarks:** This species is recognized by substipitate, imbricate, laccate basidiocarp and duplex context with dark

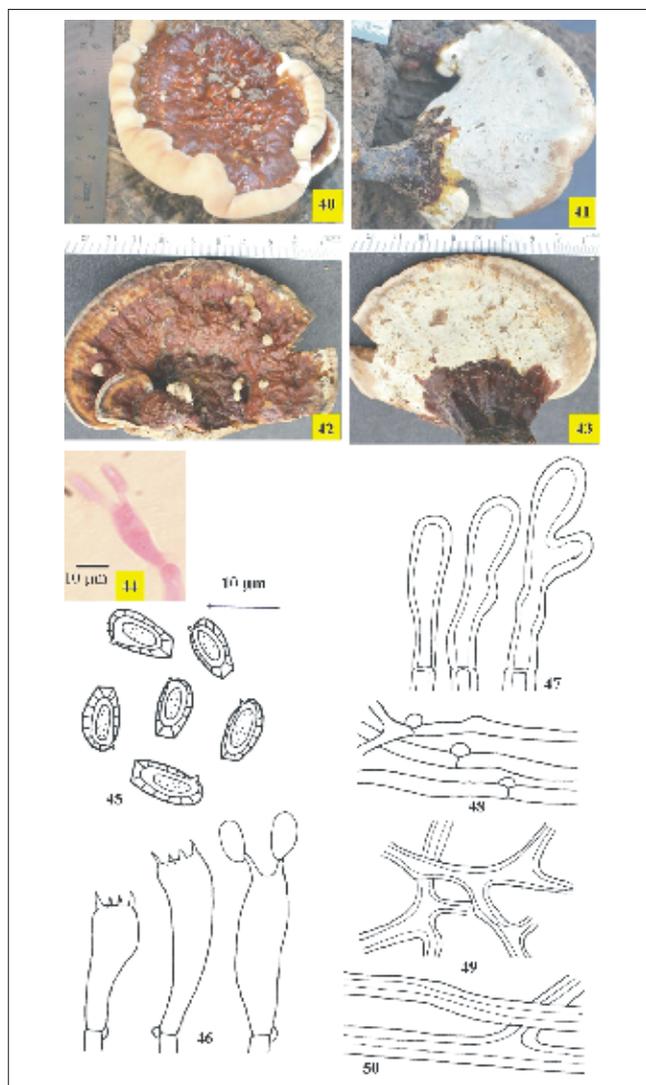


**Figs. 31-39: *Ganoderma chalceum*.** Basidiocarp showing 31. Abhymenial surface; 32. Hymenial surface; Photomicrographs showing 33. Cuticular elements; 34. Basidiospore and skeleto-binding hyphae; 35. Basidiospores; 36. Generative hyphae; 37. Binding hyphae; 38. Skeleto-binding hyphae; 39. Cuticular

brown zone near the pore tube and pale brown towards the abhymenial side. *G. chalceum* is known to be distributed in Maharashtra (Foroutan and Vaidya, 2007; Bhosle *et al.*, 2010; Ranadive *et al.*, 2011; Ranadive, 2013; Ranadive and Jagtap, 2016) and Uttarakhand (Singh, 2016). This is first report of *G. chalceum* from the study area.

**5. *Ganoderma chenghaiense*** J.D. Zhao, *Acta Mycologica Sinica* 8(1): 31, 1989. **Figs. 40-50**

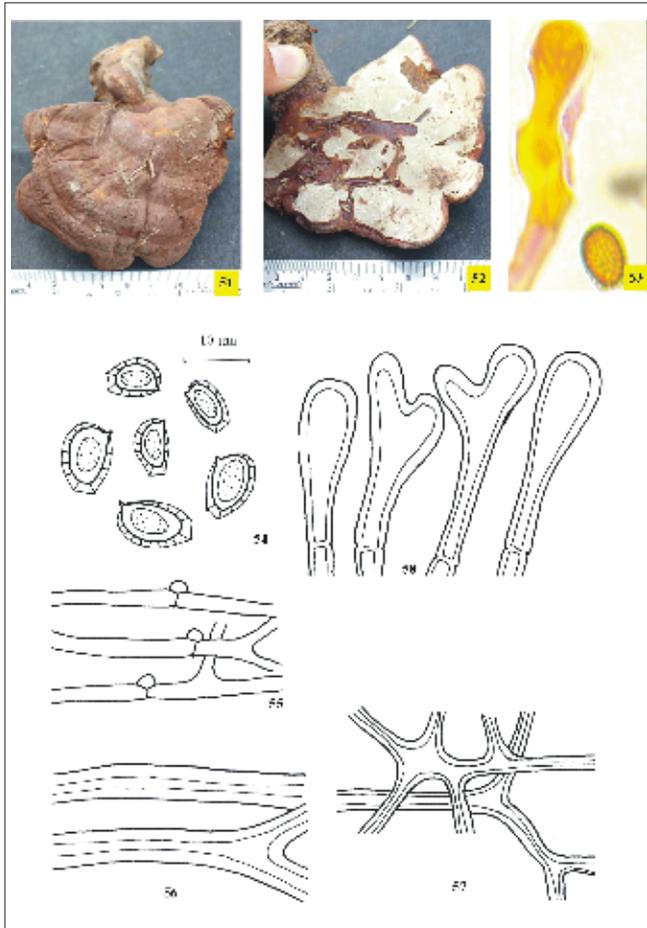
**Basidiocarps** annual, pileate, stipitate, corky, pilei up to 11×7.5×1 cm, suborbicular, tuberculiform; abhymenial surface laccate, tuberculate, sulcate, reddish brown when fresh, not changing much on drying; hymenial surface poroid, orange white when fresh, greyish brown on drying; pores round to angular, 4-5/mm; dissepiments up to 50 µm thick; context up to 8 mm thick, homogeneous, light brown; pore tube up to 2 mm long, light-brown; margins obtuse, wavy to irregular, abhymenial margins yellowish brown, hymenial margins greyish yellow, sterile up to 5 mm on hymenial facet;



**Figs. 40-50: *Ganoderma chenghaiense*.** Fresh basidiocarp showing 40. Abhymenial surface; 41. Hymenial surface; Dried basidiocarp showing 42. Abhymenial surface; 43. Hymenial surface; 44. Photomicrograph showing basidia with basidiospores; 45. Basidiospores; 46. Basidia; 47. Cuticular elements; 48. Generative hyphae; 49. Binding hyphae; 50. Skeleto-binding hyphae.

stipe lateral to eccentric, up to 3×5 cm, laccate, solid, violet brown. **Pilear crust** hymeniodermis; cuticular elements 31-43.4×7.4-9.9 µm, subcylindrical, dilated at the tip, smooth, thick walled. **Generative hyphae** up to 3.5 µm wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 5.5 µm wide, branched, aseptate, brown, thick-walled; binding hyphae up to 4.5 µm wide, much branched, aseptate, thick-walled. **Basidia** 22.2-31.0×7.4-8.6 µm, subclavate, 4-sterigmate, basally clamped; sterigmata up to 3.1 µm long. **Basidiospores** 9.0-12.5×4.3-6.8 µm, ellipsoid to ovoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore, thick, brown, echinulate.

**Specimens examined:** India, Union Territory of



**Figs. 51-58: *Ganoderma crebrostriatum*.** Basidiocarp showing 51. Abhymenial surface; 52. Hymenial surface; 53. Photomicrograph showing cuticular element and basidiospore; 54. Basidiospores; 55. Generative hyphae; 56. Skeleto binding hyphae; 57. Binding hyphae; 58. Cuticular elements.

Chandigarh, Sector 18C, at the base of *Acacia nilotica*, J.Brar and G.S. Dhingra 8568(PUN), August 5, 2016; at the base of *A. nilotica*, J.Brar and G.S. Dhingra 8585(PUN), August 5, 2016; at the base of *A. nilotica*, J.Brar and G.S. Dhingra 8586(PUN), August 5, 2016.

**Remarks:** This species is unique in having laccate, tuberculate abhymenial surface, homogeneous dark brown context and hymeniodermis pilear crust. The only available earlier report from India is on the basis of collections made from Uttarakhand (Singh, 2016). This is the first report from Union Territory of Chandigarh.

**6. *Ganoderma crebrostriatum*** J.D. Zhao & L.W. Hsu, *Acta Mycologica Sinica*: 161, 1983. **Figs. 51-58**

**Basidiocarps** annual, pileate, stipitate, pilei up to 11.5×12×1 cm, suborbicular to orbicular, corky; abhymenial surface laccate, sulcate, faintly zonate, reddish brown when fresh, not changing much on drying; hymenial surface poroid, reddish grey when fresh, greyish brown on drying; pores round to angular, 4-5/mm; dissepiments up to 46 µm thick; context up

to 6 mm thick, dark brown, homogeneous; pore tube up to 4 mm long, light-brown; margins acute or obtuse, fairly irregular to incurved, abhymenial margins light brown, hymenial margins orange white, sterile up to 2 mm on hymenial facet; stipe dorso-lateral, up to 4×3 cm, laccate, solid, brownish orange. **Pilear crust** hymeniodermis; light brown, cuticular elements 26-33×4.8-8-12.5 µm, clavate to subclavate to irregular, lobed. **Generative hyphae** up to 3.2 µm wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 5.6 µm wide, rarely branched, aseptate, thick-walled; binding hyphae up to 3.7 µm wide, much branched, aseptate, thick-walled. **Basidia** not observed. **Basidiospores** 8.6-11.8×4.8-7.5 µm, ellipsoid to subellipsoid, inamyloid, acyanophilous truncate at the apex, uniguttulate, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimens examined:** India, Union Territory of Chandigarh, Sector 18C, at the base of *Cassia fistula*, J. Brar and G. S. Dhingra 8572(PUN), August 5, 2016; at the base of *Cassia fistula*, J. Brar and G. S. Dhingra 8597(PUN), August 5, 2016.

**Remarks:** This species is recognized by laccate basidiocarp with irregular or incurved margins and clavate to subclavate to irregular cuticular elements. It has earlier been reported from Uttarakhand (Singh, 2016) and Union Territory of Chandigarh (Kaur, 2017; Kaur *et al.*, 2017).

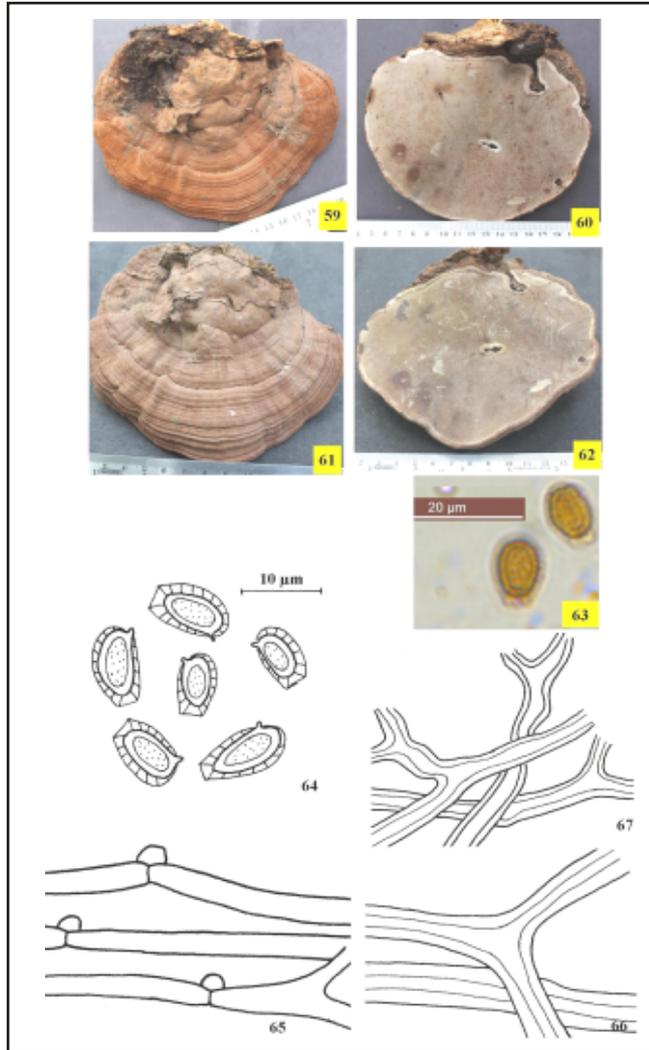
**7. *Ganoderma donkii*** Steyaert, *Persoonia* 7(1): 75, 1972.

**Figs. 59-67**

**Basidiocarp** annual, pileate, sessile, solitary, pilei up to 15×13×2 cm, suborbicular to flabelliform, woody; abhymenial surface non laccate, zonate, fairly sulcate, brownish orange when fresh, reddish brown on drying; hymenial surface poroid, dull red when fresh, light brown on drying; pores round to angular, 4-5/mm; dissepiments up to 37.6 µm thick; context up to 5 mm thick, homogeneous, dark brown; pore tubes up to 15 mm long, brownish; margins obtuse, irregular, abhymenial margins reddish brown, hymenial margins light brown, sterile up to 3 mm on the hymenial facet. **Pilear crust** anamixodermis; soft, easily broken when depressed with nail, brown. **Generative hyphae** up to 3.5 µm wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 6.2 µm wide, distantly branched, aseptate, brown, thick-walled; binding hyphae up to 3.8 µm wide, much branched, aseptate, thick-walled. **Basidia** not observed. **Basidiospores** 8.5-12×4.8-6.8 µm, ovoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, Opposite to Panjab University, gate # 3, at the base of dried angiospermous tree, J. Brar and G. S. Dhingra 8570(PUN), August 15, 2016.

**Remarks:** The peculiar features of *G. donkii* are suborbicular to flabelliform basidiocarp with non-laccate abhymenial surface and anamixodermis pilear crust. Foroutan and Vaidya (2007) described it for the first time from Maharashtra followed by Singh (2016) from Dehradun (Uttarakhand). Presently it is being recorded for the first time from Union

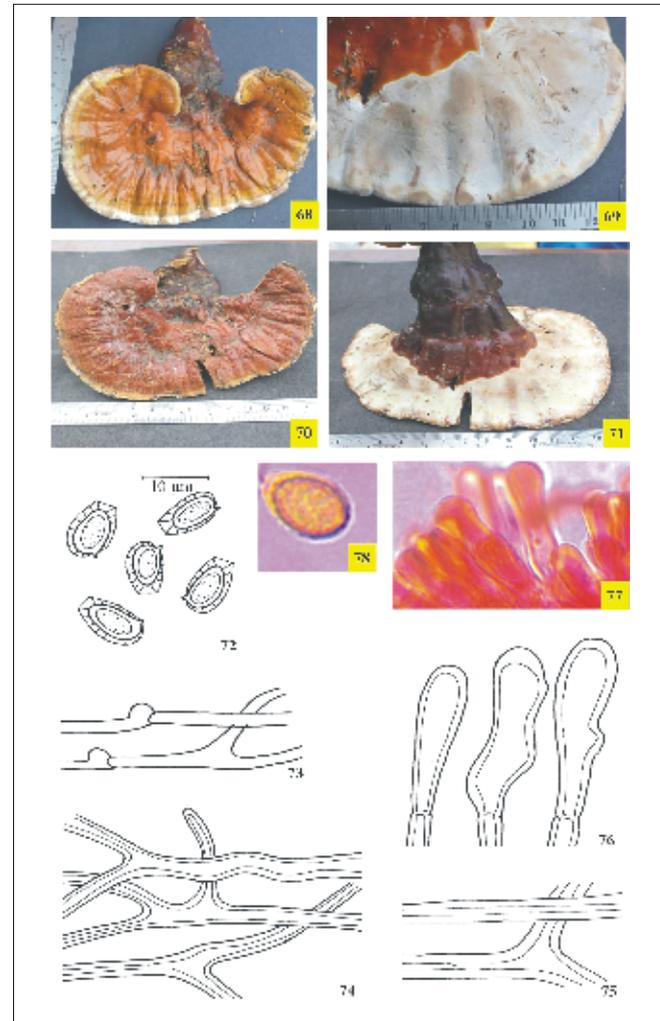


**Figs. 59-67: *Ganoderma donkii*.** Fresh basidiocarps showing 59. Abhymenial surface; 60. Hymenial surface; Dried basidiocarps showing 61. Abhymenial surface; 62. Hymenial surface; 63. Photomicrograph showing basidiospores; 64. Basidiospores; 65. Generative hyphae; 66. Skeleto-binding hyphae; 67. Binding hyphae.

Territory of Chandigarh.

**8. *Ganoderma elegantum*** Ryvar den, *Synopsis Fungorum* 19: 81, 2004. **Figs. 68-78**

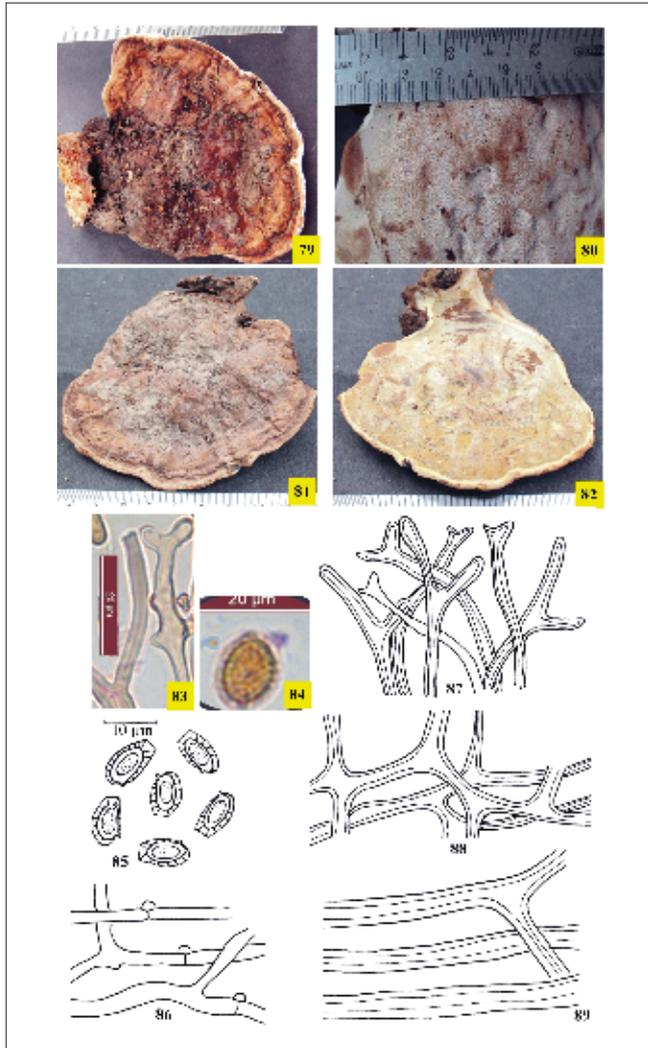
**Basidiocarp** annual, pileate, stipitate, pilei up to 14×8×0.8 cm, corky; abhymenial surface laccate, sulcate, orange white to light orange to orange when fresh, reddish brown on drying; hymenial surface poroid, yellowish white when fresh, pale yellow on drying; pores round, 5-6/mm; dissepiments up to 41 μm thick; context up to 6 mm thick, duplex, having dark brown zone near the pore tubes and pale brown zone near the abhymenial facet, with dark resinous bands; pore tubes up to 2 mm long, orange white; margins acute to obtuse, irregular, abhymenial margins yellowish white when fresh, pale orange on drying, hymenial margins creamish white when fresh, reddish brown on drying, sterile up to 9 mm; stipe lateral, up to 10×1.5 cm, broad at apex narrow at base, solid,



**Figs. 68-78: *Ganoderma elegantum*.** Fresh basidiocarps showing 68. Abhymenial surface; 69. Hymenial surface; Dried basidiocarp showing 70. Abhymenial surface; 71. Hymenial surface; 72. Basidiospores; 73. Generative hyphae; 74. Binding hyphae; 75. Skeleto-binding hyphae; 76. Cuticular elements; Photomicrograph showing 77. Cuticular elements; 78. Basidiospore.

laccate, reddish brown to dark brown, context brown with two black bands differentiating fairly paler core and slightly darker peripheral part. **Pilear crust** hymenioderms; cuticular elements up to 27.5-34.5×7-8.6 μm, cylindrical, dilated at the tip, thick-walled. **Generative hyphae** up to 3.5 μm wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 5 μm wide, distantly branched, aseptate, brown, thick-walled; binding hyphae up to 3.5 μm wide, much branched, septate, thick-walled. **Basidia** not observed. **Basidiospores** 9.3-11×4.9-6.5 μm, ellipsoid, inamyloid, acyanophilous, truncate at apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, Sector 21D, at the base of *Ficus religiosa*, J. Brar and G. S. Dhingra 8571(PUN), August 15, 2016.



**Figs. 79-89: *Ganoderma lipsiense*.** Fresh basidiocarp showing 79. Abhymenial surface; 80. Hymenial surface; Dried basidiocarp showing 81. Abhymenial surface; 82. Hymenial surface; Photomicrograph showing 83. Cuticular elements; 84. Basidiospore; 85. Basidiospores; 86. Generative hyphae; 87. Cuticular elements; 88. Binding hyphae; 89. Skeleto-binding hyphae.

**Remarks:** It is peculiar in having laterally stipitate, laccate basidiocarps with duplex context having dark resinous bands with dark brown zone near the pore tubes and pale brown zone towards the abhymenial side. The lateral stipe possesses brown context with two black bands differentiating fairly paler core and slightly darker peripheral part. The only earlier report from India is by Singh (2016) from Uttarakhand. Presently it is being described for the first time from the study area.

**9. *Ganoderma lipsiense*** (Batsch) G.F. Atk., *Annales Mycologici* 6: 189, 1908. - *Boletus lipsiensis* Batsch, *Elenchus fungorum*. Continuatio prima: 183, t. 25: 130, 1786.

**Figs. 79-89**

**Basidiocarps** perennial, pileate, sessile, solitary to imbricate, pilei up to 11×7.5×1.2 cm, applanate; abhymenial surface non

laccate, rough to irregular, faintly zonate, sulcate, greyish brown to greyish red when fresh, greyish red on drying; hymenial surface poroid, white to yellowish white when fresh, greyish orange on drying; pores round to angular, 3-5/mm; dissepiments up to 35  $\mu$ m thick; context up to 8 mm thick, homogeneous, brown; pore tubes up to 4 mm long, dull red; margins obtuse, irregular, white to yellowish white both on the abhymenial and hymenial facet, sterile up to 5 mm on the hymenial facet. **Pilear crust** trichodermis; subhyaline, formed of thin-walled generative hyphae, thick-walled, brown, skeletal hyphae and thick-walled, branched, binding hyphae; projecting from the surface as trichomes, easily broken when depressed with nail. **Generative hyphae** up to 3.5  $\mu$ m wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 5  $\mu$ m wide, distally branched, aseptate, brown, thick-walled; binding hyphae up to 4.5  $\mu$ m wide, frequently branched, aseptate, thick-walled. **Basidia** not observed. **Basidiospores**; 8-11.5 × 5-6.3  $\mu$ m, ovoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

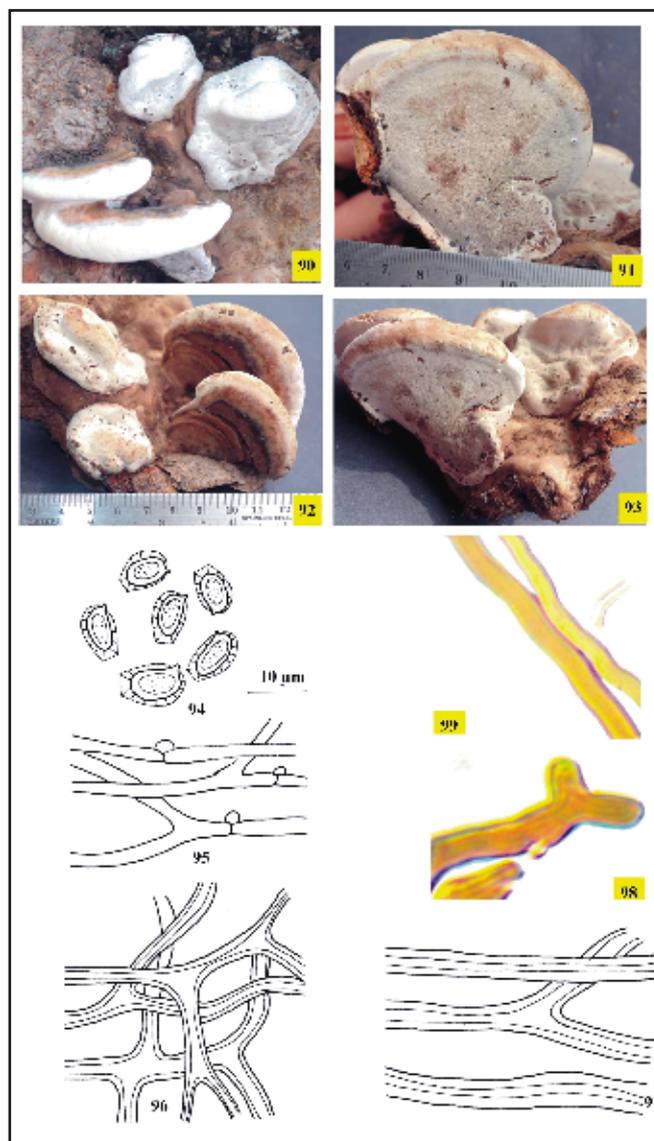
**Specimens examined:** India, Union Territory of Chandigarh, Rock Garden, on *Cassia fistula*, J. Brar and G.S. Dhingra 8569 (PUN), August 5, 2016; on *Cassia fistula*, J. Brar and G.S. Dhingra 8592 (PUN), August 5, 2016

**Remarks:** *G. lipsiense* is unique in having applanate basidiocarps with trichodermis pilear crust that breaks on compression. It is a fairly common species of the genus and has earlier been described as *G. applanatum* from West Bengal and Assam (Bose, 1920, 1922, 1937; Banerjee, 1947; Sharma and Ghosh, 1989), Uttarakhand (Thind and Chatrath, 1960; Sharma, 2000, 2012; Prasher and Lalita, 2013), Himachal Pradesh (Dhanda, 1977; Sharma, 2000, 2012; Prasher and Ashok, 2013), Jammu and Kashmir (Dhanda, 1977), Madhya Pradesh (Saxena, 1961) and Punjab (Dulat, 1992; Lalji, 2003; Dargan *et al.*, 2006). Ranadive *et al.* (2011), Singh (2016) and Kaur (2017) described it as *G. lipsiense* from Maharashtra, Uttarakhand and Union Territory of Chandigarh, respectively. Recently, Kaur *et al.*, (2017) reported it as *G. applanatum* from the study area.

**10. *Ganoderma lobatum*** (Schwein.) G.F. Atk., *Annales Mycologici* 6: 190, 1908. - *Polyporus lobatus* Schwein., *Transactions of the American Philosophical Society* 4(2): 157, 1832.

**Figs. 90-99**

**Basidiocarp** perennial, pileate, sessile, emerging underneath the older basidiocarps, pilei up to 7.5×4.5×1.3 cm, round to flabelliform, applanate, woody; abhymenial surface, non-laccate, concentrically zonate and sulcate, orange white to dull red to reddish brown when fresh, not changing much on drying; hymenial surface poroid, reddish grey when fresh, reddish white on drying; pores round to angular, 4-5/mm; dissepiments to 54  $\mu$ m thick, context up to 10 mm thick, homogeneous reddish brown; pore tube up to 3 mm long, brown; margins obtuse, irregular, thick, abhymenial margins dull red to brown, hymenial margins orange white, sterile up to 4 mm on the hymenial facet. **Pilear crust** anamixodermis; hard, blackish brown. **Generative hyphae** up to 3  $\mu$ m wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up

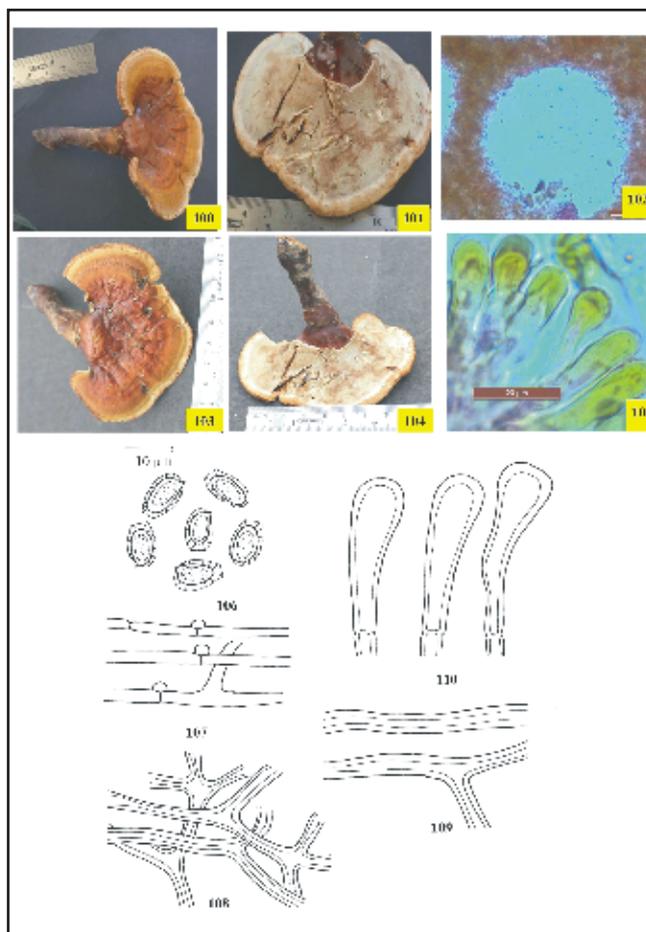


**Figs. 90-99: *Ganoderma lobatum*.** Fresh basidiocarp showing 90. Abhymenial surface; 91. Hymenial surface; Dried basidiocarp showing 92. Abhymenial surface; 93. Hymenial surface; 94. Basidiospores; 95. Generative hyphae; 96. Binding hyphae; 97. Skeleto-binding hyphae; Photomicrographs showing 98. Binding hyphae; 99. Skeleto-binding hyphae.

to 5.5  $\mu\text{m}$  wide, distally branched, aseptate, brown, thick-walled; binding hyphae up to 3.5  $\mu\text{m}$  wide, much branched, aseptate, subhyaline, thick-walled. **Basidia** not observed. **Basidiospores** 8.5-11.2 $\times$ 5.5-7.4  $\mu\text{m}$ , ellipsoid to ovoid, inamyloid, acyanophilous, truncate at apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, Sector 21D, on the trunk of *Acacia nilotica*, J. Brar and G. S. Dhingra 8573(PUN), August 15, 2016.

**Remarks:** It is characteristic in having round to flabelliform, applanate, non-laccate basidiocarps that emerge underneath the older basidiocarp. It is distributed in Maharashtra (Foroutan and Vaidya, 2007; Ranadive *et al.*, 2011; Ranadive,



**Figs. 100-110: *Ganoderma lucidum*.** Fresh basidiocarp showing 100. Abhymenial surface; 101. Hymenial surface; 102. Photomicrographs showing cross section through pore tube; Dried basidiocarp showing 103. Abhymenial surface; 104. Hymenial surface; 105. Photomicrograph showing cuticular elements; 106. Basidiospores; 107. Generative hyphae; 108. Binding hyphae; 109. Skeleto-binding hyphae; 110. Cuticular elements.

2013; Ranadive and Jagtap, 2016), Himachal Pradesh (Kaur, 2013), Uttarakhand (Singh, 2016) and Union Territory of Chandigarh (Kaur, 2017; Kaur *et al.*, 2017).

**11. *Ganoderma lucidum*** (Curtis) P. Karst., *Revue Mycologique Toulouse* 3(9): 17 (1881). *Polyporus lucidus* (Curtis) Fr., *Systema Mycologicum* 1: 353 (1821). **Figs. 100-110**

**Basidiocarps** annual, pileate, stipitate, pilei up to 9.5 $\times$ 5 $\times$ 1 cm, dimidiata, corky; abhymenial surface laccate, faintly zonate, sulcate, brownish red when fresh, reddish brown on drying; hymenial surface poroid, dull red when fresh, reddish grey in dried; pores round, 4-5/mm; dissepiments up to 34  $\mu\text{m}$  thick; context up to 8 mm thick, duplex, light brown to brown; pore tube up to 2 mm long; margins acute, wavy to irregular, abhymenial margins orange white when fresh to greyish orange on drying, hymenial margins pale orange when fresh and orange white on drying, sterile up to 5 mm on the hymenial facet; stipe central, up to 6.5 $\times$ 2 cm, laccate, cylindrical, hollow, reddish brown. **Pilear crust** hymeniodermis; cuticular elements 35-41 $\times$ 10.5-11  $\mu\text{m}$ ,

cylindrical, smooth, dilated at the tip, thick-walled. **Generative hyphae** up to 3.5  $\mu\text{m}$  wide, branched, septate, clamped, subhyaline, thin- to thick-walled; skeleto-binding hyphae up to 5  $\mu\text{m}$  wide, aseptate, thick-walled; binding hyphae up to 3.8  $\mu\text{m}$  wide, branched, aseptate, thick-walled. **Basidia** not observed. **Basidiospores** 9.5-11.5  $\times$  6.2-7.5  $\mu\text{m}$ , ellipsoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimens examined:** India, Union Territory of Chandigarh, 18D park, at the base of *Cedrella toona*, J. Brar and G. S. Dhingra 8582(PUN), August 15, 2016; at the base of *Cedrella toona*, J. Brar and G. S. Dhingra 8594(PUN), August 15, 2016.

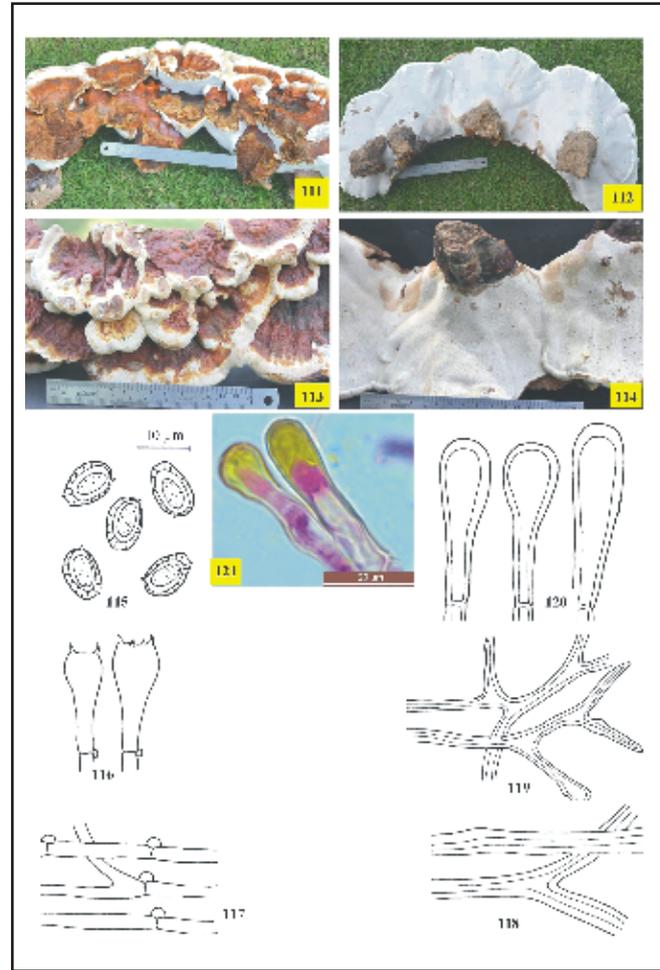
**Remarks:** *G. lucidum*, commonly encountered species, is typical in having laccate, stipitate basidiocarp with duplex context and hymeniodermis pilear crust. It is distributed from plains, including the study area, to temperate region of the Himalaya (Bose, 1920, 1922, 1937; Banerjee, 1947; Thind *et al.*, 1957; Bakshi, 1971; Dhanda, 1977; Singh, 1987; Sharma and Ghosh, 1989; Dulat, 1992; Leelavathy and Ganesh, 2000; Lalji, 2003; Dargan *et al.*, 2006; Sharma, 1985, 2000, 2012; Bhosle *et al.*, 2010; Kaur, 2013; Prasher and Ashok, 2013; Prasher and Lalita, 2013; Prasher, 2015; Singh, 2016; Kaur, 2017; Kaur *et al.*, 2017).

**12. *Ganoderma mediosinense*** J.D. Zhao, *Acta Mycologica Sinica* 7(4): 205, 1988. **Figs. 111-121**

**Basidiocarps** annual, stipitate, rosulate, pilei up to 23 $\times$ 11 $\times$ 2 cm, corky; abhymenial surface laccate, radially and largely rugose, indistinctly concentrically zonate, sulcate, brownish orange when fresh, reddish brown on drying; hymenial surface poroid, greyish white when fresh, reddish grey on drying; pores round to angular, 4-5/mm; dissepiments up to 48.5  $\mu\text{m}$  thick; context up to 17 mm thick, brown to light brown, homogenous, soft; pore tubes up to 3 mm long, light brown; margins obtuse, reddish white on abhymenial and hymenial surface, sterile up to 1 cm on the hymenial facet; stipe eccentric, up to 5 $\times$ 6.5 cm, laccate, violet brown. **Pilear crust** hymeniodermis; cuticular elements 31.5-35 $\times$ 9.3-10.5  $\mu\text{m}$ , clavate, brown, smooth, thick-walled. **Generative hyphae** up to 3.5  $\mu\text{m}$  wide, branched, septate, clamped, thin-walled; skeleto-binding hyphae up to 5.0  $\mu\text{m}$  wide, distantly branched, aseptate, thick-walled; binding hyphae up to 4.0  $\mu\text{m}$  wide, much branched, aseptate. **Basidia** 18.5-21.0 $\times$ 6.8-9.4  $\mu\text{m}$ , subclavate, 4-sterigmate, basally clamped; sterigmata up to 2.7  $\mu\text{m}$  long. **Basidiospores** 9.8-11.2 $\times$ 6.8-7.4  $\mu\text{m}$ , ellipsoid to ovoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimens examined:** India, Union Territory of Chandigarh, Sector 18D, at the base of *Ficus religiosa*, J. Brar and G. S. Dhingra 8575(PUN), August 15, 2016; at the base of *F. religiosa*, J. Brar and G. S. Dhingra 8595(PUN), August 15, 2016; at the base of *F. religiosa*, J. Brar and G. S. Dhingra 8596(PUN), August 15, 2016.

**Remarks:** The presence of rosulate basidiocarps with fairly eccentric stipe and hymeniodermis pilear crust are the

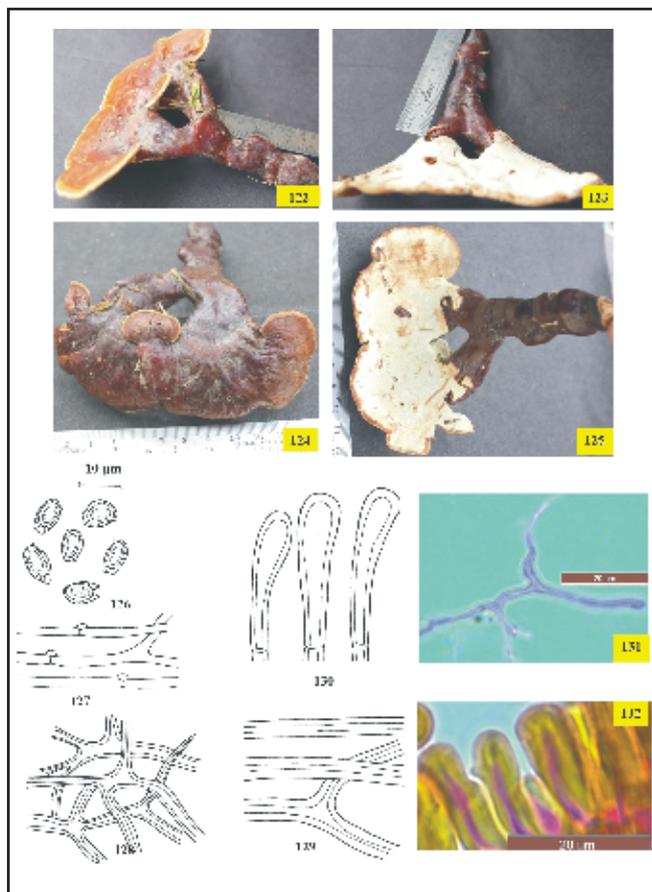


**Figs. 111-121: *Ganoderma mediosinense*.** Fresh basidiocarps showing 111. Abhymenial surface; 112. Hymenial surface; Dried basidiocarps showing 113. Abhymenial surface; 114. Hymenial surface; 115. Basidiospores; 116. Basidia; 117. Generative hyphae; 118. Skeleto-binding hyphae; 119. Binding hyphae; 120. Cuticular elements; 121. Photomicrograph showing cuticular elements.

distinguishing features of *G. mediosinense*. Kaur *et al.*, (2017) described it for the first time from India on the basis of collections made from Union Territory of Chandigarh.

**13. *Ganoderma ramosissimum*** J.D. Zhao, *Acta Mycologica Sinica* 8(1): 29, 1989. **Figs. 122-132**

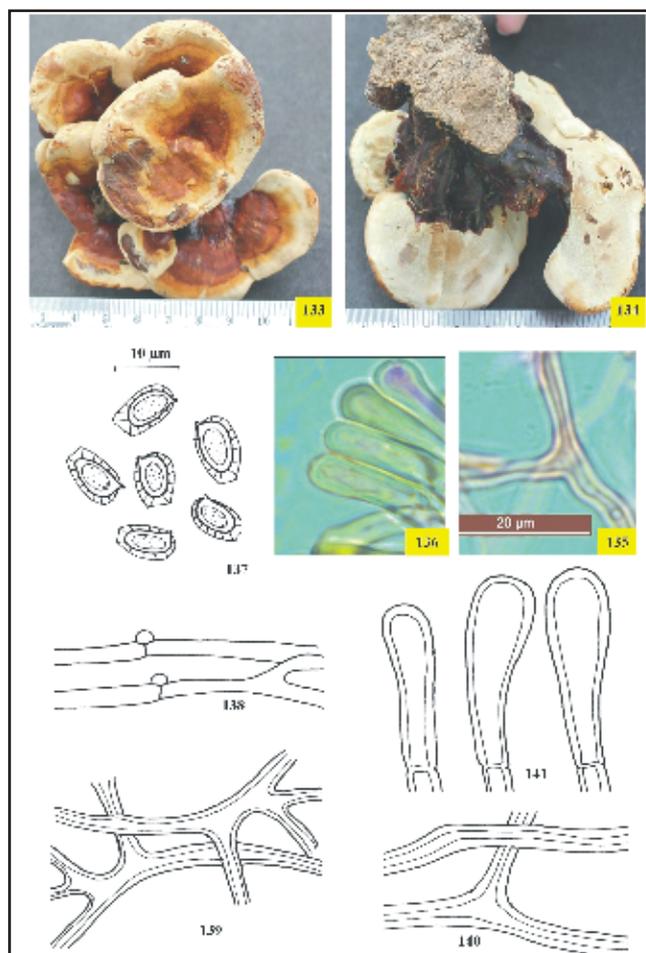
**Basidiocarps** annual, pileate, stipitate, pilei up to 12.5 $\times$ 6 $\times$ 0.7 cm, suborbicular to irregular, corky, stipe dichotomously branched; abhymenial surface laccate, sulcate, greyish orange to brownish orange when fresh and reddish brown to violet brown on drying; hymenial surface poroid, orange white when fresh and yellowish white on drying; pores round to angular, 4-5/mm; dissepiments up to 54  $\mu\text{m}$  thick, context up to 4 mm thick, light brown and dark brown, with resinous band in between light brown and dark brown zone; pore tubes up to 3 mm long; margins acute, wavy to irregular, abhymenial margins reddish brown, hymenial margins reddish orange, sterile up to 3 mm on hymenial facet; stipe lateral to eccentric, dichotomously to irregularly branched, up



**Figs. 122-132:** *Ganoderma ramosissimum*. Fresh basidiocarp showing 122. Abhymenial surface; 123. Hymenial surface; Dried basidiocarp showing 124. Abhymenial surface; 125. Hymenial surface; 126. Basidiospores; 127. Generative hyphae; 128. Binding hyphae; 129. Skeleto-binding hyphae; 130. Cuticular elements; Photomicrographs showing 131. Binding hyphae; 132. Cuticular elements.

to 10×2.5 cm, laccate, violet brown. **Pilear crust** hymenioidermis; cuticular elements 34.1-40.3×7.5-8.1 μm, cylindrical, fairly dilated at the apex, yellowish brown, smooth, thick-walled. **Generative hyphae** up to 3.2 μm wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding hyphae up to 5.5 μm wide, distantly branched, aseptate, yellowish brown, thick-walled; binding hyphae up to 3.7 μm wide, much branched, aseptate, subhyaline, thick-walled. **Basidia** not observed. **Basidiospores** 8.6-10.5×4.9-6.2 μm, ellipsoid to broadly ovoid, inamyloid, acyanophilous, truncate at the apex, exospores thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimens examined:** India, Union Territory of Chandigarh, Sector 18D, at the base of *Azadirachta indica*, J. Brar and G. S. Dhingra 8576 (PUN), August 5, 2016; at the base of *A. indica*, J. Brar and G. S. Dhingra 8580 (PUN), August 5, 2016; at the base of *Ficus religiosa*, J. Brar and G. S. Dhingra 8583 (PUN), August 15, 2016; at the base of *Cedrella toona*, J. Brar and G. S. Dhingra 8584 (PUN), August 15, 2016; at the base of *C. toona*, J. Brar and G. S. Dhingra 8588 (PUN),



**Figs. 133-141:** *Ganoderma resinaceum*: Basidiocarp showing 133. Abhymenial surface; 134. Hymenial surface; Photomicrographs showing 135. Skeleto-binding hyphae; 136. Cuticular element; 137. Basidiospores; 138. Generative hyphae; 139. Binding hyphae; 140. Skeleto-binding hyphae; 141. Cuticular elements.

August 15, 2016; at the base of *F. religiosa*, J. Brar and G. S. Dhingra 8599 (PUN), August 15, 2016; Sector 18C, at the base of *F. religiosa*, J. Brar and G. S. Dhingra 8600 (PUN), August 15, 2016; Sector 19C, at the base of *C. toona*, J. Brar and G. S. Dhingra 8587 (PUN), August 15, 2016; Sector 19C, at the base of *C. toona*, J. Brar and G. S. Dhingra 8589 (PUN), August 15, 2016; Lake Reserve Forest, at the base of *F. religiosa*, J. Brar and G. S. Dhingra 8598 (PUN), August 15, 2016; Opposite to Panjab University, gate # 3, at the base of *F. religiosa*, J. Brar and G. S. Dhingra 8601 (PUN), August 15, 2016.

**Remarks:** It is characterized by laccate basidiocarp having dichotomous to irregular branched stipe. In India it is distributed in Himachal Pradesh (Kaur, 2013), Uttarakhand (Singh, 2016), and Union Territory of Chandigarh (Kaur, 2017; Kaur *et al.*, 2017).

**14. *Ganoderma resinaceum*** Boud., *Bulletin de la Société Mycologique de France* 5: 72, 1889. **Figs. 133-141**

**Basidiocarp** annual, pileate, stipitate, pilei up to 6×4×1.1 cm,

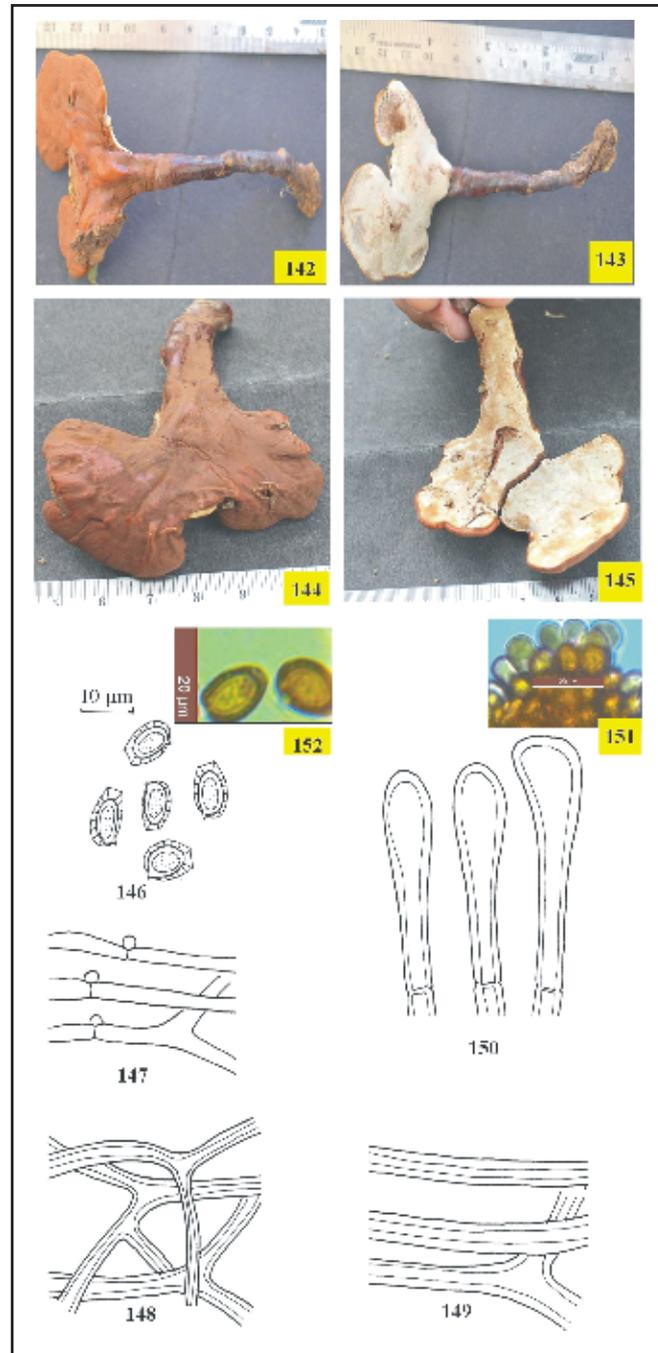
circular, corky; abhymenial surface laccate, sulcate, fairly zonate, reddish brown to dark brown, not changing much on drying, with a resinous layer that becomes brownish orange on bruising; hymenial surface poroid, yellowish white to orange white when fresh, pale red to greyish red on drying; pores round to angular, 4-5/mm; dissepiments up to 31  $\mu\text{m}$  thick; context up to 7 mm thick, duplex, concentrically zonate, light brown near abhymenial surface, brown near tube layer; pore tubes up to 4 mm long, yellowish white; margins obtuse, regular, abhymenial margins pastel red, hymenial margins pale orange to greyish orange, sterile up to 7 mm on hymenial facet; stipe centric, up to 5 cm long, laccate, violet red, solid, broad at apex and narrower at base. **Pilear crust** hymenioidermis; cuticular elements 27.5-31.5 $\times$ 7.4-10.5  $\mu\text{m}$ , cylindrical, dilated at the tip, yellowish brown, thick-walled. **Generative hyphae** up to 3.5  $\mu\text{m}$  wide, branched, septate, clamped, thin-walled; skeleto-binding hyphae up to 5  $\mu\text{m}$  wide, aseptate, distantly branched, thick-walled; binding hyphae up to 3.5  $\mu\text{m}$  wide, much branched, thick-walled. **Basidia** not observed. **Basidiospores** 8.5-11.5 $\times$ 5.5-6.8  $\mu\text{m}$ , ellipsoid to ovoid, inamyloid, acyanophilous, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimens examined:** India, Union Territory of Chandigarh, Sector 18D park, at the base of *Acacia nilotica*, J. Brar and G. S. Dhingra 8577 (PUN), August 15, 2016; at the base of *A. nilotica*, J. Brar and G. S. Dhingra 8579 (PUN), August 15, 2016; at the base of *A. nilotica*, J. Brar and G. S. Dhingra 8581 (PUN), August 15, 2016; Sector 18C, at the base of *Ficus religiosa*, J. Brar and G. S. Dhingra 8574 (PUN), August 15, 2016; Lake Reserve Forest, at the base of *F. religiosa*, J. Brar and G. S. Dhingra 8593 (PUN), August 15, 2016.

**Remarks:** *G. resinaceum* is marked by stipitate, laccate basidiocarps with a resinous layer on the abhymenial surface that becomes brownish orange on bruising and ellipsoid to ovoid basidiospores. It is distributed in Himachal Pradesh (Dhanda, 1977; Kaur, 2013), Jammu and Kashmir (Dhanda, 1977), West Bengal (Sharma 2000; 2012), Maharashtra (Foroutan and Vaidya, 2007; Ranadive *et al.*, 2011; Ranadive, 2013; Ranadive and Jagtap, 2016), Utrakhand (Sharma, 2000, 2012; Singh, 2016) and Union Territory of Chandigarh (Kaur, 2017; Kaur *et al.*, 2017).

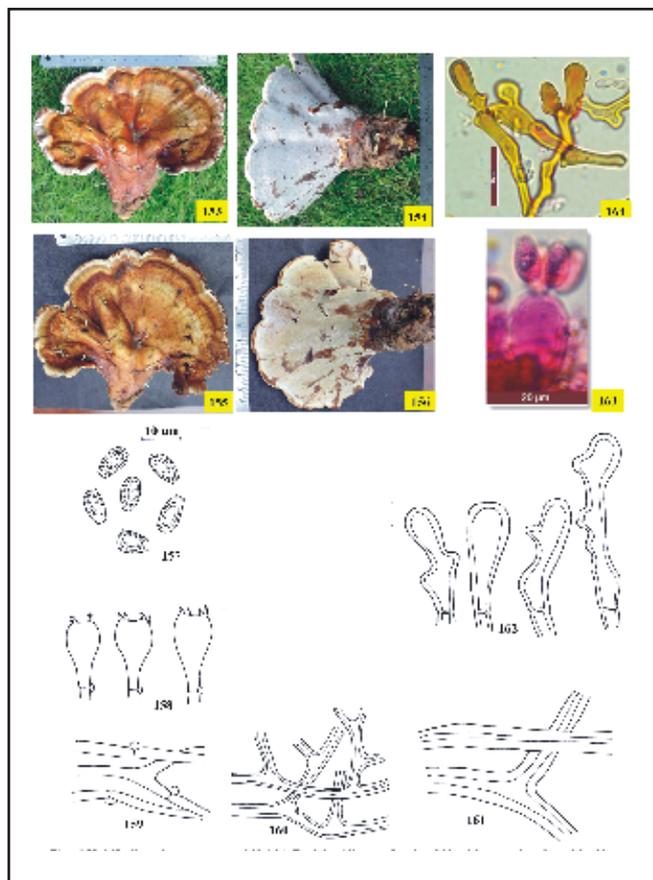
**15. *Ganoderma stipitatum*** (Murrill) Murrill, *North American Flora* 9(2): 122, 1908. *Fomes stipitatus* Murrill, *Bulletin of the Torrey Botanical Club* 30(4): 229, 1903. **Figs. 142-152**

**Basidiocarp** annual, pileate, stipitate, pilei up to 6.5 $\times$ 5 $\times$ 1 cm, reniform to suborbicular, irregular, corky; abhymenial surface laccate, smooth to sulcate, orange red when fresh, reddish brown on drying; hymenial surface poroid, reddish white when fresh, reddish grey on drying; pore round to angular, 4-5/mm; dissepiments up to 34.5  $\mu\text{m}$  thick; pore tubes up to 4.5 mm long, light-brown; context up to 5.5 mm thick, duplex, reddish grey near the pore tubes and pale brown closer to the abhymenial surface, soft, zonate, resinous bands emerging near basal region of the basidiocarp and base of the stipe and extend about 1 cm from the margins; margins acute to obtuse, abhymenial margins orange red when fresh and reddish brown on drying, hymenial margins deep orange



**Figs. 142-152: *Ganoderma stipitatum*.** Fresh basidiocarp showing 142. Abhymenial surface; 143. Hymenial surface; Dried basidiocarp showing 144. Abhymenial surface; 145. Hymenial surface; 146. Basidiospores; 147. Generative hyphae; 148. Binding hyphae; 149. Skeleto-binding hyphae; 150. Cuticular elements; Photomicrographs showing 151. Cuticular elements; 152. Basidiospores.

when fresh and reddish grey on drying, sterile up to 1 mm on the hymenial facet; stipe lateral, up to 4.5 $\times$ 1.2 cm, laccate, cylindrical, reddish brown. **Pilear crust** hymenioidermis; cuticular elements 37-42 $\times$ 9.2-12.4  $\mu\text{m}$ , smooth, cylindrical, dilated at the tip, yellowish-brown, thick-walled, amyloid. **Generative hyphae** up to 3.5  $\mu\text{m}$  wide, branched, septate,



**Figs. 153-164: *Ganoderma zonatum*.** Fresh basidiocarp showing 153. Abhymental surface; 154. Hymenial surface; Dried basidiocarp showing 155. Abhymental surface; 156. Hymenial surface; 157. Basidiospores; 158. Basidia; 159. Generative hyphae; 160. Binding hyphae; 161. Skeleto-binding hyphae; 162. Cuticular elements; Photomicrographs showing 163. Basidia with basidiospores; 164. Cuticular elements.

clamped, subhyaline, thin-walled; skeleto-binding hyphae, up to 5.5  $\mu\text{m}$ , distantly branched, aseptate, yellowish-brown, thick-walled; binding hyphae up to 3.7  $\mu\text{m}$  wide, branched, aseptate, subhyaline, thick-walled. **Basidia** not observed. **Basidiospores** 8.5-10 $\times$ 5.5-6.2  $\mu\text{m}$ , ellipsoid, inamyloid, acyanophilous, truncate at apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, Lake Reserve Forest, at the base of *Cedrella toona*, J. Brar and G. S. Dhingra 8591(PUN), August 15, 2016.

**Remarks:** The presence of stipitate, laccate basidiocarp, duplex context with resinous bands emerging near basal region of the basidiocarp and base of the stipe and fairly thicker cuticle differentiates *G. stipitatum* from other species of the genus. The earlier reports of it include Foroutan and Vaidya (2007), Bhosle *et al.* (2010), Ranadive *et al.* (2011), Ranadive (2013) and Ranadive and Jagtap (2016) from Maharashtra and Singh (2016) from Uttarakhand. It is being reported for the first time from the study area.

**16. *Ganoderma zonatum*** Murill, *Bulletin Torrey Botanical Club* 29: 606, 1902. **Figs. 153-164**

**Basidiocarp** annual, pileate, substipitate, pilei up to 15 $\times$ 8.5 $\times$ 1.2 cm, light in weight; abhymental surface laccate, sulcate, concentrically zonate, pale red to reddish orange when fresh, brownish orange on drying; hymenial surface poroid, greyish white when fresh, reddish grey on drying, becomes brownish on bruising; pores round, 4-5/mm; dissepiments up to 47  $\mu\text{m}$  thick; context up to 7 mm thick, dark brown, with a faint zone above tube layer, soft; pore tubes up to 3 mm long; margins, obtuse, fairly wavy to irregular, abhymental margins yellowish white to brown (on bruising), hymenial margins greyish white to brown (on bruising), sterile up to 5 mm on the hymenial facet. **Pilear crust** hymenioidermis; cuticular elements 27.5-43.5 $\times$ 6.8-10.5  $\mu\text{m}$ , fairly irregular to lobed, occasionally branched, brown, smooth, thick-walled, amyloid. **Generative hyphae** up to 3.1  $\mu\text{m}$  wide, branched, septate, clamped, subhyaline, thin-walled; skeleto-binding up to 7.5  $\mu\text{m}$  wide, distantly branched, aseptate, thick-walled; binding hyphae up to 3.7  $\mu\text{m}$  wide, much branched, aseptate, subhyaline, thick-walled. **Basidia** 17.2-20.0 $\times$ 7.4-10  $\mu\text{m}$ , subclavate, 4-sterigmate, basally clamped; sterigmata up to 2.4  $\mu\text{m}$  long. **Basidiospores** 10.5-12.5 $\times$ 5.5-6.5  $\mu\text{m}$ , inamyloid, acyanophilous, oblong-ellipsoid, truncate at the apex, exospore thin, subhyaline, smooth, endospore thick, brown, echinulate.

**Specimen examined:** India, Union Territory of Chandigarh, Madhya Marg, at the base of *Cassia fistula*, J. Brar and G. S. Dhingra 8578(PUN), August 15, 2016.

**Remarks:** *G. zonatum* can be distinguished from other species on the basis of prominent zones on abhymental surface and irregular, lobed to branched cuticular elements and oblong-ellipsoid basidiospores and has been earlier reported from Maharashtra (Ranadive *et al.*, 2011; Ranadive, 2013). It is the first report of *G. zonatum* from the study area.

#### Key to the species of *Ganoderma* from Union Territory of Chandigarh

1. Abhymental surface laccate.....2
1. Abhymental surface non-laccate.....12
2. Basidiocarp substipitate.....3
2. Basidiocarp stipitate.....5
3. Context duplex.....*G. chalcum*
3. Context homogeneous/non-homogeneous.....4
4. Context homogeneous, basidiospores ellipsoid to ovoid, =10.5  $\mu\text{m}$  long.....*G. capense*
4. Context non-homogeneous, basidiospores oblong ellipsoid >10.5  $\mu\text{m}$ .....*G. zonatum*
5. Basidiocarp with branched stipe.....*G. ramosissimum*
5. Basidiocarp with unbranched stipe.....6
6. Hymenioidermis with irregular to lobed cuticular elements.....*G. crebrostriatum*

6. Hymenodermis with regular cuticular elements.....7
7. Context homogeneous .....8
7. Context duplex.....9
8. Basidiocarp rosulate, stipe eccentric.....*G. mediosinense*
8. Basidiocarp orbicular, tuberculiform, stipe lateral to eccentric.....*G. chenghaiense*
9. Abhymenial surface covered with resinous layer.....*G. resinaceum*
9. Abhymenial surface not covered with resinous layer.....10
10. Pores round, stipe centric to eccentric.....*G. lucidum*
10. Pores round to angular, stipe not as above.....11
11. Stipe with a prominent paler core and slightly darker peripheral part .....*G. elegantum*
11. Stipe with a prominent paler core .....*G. stipitatum*
12. Pilear crust trichodermis.....*G. lipsiense*
12. Pilear crust anamixodermis.....13
13. Basidiocarp annual.....14
13. Basidiocarp perennial.....15
14. Basidiospores ellipsoid (9.8-11.8×6.2-6.8 μm).....  
.....*G. australe*
14. Basidiospores ovoid (8.5-12×4.8-6.8 μm).....*G. donkii*
15. New pilei emerge underneath the older basidiocarp....  
.....*G. lobatum*
15. New pilei do not emerge underneath the older basidiocarp ..... *G. brownii*

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