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**NEW DISTRIBUTIONAL RECORDS OF *GANODERMA COLOSSUS*
(GANODERMATACEAE) FROM JHARKHAND AND RAJASTHAN**

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ABSTRACT

Ganoderma colossus (Ganodermataceae) which is reported from few other parts of India is recorded with detailed description and illustration in present communication for the first time from two Indian states: Jharkhand and Rajasthan.

Key Words: Distribution, Ganodermataceae, Ganoderma, India, Taxonomy

INTRODUCTION

Ganoderma colossus (Fr.) C.F. Baker is delimited under the family Ganodermataceae because of its double-walled colored ornamented basidiospores and arboriform skeletal hyphae. However, few but noteworthy studies based upon morphology (Murill, 1905) coupled with molecular evidence and critical studies on the ornamentation of basidiospores (poroid or reticulate endospore-surface) placed this species under combination: *Tomophagus colossus* (Wu and Zhang, 2003; Tham *et al.*, 2012) although, Futardo (1965), Steyaert (1972), Corner (1983), Ryvarden and Johansen (1980), Ryvarden (2000), Index fungorum (www.indexfungorum.org) did not agree with this placement and had been kept *T. colossus* as synonym of *Ganoderma colossus*.

Coming to the Indian context, *Ganoderma* species are well reflected in various regional mycoflora (Leelavathy and Ganesh, 2000; Foroutan and Vaidya, 2007; Bhosle *et al.*, 2010, Ranadive *et al.*, 2011) and monograph (Steyaert, 1972). Along with some other species of *Ganoderma*, *G. colossus* was reported for the first time by Bose (1921) from Hooghly West Bengal with its description and distributional range. Later, its occurrences were also evidenced by Bakshi (1966), Steyaert (1972), Sharma *et al.*, 2006, Sharma (2012) from Dehradun, Maharashtra (Bombay), Punjab Shivalik and Assam and Meghalaya successively. Recently, a number of specimens were collected by the senior author during a routine macrofungal foray to Koderma Wildlife Sanctuary (a part of North Chotanapur Plateau in Jharkhand). Simultaneously, few other samples were also received from other two states: Maharashtra and Rajasthan. Thorough examination of all these materials followed by literature studies reveals three of them as *Ganoderma colossus*. It is being reported here for the first time from two Indian states: Jharkhand and Rajasthan with its detailed description along with the illustrations.

MATERIALS AND METHODS

Macromorphological/field characters were noted from the fresh basidiomata (CAL 6608). Field photographs of these basidiomata were taken with the aid of Olympus C-5060. Colour codes and terms (mostly) are after Methuen Handbook of Colour (Kornerup and Wanscher, 1978). After recording the macromorphological characters in the base camp, basidiomata were dried in the sun.

Micromorphological features were recorded at the magnification of $\times 100$, $\times 400$ and $\times 1000$ with the aid of a light microscope: Olympus CX 41 from the dry samples mounted in a mixture of 5% KOH and phloxin, lactophenol cotton blue and Melzer's reagent.

Microphotographs were taken with the help of a dedicated camera Olympus C-5060 attached with Olympus CX 41. Spore measurements are recorded based on that of twenty basidiospores. Spores are measured in side view. Spore measurements and length/width ratios (Q) are presented as: minimum–mean–maximum. Herbarium name is after Holmgren *et al.*, (1990).

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Taxonomic Treatment

Ganoderma colossus (Fr.) C.F. Baker, *Brotéria*: 425 (1918); *Tomophagus colossus* (Fr.) Murill, *Torreyia* 5:197 (1905).



Figure 1: *Ganoderma colossus*. A- Habitat bearing a number of basidiomata. B - Fresh basidiomata. C & D - Basidiomata showing stitpitate nature. E - Sessile basidiomata showing zonate and sulcate pilear surface. F - Pore surface. G - Thick obtuse margin. H - V. S. of basidiomata showing context and tubes. I - Hymenial surface showing angular to rounded pores.

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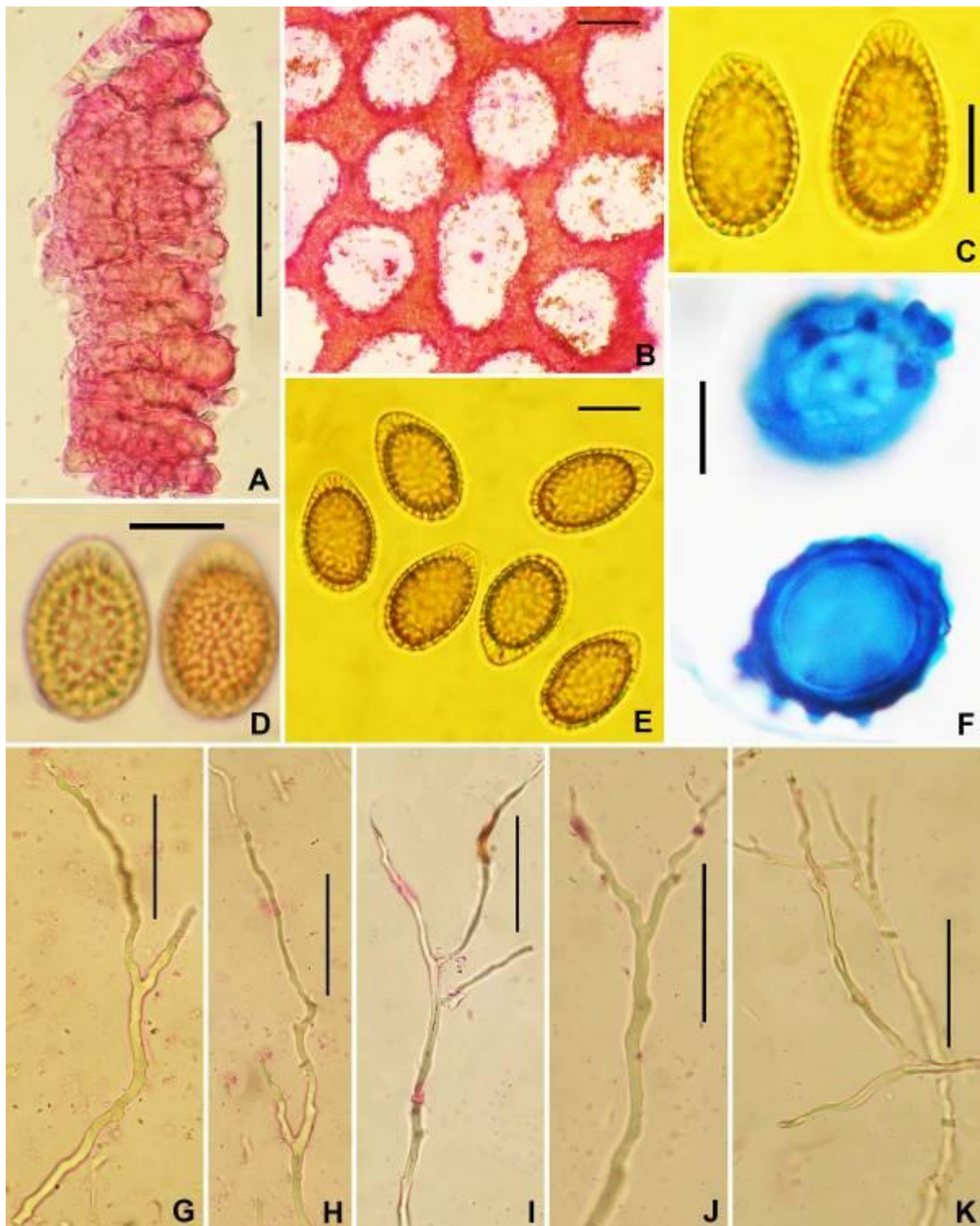


Figure 2: *Ganoderma colossus*. A - Cuticular cells. B - Section through tubes. C - Slightly truncate and echinulate basidiospores. D - Basidiospores showing reticulate endospore surface. E - Basidiospores. F - Chlamydospores. G-K - Arboriform skeletal hyphae. Scale bars: A = 50 μm , B = 100 μm , C-F = 10 μm , G-K = 50 μm .

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Basidiomata annual, laterally stipitate to sessile, unguulate, dimidiate, large, distinctly light weight, broadly attached. Pileus 160–235 × 100–120 mm, up to 75 mm thick near base; surface deeply zonate, weakly sulcate near base while gradually deeply sulcate towards margin, glabrous, slightly laccate, that can be easily peeled off, irregularly swollen, light yellow (4A5) to reddish yellow (4A6), mostly dark orange (5A6) at the base, becoming greyish orange (5B4–5B5) in older specimens; with light cream colour patches due to separation of cuticle surface. Margin thick, obtuse, wavy to undulating in some specimens, sterile. Pore surface orange white (5A2) to yellowish grey (4B2); pores angular to rounded 2–3/ mm. Stipe up to 100 mm long, 55 mm in diameter, cylindrical, slightly laccate, glabrous, short, concolorous with pileus surface. Context thick, homogenous, soft, densely packed woolly to corky, up to 32 mm thick yellowish white (4A2) to pale orange (5A3) temporally becoming yellowish brown (5D8) with KOH. Tubes up to 18 mm long, straight, darker than context, brownish grey (5C2) to greyish brown (5D3), turning temporally dark brown (6F8) with KOH.

Cuticle layer 162–250 µm thick with crystalline layer present on the surface; cuticular cells 18–25 × 6–7.5 µm, clavate, with some granular content inside, hyaline. Hyphal system dimitic. Generative hyphae 2.6–3.2 µm wide, thin- to thick-walled (wall up to 0.5 µm thick), clamped, branched, rare, hyaline. Skeletal hyphae 4–6 µm wide, thick walled (wall up to 2.9 µm thick), mostly aciculiform but also little branched arboriform, smooth, dominating, hyaline in phloxin, cyanophilic. Basidia not found. Basidiospores 14–16.8–20 × 9–11.3–13 µm, Q=1.27–1.64–1.81, broadly ellipsoid to ovoid, truncate or rounded at the apex; exospore smooth and hyaline; endospore ornamented partially reticulate, pale yellow. Chlamydospores 15–18 × 12–14 µm, spherical, verrucose, thick-walled, cyanophilic.

Specimens examined: India, Jharkhand, Kodema Wildlife Sanctuary, Near Sanctuary gate, NH-31 alt. 378 m, 10 September 2012, N24°32'25.5" E85°35'19.2", on living tree of *Ficus*, leg. Arvind Parihar, 6608; *ibid.*, Rajasthan, Jhunjhnu-district, Bugala village, alt.380 m, August 2011, N27°56'27.42"E 75°26'51.98" on the soil probably attached with decaying wood/root, leg. Ramesh Kumar, RK-11-02(CAL).

Distribution: America; Africa; Asia, India (Assam, Maharashtra, Meghalaya, Punjab, Uttarakhand, West Bengal).

Notes: As far as the macro- and micromorphological characters are concerned, present specimens strongly agree with that of its counterpart reported from America (Murill, 1905; Futardo, 1965), Africa (Ryvarden and Johansen, 1980) and Taiwan (Wu and Zhang, 2003). But, unlike earlier reports (except that of Futardo, 1965) on Indian and extralimital materials on *Ganoderma colossus* (Murill, 1905; Bose, 1921; Bakshi, 1966; Steyaert, 1972; Ryvarden and Johansen, 1980, 2000; Sharma, 2012) present collections show stipitate nature of their basidiocarp. The presence of deeply zonate and sulcate pilear surface is also significant as it was not reported from the other Indian collections. Microscopically, poroid or reticulate nature (Wu and Zhang, 2002; Tham *et al.*, 2012) of endospore surface of this species is also distinctly different from that (aculeate or verrucose nature) of the basidiospores found in rest of the *Ganoderma* species.

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