Morphological And Anatomical Studies on *Bolbitius Marginatipes* (Bolbitiaceae) From Amravati, Maharashtra

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doi.org/10.64643/IJIRTV12I9-195985-459

***Abstract*—The current study presents a comprehensive morpho-taxonomic description of *Bolbitius marginatipes* from dung-enriched grasslands in the Amravati region of Maharashtra, India. Macro- and micro-morphological features such as pileus shape and color, arrangement of lamellae, stipe features, spore size, and cystidia features were recorded. These features were compared with the recent taxonomic classification in Bolbitiaceae. The current study adds to the knowledge of coprophilous agarics in central India and provides up-to-date morphological information to the global taxonomy of *Bolbitius*.**

***Index Terms*—*Bolbitus*, Coprophilous, Fungal-Taxonomy**

I. INTRODUCTION

The genus Bolbitius Fr. (Bolbitiaceae, Agaricales) is represented by small to medium-sized, fragile, saprotrophic agarics, which are mostly found on dung, compost, dung-enriched soils, and humus soils. This genus can be distinguished by thin-fleshed, hygrophanous basidiomata, bright yellow to ochre-colored pilei, adnexed lamellae, rust-brown spore prints, smooth basidiospores with a prominent germ pore, and the lack of an annulus (Singer 1986; Watling 1982; Kirk et al., 2008). These agarics are of immense ecological importance in the decomposition of organic matter in terrestrial ecosystems (Lodge et al., 2004; Karun et al., 2018).

Among the recorded species, *Bolbitius marginatipes* is a coprophilous species, which is found in temperate and subtropical regions, often in association with dung-enriched soils and grasslands (Watling 1982; Pegler 1986). Although several species of *Bolbitius* have been recorded from India, including Punjab, South India, and Western Ghats (Amandeep et al., 2013; Senthilarasu & Kumaresan, 2016), the morpho-taxonomic details of *B. marginatipes* from central India are still meager.

In the current study, *B. marginatipes* was recorded from the dung-rich habitats of the Amravati region of Maharashtra. The importance of accurate morphological descriptions based on updated nomenclature has been emphasized by the current studies. This paper aims to provide a macro- and micro-morphological description to enhance the regional agaric flora and contribute to the current taxonomic knowledge of Bolbitiaceae in India.

II. MATERIALS & METHODS

Specimens of mushrooms were collected from dung-enriched grasslands and cattle grazing areas in the Amravati district of Maharashtra. Fresh basidiomata were observed for macroscopic features such as shape and size of the pileus and stipe, texture, hygrophanous properties, color variation, lamellar attachment, and habitat and substrate information. Field observations were done according to standard procedures (Atri & Saini 2000; Atri et al., 2005; Lodge et al., 2004). Color observations were done according to the Kornerup and Wanscher system (1978) to provide uniformity in noting the colors of the pileus, lamellae, and spore print.

The collected specimens were hot air-dried and packed in moisture-proof cellophane packets bearing collection numbers. Dried specimens were conserved using small amounts of 1-4 paradichlorobenzene crystals to protect against insect damage (Smith 1949; Atri & Saini 2000).

Microscopic observations were made by preparing hand-cut sections of the pileus, lamellae, and stipe. Dried specimens were revived using 10% KOH

solution, and sections were stained using 1% cotton blue or 2% Congo Red dyes for better visibility. Observations were made using oil immersion, and measurements were taken from at least 20 fully grown structures. Taxonomic identification was done according to standard monographs of Bolbitiaceae (Singer 1986; Watling 1982) and recent phylogenetictreatments (Song & Bau 2023; Wang et al., 2024) for updated classification.

III. OBSERVATION

1. *Bolbitius marginatipes* (G.F. Atk.) Singer
Figs 1-3
Pileus: 15–40 mm wide; hemispherical to convex then plane upon maturity; surface smooth, distinctly hygrophanous, bright yellow to golden-yellow (4A6–5A8), fading with age; margin translucent-striated; context thin and fragile. Lamellae: Adnexed to narrowly adnate; moderately crowded; pale yellow becoming ochraceous to rusty with age; edges finely serrulate. Stipe: 40–90 × 2–5 mm; cylindrical, hollow, fragile; surface pale yellow to whitish with fine fibrillose striations; basal mycelium sparse. Basidiospores: 10–15 × 6–8 µm; ellipsoid to broadly ellipsoid; smooth; rusty-brown spore print; germ pore distinct. Basidia: Clavate, 4-spored. Cheilocystidia: Lageniform to fusiform; thin-walled. Pileipellis: Cutis of cylindrical hyphae.

Collection examined:
India, Maharashtra, Amravati, Near Morshi (21°17'24.5"N 78°02'18.3"E) on cattle dung and humus-rich soil, scattered to gregarious, 14.09.2024.

Remark:
Bolbitius marginatipes closely resembles *B. titubans* but can be distinguished by its distinctive pileus colour and cheilocystidial morphology. The present account affirms earlier records of *B. marginatipes* in India but extends documentation to central Maharashtra with updated morphological detail.

Fig. 1 – Bolbitus *marginatipes*: Carpophores

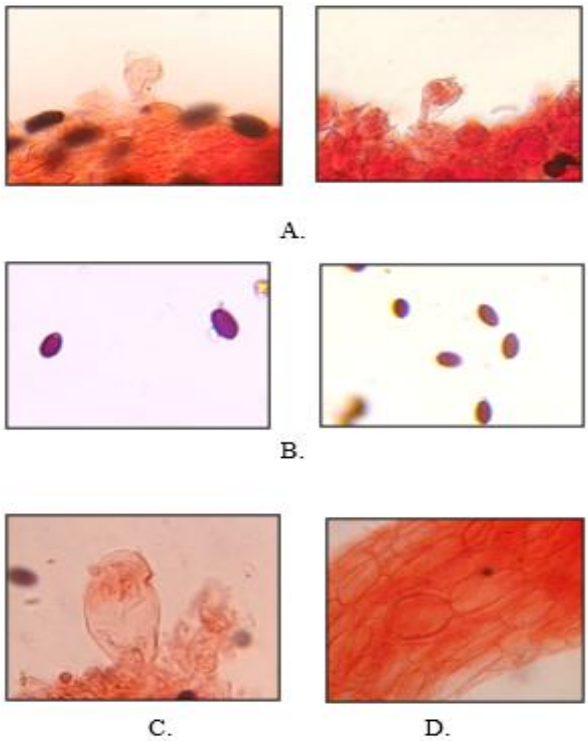
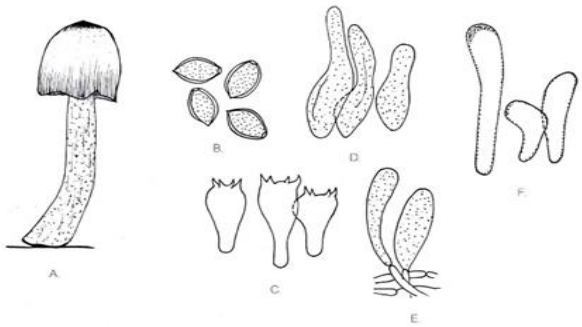


Fig. 2 *Bolbitius marginatipes* : A. Basidia, B. Basidiospore, C. Cheilocystidia, D. Pileal elements



Figs. 3 – *Bolbitius marginatipes (G.F. Atk.) Singer* A: Carpophores; B: Basidiospores; C: Basidia, D: Cheilocystidia, E: Pleal elements, F: Caulocystidia

VI. CONCLUSION

The paper offers a concise taxonomic assessment of the genus Bolbitius, relying on major macro- and micro-morphological traits such as pileus and stipe morphology, spore morphology, and cystidia. The described species mainly develop on dung and nutrient-rich substrates, where they play the role of successful saprotrophs. This study helps to fill the gap in regional fungal checklists. While morphology is a crucial tool in species identification, the application of molecular approaches is required to address cryptic diversity and ensure correct taxonomic assignment in future mycological research.

ACKNOWLEDGMENT

The author extended their gratitude toward the Department of Botany, Shri Shivaji Science College, Amravati, for their laboratory facilities provided during research work.

REFERENCES

[1] K. Amandeep, N. S. Atri, and K. Munruchi, “Diversity of Bolbitius spp. collected on dung from Punjab, India,” Mycosphere, vol. 4, no. 6, pp. 1053–1064, 2013.

[2] N. S. Atri and S. S. Saini, “Taxonomic studies on North Indian agarics: Collection and preservation techniques,” Mushroom Research, vol. 9, no. 1, pp. 35–40, 2000.

[3] N. S. Atri, A. Kaur, and S. S. Saini, “Taxonomic studies on agarics: Collection and description methodology,” Mushroom Research, vol. 14, no. 2, pp. 66–70, 2005.

[4] M. Asif, M. Saba, et al., “Multilocus phylogeny contributes to fungal taxonomy with new taxa of Conocybe (Bolbitiaceae, Agaricales),” Mycologia, vol. 117, no. 3, pp. 463–479, 2025.

[5] R. E. Halling, “Recommendations for morphological documentation in macrofungi,” Mycological Progress, vol. 13, pp. 357–365, 2014.

[6] N. C. Karun, B. S. Bhagya, and K. R. Sridhar, “Biodiversity of macrofungi in Yenepoya campus, Southwest India,” Microbial Biosystems, vol. 3, pp. 1–11, 2018.

[7] P. M. Kirk, P. F. Cannon, D. W. Minter, and J. A. Stalpers, Dictionary of the Fungi, 10th ed. Wallingford, U.K.: CABI, 2008.

[8] A. Kornerup and J. H. Wanscher, Methuen Handbook of Colour, 3rd ed. London, U.K.: Eyre Methuen, 1978.

[9] D. L. Largent, How to Identify Mushrooms to Genus I: Macroscopic Features. Eureka, CA, USA: Mad River Press, 1986.

[10] D. J. Lodge, J. F. Ammirati, T. E. O’Dell, and G. M. Mueller, “Collecting and describing macrofungi,” in Biodiversity of Fungi, Amsterdam, Netherlands: Elsevier Academic Press, 2004, pp. 139–215.

[11] D. N. Pegler, Agaric Flora of Sri Lanka. Kew, U.K.: Kew Bulletin Additional Series 12, 1986.

[12] G. Senthilarasu and V. Kumaresan, “Diversity of agaric mycota of Western Ghats of Karnataka, India,” Current Research in Environmental & Applied Mycology, vol. 6, pp. 75–101, 2016.

[13] R. Singer, The Agaricales in Modern Taxonomy, 4th ed. Koenigstein, Germany: Koeltz Scientific Books, 1986.

[14] A. H. Smith, Mushrooms in Their Natural Habitats. New York, NY, USA: Hafner Publishing Company, 1949.

[15] H. B. Song and T. Bau, “Taxonomic revision within Bolbitiaceae using multigene phylogeny,” Journal of Fungi, vol. 9, no. 9, pp. 924–945, 2023.

[16] P. Voto, “Updated taxonomic treatment of Bolbitiaceae in Europe,” Rivista di Micologia, vol. 65, no. 2, pp. 205–238, 2024.

[17] K. Wang, S. L. Liu, X. Z. Liu, et al., “Catalogue of fungi in China 3: Updated taxa and distribution of Basidiomycota,” Mycology, vol. 15, no. 1, pp. 112–184, 2024.

[18] R. Watling, British Fungus Flora: Agarics and Boleti, vol. 3, Bolbitiaceae. Edinburgh, U.K.: Royal Botanic Garden, 1982.