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SHORT COMMUNICATIONS

Tulostoma chudaei Pat An addition to macrofungal flora of India

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Tulostoma chudaei, a member of the family *Agaricaceae* is described based on collections made in India. Detailed macro- and microscopic features are presented in this paper.

Key words: Agaricales, macro-fungi, new record

India is a treasure house of fungi showing enormous diversity. Compilation of Indian fungal occurrence records more than 27,000 species of fungi which forms the largest biotic community after insects (Sarbhoy *et al.*, 1996). But this number depicts only a fraction of total fungal wealth that has been subjected to scientific scrutiny (Swapna *et al.*, 2008). Taxonomic studies of South Asian macrofungi have recently been reported to be in decline (Hyde, 2003) and this is a rising cause of concern among macrofungal conservationists and enthusiasts especially when so little is known and much is waiting to be explored. Inventories in the state of West Bengal by author's group during last decade have helped to reveal the richness of macrofungal diversity of this state (Acharya and Acharya 2001; Acharya and Bhutia, 2003; Acharya *et al.*, 2004; Dutta *et al.*, 2011; Pradhan *et al.*, 2011) which is mainly attributed to the milieu of ecological domains with variable combination of altitudinal (coastal-subalpine), climatic and edaphic factors. The genus *Tulostoma* (Agaricales, Fungi) was proposed by Persoon in the year 1801 and is characterized by the presence of a distinct stipe inserted in a socket at the base of the subglobose endoperidium which opens by a small and apical mouth. Literature review reveals that till date only 27 species of *Tulostoma* had been reported from India (Bilgrami *et al.*, 1991).

In this communication *Tulostoma chudaei* Patouillard, collected from two districts of West Bengal viz. Howrah and South 24 Parganas is reported for the first time from Indian subcontinent.

The study materials were collected during the field trip of monsoon season (2008-2011) in various districts of the state of West Bengal, India by the authors group. The morphological as well as ecological features of the fresh specimens were studied and colour photographs were taken in the field. Coordinate of the locality were noted with Garmin etrex GPS machine. The colour of the specimen was determined by colour identification chart, Flora of British Fungi (1969). Then the specimens were brought to the laboratory and microscopic features were examined by using Carl Zeiss AX10 Imager A1 phase contrast microscope. Microscopic studies were carried out on dry samples, mounted in 5% KOH and Congo red. For spore measurement, 30 spores from three mature basidiocarp collections (n=30) were studied. SEM photomicrographs were obtained with HITACHI S 3400N instrument (Hitachi, Japan). Spores were mounted in 70% ethyl alcohol and dispersed with a fine needle on either a copper or an aluminium stub, and air dried. The stubs were coated with a layer of gold-palladium or gold alone, and processed in a standard sputter coater. Observations were made at 10 kV. The specimens were identified following Moreno *et al.*, (1995). The voucher collections are deposited with the accession code AMFH in the Mycological Herbarium of University of Calcutta, Kolkata, West Bengal, India.

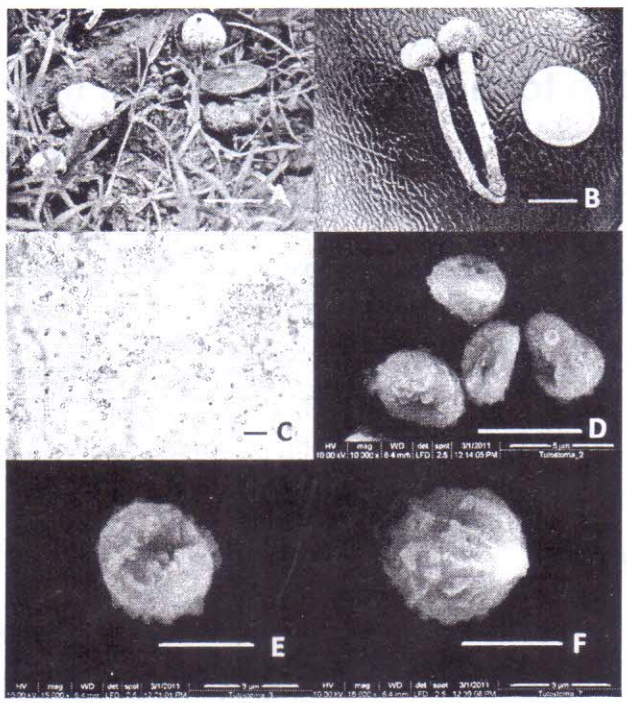

Fig. 1 : T*ulostoma chudaei* a-b. Basidiocarps. **c.** Basidiospores with capillitium. **d-f.** SEM micrographs of Basidiospores. (Bars: a = 15 mm; b = 15 mm; c = 63 µm; d = 5 µm; e-f = 3 µm).

***Tulostoma chudaei* Pat.**

Position in classification*: Fungi, Basidiomycota, Agaricomycotina,Agaricomycetes,Agaricomycetidae, Agaricales, Agaricaceae, *Tulostoma*, *T. chudaei* (*http://www.mycobank.org/px?Table=Mycobank&Page=200&ViewMode=Basic; accessed on 05/11/2012)

Basidiocarp stipitate, 40-52 mm long (Fig. 1a-b). *Spore sac* 14-15 × 6-11 mm diam., globose to subglobose, sometimes reniform. Mouth circular and plane, slightly raised (up to 0.5 mm). *Gleba* ferrugineous. *Stipe* 23-40 × 3.8-4 mm, smooth, longitudinally striate, slightly equal, with a 7-8 mm wide bulbous base. *Basidiospores* (3.2) 3.9-5.9(-6.3) × 3.2-4.7(-5.9) µm, [SEM size of spores 4-4.6 × 3.8-4 µm] (Q=1-1.5; Qav = 1.15) globose to subglobose, uniguttulate, droplet pale pink in colour, with a large apiculum, sub-smooth and pale yellow under light microscope (Fig. 1c); verrucose with SEM (Fig. 1d-f). *Capillitium* (Fig. 1c) 4.7-7.9 µm diam., thick-walled, with a lumen, branched, hyaline to yellowish, broadened at the septa, septa sparse. *Clamps* absent. *Exoperidium* hyphal, persistent, consisting of a tangle of hyphae 3.9-5.9 µm diam., 1.2-1.8 µm, thin-walled, septate, branched, hyaline. *Endoperidium* sub-smooth, dirty white to creamy white, consisting of 4.3-7.1 µm diam., walls 1.2-1.6 µm thick, interwoven hypha, which are thick-walled, hyaline, septate, branched, slightly broadened at the septa. *Stipitipellis* of parallel, 7.1-7.9 µm broad, septate, sub-smooth hyphae, pale yellowish ochre; context of relatively thin walled, 4.3-7.9 µm broad hyaline hyphae.

Habitat

The mushroom was found growing gregariously in the moist grassland during the month of July and is uncommon to the region.

***Edibility*:** Not reported.

Specimen examined

South 24 Parganas, Sajnekhali (22°07'427"N, 088°49'840"E; 6 m amsl), Krishnendu Acharya and Arun Kumar Dutta, West Bengal, India, on moist grassland, 04th July, 2010, AMFH 216; Howrah, Sankrail block, Jangalpur (22°35'137"N, 088°13'799"E; 7 m amsl), Nilanjan Chakraborty, West Bengal, India, on moist grassland, 24th July, 2010, AMFH 152.

Remarks

Tulostoma and the allied genera like *Battarraea*, *Battarraeoides*, *Chlamycopus*, *Dictyocephalus*, *Phellorinia*, *Queletia* and *Schizostoma* are characterized by epigeous fruit-bodies at maturity, with a fertile head on the apex of a well developed stipe. Typical character of *Tulostoma* is the discontinuity of the spore sac with the stipe, distinct presence of collar and socket, absence of basidia in mature gleba, and spore release by dehiscence of apical pore or aperture (Moreno *et al.* 1995). *Tulostoma chudaei* Pat. can be easily identified by the presence of capillitium which is broadened at septa and the spores having conspicuous ribbed verrucae, which matches nicely with our specimen.

Present specimen resembles *T. jourdani* Pat. in having sub-smooth spores surface topography under light microscopy. However, spores of later as asperulate-rugose surface under SEM (Moreno *et al.* 1995), which distinguishes it from our specimen.

The holotype of *T. chudaei* was collected by M. Chudeau in 1906 from an illegible locality (not mentioned in protologue) in Sudan, Africa. Since

then it has been collected from Baja California, Mexico (Guzman *et al.*, 1992; Moreno *et al,*. 1995); arid zones of Africa, America, and Australasia (Wright, 1987) and Argentina (http://ara.inbio.ac.cr).

The genus is placed under *Tulostomataceae* by Fischer (1900) and currently ascribed to *Agaricaceae* (Kirk *et al.*, 2008). This group currently consists of 79 species (Hawksworth *et al.* 1995) which are worldwide in distribution and commonly found in warm and sandy places (Wright, 1987).

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