

RESEARCH ARTICLE

A New record of *Hygrocybe calyptriformis* (Berk. & Broome) Fayod (Agaricales: Hygrophoraceae) from Anaimalai Hills, Southern Western Ghats of India

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Abstract

The pink waxcap *Hygrocybe calyptriformis* (Berk.) Fayod is a species of agaric (gilled mushroom) in the family Hygrophoraceae. This species has been recorded and documented in Southern Asia, especially in Western Ghats of Tamil Nadu. In many European countries, conservation of *H. calyptriformis* is of big concern, appearing on national red lists of threatened fungi. In a study on documentation of mushrooms in Southern Western Ghats from April 2012 to March 2013, *H. calyptriformis* was recorded from tea estates in Anaimalai hills in Valparai taluk of Coimbatore district. The macroscopic characters have been thoroughly observed for their growth and development up to early budding primordia to matured open basidia stages. The complete morphological characters were observed and noticed with the help of previous reports and standard literatures of other similar mushrooms.

Keywords: *Hygrocybe calyptriformis*, Hygrophoraceae, Western Ghats, Anaimalai Hills, macroscopic characters.

Introduction

The genus *Hygrocybe* (Fr.) P. Kumm. (Hygrophoraceae) is a well-known and well-represented taxon throughout the world (Singer, 1986). The term *Hygrocybe* originates from Fries (1821) who at first recognized the group as a member of the 'tribus' *Clitocybe* ('subtribus' *Hygrocybe*) and subsequently, not earlier than 1838, transferred them as a 'tribus' to the genus *Hygrophorus*. It was raised to the rank of a separate genus by Kummer (1871). In India, the genus is represented by 49 species (Manjula, 1983; Natarajan *et al.*, 2005; Leelavathy *et al.*, 2006; Vrinda *et al.*, 2009; Senthilarasu *et al.*, 2010), out of which, 40 are from the state of Kerala. According to the opinion of most mycologists, both *Hygrocybe* and *Hygrophorus* should be classified as separate genera in the family Hygrophoraceae. Currently, about half of the researchers recognize multiple segregate genera while the remainder divides the genus *Hygrocybe* into three subgenera, namely subg. *Hygrocybe* s.str. Bon 1976, subg. *Pseudohygrocybe* Bon 1976 and subg. *Cuphophyllus* Donk 1962 (Boertmann, 1995; Candusso 1997; Krieglsteiner, 2001). Western Ghats is one of the eight major biodiversity hotspots (Myers *et al.*, 2000). While less than 6% of India's landmass, more than 30% of all plant and vertebrate species of the Indian sub-continent are found there. Western Ghats are also listed as one of the 200 globally most important ecoregions (Olson and Dinerstein, 1998). The Valparai plateau in the southern region of the Western Ghats has undergone extensive fragmentation from the early 1900s because of forest clearance for tea, coffee, cardamom and eucalyptus plantations and the

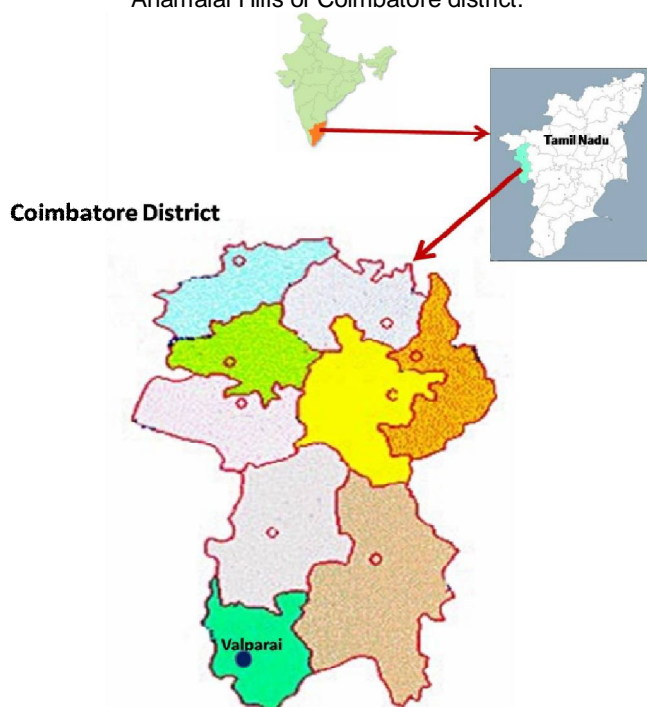
associated infrastructural development (Joseph *et al.*, 2009). Isolated remnants of rainforest in the middle of these plantations are known for their rich biodiversity. Chapron *et al.* (2010) identified the preservation of the forests fragments of Valparai as one of the 100 top conservation priorities in Asia.

The mushroom *Hygrocybe calyptriformis* is illustrated in many popular field guides including Phillips (1981), Bon (1987), Courtecuisse and Duhem (1995) and Courtecuisse (1999). The English name 'Waxcap' for the genus *Hygrocybe*, refers to the waxy texture of many of the caps and particularly the gills. The long, thin basidia that cover the gills are characteristic of the genus and contribute to this feature. *Hygrocybe calyptriformis* is widespread in Northern Europe, but generally rare and occurring locally. The fungus is also known in North America, Asia and Japan (Dennis, 1986; Arnolds, 1990; Breitenbach and Kränzlin, 1991; Boertmann, 1995). In South Asian countries, there is no report available on the occurrence of *Hygrocybe calyptriformis*. Hence, this is the first recorded for the occurrence of this mushroom species in Western Ghats of Indian sub-continent. In the United Kingdom, most records of fruiting of Pink Waxcap were between September and November with a peak in October. It was very similar to *Hygrocybe autoconica*, but marked with differences: Cap cone-shaped with a definite peak when young, golden yellow-orange or red, sticky when wet; gills are waxy, white to olive yellow, and almost free from the stalk that is often twisted, hollow, striated and the same color as the cap.

Materials and methods

Study area: Frequent field surveys were carried out in tea plantations in Anamalai hills during April 2012-March 2013. Anamalai hills lie in Western Ghat belts located at Valparai taluk of Coimbatore (Fig. 1). Valparai is a hill town in the Anaimalai hills. It receives an annual rainfall of around 450 cm and the rainfall reaches its peak intensity around the months of July-August. The terrain being hilly is cool during most of the year with average summer temperature in the range of 12-29°C during March-April and average relative humidity of 53.3-92.4% (Muraleedharan, 2002). The recorded species was found in experimental farm of tea garden in UPASI Tea Research Institute which lies between 10°.16.143'N latitude and 76°.58.043'E longitude and elevated as 1064 m above from the sea level.

Fig. 1. Map showing the Collection site (Valparai) in Anamalai Hills of Coimbatore district.



Collection and identification of *Hygrocybe calyptriformis*: During the course of our investigation on the agaric flora of Western Ghats of Kerala, a striking agaric with bright pigmentation was collected and studied. Fifteen basidiocarps were found in clusters, which exposed their pinkish, shiny, wax coated, glutinous cone like pileus, with long white colored stem. Before picking out, the fruit bodies were photographed. They were plucked without damage and shifted to the laboratory for further identification. Macroscopic details such as shape, color, dimension and odor of fresh basidiocarps were recorded. Terminologies used by Largent (1977) were followed for recording the characters of the specimen. Kornerup and Wanscher's (1978) color chart was followed to determine the color of the fresh specimen.

Results

Habit and habitat: Caespitose, scattered on soil amongst Mosses, growing under shade of *Spathodea campanulata* tree and *Camellia sinensis* bush in soil in tropical rain forest, October-November (Fig. 2a and b).

Fig. 2. *Hygrocybe calyptriformis*.



Habit



View of basidiocarp

Taxonomy

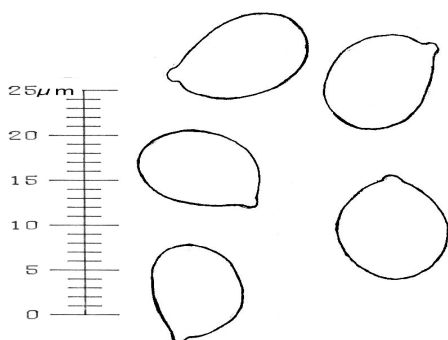
Materials examined: 12th November, 2012, Large fruit bodies (16 Nos), of *Hygrocybe calyptriformis* were found to occur on soil instead with stone fence in cluster as well as troops in the shady place of Anamalai hills of Coimbatore district; Tamil Nadu. Coll: R. Govindaraj and S. Ignacimuthu; (ERIM 12).

Macroscopic description: The taxonomic description is based on Boertmann (1995) and Arnolds (1990) and taken from Newton *et al.* (2000). Cap: Pileus conic, conico-campanulate, convex-umbonate or cuspidate, frequently splitting through the pileus and lamellar context near the pileus margin; splitting margin when expanded; slightly greasy to finely radially fibrillose. Color: a distinctive pale violaceous rose or flesh pink, becoming pale salmon to whitish with age pigments non-encrusting and insoluble in alkali, lilac, vinaceous or absent (white); lamellae narrowly attached (adnexed,

narrowly sinuate) or free; pileipellis hyphae radially arranged, fusiform; basidia usually 5 or more times longer than the spore length; adnate type of gills attachment. Gill trama regular, with elements to 1 mm or more in length. Stipe: 40-120 x 5-15 mm. hollow, Smooth or finely fibrillose, dry; white or pale lilac to pink. There is no volva and annulus present; rhizomorph is white in color.

Microscopic description: Microstructure: Basidiospores hyaline, thin-walled, in amyloid, not metachromatic, ellipsoid or broadly ellipsoid, not stangulated; lamellar trama strictly regular, of long, fusiform hyphae often exceeding 140 μm in length, with right-angled septa; clamp connections typically absent or rare in context and the pellis, but toruloid clamps present at base of basidia and/or basidioles. Spores: Spore print was white in color. (5.5-) 6.5-9 x (4-) 4.5-6.0 (-7) μm ; Q = 1.2-1.8, average 1.4-1.5 (Fig. 3). Broadly ellipsoid to ellipsoid, basidia mostly four-spored, pileipellis an ixocutis up to 70 μm thick with a few gelatinised hyphae; Stipitipellis a cutis.

Fig. 3. Structure of spore.



Hygrocybe calyptriformis, collected from Anamalai hills was compared with *Hygrocybe autoconica*, which was reported by Leelavathy *et al.* (2006) and found that there is not much difference in all the macroscopic and microscopic characters except some characters like pigments of pileus and stipe region. So the collected species *H. calyptriformis* is reported as a new record in the genus *Hygrocybe* in India.

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