

## The genus *Volvariella* from Mount Abu, Rajasthan, India

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Received : 25.01.2021

Accepted : 22.02.2021

Published : 29.03.2021

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In the present paper, six species of *Volvariella*, namely, *Volvariella bombycina* var. *flaviceps*, *V. earlei*, *V. hypopithys*, *V. pusilla*, *V. speciosa* var. *gloiocephala* and *V. speciosa* var. *speciosa* have been described from varied habitats and substrates of Mount Abu, Rajasthan.

**Key words:** Agaricales, Basidiomycetes, macrofungi, taxonomy

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### INTRODUCTION

Geographical conditions and climatic conditions of Mount Abu are very different from the rest of Rajasthan, a state of India in which desert conditions are prevalent, monsoon rains are scarce and vegetation is mostly xeromorphic and xerophytic. Mount Abu, situated at a height of 1220 metres above mean sea level experiences a cool and pleasant climate with conditions of wetness, low temperatures all the year round ranging from 11-28! , good monsoon rains with average 67-177 cms, dense flora of Angiosperms, Gymnosperms, Pteridophytes and mosses paving a way for luxuriant growth of mushrooms on a wide variety of substrates. During mycofloristic explorations, widely diverse mushrooms have been reported from varied habitats and substrates from various localities of Mount Abu like lignicolous , humus rich habitats, ectomycorrhizal , grassy habitat , amongst leaf litter, on living and dead deciduous and coniferous trees(Chouhan *et al* 2010).

Diversity of mushrooms specially agarics is maximum as it is evident during surveys carried out in various localities of Mount Abu . The genus *Volvariella* Sp of family Pluteaceae is characterized by small ,medium or large fruiting bodies, convex to expanded, with free, pink, crowded gills, central stipe, volva distinctly present, basidiospores ovoid to ellipsoid, smooth, hymenophoral trama

convergent type, pileal surface an undifferentiated repent epicutis of radially parallel hyphae, clamp connections mostly absent.

The genus *Volvariella* is represented by 50 species world over (Kirk *et al.*2008). In India, taxonomic description of some species has been given from various parts of the country ( Atri *et al.* 2005; Natrajan *et al.* 2005; Kumar *et al.* 2009; Datta *et al.* 2011, Kumaresan *et.al*, 2011; Senthilarasu *et al.* 2012; Kaur *et al.* 2013).

In the present communication, six species of *Volvariella* namely, *Volvariella bombycina* var. *flaviceps*, *V. earlei*, *V. hypopithys*, *V. pusilla*, *V. speciosa* var. *gloiocephala* and *V. speciosa* var. *speciosa* have been described from different habitats of Mount Abu.

### MATERIALS AND METHODS

Mushrooms were collected from various localities of Mount Abu where natural vegetation was in abundance. Field notes were prepared relating to various characters like morphology, size , shape , colour, substrate of growth according to mushroom identifier key (Jordan 1995, Pegler 1977). Ethanobotanical information and local uses were also noted along with date and time of collection. Field photography was done for all the mushrooms in their natural habitat. The specimens were carefully dug out and cleaned gently with the

help of brush to remove soil particles and litter. The specimens were then placed in small card board boxes or paper bags after assigning a specimen number and a label with necessary information. Further, macroscopic and microscopic observations were made in the laboratory by using specific terminology and characters. (Singer 1962, Pegler, 1977). All the collections have been deposited under JNV/Mycl in the Herbarium of Botany Department, Jai Narain Vyas University, Jodhpur, Rajasthan (India). During the present investigation, authentic names, basionym and synonyms of the investigated taxa are according to the Dictionary of Fungi (Kirk et al. 2008) and Mycobank (www.mycobank.org). Mushroom photographs of the field and microscopic photographs with section of gills and spores have been given with this communication. All photographs are copyright of the authors Reenu Chouhan and Charu Panwar.

## RESULTS AND DISCUSSION

### Taxonomic Observations

*Volvariella bombycina* var. *flaviceps* (Murrill) Shaffer, *Mycologia* **49**: 560(1957).

Basionym and Synonym: *Volvaria flaviceps* Murrill, *Mycologia* **41**:490(1949)

*Pileus* 3-3.5 cm, bright flavous uniformly, campanulate, solitary, surface dry, fibrillose, margin fimbriate. *Stipe* 3.3-4 x 0.5- 1.1 cm, white, curved, glabrous, enlarging below, volva 3-4 cm high and 2.0 cm at the top, tapering towards the base, dry, dirty white with large, flat umbrinous scales. *Lamellae* white, crowded, free, thin, entire. context thin, white, unchanging. *Spores* 7.5- 10 µm x 4.7-6.5µm, shape ovoid to oval, pointed. *Basidia* clavate, 4-spored. *Pleurocystidia* 20-91 x 8-32 µm, fusoid-ventricose or clavate, abundant. *Cheilocystidia* 34-75 x 1—25µm, fusoid-ventricose, lanceoloid or clavate. (Fig 1 a-c).

Material examined – India, Rajasthan, Mount Abu growing solitary on wood. July 28, 2019, Reenu Chouhan JNV/Mycl / 52.

Discussion – Taxonomic description of the genus *Volvariella bombycina* var. *flaviceps* (Murrill) Shaffer is being obtained for the first time from this region. It is a new fungus record for the country, India. *Volvariella bombycina* has been described earlier

from various parts of the country but variety *flaviceps* is the yellow variety, *Volvariella bombycina* var. *flaviceps*, in which cap is “uniformly bright-flavous.” The details are in close agreement to species described earlier.

*Volvariella earlei* (Murrill) Shaffer *Mycologia* **49**(4): 550(1957)

Basionym: *Volvariopsis earlei* Murrill, *Mycologia* **3**(6):282(1911)

Synonyms: *Volvariopsis earlei* Murrill, *Mycologia* **3**(6):282(1911)

*Volvaria earlei* Murrill *Mycologia* **4**(6):332(1912)

*Volvopluteus earlei* (Murrill) Vizzini, Contu & Justo, *Fungal Biology* **115**(1):15(2011)

*Pileus* 3.5-5.0cm diameter, white to pinkish-gray, discolouring with age, convex, expanding, glabrous, striate on the margin. *Stipe* 4.5-9.5 cm, 0.8-1.0cm diameter, white, concolorous to the pileus, tapering upwards from enlarged base, solid, glabrous. Volva 5-10 mm high, vaginate, white to pinkish gray. *Lamellae* white, flesh pink, crowded, broad, free. *Basidia* clavate, 4-spored. *Pleurocystidia* 30-60 x 15-30 µm, clavate or obovoid. *Cheilocystidia* 24-74 µm x 8-30 µm, fusoid, clavate, abundant. *Spores* 11.5 x 15.0µm x 6.5-8.5 µm, oval or ovoid or obovoid (Fig.1 d-f).

Material examined – India, Rajasthan, Mount Abu growing gregarious on soil. July 10, 2018, Reenu Chouhan JNV/Mycl / 42.

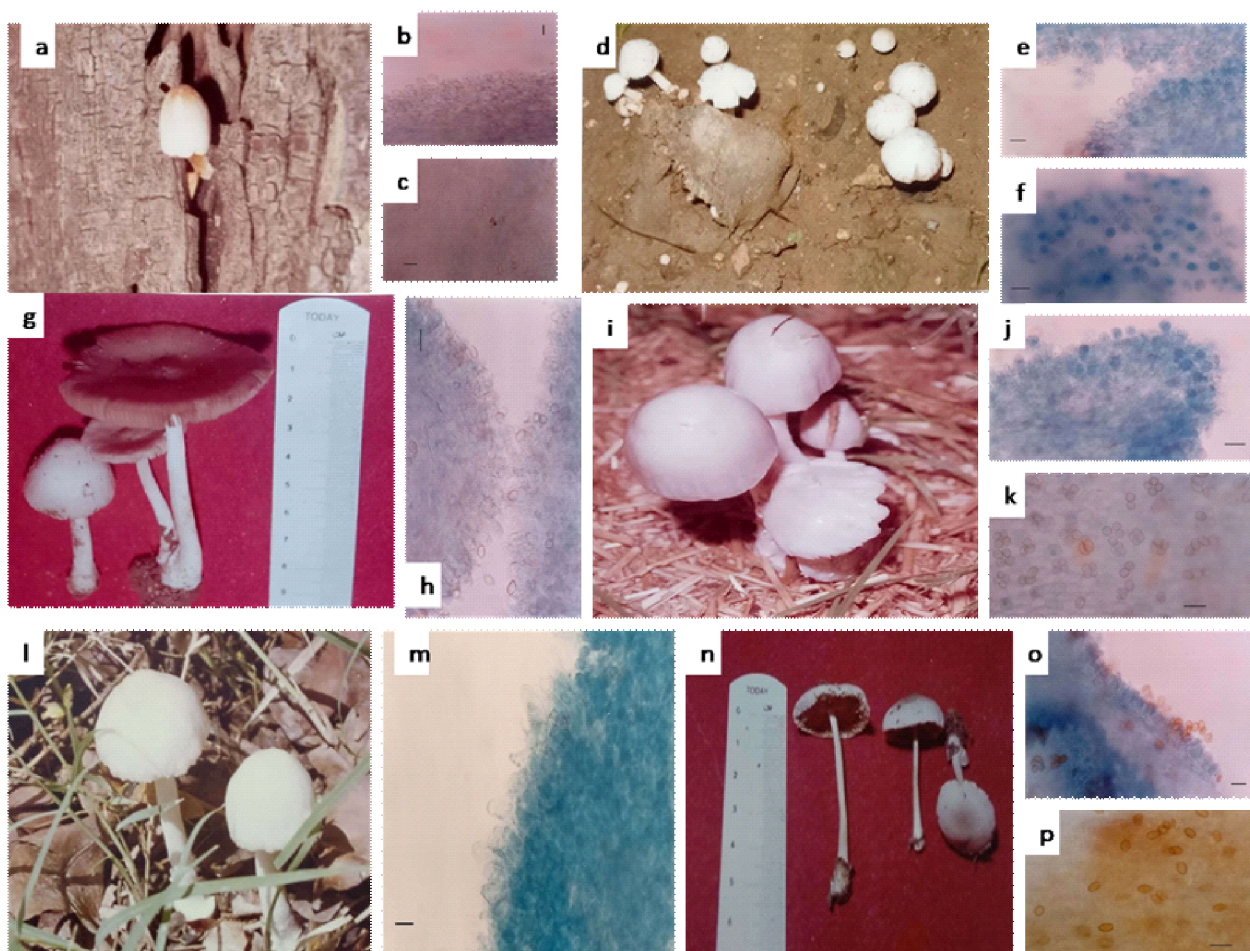
Discussion – Taxonomic description of the genus *Volvariella earlei* (Murrill) Shaffer is being obtained for the first time from this region. It is a new fungus record for Mount Abu, Rajasthan, North West India. The details are in close agreement to species described earlier.

The taxonomy of the genus has been described from Spain (Justo and Castro, 2010). In India, the genus has been described from Punjab state.

*Volvariella speciosa* var. *gloiocephala* (DC.) Singer, *Lilia* **22**:401(1951)

Basionym: *Agaricus gloiocephalus* DC., *Flore. Franc.* **6**:52(1815)

*Pileus* 5-10 cm diameter, dull white or fulvous pearl gray, ovoid when young, expanding campanulate convex to plane but umbonate, viscid, glabrous, margin fully striate, flesh thin. *Stipe* 8-15 cm x 1.2-



**Fig 1.** Habit (a,d,g,i,l,n), Section of gills showing basidia and cystidia (b,e,h,j,m,o) and spores (c,f,k,p) of - (a-c) *Volvariella bombycina* var. *flaviceps* (d-f) *Volvariella earlei* (g-h) *Volvariella speciosa* var. *gloiocephala* (i-k) *Volvariella speciosa* var. *speciosa* (l-m) *Volvariella hypopithys* (n-p) *Volvariella pusilla* ( Basidia and cystidia , Scale 1cm =15  $\mu$ m ; Spores, Scale 1cm =10 $\mu$ m )

2.0 cm white,terete,enlarging to lobed base,soild,glabrous, volva with margin even or lobed, white. *Lamellae* white, later flesh- pink, crowded or so, broad front, narrow behind. *Basidia* clavate, 4-spored.*Pleurocystidia* 40-90 x 15- 36  $\mu$ m,clavate,fusoid,sub- cylindrical, fusoid-ventricose. *Cheilocystidia* 35-65 x 10-30  $\mu$ m, fusoid -ventricose. *Spores* 11.5-15.5 $\mu$ m x 7.5-8.0  $\mu$ m,ovoid or oval.(Fig 1 g-h).

Material examined – India, Rajasthan, Mount Abu growing on soil and leaf litter .July 02, 2015, Reenu Chouhan JNV/Mycl / 43.

Discussion –The *Volvariella speciosa* var. *gloiocephala* ( DC.)Singer, Lilioa is being described for the first time from this region. It is a new fungus record for Mount Abu, Rajasthan, North West India. The details are in close agreement to species described earlier (Shaffer,1957). Earlier, the taxonomy of the genus has been described from West Bengal, India ( Dutta *et al* 2011 ) .

*Volvariella speciosa* var. *speciosa*(Fr.ex.Fr.)Singer, *Lilioa* 22:401(1951)

Basionym: *Amanita speciosa* Fr.*Observationes mycolicae* 1:1(1815).

*Pileus* 5-14 cm,white to light avellaneous on light brownish grey, ovoid to globose when young, expanding to convex, viscid ,shiny, glabrous, margin striate slightly, flesh thick in the centre, thin towards the margins, pinkish-white, soft. *Stipe* 10-20 cm x 1.0-2.0 cm, enlarging towards base, glabrous base slightly villose,volva shallow, lobed margin free, white. *Basidia* clavate, 4-spored. *Pleurocystidia* 30-95  $\mu$ m x11-18  $\mu$ m,clavate, fusoid-ventricose. *Cheilocystidia* 22-90  $\mu$ m x 9-38  $\mu$ m, clavate, sometimes with a slender projection, fusoid, abundant. *Spores* 11.5- 18.5 $\mu$ m x 7.5-12.5  $\mu$ m,oval to ovoid (Fig 1 i-k).

Material examined – India, Rajasthan, Mount Abu growing in groups on agricultural residues. July 10,2014, Reenu Chouhan JNV/Mycl / 44.

Discussion –The *Volvariella speciosa* var. *speciosa* (Fr.ex.Fr.)Singer is being described for the first time from this region. It is a new fungus record for Mount Abu, Rajasthan, North West India. The details are in close agreement to species described earlier. In India, the genus has been described from Kerala, South India.

*Volvariella hypopithys* ( Fr.)M.M Moser, Kleine Kryptogam. Von Mitt.Die Ia und Bau. 2:110(1953)  
Basionym: *Agaricus hypopithys* Fr.  
*Hymenomyces europaei*:183(1874).

*Pileus* 2-6 cm diameter, white, campanulate to convex, subumbonate, dry, fibrillose, silky, margin slightly striate. *Stipe* 2-8cm in length x 0.3- 0.5 cm, white, terete, with a bulbous base, solid, densely villose, volva membranous, wavy, lobed. *Lamellae* flesh-pink, crowded, narrow, edges fimbriate, white. *Basidia* clavate, 4-spored. *Pleurocystidia* 15-70 x 8-30 µm, fusoid to fusoid-ventricose, sometimes with a enlarged apex or constricted base, abundant. *Cheilocystidia* 20-85 x 8-35 µm, fusoid – ventricose, clavate or dumbbell shape. *Spores* 5.0 - 6.5µm x 3.3- 4.0 µm, ovoid (Fig 1 l-m).

Material examined – India, Rajasthan, Mount Abu growing on humus – rich soil and leaf litter. July 02,2018, Reenu Chouhan JNV/Mycl / 56.

Discussion –The *Volvariella hypopithys* (Fr.)M.M Moser )is being described for the first time from this region. It is a new fungus record for Mount Abu, Rajasthan, North West India. The details are in close agreement to species described earlier. The taxonomy of the genus has been described from Kerala, South India.

*Volvariella pusilla*( Pers.)Singer, Lilioa 22:401(1951)  
Basionym: *Amanita pusilla* Pers. *Observationes mycolicae* 2:36(1800)

*Pileus* 0.5-2.5cm diameter, greyish –brown, ovoid when young but expanding to campanulate-convex, umbonate, viscid at first later dry, appressed fibrillose, margin distinctly striate, flesh thin. *Stipe* 3-6cm in length x 0.2- 0.5 cm, white, tapering towards apex, solid or hollow, fibrillose, volva glabrous, greyish, wavy, lobed. *Lamellae* white later flesh-pink, free, edges entire. *Basidia* clavate, 4-spored. *Pleurocystidia* 24-70 x 7-20 µm,

clavate to dumbbell shaped. *Cheilocystidia* 21-60 x 7-20 µm, clavate or dumbbell shape. *Spores* 5.7- 7.5 x µm x 4.5- 6.5 µm, ovoid (Fig 1 n-p).

Material examined – India, Rajasthan, Mount Abu growing on humus- rich moist soil. July 10,2017, Reenu Chouhan JNV/Mycl /61.

Discussion –The *Volvariella pusilla* ( Pers.)Singer is being described for the first time from this region. It is a new fungus record for Mount Abu, Rajasthan, North West India. The details are in close agreement to species described earlier.

In India. the taxonomy of the genus has been described from West Bengal, India (Dutta et al 2011) and from Kerala, South India.

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