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# A new variety of *Volvariella pusilla* from West Bengal, India

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*Volvariella pusilla* var. *minuta*, a member of Pluteaceae was discovered from Santoshpur, a small locality of Kolkata, West Bengal, India. A comprehensive description, illustration, photographs and comparisons with phonetically similar taxa are provided.

**Key words** – Agaricales – basidiocarp – Pluteaceae– taxonomy

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## Article Information

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## Introduction

The genus *Volvariella* Speg. (Agaricales, Pluteaceae) is characterized by very small to medium or large basidiocarps with a volva but without a ring; lamellae free, often remote, crowded, sometimes readily collapsing at maturity; basidiospores pink in mass, thin to fairly thick-walled (Orton 1986).

The genus has been reported from tropical, subtropical, and temperate regions of both the eastern and the western hemispheres. It includes more than one hundred taxa (Shaffer 1957). Fifteen species of *Volvariella* have been recorded from India, of which seven species occur in the state of West Bengal viz. *V. castanea* (Masse) Rath, *V. delicatula* (Masse) Manjula, *V. diplasia* (Berk. & Broome) Singer, *V. thwaitesii* (Hook. f.) Rath, *V. terastia* (Berk. & Broome) Singer, *V. pusilla* (Pers.) Singer and *V. gloiocephala* (DC.) Boekhout & Enderle (Bilgrami et al. 1991, Hosagoudar et al. 1996, Dutta et al. 2011). The present paper describes *Volvariella pusilla* var. *minuta*, as the addition of a new variety of *V. pusilla*.

## Methods

The study materials were collected during field trips to various regions of West Bengal during 2011. The morphological and ecological features were noted and colour photographs were taken in the field. Microscopic characterization was done from dried material by mounting free-hand sections of basidiocarp in 5% KOH, Melzer's reagent, Congo red or lactophenol-cotton blue; these were examined with a Carl Zeiss AX10 Imager A1 phase contrast microscope. Colour terms follow the British Fungus Flora Colour Chart (Anonymous 1969). Density of lamellae (L/cm) was measured at the margin of the pileus excluding lamellulae. Basidiospore length excludes the length of ornamentation. Basidium length excludes the length of sterigmata. Quotient (Q = L/W) was calculated considering the mean value of length and width of 30 basidiospores. Voucher specimens have been deposited with the accession code AMFH in the Mycological Herbarium of University of Calcutta, Kolkata, West Bengal, India.

**Table 1** Comparison of *Volvariella pusilla* var. *minuta*, *V. pellucida* and *V. pusilla*.

	Characters	<i>V. pellucida</i>	<i>V. pusilla</i>	<i>V. pusilla</i> var. <i>minuta</i>
Pileus	Size	5–15 mm	5–30 mm	2–6 mm
	Shape	oval to plane	campanulate-convex to nearly plane, umbonate	cuspidate
	Surface colour	dull white	white, with grey	creamy salmon
Lamellae	Colour	white to finally dull pinkish	white to finally salmon pink	white to finally salmon coloured
	Length	2–3 cm × 1 mm	3.3 cm × 1–5 mm	4–11 × 0.6–1 mm
Stipe	Shape	slightly enlarged based or equal	equal	tapered towards apex
	Surface	glabrous	minutely pubescent to innately fibrillose	smooth
	Colour	watery grey to white	white	shiny white
Volva	Shape	2–3 lobed	cupulate	bilobed
	Colour	vinaceous buff to avellaneous	white	whitish
Basidiospores	Size	6.5–8.2 × 5.1–6 μm	5.5–7.9 × 4.3–6.3 μm	5.9–7.9 × 4.1–5.7 μm
	Shape	ovoid to ellipsoid	ovoid to ellipsoid	subglobose to ellipsoidal
	Guttule	0–1 guttule	absent	single guttule
Pleurocystidia	Shape	fusoid-ventricose	clavate-elongate, fusoid-ventricose to ovoid	cylindrical to clavate
Habitat		scattered on soil	in shade upon humus soil among grasses	saprophytic upon soil and organic mass of decomposing exposed root of <i>Ficus religiosa</i>

## Results

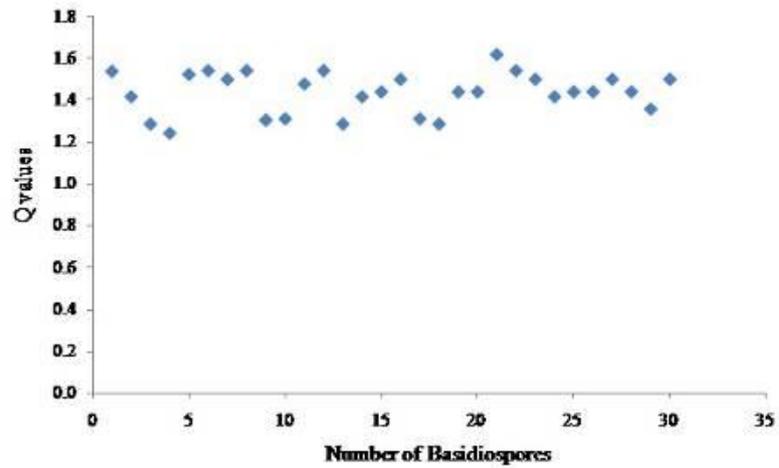
### Taxonomy

*Volvariella pusilla* var. *minuta* K. Acharya, A.K. Dutta & P. Pradhan **var. nov.** Figs 1–2 MycoBank MB801985

Etymology – ‘minuta’ = minute or very small; referring to the very small size of the basidiomes.

*Basidiocarp* pileate, lamellate, stipitate (Fig. 2a). *Pileus* 2–6 mm diam., cuspidate when old, surface glabrous, shiny, dry, creamy salmon at maturity, colour spots absent, margin smooth to striate, creamy salmon, context 0.5 mm, white. *Lamellae* free, 1 mm broad, spacing of 0.7–0.8 mm, regular, lamellulae absent, salmon coloured, edge concolorous. *Stipe* 4–11 mm long, 0.6 mm thick at the apex, slightly enlarged downward, central, hollow, fleshy/cartilaginous, slightly curved, dry, surface smooth, shiny white, context white, exannulate, volvate. *Volva* bilobed, whitish. *Odor* and *taste* not distinctive.

*Basidiospores* (5.9–)6.9–7.1(–7.9) × (4.1–)4.7–5.5(–5.7) μm [ $X_m=7.1\pm 0.4 \times 4.9\pm 0.4 \mu\text{m}$ ,  $Q=1.2-1.6$ ,  $Q_m=1.4$ ,  $n=30$  spores,  $s=2$  specimen] (Fig. 1), subglobose to ellipsoidal, smooth, hyaline to pale ochraceous salmon, apiculus and single guttule visible, germ pore absent (Fig. 2c). *Basidia* 16.8–18.5 × 8–9 μm, clavate, 4-spored; sterigmata 3.9 μm long, straight (Fig. 2b). *Lamella-edge* sterile. *Pleurocystidia* common, 26.9–28.5 × 6.7–7.4 μm, cylindrical to clavate, hyaline (Fig. 2d). *Cheilocystidia* 26.8–27.9 × 10–10.5 μm, clavate with narrow apex, rare, pale ochraceous. *Lamellar trama* regular, hyphae 6.7–8.4 μm diam., septate, apices of some hyphae filled with dense granular content. *Pileipellis* composed of hyaline, 10 × 6.7 μm diam., subglobose to clavate hyphae. *Pileal context* composed of branched septate hyaline hyphae, 5–8.4 μm broad. *Stipitipellis* composed of hyaline hyphae, with partially oblique septa, 7.9–11.8 μm diam. *Stipe context* composed of septate, hyaline hyphae, 3.9–11.8 μm broad. *Clamp-connections* absent. *Oleiferous hyphae* absent.



**Fig. 1** – *Volvariella pusilla* var. *minuta*. Q values of basidiospores (mean  $1.4 \pm 0.098$ ).



**Fig. 2** – *Volvariella pusilla* var. *minuta*. **a** Basidiocarp. – Bar = 5 mm. **b** Basidium. – Bar = 10 µm. **c** Basidiospores. – Bar = 5 µm. **d** Pleurocystidia. – Bar = 5 µm.

Known distribution – Terrestrial (among mosses), and saprophytic upon the mixture of soil and organic mass of decomposing exposed root of *Ficus religiosa* L., India.

Material examined – INDIA, West Bengal, Kolkata, Santoshpur, ectomycorrhizal upon *Ficus religiosa* root, 24 June 2011, K. Acharya, AMFH 280 (holotype).

### Discussion

*Volvariella pusilla* var. *minuta* is distinguished by having a unique combination of characters, viz. a tiny basidiocarp with cuspidate, creamy salmon coloured, 2–6 mm diam. pilei; 1 mm wide lamellae, free, with no lamellulae; a small central, surface smooth, shiny stipe with a white bilobed volva and moderately sized basidiospores ( $X_m=7.1 \times 4.9 \mu\text{m}$ ,  $Q_m=1.4$ ).

The newly described specimen matches the description of *Volvariella pusilla*, differing only in forming rather smaller basidiocarps and bilobed volva. Because of this obvious distinction and its distribution in India, it is considered to be a new variety of *V. pusilla*.

*V. pusilla* var. *minuta* shows similarity with *V. hypopithys* (Fr.) Moser and *V. pellucida* Shaffer. However, *V. hypopithys* differs in having a cap that is six to eight times larger, a longer stipe, presence of hairs on stipe surface and smaller spores whereas *V. pellucida* has a dull white pileus, a stipe that measures 2–3 × 1

mm, vinaceous buff to avellaneous volva, fusoid-ventricose shaped pleurocystidia and is found scattered on soil. A comparison of characters of *Volvariella pusilla* var. *minuta*, *V. pellucida* and *V. pusilla* are provided in Table 1.

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