



## A new variety of *Rhodocybe popinalis* (Entolomataceae, Agaricales) from coprophilous habitats of India

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### ABSTRACT

A large spored variant of *Rhodocybe popinalis*, a member of the family Entolomataceae, was discovered growing on a mixed cattle and horse dung heap from Punjab, India. In this paper, taxonomic details of the new taxon including chemical color reactions of the pileus surface, field photograph, microphotographs and line drawing of macroscopic and microscopic features are presented and its distinctive characters are discussed.

**Key Words:** Basidiomycota, mushroom, Punjab, taxonomy.

### INTRODUCTION

The genus *Rhodocybe* Maire is characterized by small to medium sized carpophores; white, yellow–brown, red–brown or grey, convex, plane, or depressed pileus; adnexed, adnate, or decurrent lamellae; central to rarely eccentric stipe; pink to sordid gray spore print; hyaline to pale stramineous, rough–warty–spinulose basidiospores, with the hilum of the nodulose type; usually fertile lamellae edges and pileus cuticle a cutis, or a trichoderm.

The genus was classified under family Tricholomataceae by Maire (1926). Singer (1986) treated this genus under family Entolomataceae. Although Kirk *et al.* (2008) have put *Rhodocybe* equivalent to *Entoloma* Fr.: Kummer, but Co–David *et al.* (2009) and MycoBank do not support the merging of these genera. This genus is separated from *Entoloma* by spore characters as it possesses indistinctly angular spores which are often rough to tubercular–warty in profile view, and warts are very small and isolated and not longitudinally seriate while *Entoloma* has distinctly angular spores in profile view, but not rough.

Kirk *et al.* (2001) recognized 40 species of the genus. From India, 3 species of *Rhodocybe* are known. These are *R. subgilva* (Berk. & Broome) Pegler (Manimohan *et al.* 1988); *R. nitellina* (Fr.) Singer

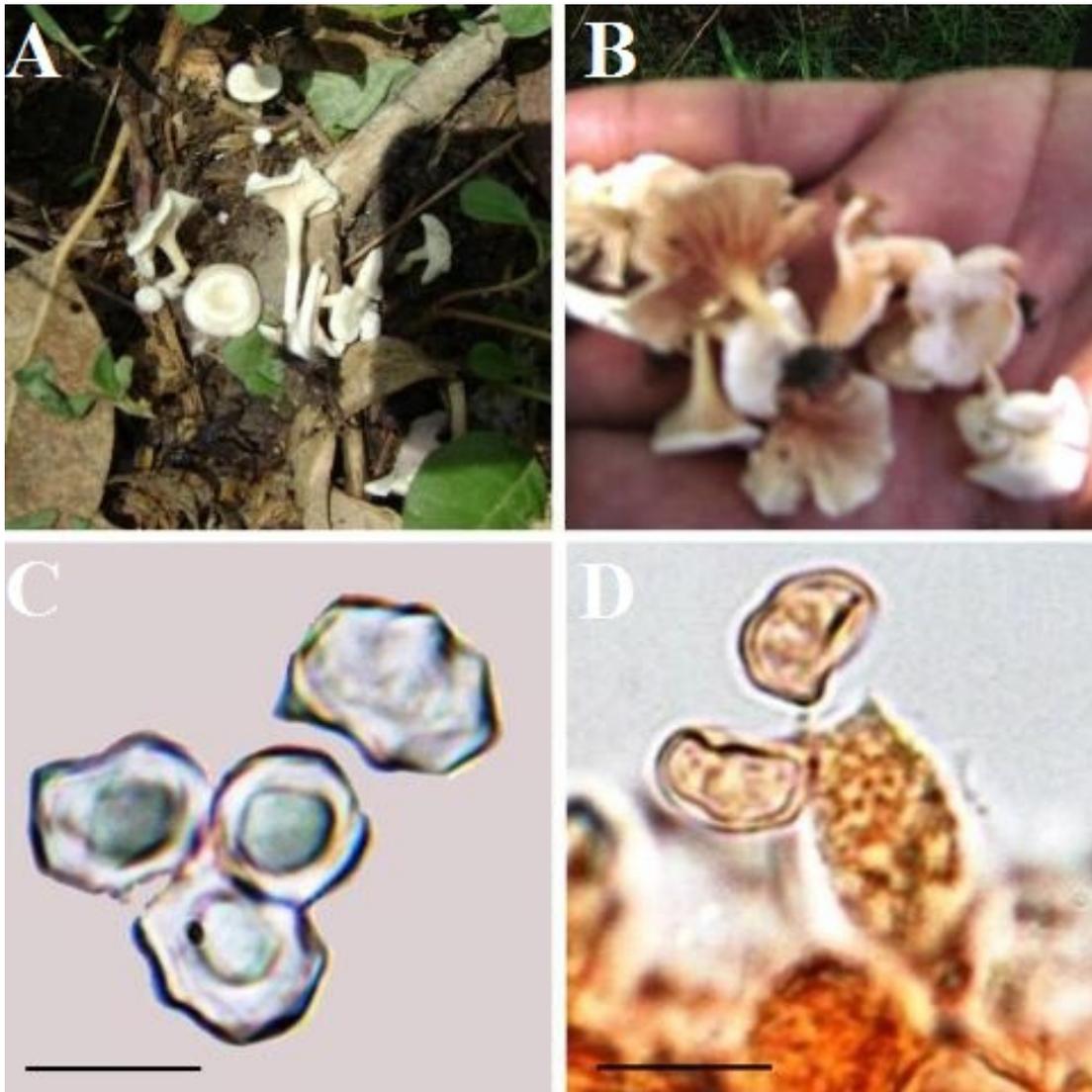
(Vrinda *et al.* 2000) and *R. albovelutina* (G. Stev.) Horak (Kaur *et al.* 2011). A collection of *Rhodocybe popinalis* (Fr.) Singer was made from a pile of dung and it was noted that the spores were much larger than usual for this species. We present it as a first record for India and a variety of *R. popinalis* based on macroscopic and microscopic examination

### MATERIALS AND METHODS

The material was collected from a heap of dung in Punjab. The standard method of collection, preservation and description of agarics was followed (Pegler 1977, Singer 1986, Atri *et al.* 2005). The color terminology used for morphological description is that of Kornerup & Wanscher (1978). The specimens were hot air dried and preserved in a cellophane paper bag. The microscopic characters were observed by cutting free hand sections after reviving a part of the dried specimens in 10% KOH solution. Line drawings of anatomical features were drawn with the aid of Camera Lucida under oil immersion lens. Basidium length excludes the length of the sterigmata. The spore shape quotient ( $Q = L/W$ ) was calculated considering the mean value of length divided by the width of 30 basidiospores. The specimen has been deposited in the Herbarium of Botany Department, Punjabi University, Patiala (Punjab), India under PUN.

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**Fig. 1 – *Rhodocybe popinalis* var. *macrosporus*. A Carpophores growing in natural habitat. B Carpophores showing decurrent lamellae. C Basidiospores. D Basidia bearing basidiospores. Bars C-D 10  $\mu$ m.**

#### TAXONOMY

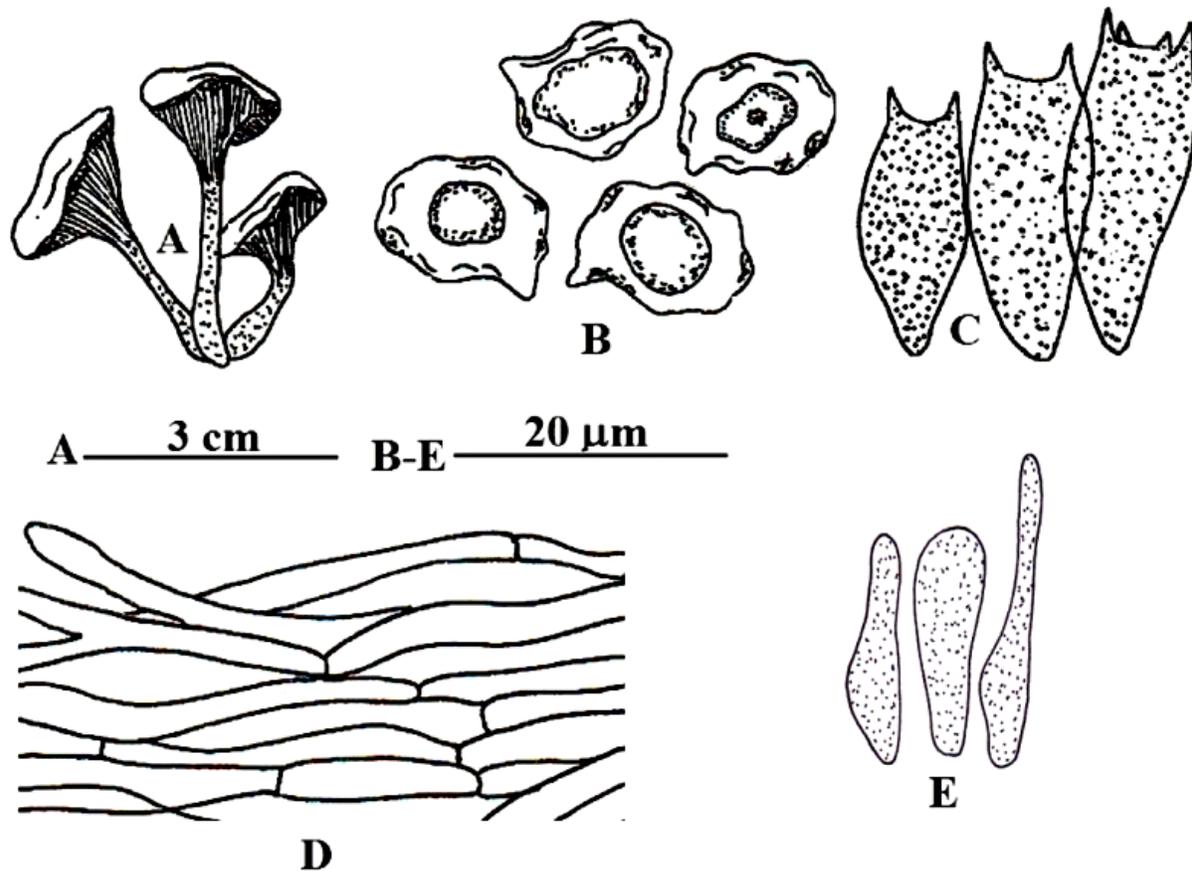
*Rhodocybe popinalis* var. *macrosporus* Amandeep Kaur, NS Atri & Munruchi Kaur, var. nov. Figs. 1–2

Mycobank No.: MB 805421

Etymology: referring to the distinctly larger basidiospores

Carpophores 1.4–4 cm in height. Pileus 0.7–1.6 cm broad, applanate, deeply depressed at the center; surface moist, white (10A<sub>1</sub>) to pinkish white (10A<sub>2</sub>), rarely with grayish brown (6D<sub>3</sub>) shades, smooth;

margin irregular, wavy to involute, splitting at maturity; cuticle not peeling; flesh thin, pale, unchanging; taste and odor not distinctive. Lamellae decurrent, unequal, 3–sized, subdistant to crowded, narrow, pinkish white (6C<sub>4</sub>) at maturity, forked, fragile; gill edges smooth. Stipe central to occasionally eccentric, 1.2–3.8 cm long, 0.1–0.15 cm broad, tubular, with subbulbous base, hollow, pruinose, pinkish white (10A<sub>2</sub>), changes to brownish yellow (5C<sub>7</sub>) on handling.



**Fig. 2 – *Rhodocybe popinalis* var. *macrosporus*. A Carpophores. B Basidiospores. C Basidia. D Pileus cuticle. E Caulocystidia.**

Basidiospores  $8.5\text{--}13.6 \times 6\text{--}8.5 \mu\text{m}$  ( $Q=1.52$ ), rugulose, rounded angular in face view, bumpy in side view, germ pore absent, hyaline in water and KOH, inamyloid, thin walled, wall evenly cyanophilic and not appearing mottled; apiculus  $1.7\text{--}3.4 \mu\text{m}$  long. Basidia  $15.3\text{--}22 \times 6.8\text{--}8.5 \mu\text{m}$ , clavate, 2- and 4- spored, thin walled, with granular content, lacking cyanophilic and siderophilic bodies; sterigmata  $1.7\text{--}3.4 \mu\text{m}$  long. Hymenial pseudocystidia absent. Gill edges fertile. Cheilocystidia and pleurocystidia absent. Pileus cuticle a cutis, context made up of interwoven, cylindrical, thin walled, hyaline,  $5\text{--}10 \mu\text{m}$  broad hyphae. Hymenophoral trama hyphae interwoven, thin walled, hyaline,  $3.5\text{--}8.5 \mu\text{m}$  broad. Stipe cuticle hyphal, with scattered caulocystidia; context hyphae longitudinally running, thin walled, granular,  $3.5\text{--}15.3 \mu\text{m}$  broad; caulocystidia  $22\text{--}32.3 \times 5\text{--}7 \mu\text{m}$ , cylindrical to lageniform, thin-walled, granular throughout. Clamp-connections absent.

Chemical color reaction – Pileus surface turns reddish brown ( $8E_6$ ) with 3% KOH and grayish brown ( $6D_3$ ) with 10% KOH.

**Material examined:** India, Punjab, Hoshiarpur, Asalpur, 295 m alt., growing in caespitose groups on a mixed cattle and horse dung heap, 14 July 2010, Amandeep Kaur, PUN 4804 (Holotype).

#### DISCUSSION

This collection belongs to *Rhodocybe* section *Decurrentes* (Konrad & Maublanc) Singer as it possesses small sized carpophores with decurrent gills, and pileus surface white to pinkish white with grayish brown shades, and lacks hymenial pseudocystidia and clamp connections (Baroni 1981). All its features conform with the details given for *R. popinalis* except for the distinctly larger spores measuring  $8.5\text{--}13.6 \times 6\text{--}8.5 \mu\text{m}$  in comparison to  $(4.5) 5\text{--}7 (8) \times (3.5) 4\text{--}5.5 (6) \mu\text{m}$  in size as described

by Baroni (1981). Thus, a new variety *Rhodocybe popinalis* var. *macrosporus* var. nov. is being proposed to accommodate the above examined variant.

*R. popinalis* is reported to be a widespread species growing in grassland and in coastal dunes during the months of June and November in Europe and America (Baroni 1981). The present collection has been found growing on mixed cattle and horse dung heap in mid July. The species is recorded for the first time from India.

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