

## Arare *Russula* (*Russulaceae*) from Kerala, India

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### ABSTRACT

*Russula innocua*, a rare species is collected from Kerala state during an ongoing study on the *Russulaceae* of Kerala. Full description, field photographs and illustrations of this species are provided.

**KEYWORDS:** Ectomycorrhiza, new record, *Russula*, taxonomy

### INTRODUCTION

Family *Russulaceae* is one of the largest ectomycorrhizal families and includes agaricoid, secotioid, pleurotoid and gasteroid forms (Buyck *et al.*, 2008; Morozova *et al.*, 2013). Members of this family generally form ectomycorrhizal association with diverse angiosperm and gymnosperm trees. The monophyletic genus *Russula* Pers. is the most dominant with over ca.1100 species known world over (Lebel *et al.*, 2013; Kirk, 2014). The genus is represented in India by about 157 taxa (Sharma *et al.*, 2018). During our ongoing studies on the *Russulaceae* of Kerala, we came across a rare species of *Russula*, so far not known from India, which is described and discussed here.

### MATERIALS AND METHODS

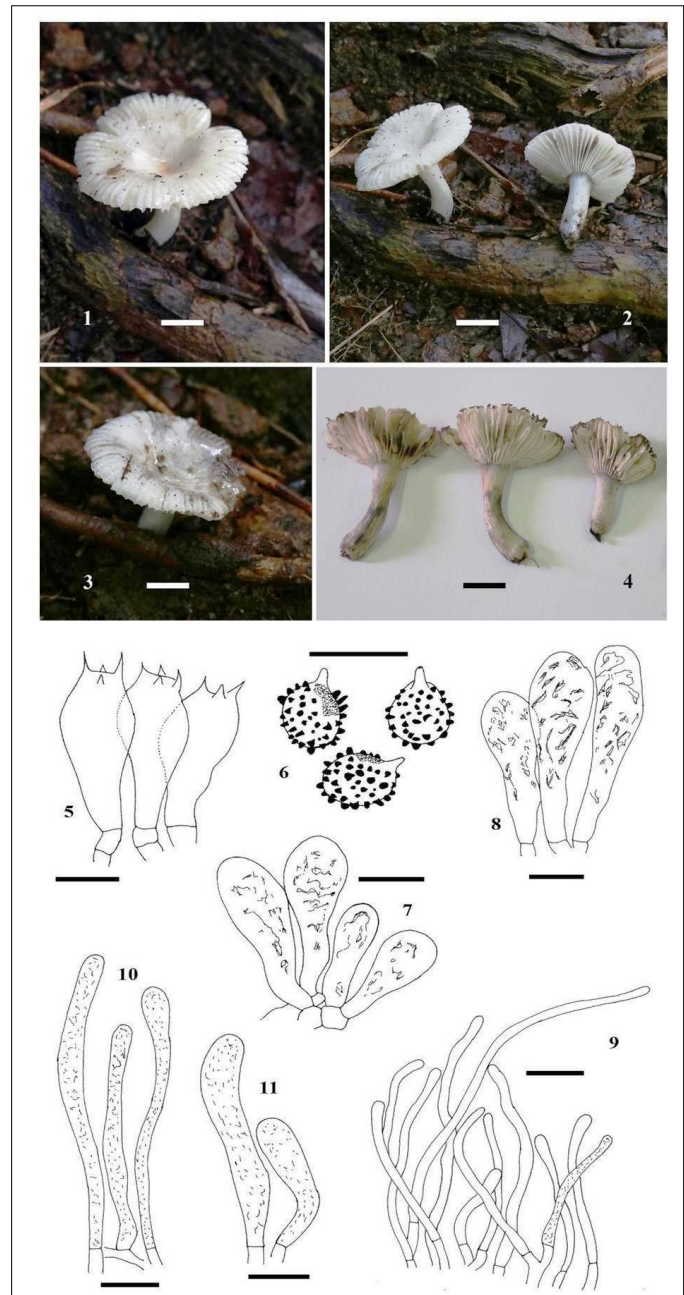
Gross morphological description is based exclusively on fresh materials collected from Kerala State, India. Colour code follows Kornerup and Wanscher (1978). Microscopic characters were studied on dried materials using hand cut sections of basidiomata revived in a 3% aqueous KOH, stained with 1% Congo red and examined under a Leica DME 1000 compound microscope. The mean quotient (Q) of spore length divided by spore width was calculated from measurements of 20 basidiospores. Line drawings were made with assistance of an attached drawing tube. All materials examined are deposited at the Mycological Herbarium of Tropical Botanic Garden and Research Institute, Trivandrum [TBGT (M)].

### TAXONOMIC DESCRIPTION

*Russula innocua* (Singer) Singer, *Bulletin de la Société Mycologique de France* **54**: 176(1938)

*Russula smaragdina* f. *innocua* Singer, *Annls mycol.* **33** (5-6): 304 (1935) **Figs. 1-4; 5-11**

Pileus 3-5 cm diam., convex with a central depression; surface white, yellowish white (2A2) at the centre, slimy when wet, otherwise dry, tuberculate-striate, cuticle removable (1/2-3/4), smooth and shiny; margin scalloped. Lamellae adnate, fragile, white, up to 4 mm wide, ventricose, subdistant, without lamellulae or rarely with very few lamellulae, not bifurcated, finely intervenose, turning greyish



**Figs. 1-4. *Russula innocua*:** 1-2. Habit *in situ*; 3-4. Grey basidiomata. **Figs. 5-11. *R. innocua*:** 5. Basidia; 6. Basidiospores; 7. Cheilocystidia; 8. Pleurocystidia; 9. Pileipellis hyphae; 10. Pileocystidia; 11. Caulocystidia. Scale bar = 10  $\mu$ m.

on handling; edge concolorous to the sides, entire. Stipe 3-3.5 × 0.6-1 cm, central, cylindric, tapering from a clavate base, fragile, spongy; surface white, smooth and glabrous, dry, greying. Context white, up to 2 mm thick, soft, greying on drying. Odour not characteristic. Taste mild to finally acrid. Whole basidiomata turns grey on drying (Figs. 3-4). Spore print, not obtained.

Basidiospores 7.5-9 (9.6) × 6.6-7.5 (8.7) μm, (Q=1-1.30 μm, Q'= 1.17 μm), subglobose to broadly ellipsoid composed of isolated, amyloid warts, up to 1.2 μm high, devoid of any connections; suprahilar plage amyloid. Basidia 28-34 × 10-12 μm, clavate, 4-spored. Sterigmata up to 4 μm in height. Lamella-edges heteromorphous; cheilocystidia and pleurocystidia similar, macrocystidioid. Cheilocystidia 22-40 × 6.5-10 μm, broadly clavate, thin-walled, filled with granular refractive contents, black in SV. Pleurocystidia similar but larger, 36-58 × 9.5-12 μm. Pileal trama heteromorphous with sphaerocytes and hyphae; sphaerocytes 24-54 × 21-48 μm, thin-walled, hyaline, connecting hyphae thin-walled, hyaline, septate, branched, up to 6 μm wide. Subhymenium pseudoparenchymatous. Hymenophoral trama heteromorphous, composed of sphaerocytes, 18-63 × 16-60 μm; connecting hyphae thin-walled, hyaline, up to 4.8 μm. Pileipellis a gelatinized epicutis of erect, obtuse-ended hairs, 19.2-72 × 2.4-3 μm, some slender and filiform, some with moderately thick, refractive walls, interspersed with numerous narrowly clavate, macrocystidioid pileocystidia, 39-78 × 3-6 μm, blackening in SV, often projecting out. Stipitipellis a repent epicutis of parallelly arranged hyphae, disrupted by cylindric to cylindro-clavate macrocystidioid caulocystidia with refractive granular contents, blackening in SV, 24-44 × 4.8-6 μm. Oleiferous hyphae present. Clamp connections absent in all parts of the tissues.

**Macrochemical reactions:** Sulphovanillin (SV) on pileus, stipe surfaces and gills-pale bluish and then turn brown; FeSO<sub>4</sub> on pileus and stipe surfaces-pink.

**Habitat and Phenology:** Solitary on soil associated with *Vateria indica*. April, September.

**Specimens Examined:** INDIA, Kerala State, Thiruvananthapuram dist., JNTBGRI campus: 02 Apr. 2008, TBGT (M) 10817; 6 Sep. 2019, TBGT (M) 17958.

## DISCUSSION

*Russula innocua* is identified by the small size, colour of the smooth and shiny cap, whitish lamellae, greying of the fruit body due to dehumidification, large spinous basidiospores with isolated, amyloid warts, presence of slightly thick-walled hairs in the epicutis and presence of abundant cystidia which are SV positive. According to Sarnari (1998), it is an extremely rare species. We could collect it only twice from

Kerala. Except for the slightly smaller basidiospores, the Kerala collection matches exactly with the description of Sarnari (1998), recorded from Italy.

Earlier, this small *Russula* species carried the name *smaragdina* incorrectly (Sarnari 1998). Quélet attributed emerald green to his *R. smaragdina* Quélet ('verde smeraldo'). Romagnesi (1967) redescribed a mushroom from France with this name, but according to Sarnari (1998), this character was not at all appropriate to the mushroom redescribed by Romagnesi (1967).

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