

## New or interesting *Russula* from Sikkim Himalaya (India)

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**Abstract** – *Russula khanchanjungae* and *R. tsokae* are described as new to science from subtropical to temperate forests of Sikkim Himalaya. *R. griseocarnosa*, recently described from China, is reported for the first time from India where it appears to be equally associated with *Lithocarpus* (Fagaceae). Macro- and micromorphological characters of all taxa are illustrated and their systematic placement and relations to other species are discussed.

**Russulaceae / taxonomy / systematics / India / Lithocarpus / Russula subg. Ingratula / Russula subg. Compacta**

### INTRODUCTION

The Khanchanjunga Biosphere Reserve (KBR) is one of the 15 protected Biosphere Reserves of the Indian subcontinent and is situated in the West and North district of the small state Sikkim (Fig. 1), one of the Hot Spots of biodiversity in India. It stretches between N27°15' to N27°57' and E88°02' to E88°40' and has an area of 2620 km<sup>2</sup>. With vegetation types ranging from subtropical to temperate forests, alpine forests and meadows, KBR ranks among the richest areas for plant diversity in the Sikkim Himalaya. *Russula* is a common ectomycorrhizal genus in the Himalayan forests (Saini & Atri 1981, 1982; Saini *et al.* 1988, 1989; Atri & Saini 1990a, 1990b; Atri *et al.* 1991, 1992, 1993, 1997; Adhikari 1999) and many new species have already been described from these areas (Rawla & Sarwal 1983; Adhikari & Durrieu 1999; Das *et al.* 2005, 2006a, 2006b).

In this contribution, the authors describe some of the new or interesting taxa that were collected in three temperate and one subtropical locality during 2008-2010: A part from the collections by Das, two of us (KD & KVP) collected a number of wild mushrooms including some *Russula* species while surveying parts of the KBR during August-September 2009. As far as visited temperate localities are concerned, the first site is a mixed broad-leaved forest situated between Sachen and Prekchu dominated mainly by *Acer campbellii*, *Alnus nepalensis*, *Betula utilis*, *Lithocarpus pachyphylla*, *Castanopsis hystrix*, *Lyonia ovalifolia*, *Pieris formosa*, *Magnolia campbellii* and *Quercus lamellosa*. The second site is



Fig. 1. Map of the state Sikkim showing Khanchanjunga Biosphere Reserve.

located near Tsoka and is a temperate forest dominated mainly by conifers such as *Tsuga dumosa*, *Abies densa* and *A. spectabilis* in association with species of *Rhododendron* and *Betula*. The third site in the temperate belt concerns a broad-leaved forest in Chittrey dominated by *Rhododendron* species, *Lithocarpus pachyphylla*, *Corylus ferox* and *Castanopsis* species.

Finally, *Russulas* were also collected outside the KBR from Chorten which is a subtropical broad-leaved forested area dominated by *Schima wallichii*, *Alnus nepalensis*, *Betula alnoides*, *Castanopsis tribuloides*, *Macaranga denticulata*, *Engelhardia spicata* and various *Quercus* species.

## MATERIALS AND METHODS

Macroscopical characters were noted in the field from the fresh samples, whereas microscopical characters were studied later on dry materials mounted in a mixture of 5% KOH, 1% Phloxin, Congo red and 30% Glycerol. Colour codes and terms are after Kornerup & Wancher (1978, 1981) and the Munsell Soil Colour Charts (2000). Spore drawings for *R. khanjanchungae* sp. nov. were made with a Zeiss Axioscop 2 microscope and drawing tube at 6000x magnification. Line drawings of all other microscopic structures were made at an original magnification of 1000x. Basidium length excludes the length of sterigmata. Basidiospore dimensions are based on measurements of 20 basidiospores and indicate also the length-width ratio ( $Q = L/W$ ). Scanning Electron Microscope (SEM) illustrations of spores were obtained from dry spores from spore print that were directly mounted on a double-sided adhesive tape pasted on a metallic specimen-stub and then scanned without gold coating at different magnifications in low vacuum mode to observe patterns of spore-ornamentation. SEM work was carried out with a FEI's Quanta 200 model installed at the Central National Herbarium, Howrah, India. Herbarium names follow Holmgren *et al.* (1990).

## TAXONOMY

***Russula tsokae* K. Das, Van de Putte & Buyck sp. nov.**

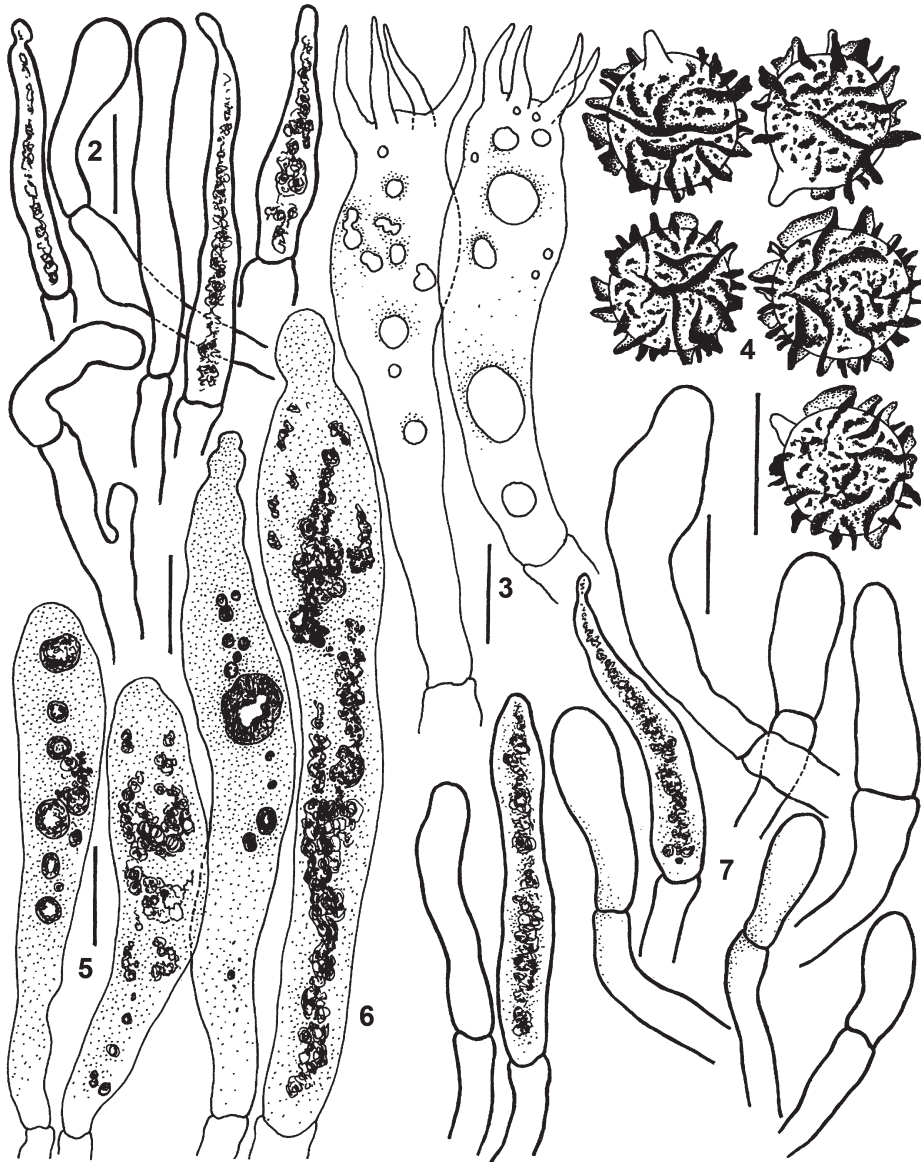
**Figs 2-7, 13-15**

*Mycobank*: 519167

*Etymology*: named after Tsoka, the name to its type locality.

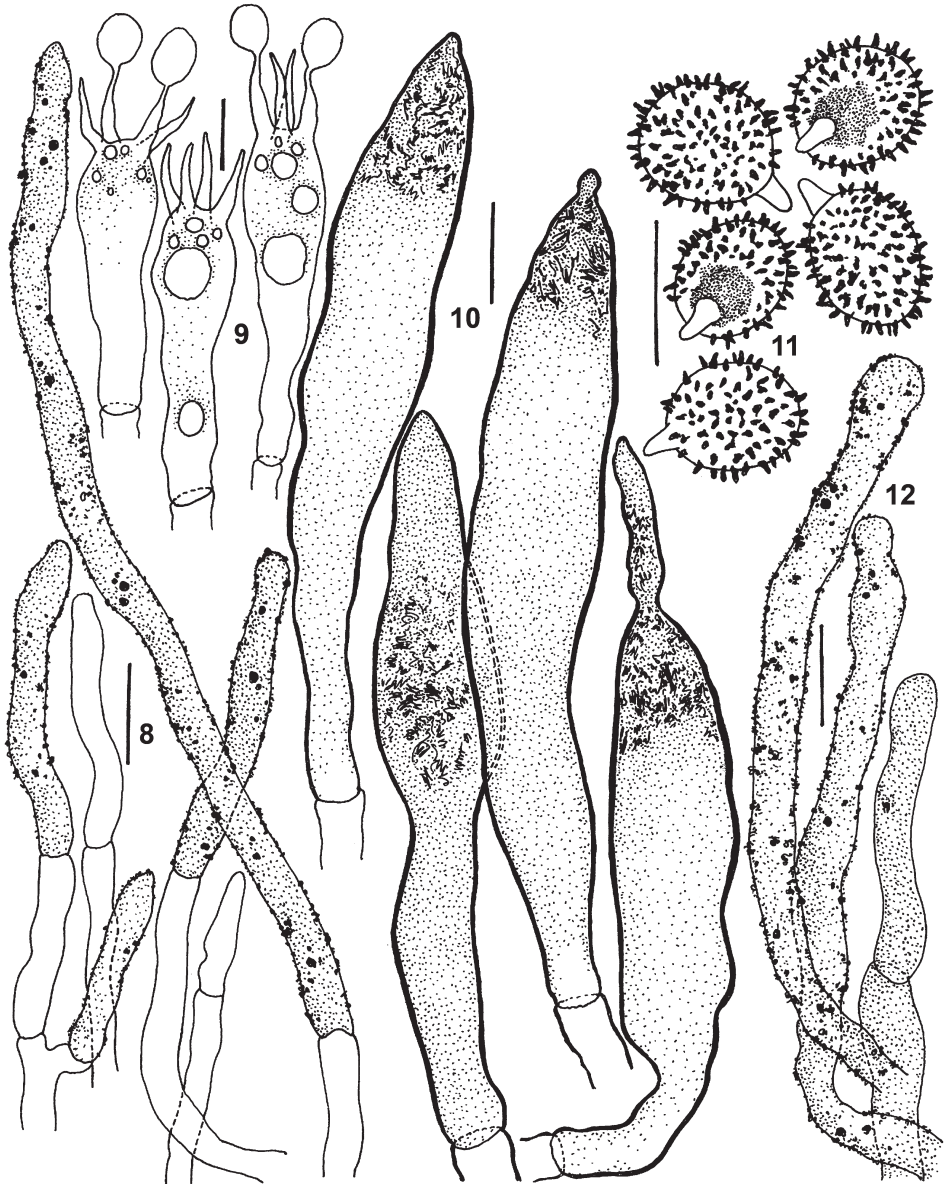
*Pileus* 80-130 mm diam., convexus ad planoconvexus, dein depresso, laevis, glutinosus, rufobrunneus, marginem versus tuberculato-striatus, centro pallidior ac luteoalbus. *Lamellae* adnexae, subdistantes, cremeae interdum maculis brunneis tinctae. *Stipes* 100-150 × 18-27 mm, cylindricus-obclavatus, luteoaurantiacus, solidus dein lacunatus. *Carnus* immutabilis, mitis. *Basidiosporae* in cumulo cremeae, 8.8-9.8-10.8 (11.8) × 8.4-9.2-9.9 (11) μm, globosae ad subglobosae, alatae, cristis usque ad 2 μm altis ornatae. *Pleuromacrocytidia* 70-110 × 11-14 μm, fusiformia. *Cheilocytidia* 50-65 × 10-11 μm, subclavata. *Pileipellis* ixocutis, hypharum extremitates septatae, 5.5 μm latae, cellula terminalis cylindrica, clavata et plus minusve crassotunicata, pileocyttidia 32-53 × 3-5 μm, fusiformia ad cylindricas, saepe capitata et plus minusve crassotunicata.

*Typus*: INDIA-SIKKIM - Tsoka, alt. 2897 m, N27°25'55.9" E88°11'06.5", under *Tsuga dumosa*, temperate mixed forest, 3 September 2009, Das & Van de Putte, KD-KVP 1283 (*holotypus* BSHC, *isotypi* PC & GENT)



Figs 2-7. *Russula tsokae* sp. nov. 2. Hyphal ends and pileocystidia in pileipellis. 3. Basidia with long sterigmata. 4. Basidiospores. 5. Cheilocystidia. 6. Pleuromacrocytidia. 7. Hyphal ends and caulocystidia in stipitipellis. Scale bars = 10 µm. (KD-KVP 1283, drawings by K. Das)

**Pileus** 80-130 mm diam., conic then convex to planoconvex with slightly depressed centre. Pileipellis smooth, glutinous, tuberculately striate, sulcate, towards margin; 8C4 (Dull red) to 8D4 (Reddish brown) or 8D6 (Reddish brown), gradually paler towards margin; centre paler and in combination with 4A2 (Yellowish white) to 4A4 (Light yellow) or 5A5 (Light orange). **Lamellae**



Figs 8-12. *Russula griseocarnosa*. **8.** Hyphae and pileocystidia in pileipellis. **9.** Basidia with long sterigmata. **10.** Pleuromacrocystidia. **11.** Basidiospores. **12.** Caulocystidia and hyphae in stipitipellis. Scale bars = 10  $\mu$ m. (KD-KVP 1220, drawings by K. Das)

adnexed, subdistant (5 to 6 per 10 mm at margin), forked from the juncture of stipe, 3A2 (Yellowish white) to 4A2 (Yellowish white), often becoming spotted with or partially turning to 9C8 (Brownish red), 9D8 (Reddish brown) or 10D8 (Strawberry) after maturity; margin slightly cracked 7F7 to 7F8 (Brown). **Stipe**



Figs 13-18. *Russula tsokae* sp. nov. **13.** Fresh basidiomata (KD-KVP 1295). **14-15.** SEM micrographs of basidiospores. *R. griseocarnosa*. **16.** Fresh basidiomata (KD-KVP 1303). **17-18.** SEM micrographs of basidiospores (photos by K. Das).

100-150 × 18-27 mm, cylindrical to obclavate with narrow base, 5A5 (Light orange) to 5A7 (Orange), 4A8 (Yellowish orange) towards apex, solid when young, multichambered at maturity. **Context** 3A2 (Yellowish white) to 4A2 (Yellowish white), unchanging after bruising, turning 9A2 (Reddish white) to 10A2 (Reddish white) with FeSO<sub>4</sub>, quickly 25C8 (Bluish green) with Guaiac and 10A5-6 (Red) with KOH. **Taste** mild. **Spore print** cream (1A2, Yellowish white).

**Basidiospores** 8.8-9.8-10.8 (11.8) × 8.4-9.2-9.9 (11) µm (Q = 1.04-1.06-1.11), globose to subglobose; ornamentation amyloid, up to 2 µm high, subreticulate, composed mostly of high ridges and plenty of low warts and ridges; some high ridges are acute, some connected with each other by lower lines forming an irregular, interrupted reticulum; suprahilar plage indistinct, non amyloid. **Basidia**

50-66 × 12-14 µm, clavate to subclavate, 4-spored; sterigmata 8-11 µm long. **Macro-cystidia** 70-110 × 11-14 µm, abundant, cylindrical, fusiform, often with capitate apex projecting up to 44 µm beyond basidioles, content very distinct, also abundant but smaller near the gill edge, 50-65 × 10-11 µm, mostly subclavate. **Lamellar trama** composed of nested sphaerocytes surrounded by connective hyphae. **Pileipellis** thick, up to 500 µm, an ixocutis, composed of branched extremities of septate hyphae and pileocystidia; pileocystidia 32-53 × 3-5 µm, fusiform to cylindrical, often capitate thick-walled; hyphal ends up to 5.5 µm broad, cylindrical to clavate, thick-walled, wall up to 0.7 µm thick. **Stipitipellis** up to 60 µm thick, composed of cylindrical, subclavate to clavate hyphal ends up to 8 µm broad and caulocystidia measuring 35-50 × 4-5.5 µm, cylindrical to fusiform with capitate to acute apex, with dense contents. Stipe trama composed of nested sphaerocytes (40-50 µm diam.) surrounded by connective hyphae. **Clamp connections** absent in all tissues.

*Specimens examined*: INDIA-SIKKIM - Tsoka, alt. 2897 m, N27°25'55.9" E88°11'06.5", under *Tsuga dumosa*, temperate mixed forest, 3 September 2009, *Das & Van de Putte*, KD-KVP 1283 (*holotype* BSHC, *isotype* PC & GENT) - *ibid.*, 4 September 2009, *Das & Van de Putte*, KD-KVP 1295 (BSHC) - Chorten, alt. 1557 m, N27°18'48.2" E88°36'20.2", under *Schima wallichii*, subtropical forest, 22 May 2010, *Das*, KD 13072 (BSHC).

*Commentary*: The combination of macro- and micromorphological characters clearly place *Russula tsokae* in the vicinity of the *R. laurocerasi*-group (subgenus *Ingratula*). Our species can easily be recognised by the combination of the reddish brown tuberculately striate pileus, yellowish orange stipe, cream spore print and subreticulate basidiospores with very high ridges (up to 2 µm high).

*R. tsokae* somehow resembles *R. senecis* Imai, a species originally described from Japan, but frequently occurring in Sikkim Himalaya. The senior author found it in subtropical deciduous forest at 1162 m alt under *Quercus* sp. (KD-0014, BSHC); and also under *Lithocarpus* sp. in temperate deciduous forest at 2630 m alt. (*K. Das*, KD-0073, BSHC). Both species possess a glutinous, tuberculately-striate pileus, a yellowish chambered stipe and basidiospores with high ridges (up to 2.2 µm high) and warts. However, the latter species is easily distinguished by its cream-coloured lamellae with brown edges and pale ochraceous brown-dotted stipe (Hongo 1973).

*R. periglypta* Berk. & Br. is another member of subgenus *Ingratula* that was originally described from Sri Lanka (Berkeley & Broome 1871) and recently reported from Kerala State (Manimohan & Deepna Latha in press). The Kerala collections possess an equally glutinous cap with tuberculate-striate margin and very similar spore features (unlike the type collection), but differ from our taxon by their white stipe and entirely pale yellowish cap.

*R. fuscogrisea* Petch (1922), another likely member of subgenus *Ingratula*, was described from Sri Lanka and is probably close to *R. pectinata* group because of its entirely different, densely warted spores (Pegler 1986).

In our experience, the yellow stipe surface is a reliable and important feature for the characterization of our taxon. A yellowish lower portion of the stipe is known from some other exotic species in the subgenus, viz. *R. mutabilis*, a very acid species with reddening context from eastern North America, and also from the European and American species in subsection *Velatae*, the latter having considerably smaller basidiospores with low ornamentations of isolated warts and pigment-encrusted velar hyphal endings near the pileus margin (Sarnari 1998, Kränzlin 2005).

*Russula griseocarnosa* X. H. Wang, Zhu L. Yang & Knudsen,  
*Nova Hedwigia* 88(1-2): 274. 2009

**Figs 8-12, 16-18**

**Pileus** 68-110 mm diam., convex when young, gradually plano-convex to plane at maturity, slimy and viscid when moist, in immature basidiomata, with colors ranging in young fruit bodies from 1A4 (Pastel yellow) to 1A7 (Greenish yellow) or 2A4 (Light yellow), 3A4 (Pastel yellow) to 3A5 (Light yellow) or 3B4 (Straw yellow), often 7B8 (Reddish orange) to 7C8 (Copper red) or 7D5 (Light brown) to 7D8 (Burnt sienna) in irregular patches or in combination; in mature basidiomata 7D4 (Light brown) to 7D5 (Light brown) turning slowly to 7C5 (Brownish orange) or 6C4 (Brownish orange) to 6C6 (Burnt umber) or 6E8 (Brown) or darker up to 7E4 (Brown) to 7E5 (Somalis) or 10C8 (Brownish red) or lighter 10B3, often with patches of 3A3 (Pale yellow) to 3A4 (Pastel yellow), 3A5 (Light yellow) or 4A8 (Saffron yellow) to 4C7 (Brazen yellow); the center sometimes darker with a subtle radial cracking, 8D8 (English red) to 8E8 (Persian red) or 9F5 (Reddish brown) to 9F8 (photo brown). **Lamellae** adnexed, subdistant (7/cm at margin), 1A3 (Pale yellow) to 1A4 (Pastel yellow), turning black at maturity or upon bruising; margin slightly crenate. **Stipe** 74-103 × 17-26 mm, subcylindrical, white (1A1) with a tinge of 11A2 (Reddish white) to 11A3 (Rose) or 12A4 (Flamingo), turning black at maturity or upon bruising. **Taste** mild. **Smell** none. **Context** 1A1 (white) turning slowly 10C7 (Brownish red) and black finally (after 25 minutes); turning 30D4 to 30E4 (Dull green) with FeSO<sub>4</sub>; 25A7 to 25A8 (Bluish green) with Gaic; 2A2 (Pale) to 2A3 (Yellowish pale) with KOH. **Spore print** 1A1 (white).

**Basidiospores** (7.4) 8-8.5-10 × (6.2) 7-7.3-8 μm (Q = 1.11-1.20-1.28), subglobose to broadly ellipsoid; ornamentation amyloid, up to 1.6(2) μm high, composed mostly of isolated cylindrical to conical, straight or curved warts, few connected with each other; suprahilar plate distinct and amyloid. **Basidia** 38-50 × 10-13 μm, clavate to subclavate, 4-spored; sterigmata long, 7.5-12.5 μm. **Macro-cystidia** 78-109(130) × 11-15(20) μm, abundant, fusiform, fusoid-ventricose, often with acute, capitate or appendiculate apex (appendage up to 18 μm long), projecting up to 50 μm beyond basidioles, near the gill edge often narrower and less fusiform, 63-78 × 10-12 μm, but more frequently capitate and resembling the terminal elements of the pileus surface. **Subhymenium** layer up to 35 μm thick, pseudo-parenchymatous. **Lamellar trama** composed of nested sphaerocytes surrounded by connective hyphae. **Pileipellis** up to 125 μm thick, a loose trichoderm originating from a dense subpellis of often irregularly inflated, strongly branched, larger hyphae; hyphal extremities of the suprapellis composed of 2-3, mostly subcylindrical, slender cells, measuring 3-6.5 μm broad, sometimes slightly or somewhat irregularly inflated close to the tip, mostly filled with a dense oily content (probably from pigment) and pale brownish to refringent in KOH, more or less thin-walled but with zebroid (close to the base) to granular (near the tip) incrustations. **Stipitipellis** up to 90 μm thick, a loose trichoderm, with similar hyphal endings as in cap, up to 7 μm broad, septate, with or without incrustations. Apex of the terminal cell rounded to capitate. **Stipe trama** composed of nested sphaerocytes surrounded by connective hyphae. **Clamp connections** absent in all tissues.

*Specimens examined*: INDIA-SIKKIM - between Sachen and Prekchu, alt. 2200 m, under *Lithocarpus pachyphylla* in temperate mixed broad-leaved forest, 28 August 2009, Das & Van de Putte, KD-KVP 1220 (BSHC) - ibid., 7 September 2009, Das & Van de Putte, KD-KVP 1303 (BSHC) - Chittrey, alt. 2602 m, N27°16'10.2" E88°03'08.1", under *Lithocarpus pachyphylla* in temperate broad-leaved forest, 13 September 2008, Das, KD 0082 (BSHC).



*Commentary:* Because of its general colors and aspect of the pileipellis, this species is reminiscent of *R. olivacea* from which it differs nevertheless strongly by the blackening context, the white spore print (notwithstanding the first cream and later yellowish color of the lamellae) and the green reaction of the context to  $\text{FeSO}_4$  (which is probably due to the graying context).

Notwithstanding the geographical distance from the type locality, there is little doubt that we are dealing with the same taxon, which can be seen as an example of the Chinese influences that are also present in the Himalayan flora. Morphological characters agree very well, but it is possible that a local variant or subspecies may be implicated as suggested by the slightly different colors of the pileus, the apparently somewhat lower spore ornamentation and the more temperate climate of our collecting sites. However, an answer to this question requires also a molecular approach and should preferably implicate material from northern Thailand where this species seems to be present as well (Wang *et al.* 2009). In China, *R. griseocarnosa* is associated with *Lithocarpus* (and *Castanopsis*), which is equally the case for our collections.

***Russula khanchanjungae* Van de Putte, K. Das & Buyck sp. nov. Figs 19-23, 24-26**

*Mycobank:* 519320

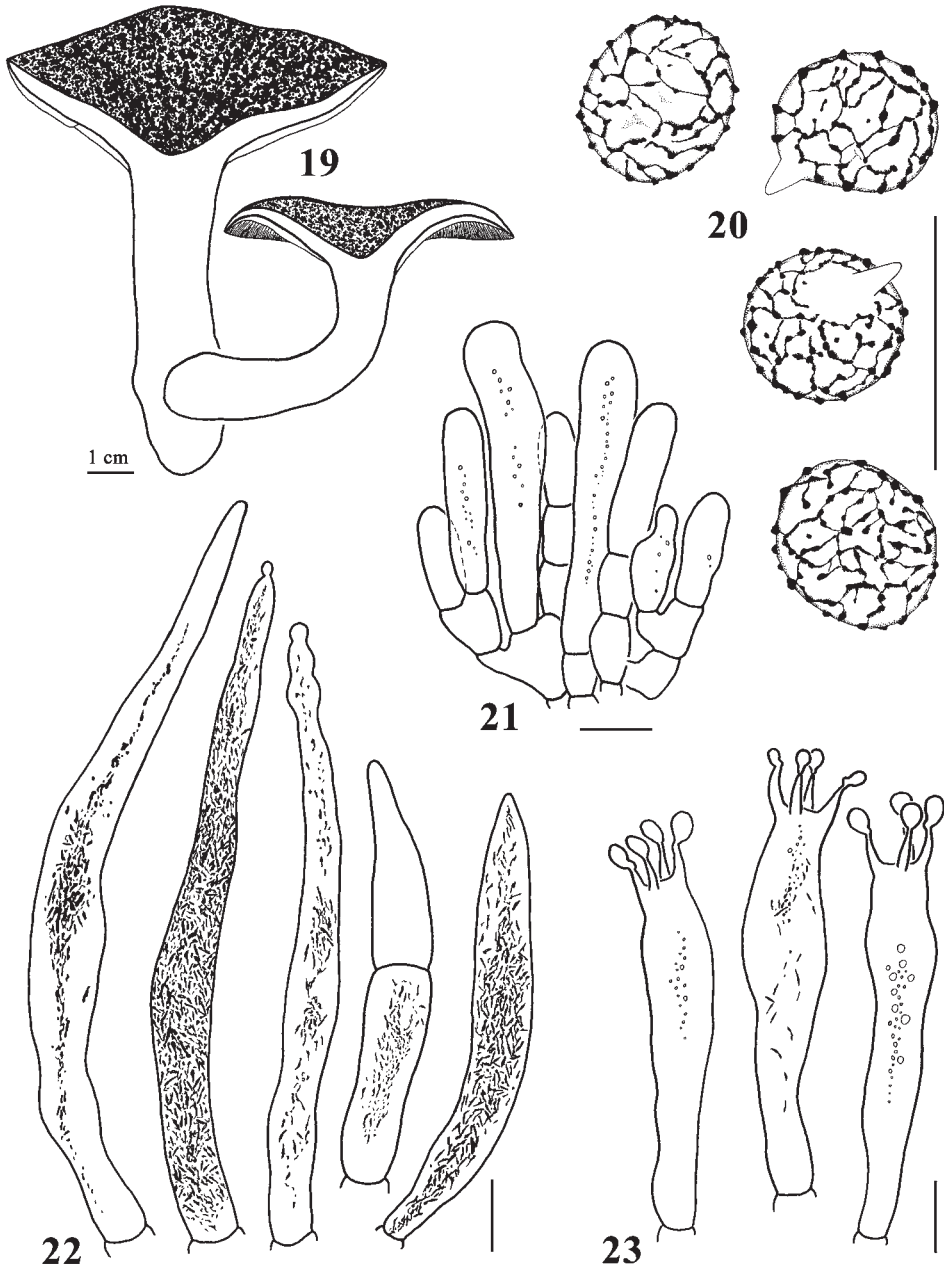
*Etymology:* refers to the name of the Biosphere Reserve where it has been collected.

*A Russula eccentrica praesertim differt lamellis densissimis valde angustioribusque tactu pallide brunnescentibus et pilei superficie major areolato-rimosa.*

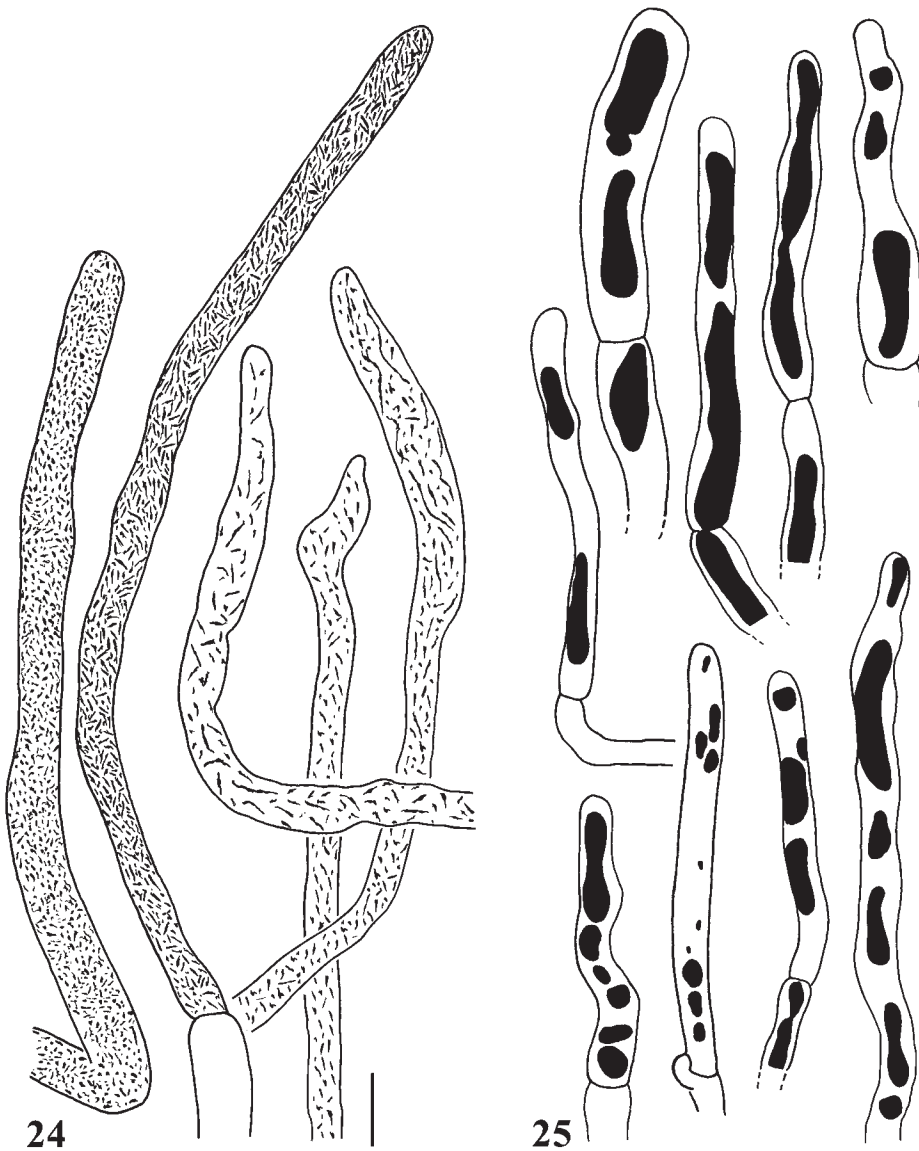
*Typus:* INDIA-SIKKIM - Khanchanjunga Biosphere Reserve, path from Tsoka to Djongri, alt. 3000 m, N27°25'55.9" E88°11'06.5", in mixed forest with *Abies densa*, *Betula utilis*, *Rhododendron barbatum*, *Rhododendron* spp., 2 September 2009, Verbeken, Das & Van de Putte, AV-KD-KVP 09-116 (*holotypus* GENT, *isotypus* BSHC).

**Basidiocarps** medium-sized. **Pileus** 40-80 mm diameter, convex when young, infundibuliform when mature, then with straight, inflexed or reflexed margin, brown with greyish-yellowish (5D4-5D5, 10YR5/4) tinge, surface sticky, areolate-rimose. **Lamellae** narrowly adnate to subdecurrent, off-white to pale coffee-and-milk, very close ( $L+1/\text{cm} = 25-30$ , total number of  $L = 75-110$ ) and narrow (1.5-2 mm), brittle, intermixed with numerous lamellulae of different lengths, with few to numerous furcations, very slowly (30-60 minutes) discoloring brown (7D5-7D4) where damaged; edge even, concolorous. **Stipe** 60-65 × 8-20 mm, centrally attached, subcylindrical or tapering towards the top, solid, sticky, areolate-rimose grey with slightly brownish tinge, but often whitish near the base. **Context** very firm, off-white, faintly to clearly but slowly discoloring brown when cut. **Smell** strong and chlorine like. **Taste** unpleasant but rather mild, immediately turning greenish-blue with gaiac (24D6 with slightly more greenish tinge), showing a faint, pale brown (10YR8/6) reaction after 2-3 seconds with  $\text{FeSO}_4$ , insensitive to a 10% potassium solution.

**Basidiospores** 7.3-8.4-9.4 × 6.3-7.1-7.8  $\mu\text{m}$ , subglobose to broadly ellipsoid ( $Q=1.08-1.18-1.31$ ); ornamented with low, small and obtuse warts that are connected by fine lines into an incomplete but dens reticulum; plage not amyloid. **Basidia** 49-61 × 8-12  $\mu\text{m}$ , 4-spored, clavate-pedicellate; basidiola subcylindrical to subclavate. **Macrocyttidia** 37-112 × 8-10  $\mu\text{m}$ , dispersed even less abundant and occasionally septate on lamella edge, mostly very slender and (sub)fusiform to subcylindrical with an obtuse, mucronate to capitate tip, near the gill edge some also shorter and more inflated; contents abundant, needle-like to granular and



Figs 19-23. *Russula khanchanjungae* sp. nov. **19.** Fresh basidiomata (AV-KD-KVP 09-106, *holotype*). **20.** Basidiospores (*holotype*). **21.** Basidiola (AV-KD-KVP 09-109). **22.** Hymenial macrocystidia (AV-KD-KVP 09-109). **23.** Basidia with young spores (AV-KD-KVP 09-109). Scale bar = 10  $\mu$ m unless otherwise indicated. (drawings by K. Van de Putte)



Figs 24-25. *Russula khanchanjungae* sp. nov. **24.** Pileocystidia. **25.** Hyphal ends with vacuolar contents in pileipellis. Scale bar = 10  $\mu\text{m}$ . (all from holotype, drawings by K. Van de Putte)

hardly reacting to sulphovanillin. **Marginal cells** abundant, smaller than basidia, usually subfusiform or even more irregular and resembling the hyphal endings of the cap surface, many filled with brown vacuolar pigment. **Lamellar trama** composed of sphaerocytes. **Pileipellis** 120-150  $\mu\text{m}$  thick, composed of pericline to slightly ascending, branched and septate hyphal terminations and pileocystidia; hyphal endings 3-10  $\mu\text{m}$  broad, cylindrical, subcylindrical to more or less sinuate



Figs 26-27. **26.** *Russula khanchanjungae* sp. nov. Ageing basidiomata showing the areolata aspect of the pileus and stipe as well as the lamellae developing a slightly pinkish hue (holotype, picture by K. Das), **27.** Young basidiomata showing the brownish discoloration when injured (AV-KD-KVP 09-106, picture by K. Van de Putte)

or somewhat inflated, apex obtuse, with oil-like brown-colored contents, similar near cap margin and centre; pileocystidia dispersed in between the hyphal endings, some very long and continuing in underlying tissues of the pileal trama, similar in diam. to the hyphal endings, cylindrical, subcylindrical to subclavate or slightly tapering upwards, obtuse at the tip, filled with needle-like to granular contents that hardly react to sulphovanillin. **Pilear trama** composed of sphaerocytes, hyphae and dispersed, cylindrical, cystidioid elements with refringent, needle-like contents. **Clamp connections** absent.

*Specimens examined*: INDIA-SIKKIM - Khanchanjunga Biosphere Reserve, path from Tsoka to Djongri, alt. 3000 m, N27°25'55.9" E88°11'06.5", mixed forest with *Abies densa*, *Betula utilis*, *Rhododendron barbatum*, *Rhododendron* spp., 2 September 2009, Verbeken, Das & Van de Putte, AV-KD-KVP 09-106 (GENT) – *ibid.*, 3 September 2009, Verbeken, Das & Van de Putte, AV-KD-KVP 09-109 (GENT) – *ibid.*, 3 September 2009, Verbeken, Das & Van de Putte, AV-KD-KVP 09-110 (GENT) – *ibid.*, 4 September 2009, Verbeken, Das & Van de Putte, AV-KD-KVP 09-116 (*holotype* GENT, *isotype* BSHC).

*Commentary*: This *Russula* with crowded polydymous gills clearly belongs in subgenus *Compacta* but is characterized by the absence of the typical pinkish red, then grayish black discoloration of the context when injured and also by the peculiar, chlorine-like odor. It is otherwise strongly reminiscent in the field of the tropical African *R. subfistulosa* Buyck because of the relatively long stipe, firm context, very crowded and narrow gills and the areolate-rimose aspect of both pileus and stipe surface. The latter species, however, has a very acrid taste, develops pinkish tints when cut, has no odor and is also very different microscopically (for a detailed description, see Buyck 1993).

Among the possibly close and already described *Russulas* in subgenus *Compacta* that might occur in this part of the world, we can cite *R. subnigricans* Hongo, *R. indica* Sathe & Daniel and *R. purpureonigra* Petch. The two latter species can be discarded immediately because of their strongly blackening context. *R. subnigricans* on the other hand also lacks the strong discoloration of the context, but has much more spaced and much less narrow gills, it is also different microscopically and might belong to a group of species that is close to the North American *R. eccentrica* Peck (see Buyck & Halling 2004, Buyck *et al.* 2005). The latter group of species are much more variable in general aspect compared to those that belong in subsection *Fistulosinae*, and typically exhibit only a very faint reddening of the context upon injury or not at all. *R. eccentrica* and most of its related species equally possess disagreeable odors but exhibit with age a remarkable color change of the gills which become distinctly brownish pink to pinkish red at maturity, even up to the point that are reminiscent of *Entoloma* or even *Cortinarius*. Although *R. khanchanjungae* lacks the overall color change of its gills, it does develop a slow pale pinkish brown discoloration upon injury.

The widely distributed *R. compacta* has also several characters in common with our new species: it has a strong, disagreeable smell, its equally crowded gills turn brownish upon injury and its pileus may become more or less areolate in certain fruiting conditions. However, the pileipellis of *R. compacta* is quite different under the microscope.

In conclusion, we prefer to place our new species close to *R. eccentrica*, especially since both species share very similar microscopical features, e.g. of spores, marginal cells, pileocystidia and also the often abruptly ending basal part of the hymenial cystidia resulting in a relatively broad, almost truncated base as opposed to the more typical, long downward tapering base observed for cystidia in most other species.

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