



Rough spored agarics from India: New Records

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(Received on: 21 March, 2014; accepted on: 12 April, 2014)

ABSTRACT

During the fungal forays undertaken to various localities of North Kashmir three rough spored taxa were identified as first time reports from India viz. *Hebeloma sarcophyllum* (Peck) Sacc., *Cortinarius mucosus* (Bull.) J. Kickxf. and *Russula stutzii* Pers.

Key Words: Basidiospores, carpophores, spore print, new record, India.

INTRODUCTION

While on fungal forays during spring and autumn season of 2012 to various localities of District Baramulla in North Kashmir a number of agarics were collected. Of these three very interesting rough spored agarics were met with, which are earlier not known from India. The taxonomic description and supported by Camera Lucida drawings and field photographs of *Hebeloma sarcophyllum* (Peck) Sacc., *Cortinarius mucosus* (Bull.) J. Kickxf. and *Russula stutzii* Pers. are given. These are not earlier known from India.

MATERIALS AND METHODS

The macroscopic and microscopic details were worked out as per the standard methodology given by Atri et al. (2005). The characters pertaining to the gross morphology, shape, colour and size of the pileus, stipe and lamellae, presence or absence of annulus and chemical colour reactions were noted from the fresh specimens. Kornerup and Wanscher (1978) was used to note the colour of the various carpophores parts. The classification, terminology and generic concepts as given in the 'Dictionary of Fungi' by Kirk et al. (2008) have been followed. The

identified specimens have been deposited in the Herbarium, Department of Botany, Punjabi University, Patiala (Punjab) India under the Accession No. PUN.

TAXONOMIC OBSERVATIONS

Hebeloma sarcophyllum (Peck) Sacc. *Sylogae Fungorum*, 5– 804, 1887.

Fig. 1, 2, 7–A-F & 10

Carpophore upto 9 cm in height. Pileus upto 4.9 cm in diameter, convex to broadly bell shaped; surface grayish white (1B₁), with light brown center, white at periphery, changing to rusty brown on bruising; moist; a few scattered, rounded grayish white scales present towards the centre of the cap, rest scales washedout due to rain; margin regular, non striate, inrolled; cuticle half peeling; flesh upto 0.5 cm thick, white, changing to grayish on cutting and exposure; pileal veil present; taste and odour mild. Lamellae adnate, crowded, unequal, narrow, (upto 0.4 cm broad), light grayish (1C₁), unchanging; ruptured cog wheel present; gill edge dentate. Spore deposit pale (2A₂). Stipe central, upto 8.5 cm long, 1.2 cm broad near apex, 1.8 cm at middle, 2.6 cm broad at base, almost equal in diameter cylindrical with a bulbous base; big grooves present on the bulbous base, concolorous with pileus, changing to grayish on bruising; fleshy; surface velvety; annulate; annulus superior; white

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cottony mat present at bulbous base. Basidiospores $11.63 - 13.42 \times 7.16 - 9 \mu\text{m}$ ($Q = 1.08$), subglobose to amygdaliform, dextrinoid, double walled, outerwall ornamented; apiculate, apiculus $0.9 - 1.8 \mu\text{m}$ long, narrow apical germ pore present. Basidia $34 - 39 \times 9 - 11 \mu\text{m}$, clavate, hyaline, tetrasporic; sterigmata $4.5 - 5 \mu\text{m}$ long; cheilocystidia $27 - 50 \times 7 - 12 \mu\text{m}$, versiform, elongate - clavate with long neck having inflated apices; hyaline, thin walled. Pleurocystidia absent. Gill edges fertile.

Carpophore context homoiomerous. Pileus cuticle hyphal, made up of radially tangled $7 - 9 \mu\text{m}$ broad septate hyphae, from cuticle arises a turf of densely granular $4.5 - 6.7 \mu\text{m}$ broad projecting clamped hyphae with flame shaped apical cells; pileus context made up of loosely arranged cellular elements. Hymenophoral trama bilateral divergent. Stipe cuticle hyphal made up of $18 - 26 \mu\text{m}$ broad longitudinally arranged $7 - 9 \mu\text{m}$ broad septate clamped hyphae.

Collection examined– Jammu and Kashmir, Baramulla (1593m), village Sain, growing solitary on dead wood in the mixed forest during spring season, Hilal Ahmad Rather, PUN 5188, and May 29th, 2012.

Remarks – The external and microscopic details of the above examined collection matches with those given for *Hebeloma sarcophyllum* (Peck) Sacc. by Smith (1949). It fits well in the identification key of genus *Hebeloma* provided by Arora (1986) and Smith (1949). As this species is not earlier known from India, it constitutes a new record from India.

Cortinarius mucosus (Bull.) J. Kickx. Fl. *Crypt. Flandres* (Paris) 1–191, 1867.

Fig. 3, 4, 8 –A-F & 11

Carpophore 3.4–8.6 cm in height. Pileus 6.2 cm broad, convex, surface moist; grayish white (1B₁) with tinge of yellowish brown (5E₃) along the margin; scales are fibrillose, orange white (6A₂) at the center and yellowish brown (5D₄) all over the cap; glabrous; margin regular, non striate; cuticle half peeling; flesh upto 0.5 cm thick, white, changing to light grayish. Lamellae adnate, crowded, violet white (15A₂) when young, dull violet (15D₃) when mature; gill edges wavy. Spore print deposit light brown (7D₅). Stipe central, 3.7 cm long, 2 – 3.1cm broad, short stout; pale orange (6A₃) changing to orange gray (6A₄), ring like tinge at base; exannulate; stipe surface veined.

Basidiospores $12.53 - 14.32 \times 8.05 - 8.95 \mu\text{m}$ (excluding apiculus), ($Q = 1.0$), ellipsoid to amygdaliform with a short snout; verrucolose with interconnecting ridges present; dextrinoid (after 30

minutes); apiculate, apiculus $0.9 \mu\text{m}$ long. Basidia $32 - 43 \times 10.74 - 12 \mu\text{m}$, claviform, granular, tetrasporic; sterigmata $3.5 - 6 \mu\text{m}$ long. Cheilocystidia $43 - 63 \times 7 - 11 \mu\text{m}$, fusoid with claviform upper half and blunt, rounded apices. Pleurocystidia absent. Gill edges sterile.

Carpophore context homoiomerous. Pileus cuticle made up of horizontally tangled $7 - 9 \mu\text{m}$ broad septate hyphae giving rise to granular $5 - 7 \mu\text{m}$ broad, septate, clamped hyphae. Hymenophoral trama regular. Stipe cuticle hyphal, made up of longitudinally tangled $9 - 13 \mu\text{m}$ broad, septate hyphae.

Chemical colour reaction– Cap surface of dried carpophore turned blackish in KOH.

Collection examined– Jammu and Kashmir, Baramulla, village Boniyar (Uri), (2189 m), growing in groups in humicolous soil in the mixed forest during spring season, Hilal Ahmad Rather, PUN 5182, May 23th, 2012.

Remarks– The internal and external details of presently examined specimen exactly matches with *Cortinarius mucosus* Bull (1867), as described by Kuo (2011) and also from Rogers mushrooms. *Cortinarius mucosus* originally described as *Agaricus mucosus* by French mycologist Pierre Bulliard in 1792. The cap surface turns blackish brown in KOH solution. The presence of glutinous outer veil; perfree glabrous, sticky, shiny, flushed with tinge of yellowish brown and the presence of dextrinoid, verrucose spores taken from dried material are the significant characters for identification purpose. Presently, it has been recorded from Jammu and Kashmir.

Russula stuntzii Pers. *Observ. Mycol.* 1– 100, 1796.

Fig. 5, 6, 9 –A-H & 12

Carpophore 7.7 cm in height. Pileus cuticle 7.3 cm broad, plano convex; surface offwhite, turning to brownish in the center, grayish magenta (13D₃) at the margin; umbo absent; margin regular, striate, incurved; surface dry, hygrophanous; cuticle half peeling; flesh upto 0.4 cm thick; white, unchanging; pileal veil absent. Lamellae 0.6 cm broad, adnexed, unequal, subdistant, orange yellow (4B₈), unchanging; gill edge wavy. Spore print deposit white; fragile; taste none; odour mild. Stipe central, 6.8 cm long, 1.3 cm near the apex, 1.2 cm in the middle and 2cm broad at base, obclavate, creamy white (3A₁), unchanging, smooth, hollow.



Fig. 1. *Hebeloma sarcophyllum*. Carpophore growing on wood.



Fig. 3. *Cortinarius mucosus*. Carpophore growing in soil.



Fig. 2. *Hebeloma sarcophyllum*. Cap surface showing scattered, rounded scales.



Fig. 4. *Cortinarius mucosus* Underview of Carpophore showing Cortina and adnate lamellae.



Fig. 5. *Russula stuntzii*. Carpophore growing in soil.



Fig. 6. *Russula stuntzii*. Underview of Carpophore showing adnexed lamellae.

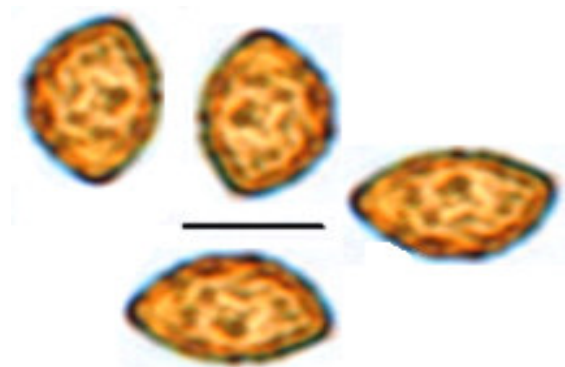


Fig. 10. *Hebeloma sarcophyllum*. Basidiospores.



Fig.11. *Cortinarius mucosus*. Basidiospores.

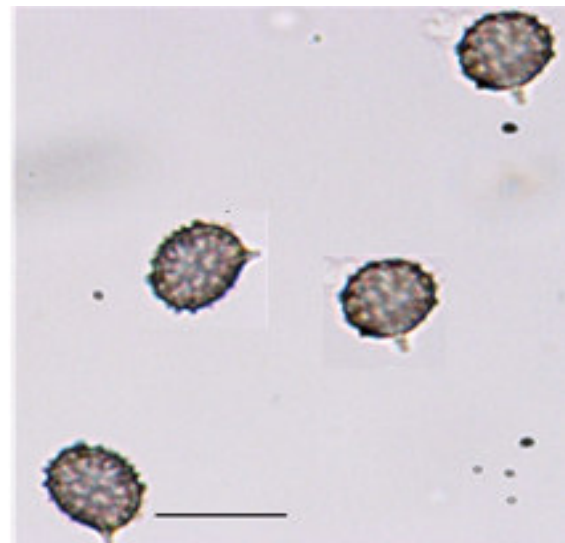


Fig.12. *Russula stuntzii*. Basidiospores.

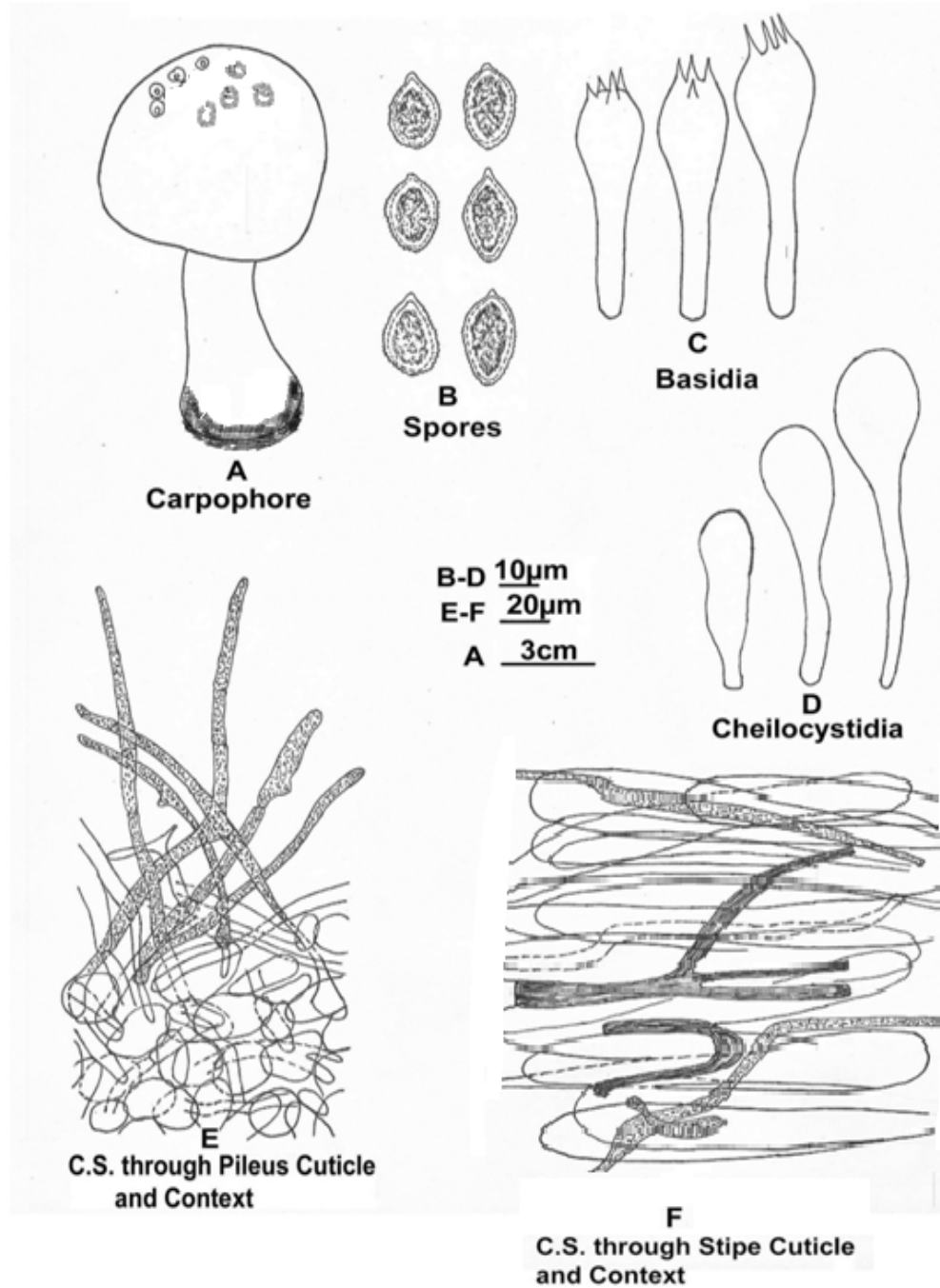


Fig. 7. A–F. *Hebeloma sarcophyllum* (Peck) Sacc. A. Carpopore B. Spores C. Basidia D. Cheilocystidia E. C. S. through pileus cuticle and context F. C.S. through stipe cuticle and context.

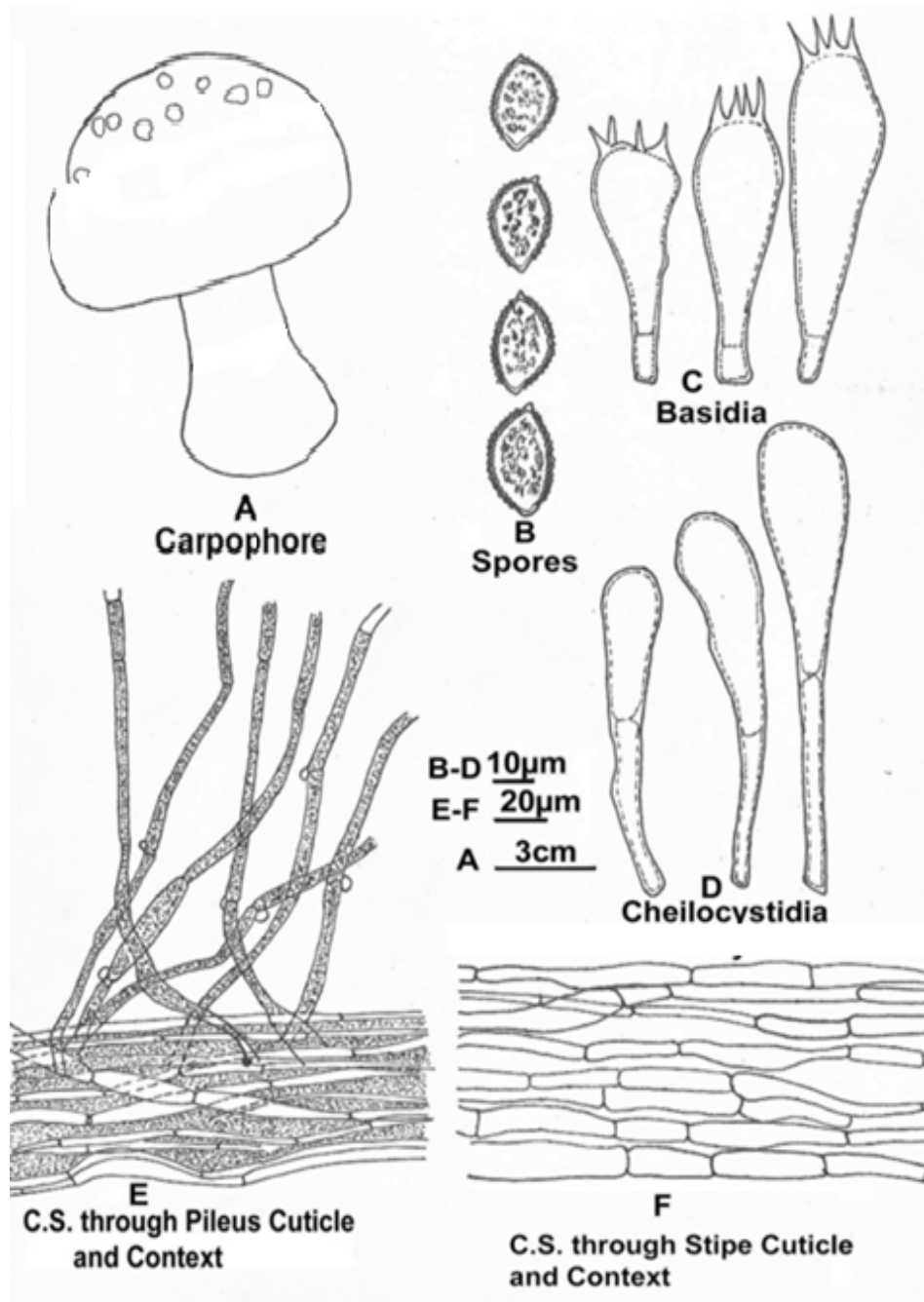


Fig. 8. A–F. *Cortinarius mucosus* (Bull.) J. Kickxf. A. Carphophore B. Spores C. Basidia D. Cheilocystidia E. C.S. through pileus cuticle and context F. C.S. through stipe cuticle and context.

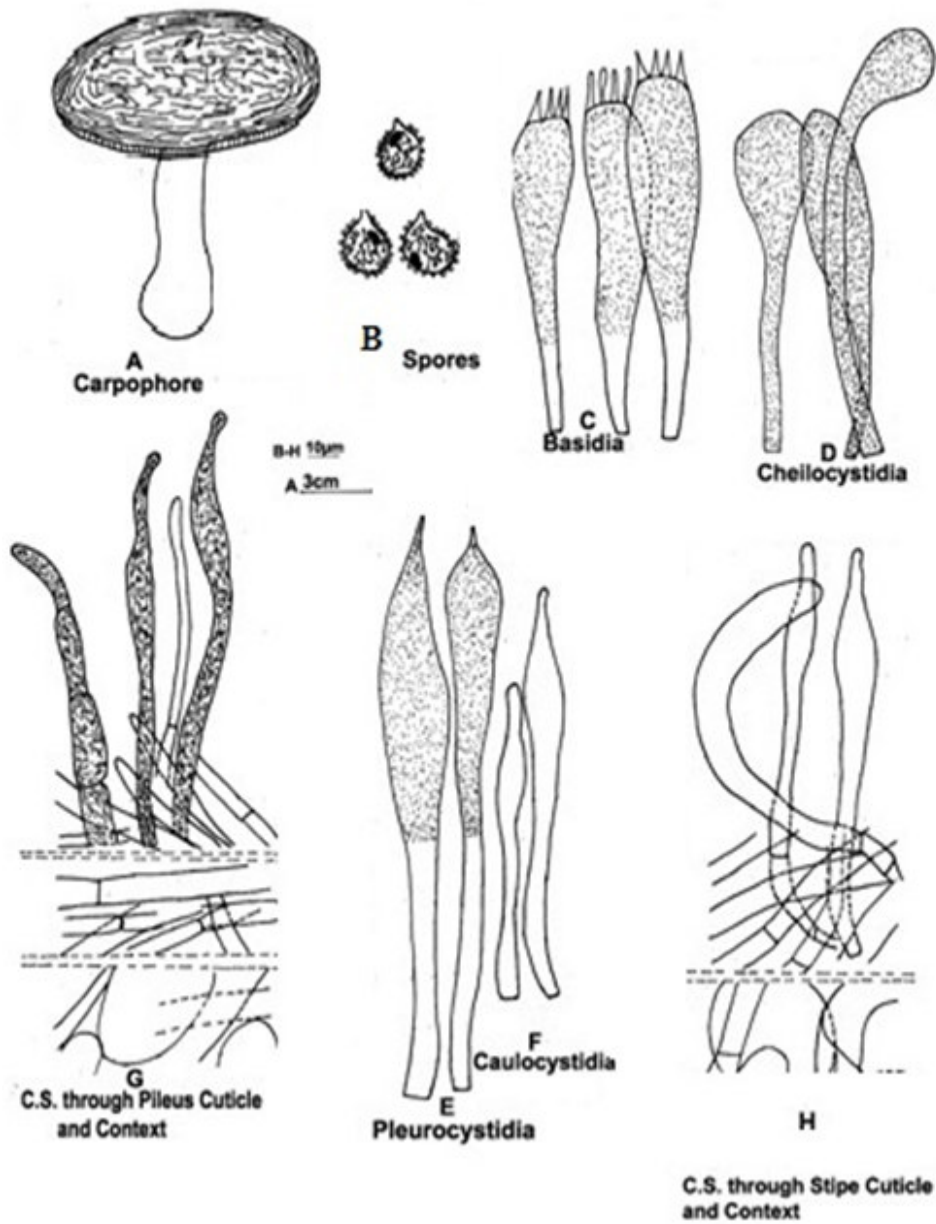


Fig. 9. A-H. *Russula stuntzii* Pers. A. Carpophore B. Spores C. Basidia D. Cheilocystidia E. Pleurocystidia F. Caulocystidia G. C.S. through pileus cuticle and context H. C.S. through stipe cuticle and context.

Basidiospores 8.95 – 10.74 × 7.16 – 8.95µm (excluding ornamentation), ornamented, globose to subglobose, (Q = 1.2), warty, warts 1.6µm high, conical, isolated warts joined by fine lines, catenulations present, incomplete reticulum, plage present; apiculate, apiculus 0.89 – 2.6µm long. Basidia 53 – 61 × 11 – 12 µm, clavate, granular, tetrasporic; sterigmata 5 – 6 µm long. Pleurocystidia: macrocystidia 111 – 150 × 10 – 12 µm long, clavate to fusoid, thick walled, with beaked to tubular tips; abundant, granular upper side. Cheilocystidia 78 – 98 × 11 – 14 µm, cylindrical, fusoid to ventricose with inflated to blunt tips.

Carpophore context heteromerous. Pileus cuticle differentiated into epicutis and subcutis. Epicutis gelatinized, hyphal made up of horizontally tangled, granular hyphae giving rise to a regular turf of projecting hyphae 2.6 – 3µm broad interspersed with fusoid pilocystidia with capitate tips measuring 66 – 107 × 4 – 5 µm. Subcutis hyphal made up of 2 – 7 µm broad, gelatinized, loosely interwoven hyphae; pileus context made up of rosettes of sphaerocysts intermingled with 3 – 6µm broad septate hyphae. Gill trama heteromerous and subhymenium indistinct. Stipe cuticle hyphal, made up of longitudinally tangled 3 – 7 µm broad septate hyphae, from the cutis arises a turf of caulocystidial elements, 53 – 70 × 7 – 8 µm, clavate to fusoid with capitate flame shaped to inflated tips; stipe context made up of rosettes of sphaerocysts intermingled with 4 – 8µm broad, branched, interwoven, hyaline septate hyphae. Clamp connections absent throughout.

Collection examined– Jammu and Kashmir, Baramulla, village Soyan Seidnar (1754 m), growing solitary in the mixed forest during spring season, Hilal Ahmad Rather, PUN 5192, May 15th, 2012.

Remarks– The above examined collection matches exactly in its morphological and anatomical characters with *R. stuntzii* Pers. as described by Grunds and Thiers (1997). Grund first described *R. stuntzii* in his thesis in 1965 as *R. pallidolividanom*. Prov. Thiers (1997) noted that *R. stuntzii* as only *Russula* species in California grows on well – rotted conifer logs. Thiers (1997) stated that *R. stuntzii* Pers. has a distinctive colour, it tends to be firm, larger and

usually has a straight stipe. *R. stuntzii* Pers. has no clear yellow colour in the cap, Grunds (1997) description of *R. stuntzii* Pers. states that the spore print is white. Thiers (1997) described *R. stuntzii* spores as white to pale yellow, and the cap colour ranging from white to grayish with purple tones as same significant characters exactly matches with our collection. Presently, it has been reported for the first time from India.

ACKNOWLEDGEMENTS

I express my sincere thanks to the Head, Department of Botany Punjabi University, Patiala and my supervisor Dr. Munruchi Kaur, Department of Botany, who had continuously encouraged me to combine my mental images with the emotion of desire to accelerate their realization. I highly appreciate their generosity and patience through the tenure of this research.

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