



## Section *Caesareae*: Two new species

Yadwinder Singh and Munruchi Kaur\*

Department of Botany, Punjabi University, Patiala – 147002, Punjab, India

\*Corresponding author: munruchi@gmail.com

| Received: 09 January 2015 | Accepted: 21 March 2015 |

### ABSTRACT

*Amanita altusdenticulata* sp. nov. and *A. kedarnathensis* sp. nov. are described as new to science from India. These two species fall under section *Caesareae* as they possess sulcate-striate pileus, a stipe with membranous annulus, a thick saccate volva and inamyloid basidiospores.

**Key Words** *Amanita*, new species, *Caesareae*, India.

### INTRODUCTION

The genus *Amanita* Pers. belongs to family Amanitaceae R. Heim ex Pouzar of order Agaricales Clem. *A. altusdenticulata* sp. nov. and *A. kedarnathensis* sp. nov. belongs to section *Caesareae* as they possess sulcate-striate pileus, a stipe with membranous annulus, a thick saccate volva and inamyloid basidiospores. *A. altusdenticulata* sp. nov. was compared with *A. caesarea*, *A. basii* and *A. masasiensis*, but these species differ from *A. altusdenticulata* by lacking deeply dentate lamellae and different color of the carpophore. Thus *A. altusdenticulata* sp. nov. is proposed as new species. Further, *A. kedarnathensis* sp. nov. was compared with *A. hemibapha*, *A. yema*, *A. tanzanica*, *A. laurae*, *A. caesareoides*, but all these differ from present species by having different color, size of carpophore and varied microscopic details. Thus, *A. kedarnathensis* sp. nov. is proposed as new to science.

### MATERIAL AND METHODS

The present fungus was collected from forest of Himachal Pradesh and Uttarakhand. Taxonomic details were studied in accordance to Atri *et al.*

(2005). The color terminology used is that of Kornerup and Wanscher (1978). The identified specimens have been deposited in the Herbarium of Department of Botany, Punjabi University, Patiala under the Accession No. PUN.

### RESULTS AND DISCUSSION

*Amanita altusdenticulata* Yadwinder Singh & Munruchi Kaur sp. nov. **Fig. 1, 2 & 4 (A-H)**

**Mycobank No.:** MB811261

**Etymology:** epithet name refer to the deeply dentate lamellae edges.

Carpophore up to 13.5 cm in height. Pileus up to 7.3 cm broad, plano-convex; umbonate, with depression around the umbo; margin irregular, nonappendiculate, sulcate striate, up to 1.5 cm from margin towards the centre; surface reddish orange (7A<sub>8</sub>) from centre, faded and deep orange (5A<sub>8</sub>) to yellowish orange towards margins; moist; atomate; glabrous; cuticle fully peeling; flesh up to 0.2 cm thick, white, unchanging. Lamellae adnexed, somewhat free with decurrent line on the stipe near the attachment to the cap; close; unequal, not in series; broad (up to 0.6 cm), pale yellow (3A<sub>3</sub>), unchanging; gill edges deeply dentate; lamellulae



**Figs 1-2.** *Amanita altusdenticulata* sp. nov. in its natural habitat (Left); Under side of cap showing lamellae with deeply dentate edges (right).

truncate. Stipe excentric, up to 11.7 cm long, up to 1.1 cm broad above, 1.5 cm broad at the base, obclavate, surface pale yellow (4A<sub>3</sub>) above, white towards base, decorated with yellowish fibrillose scales, somewhat brownish on handling; solid; annulate, annulus superior, yellow, single, attached, slightly striated above, with thickened edges; volva up to 3.0 cm broad, saccate, lobed, white, yellow from inner surface, dry, membranous, attached to the stipe base.

Basidiospores [43/1/1] 8.0-11.2 x (6.4-) 7.2-8.0 (-10.4)  $\mu\text{m}$  ( $L = 8.0-9.6 \mu\text{m}$ ;  $L' = 9.3 \mu\text{m}$ ;  $W = 7.2-8.0 \mu\text{m}$ ;  $W' = 7.8 \mu\text{m}$ ;  $Q = (1.0-1.07-1.30) (-1.40)$ ;  $Q = 1.1-1.25$ ;  $Q' = 1.18$ ); subglobose, broadly ellipsoidal to ellipsoid, rarely globose; inamyloid, hyaline, thin walled, smooth; apiculate, apiculus up to 1.6  $\mu\text{m}$  long. Basidia 33.6-61.0 x 8.0-11.2  $\mu\text{m}$ , granular, clavate, with clamp connections, tetrasterigmate; sterigmata up to 6.4  $\mu\text{m}$  long. Pileus cuticle hyphal, gelatinized, made up of subradially tangled, granular, septate, 1.6-8.0  $\mu\text{m}$  broad hyphae; pileocystidia absent; pileus context made up of loosely arranged, thin walled, septate, up to 12.8  $\mu\text{m}$  broad hyphae; acrophysalides thin-walled, narrowly clavate to clavate to broadly clavate, up to 38.4  $\mu\text{m}$ . Hymenophoral trama bilateral divergent. Stipe cuticle made up of longitudinally and compactly tangled, septate, thin walled, 1.6-4.0  $\mu\text{m}$  broad hyphae; stipe context made up of thin walled, loosely arranged, septate, 2.4-9.6  $\mu\text{m}$  broad hyphae; acrophysalides abundant, narrow to broadly narrow, thin-walled, up to 48.0  $\mu\text{m}$  broad. Volva consisting of branched, interwoven to subparallel, hyaline, 4.1-10.2  $\mu\text{m}$  wide hyphae, intermixed with colorless, granular, ellipsoid to clavate to

subpyriform, elongated, 41.0-123 x 20.4-61.3  $\mu\text{m}$  inflated cells.

**Collection Examined:** Himachal Pradesh, Shimla, Summer Hill (2,000 m), growing solitary, in mixed coniferous & broad leaved forest, under *Pinus roxburghii*, Yadwinder Singh, PUN 6382, August 12, 2009.

**Distribution and Ecology:** The present collection was collected from Himachal Pradesh, Shimla, growing solitary, in mixed coniferous and broad leaved forest, under *Pinus roxburghii* in mid-August.

**Remarks:** The above examined collection has a long sulcate-striate pileus and a stipe with membranous annulus and a thick, saccate volva, and has inamyloid basidiospores all these characters suggest that this collection is a member of the section *Caesareae* Singer ex Singer in the subgenus *Amanita* as defined by Singer (1986). Within this section, the present collection has a subhymenium with 3-5 layers of cells, thus, it belongs to stirps *Caesarea*. This collection seems to be closely allied with *A. caesarea* (Scop. : Fr.) Pers (Tulloss, 2014). But differs from it in reddish orange to deep orange to yellowish orange cap margins, subumbonate cap, with a depression around the umbo, adnexed lamellae, which are somewhat free with decurrent line on the stipe, gills with deeply dentate edges, and an excentric stipe, which is pale yellow above and white towards base, decorated with yellowish fibrillose scales and proportionally slightly broader spores. Further it was compared with *A. basii* Guzmán & Ram.-Guill. (Tulloss, 2014), but *A. basii* has a brown reddish to "cadmium orange" to a very intense red, "lake red" or brownish red in the centre of the cap which lacks an umbo and free lamellae which are yellow to

orange yellow to light yellow in mass, primrose yellow to light yellow in side view, lacking dentate edges altogether, the stipe in *A. basii* has a pale yellow to orange upper part and light yellow as the ground color, becoming brown to blackish with handling, the stipe decoration becomes more intensely orange when handled. *A. masasiensis* (Tulloss, 2014) another look-alike of the present collection differs in lacking an umbo, cap which is yellow to yellow-orange, with reddish centre, lamellae free, with smooth edges. The present collection does not fit well in any of the known species of *Amanita*, it is characteristic in possessing a cap with reddish orange to deep orange to yellowish orange color, having a depression along the umbo, pale yellow adnexed lamellae which are somewhat free with a decurrent line on the stipe, characteristic deeply dentate gill edges, excentric stipe which is pale yellow above, and white towards the base, decorated with yellowish fibrillose scales, with yellow, superior, annulus with thickened edges and saccate, white volva, yellowish from inner side. *A. altusdenticulata* is proposed as new species to accommodate this species with deeply dentate gills.

*Amanita kedarnathensis* Yadwinder Singh & Munruchi Kaur sp. nov. **Fig. 3 & 5 (A-F)**

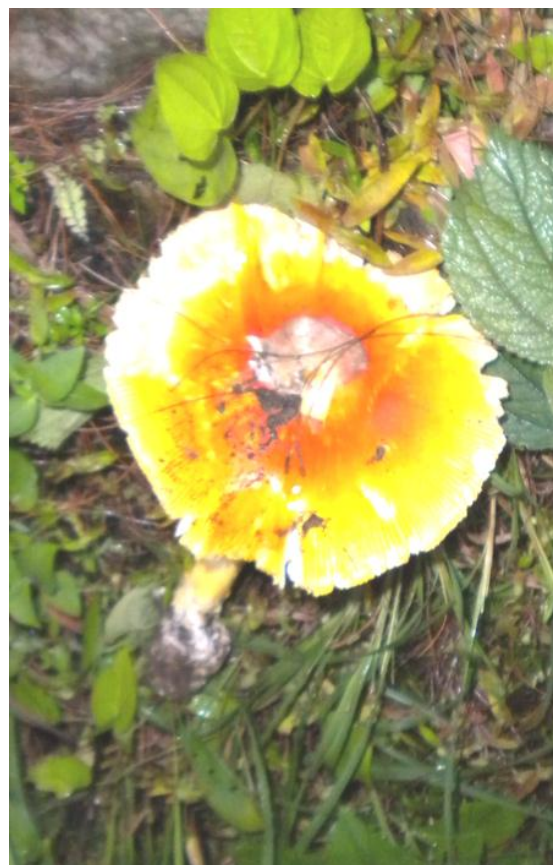
**Mycobank No.:** MB811262

**Etymology:** epithet name refers to the major locality from which this species was collected.

Carpophore up to 25.5 cm in height; Pileus up to 16.0 cm broad, plano-convex; lacking umbo; margin regular, splitting at maturity, sulcate striate along the margin, short striate, up to 1.5 cm from margin towards centre; surface reddish golden (6C<sub>8</sub>) to darker at centre, reddish yellow (4B<sub>8</sub>) towards the margin; viscid; atomate; volval remnants as membranous, white patches at centre of the cap; cuticle fully peeling; flesh yellowish white (4A<sub>2</sub>), unchanging, up to 1.1 cm thick; odor disagreeable. Lamellae free, close, unequal, not in series, broad (up to 1.2 cm), yellowish white (2A<sub>2</sub>), unchanging; gill edges smooth; lamellulae truncate. Stipe central, up to 24.5 cm long, up to 1.7 cm broad above, up to 2.2 cm in the middle and up to 2.5 cm at the base, obclavate, light yellow (4A<sub>4</sub>), covered with yellow fibrils, with yellowish white patches, unchanging; solid; scaly; annulate, annulus single, skirt like, striate above, smooth below, attached, yellowish; volva up to 4.2 cm, white, large, lobed, saccate.

Basidiospores [35/1/1] (8.0-) 8.8-11.2 (12.0) x 6.4-9.6 µm, (L = 8.8-9.6 µm; L' = 9.4 µm; W = 6.4-8.0 µm; W' = 7.0 µm; Q = (1.11-) 1.17-1.50 (-1.62); Q' = 1.31); broadly ellipsoid to ellipsoid, rarely subglobose, occasionally elongated; inamyloid, hyaline, smooth; apiculate,

apiculus up to 0.8 µm long. Basidia 32.0-43.2 x 8.0-9.6 µm, granular, clavate, with clamp connections; tetrasterigmate; sterigmata up to 4.8 µm. Hymenophoral trama bilateral divergent. Pileus cuticle hyphal, gelatinized, made up of subradially tangled, thin walled, septate 4.1-10.2 µm broad hyphae, pilocystidia absent; pileus context composed of sub-radially arranged, septate, thin walled, 4.1-16.4 µm broad clamped hyphae; acrophysalides clavate to narrowly clavate, thin walled, up to 49.0 µm broad. Stipe cuticle hyphal, made up of longitudinally and compactly interwoven, septate, thin walled, 2.0-12.3 µm broad hyphae; stipe context composed of loosely interwoven, septate, thin walled, 4.1-16.4 µm broad clamped hyphae; acrophysalides thin walled, abundant, up to 45.0 µm. Volva on stipe base composed of, ovoid, subglobose, broadly ellipsoid, to clavate 36.8-65.4 x 24.5-49.1 µm, thin walled, single or terminal inflated less abundant cells, intermixed with branched, thin walled, septate, 2.0-10.2 µm broad clamped hyphae.



**Fig. 3** *Amanita kedarnathensis* sp. nov. in its natural habitat.

**Collection examined:** Uttarakhand, Kedarnath, Kund (1,800 m), growing solitary, in coniferous forest (pure pine), under *Pinus roxburghii*, Yadwinder Singh, PUN 6383, August 16, 2010.



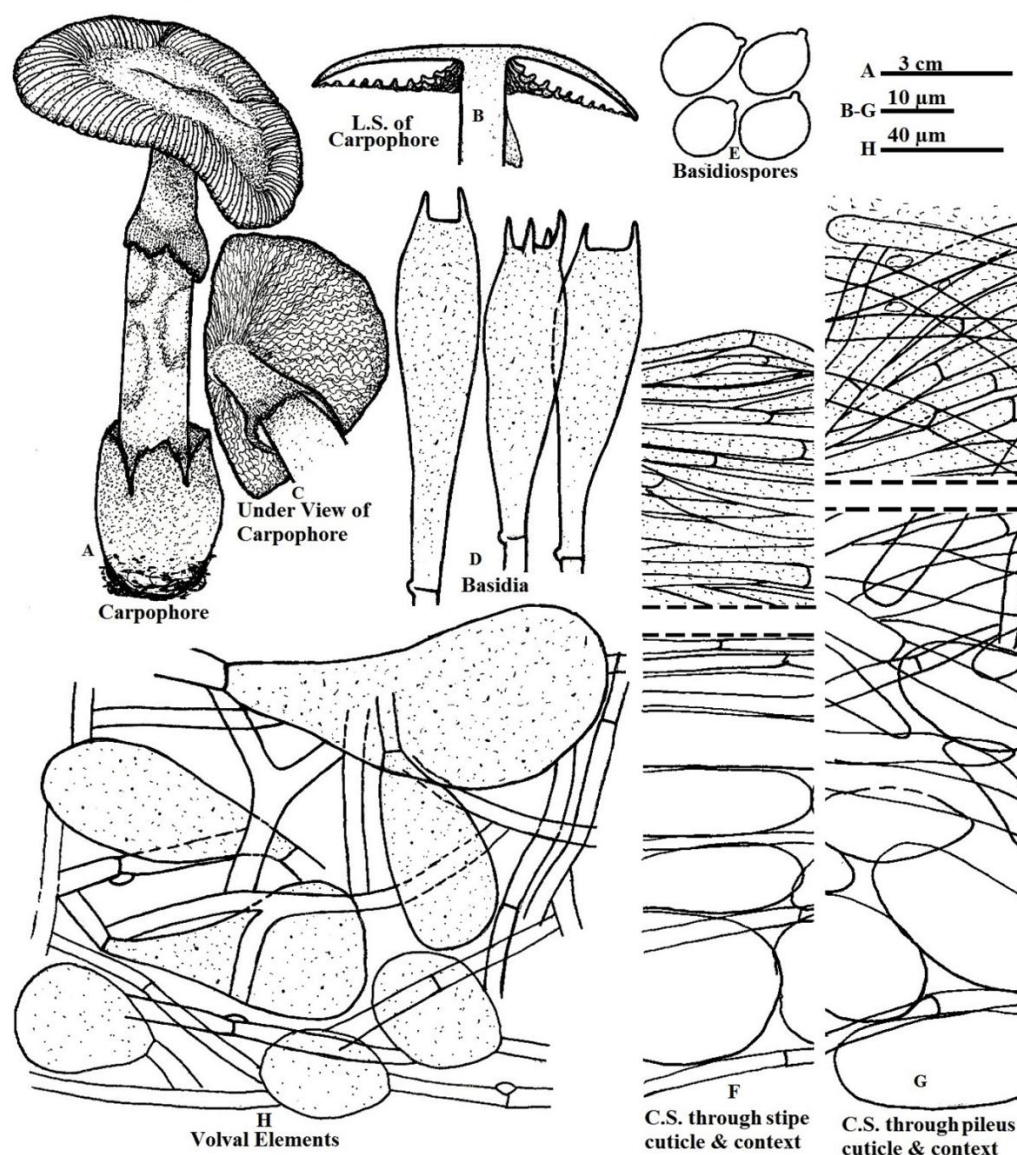
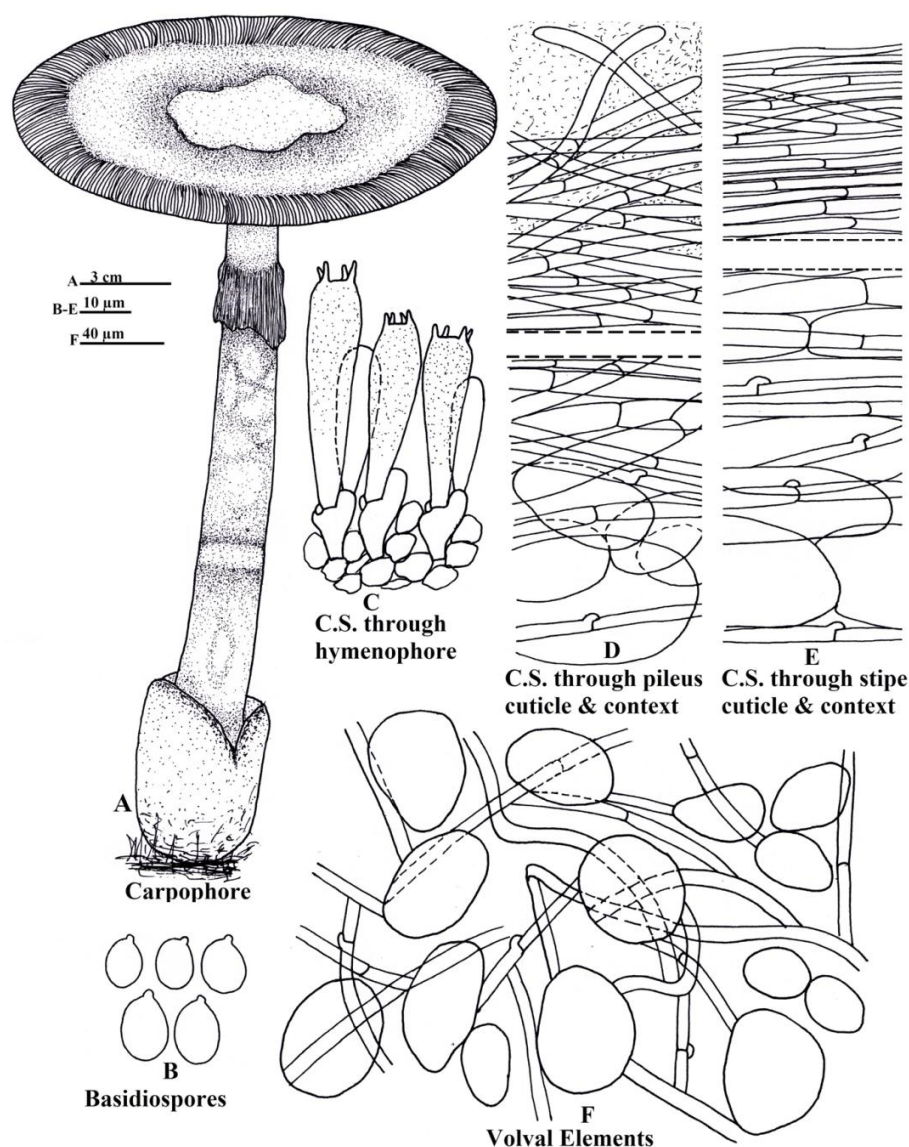


Fig. 4 (A-H) Microscopic details of *Amanita altusdenticulata* sp. nov.

**Distribution and Ecology:** *Amanita kedarnathensis* sp. nov. was found growing solitary under *Pinus roxburghii* in pure pine forest at 1,800 m in Uttarakhand.

**Remarks:** This collection belongs to section *Caesarea* of subgenus *Amanita* and stirps *Hemibapha*. It was compared with *A. hemibapha* (Berk. & Broome) Sacc., *A. yema* Guzmán & Ram.-Guill., *A. tanzanica* Härk. & Saarim. in Härk., Saarim. & Mwasumbi, *A. laurae* Guzmán & Ram.-Guill. and *A. caesareoides* Lyu. N. Vassilieva which were described by Tulloss (2014). This collection shows some similarities with *A. hemibapha* but later differs in having tomato red or capsicum red, with age and on exposure, the disc becomes deep orange and the margin distinctly more yellow, the striations on the cap extend

inward for half the cap radius, stipe is comparatively shorter in length, basidiospores are conspicuously smaller in breadth. *A. yema* differs in having darker cap color i.e. blood red to red-brown, red in the centre, shading gradually to crimson red, orange red, orange yellow at the margin, lamellae adnexed, white to pale yellowish white or yellow stipe, orange-yellow towards the base, sometimes with brownish or reddish staining on handling. No such changes occur in presently examined specimen. *A. laurae* also differs in possessing adnexed lamellae and a stipe with yellow to yellow-orange to orange-red. This collection differs from *A. tanzanica* as in this the lamellae are white also the stipe is white, and is shorter in length, basidiospores are conspicuously smaller in width. This specimen is distinctive in its



**Fig. 5 (A-F)** Microscopic details of *Amanita kedarnathensis* sp. nov.

reddish golden to darker at centre, reddish yellow towards pileus margin, short striate, plano-convex cap, lacking an umbo, volval remnants as membranous, white patch at centre of the cap, light yellow stipe, with yellowish white patches, skirt like yellowish annulus which is striate above and smooth below; large, saccate, white volva and broadly ellipsoid to ellipsoid, rarely subglobose, occasionally elongated basidiospores. This combination of characters does not fit this specimen under any of the known species of *Amanita*, thus a new species *A. kedarnathensis* sp. nov. to accommodate this interesting specimen.

#### ACKNOWLEDGMENTS

The authors are grateful to the Head, Department of Botany, Punjabi University, Patiala for providing laboratory facilities during the course of this work. To University Grant commission (UGC) we are

thankful for grant in aid under Rajiv Gandhi National Fellowship.

#### REFERENCES

- Atri NS, Kaur A and Kour H. (2005). Wild Mushrooms– Collection and Identification. In: Frontiers in Mushroom Biotechnology (R.D. Rai, R.C. Upadhyay and S.R. Sharma, eds.) pp. 9-26, N.R.C.M. Chambaghat, Solan.
- Kornerup A and Wanscher JH. (1978). Methuen Handbook of Colour (3<sup>rd</sup> ed.) Eyre Methuen, London, pp. 252.
- Singer R. (1986). *The Agaricales in Modern Taxonomy* (4<sup>th</sup> ed.) Sven Koeiltz Scientific Books, Germany, pp. 981.
- Tulloss RE (2014). Website: <http://www.amanitaceae.org>.