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SHORT COMMUNICATION

TWO NEW RECORDS OF GILLED MUSHROOMS OF THE GENUS *AMANITA* (AGARICALES: AMANITACEAE) FROM INDIA

R.K. Verma, V. Pandro & G.R. Rao

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Two new records of gilled mushrooms of the genus *Amanita* (Agaricales: Amanitaceae) from India

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Abstract: Two new records of *Amanita constricta* and *Amanita velosa* from India are reported for the first time from sal *Shorea robusta* forest of central India. Earlier *Amanita constricta* was reported from USA and Canada, while *A. velosa* was reported from USA and Mexico. The reported species are edible but they should be taken with caution as at least two deadly *Amanitas* with saccate type volvas are known. *A. velosa* grows in open areas.

Keywords: Amanitaceae, distribution, new record, sal forest.

The genus *Amanita* belongs to family Amanitaceae, order Agaricales, class Agaricomycetes of Basidiomycetous fungi. The family contains of eight genera, namely, *Amanita*, *Amanitopsis*, *Amarrendia*, *Catrama*, *Limacella*, *Saproamanita* and *Torrendia* (Verma & Pandro 2018a). This group of mushroom comprises of edible as well as deadly poisonous species. Mushroom poisoning is a perennial problem in India where mushroom collection from the wild is common. The majority of mushroom poisoning occurs due to misidentification of edible variety. Recently, diversities of macro-fungi were studied and many fungi were reported from central Indian region including two new records of *Amanita bisporigera* and *A. pantherina* from sal *Shorea robusta* forests (Verma & Pandro 2018a).

Some other edible macro-fungi, *Astraeus hygrometricus*, *Auricularia auricular-judae*, *Calvatia cyathiformis*, *C. pyriformis*, *Laetiporus sulphureus*, *Macrocybe crassa*, *Macrocybe lobayensis*, and *Schizophyllum commune* were reported from central India (Verma & Verma 2017a,b; Verma et al. 2017a,b,c). In addition, six species each of *Boletus* and *Russula* namely: *Boletellus ananas*, *B. chrysenteroides*, *B. corneri*, *B. dissiliens*, *Boletus edulis*, *B. pseudochrysenteroides*, *R. adusta*, *R. cinerella*, *R. congoana*, *R. delicula*, *R. leelavathyi*, and *R. michiganensis*) were also reported (Verma & Pandro 2018b). A total of 81 species of mushrooms of the family Amanitaceae were recorded from different parts of India including 73 species of *Amanita*, where maximum number of species were reported from Himachal Pradesh, Uttarakhand, and Kerala and the list includes both poisonous and edible mushrooms (Bhatt et al. 1999, 2017; Vrinda et al. 2005a,b; Semwal et al. 2005, 2007, 2014; Verma & Pandro 2018).

The present article reports two new records of amanitaceous mushrooms, *Amanita constricta* and *Amanita velosa*, from sal forests of Dindori (Madhya Pradesh) of central India.

Editor: Anonymity requested.

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MATERIALS AND METHODS

Study site

Sal forest of Dindori District of Madhya Pradesh (22.569°N and 81.371°E) was selected for study of *Amanita* mushrooms. In addition, sal forest of Bajag forest range (Chada Road) of Madhya Pradesh was also surveyed for amanitaceous mushrooms.

Collection and processing of mushroom

Specimens of mushrooms were collected from selected forests of Madhya Pradesh during rainy season (July 2018). Collected samples were preserved immediately in 70% alcohol after collection for microscopic study. The fruit bodies of fungi were dried under the sun or in wooden box lit with 100W electric bulb.

Identification of mushroom

Microscopic slides were prepared by using stain, mountant, clearing and softening chemicals. Slides were observed under advanced research microscope (Leica, Germany). Observations under phase contrast and dark field were also carried out whenever necessary. Photomicrography of specimens was prepared with the help of a digital camera (Leica, Germany) attached to the advanced microscope. Identification of *Amanita* was possible with the help of published literature,

monographs, books, and keys. (Roy & Samajpati 1978; Sathe et al. 1980; Bhatt & Lakhanpal 1988; 1989; Abraham & Kachroo 1989; Das & Simha 1990; Bhatt & Bhatt 1996; Bhatt et al. 1999, 2003, 2007, 2017; Vrinda et al. 2005a,b; Semwal et al. 2005, 2007, 2014; Semwal 2006a,b; Pradeep & Vrinda 2007; Mohanan 2011; Farook et al. 2013; Singh & Kaur 2016).

RESULTS

Taxonomic Description

1. *Amanita constricta* Thiers & Ammirati, Mycotaxon, 1982 (Images 1–2)

The cap 5–7.5cm wide, convex when young, becoming plano-convex to plane, eventually subumbonate to umbonate in old age, strongly sulcate to tuberculate striate margin. Cap brownish-gray, often with inconspicuous dark radial streaks. Flesh usually white, sometimes becoming faintly pinkish with exposure. Volva mainly present as a membranous fibrillose patch over the umbo; white to buff to smoke gray-brown-salmon color. Gills are close to crowded, adnate to decurrent by a short hook when young, becoming free, white at first, becoming gray, and drying tan to sordid tan to brownish gray. Gills are moderately broad with the edge usually gray and fibrillose. The stipe is 6–9cm long x 1–1.5cm wide, white, cylindrical or narrowing upward, and exannulate. Hyphae 2.5–7.5µm wide. Basidia 37–



Image 1. *Amanita constricta*: A– habits | B– details of sporophore.

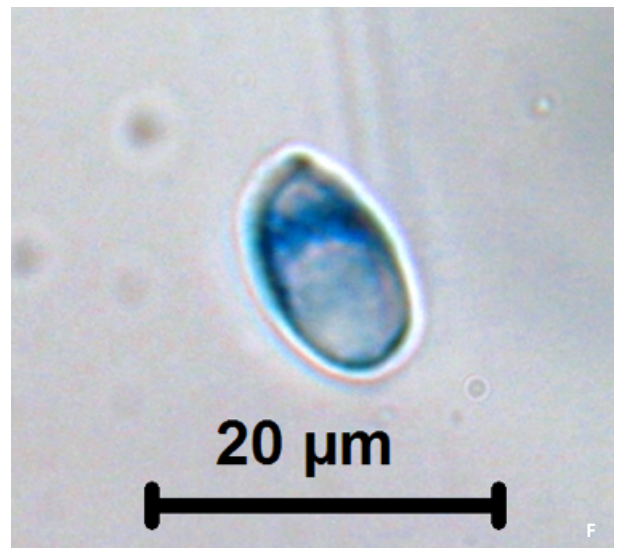
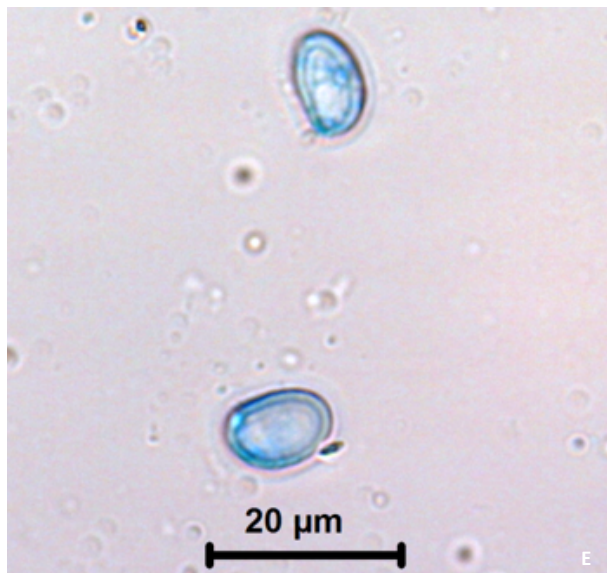
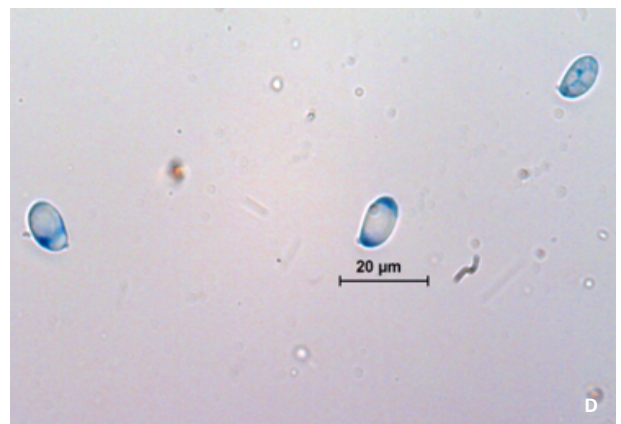
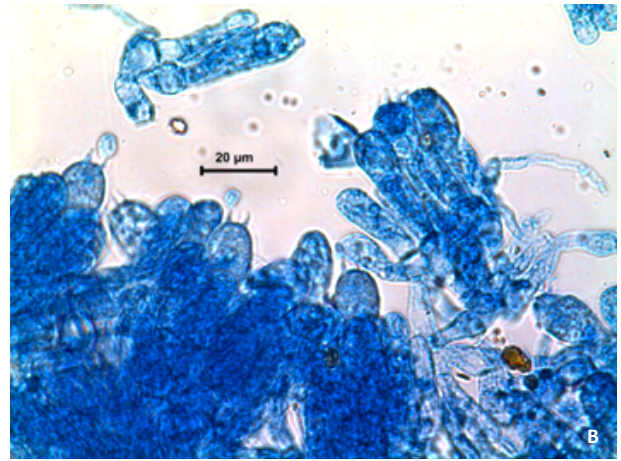


Image 2. *Amanita constricta*: A–B—pileal element and basidia | C—basidia with sterigmata | E–F—basidiospores.

60 x 10–12.5 µm, sterigmata, 4 measuring 2.5–3.7µm. Basidiospores measure 10–13.7 x 5.0–8.7µm, inamyloid, globose to subglobose to broadly ellipsoid. Pileal element cells 10–20µm wide.

Collection examined: TF- 4060, 19.vii.2018 on soil surface in sal forest, Bajag forest range, Chada Road, Dindori, Madhya Pradesh. Specimen deposited in Mycology Herbarium, Tropical Forest Research Institute, Jabalpur.

2. *Amanita velosa* (Peck) Lloyd, Mycol. Writ., 1898 (Images 3–4)

≡ *Amanitopsis velosa* Peck

The cap is 3–7cm which is pale yellowish-orange to pale orangish, pale orange or yellowish-orange to brownish orange, sometimes becoming paler toward margin; margin conspicuously grooved or striate, surface viscid when moist, smooth, pinkish-buff to orange-buff, fading with age, white, without staining. The pigment is sometimes washed out entirely by heavy rain; the fleshy cap lacks an umbo. The stipe is 2–8 x 1.5–2.0cm white to pale orange-white above, white below; it bears a robust, white, membranous, sack-like volva with pointed scales, tapering to an enlarged base; surface white, smooth to pruinose above, sometimes scaly below, universal veil forming a membranous, white cup-like volva at the base. The gills are free to narrowly adnate, crowded, off-white to pale cream to pale orangish cream in mass, with some reverse forking and anastomosing present; the short gills are more or less truncate, plentiful, unevenly distributed, of diverse lengths, occasionally adjacent to the stipe as well as to the margin. Gills close, white, sometimes with pinkish tones in age, attachment variable: free to slightly adnate or adnexed. Basidia 37.5–40.0 x 7.5–12.5 µm, sterigmata 3.7–5.0 µm, clamps are not present at bases of basidia. Basidiospores, sub-globose to broadly ellipsoid, smooth-walled, inamyloid, hyaline, measuring 7.5–12.5 x 6.2–8.5µm; spore print white.

Collection examined

TF – 4059, 19.vii.2018 on soil surface in sal forest, Bajag forest range (Chada Road), Dindori, Madhya Pradesh. Specimen deposited in Mycology Herbarium, Tropical Forest Research Institute, Jabalpur.

DISCUSSION

Amanita constricta was earlier recorded on the Pacific coastal hardwood species such as oak, arbutus or madrone (family Ericaceae) and Douglas fir, *Pseudotsuga* sp.), it grows singly or in scattered form during December–January. The species is distributed in California and extends

into southwestern Canada (Thiers & Ammirati 1982). *A. velosa* was recorded earlier from oak *Quercus agrifolia* and coast live oak from Oregon and California (USA) and Baja, California Peninsula, Mexico (Lloyd 1898). Other species of *Amanita* reported from India and recorded in sal forests are: *A. banningiana*, *A. bisporigera*, *A. chepangiana*, *A. ocreata*, *A. pantherina*, *A. populiphila*, *A. shorea* and *A. vaginata*. Among them *A. bisporigera* and *A. pantherina* were distributed in sal forest of Dindori, Madhya Pradesh (Verma & Pandro 2018). *A. chepangiana* is recorded from forests dominated by *Shorea robusta* and *Tectona grandis* and oak from Uttarakhand and Himachal Pradesh (Semwal et al. 2014), *A. shorea* was grown in pure sal forest of Himachal Pradesh (Singh & Kaur 2016). *A. banningiana*, *A. ocreata* and *A. vaginata* form ectomycorrhizal association with sal trees of Gidhani, Birbhum, Ilambazar (West Midnapur) and Kailibandh, Bishnupur (Bankura) sal forests of West Bengal (Pradhan et al. 2012). *Amanita velosa* is an edible mushroom (Boa 2004). Other edible *Amanita* spp. reported include *Amanita fulva* (Bhatt & Lakhanpal 1988), *A. rubescens* (Bhatt & Lakhanpal 1989), *A. chepangiana*, *A. hemibapha* and *A. vaginata* (Semwal et al. 2014; Vrinda et al. 2005a). *Amanita constricta* and *Amanita velosa* were collected from sal forest of Bajag, Dindori, Madhya Pradesh (India) in the present study. *A. ceciliae* and *A. pachycolea*, *A. submembranacea* and *A. vaginata* are comparable to *A. constricta*. *A. constricta* showed some similarity with *A. ceciliae* but the latter has bigger caps (5–12 cm) with grayish patches and longer stipe (7–18 cm). *A. pachycolea* also has bigger caps (7–18 cm), longer stipe (10–25 cm) and broader spores (9–14 x 9–12 µm). *A. submembranacea* differed in cap size (11.5cm) with olivaceous-pallid margin and roughly spherical spores. *A. vaginata* differ with *A. constricta* in having longer stipe (7–15 cm) with subglobose spores (8–12 µm).

Amanita velosa is an edible mushroom grows solitary to scattered during rainy season (collected on 19 July 2018) and fruit bodies were recorded in open areas of sal forest. About 20–25 fruit bodies were recorded in 25m square area on forest ground. *A. velosa* showed some similarity with deadly poisonous mushroom, *A. ocreata*, but it differed in cap size (*A. ocreata* cap reach up to 12cm in diameter). The stipe in *A. ocreata* are also longer (8–20 cm) with relatively broader spores (9–14 x 7–10 µm).

So far, a total of 73 species of *Amanita* are recorded from India (Verma et al 2018b) whereas 1,550 names were proposed under the genus *Amanita* from the world as indicated in the index fungorum. (<http://www.indexfungorum.org>).



Image 3. *Amanita velosa*: A–C—fruit bodies emerging in sal forest on open area | D—fruit body with fallen gill cover after sloughing off | E—fruit body eaten by some insect | F–G—fruit body showing volva, stipe and gills.

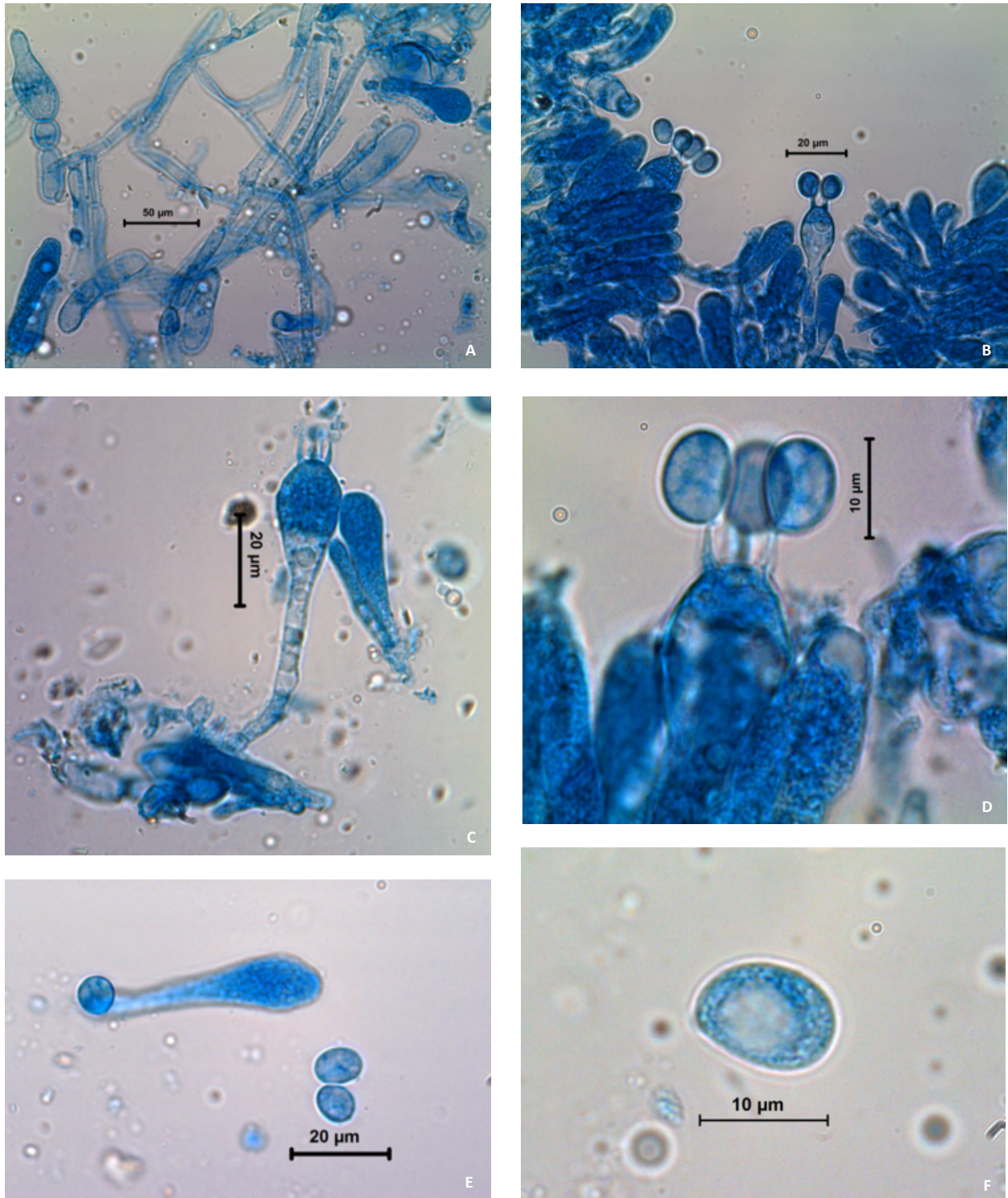


Image 4. *Amanita velosa*: A—mycelium networks | B—basidia with attached developing basidiospores | C—basidium showing detail | D—basidium and developing spores attached on sterigmata | E—basidiospores | F—a single basidiospores (enlarged).

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