

NEW RECORDS OF *RUSSULA* SPECIES FROM PAKISTAN

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Abstract

Species of *Russula* is characterized by a very variable colored cap that is first convex then flattened and slightly depressed and eventually cracks into small fragments. Stem is usually fairly stout; gills narrow and adnexed; Spores broadly ellipsoid, sub-spherical to spherical and spiny. The present report describes new records of four species of *Russula* viz., *R. cyanoxantha*, *R. grata*, *R. nitida* and *R. olivacea* from Gilgit-Baltistan. Of these, *R. olivacea*, *R. grata* and *R. nitida* are reported for the first time from Pakistan.

Key words: Asclepiadoideae, *Hoya*, New species, Plant diversity, Vietnam.

Introduction

Phylum Basidiomycota is a ubiquitous group of fungi that includes more than 31,500 species (Kirk *et al.*, 2008). This phylum is large and diverse, comprising forms commonly known as mushrooms, boletus, puffballs, earthstars, stinkhorns, birds nest fungi, jelly fungi, bracket or shelf fungi, rust and smut fungi (Alexopoulos *et al.*, 1996). Members of Basidiomycota are characterized primarily by the production of sexual spores (basidiospores) that are produced on the surface of a basidium. Many members have dolipore septa and clamp connections. Several members of Basidiomycota are well known plant pathogens, whereas others are important for their food value or because of scents, tastes, colours, and toxic properties due to a wide variety of secondary metabolites (Gallois *et al.*, 1990).

In contrast to more than 31,500 species reported from different parts of the world, less than 1000 species have been reported from Pakistan (Ahmad *et al.*, 1997). The climate of Gilgit-Baltistan area is generally suitable for growth of fungi belonging to Basidiomycota. However, the information about the basidiomycetous fungi from this area is rather scanty (Razaq & Shahzad, 2005a,b,c, 2006, 2007 a,b, 2012a,b, 2013, 2014a,b,c, 2015a,b,c, 2016a,b, 2017). The present report describes four new records of the members of genus *Russula* from Gilgit-Baltistan of which three are new to Pakistan also.

Materials and Methods

Samples of basidiomycetous fungi were collected from different areas of Gilgit-Baltistan. These fungi were photographed in their natural habitat and macroscopic details along with altitude and latitude were recorded using a GPS model Lowrance ifinder.

The samples were brought to Department of Biological Sciences, Karakoram International University, Gilgit and identified up to species level using the pertinent literature, to Ahmad (1972), Demoulin & Merriott (1981), Surcek (1988), Buczacki (1989), Shibata (1992), Swann & Taylor (1993) and Leelavathy & Ganesh (2000). The specimens were dried at room temperature to make a herbarium for future reference. The current valid names and synonymy were confirmed from www.speciesfungorum.org. A bright field Olympus Bx 51 microscope equipped with Olympus DP 12 camera was used to examine and photograph the specimens.

Results

During the present work, four species of *Russula* viz., *R. cyanoxantha*, *R. grata*, *R. nitida* and *R. olivacea* were recorded for the first time from Gilgit-Baltistan area. Of these, only *R. cyanoxantha* has been reported previously from Pakistan whereas the remaining three species appeared to be new records from Pakistan not hitherto reported (Ahmed, 1972; Mirza & Qureshi, 1978; Murakami, 1993; Ahmad *et al.*, 1997; Gardezi, 2002; Sultana *et al.*, 2011).

Key to the collected *Russula* species

1. Cap up to 20cm, Spores sub-globose *R. olivacea* 4
- Cap 2-15cm, spores sub-spherical to ellipsoid 2
2. Cap 4-8cm, spores sub-spherical *R. grata* 3
- Spores broadly ellipsoid 3
3. Cap 2-6cm, spores 8-11x7-9µm *R. nitida* 3
- Cap 5-15cm, spores 8-11x7-9µm *R. cyanoxantha* 1



Fig. 1. *Russula cyanoxantha* (A-D), *R. grata*, (E-F), *R. nitida* (G-H) and *R. olivacea* (I-K).

Russula cyanoxantha (Schaeff.) Fr. *Monog. Hymen. Suec.* 2(2): 194, 1863.

Synonymy:

Agaricus cyanoxanthus Schaeff., *Fung. Bavar. Palat.* 4: 40 (1774).

Russula cutefracta Cooke, *Grevillea* 10 (no. 54): 46 (1881).

Russula cyanoxantha f. *cutefracta* (Cooke) Sarnari, *Boll. Assoc. Micol. Ecol. Romana* 10 (no. 28): 35 (1993)

Russula cyanoxantha f. *pallid* Singer, *Z. Pilzk.* 2(1): 4 (1923).

Russula cyanoxantha var. *cutefracta* (Cooke) Sarnari, *Boll. Assoc. Micol. Ecol. Romana* 9 (no. 27): 38 (1992).

Russula cyanoxantha (Schaeff.) Fr., *Monogr. Hymenomyc. Suec.* (Upsaliae) 2(2): 194 (1863) var. *cyanoxantha*.

Distinguishing characters: Cap 4-15cm, initially convex, then becoming flattened and slightly depressed, pinkish to light brown or purplish in colour, cuticle half peeling, greasy when wet, with radiating and branching veins. Stem 5-10cm, smooth, fairly stout, usually tapering slightly upwards. Flesh white. Gills white or very pale cream, narrow, adnexed. Smell indistinct; Taste mild. Spore print white. Spores broadly ellipsoid, spiny, 6-7x7-9µm (Fig. 1A-D).

Season: June- September.

Collected from: Nultar, Distric Gilgit, alt 2915m, N = 36°08, E = 74°11, and Dichelnalla (Dashkin), District Astore, alt 3569m, N=35°30, E=74°53.

Ethnic uses/importance: Edible and used for treatment of mouth ulcers.

Habit/Habitat: Usually in groups on soil under broad-leaved trees.

Previous Report from Pakistan: From Sharan, Malakandi, Nathiagali and Dungagali (Shibata, 1992; Khalid & Iqbal, 1995).

2. *Russula grata* Britzelm., *Botan. Centralbl.* 54(4): 100 (1893).

Synonymy:

Russula grata Britzelm., *Ber. naturhist. Augsburg* 9: 239 (1898) var. *grata*.

Russula grata var. *laurocerasi* (Melzer) Rauschert, *Česká Mykol.* 43(4): 198 (1989).

Russula foetens var. *grata* (Britzelm.) Singer, *Beih. bot. Zbl.*, Abt. 2 49: 320 (1932).

Russula foetens subsp. *Laurocerasi* (Melzer) Jul. Schäff., *Z. Pilzk.* 17(2): 51 (1933).

Russula subfoetens var. *grata* (Britzelm.) Romagn., *Russules d'Europe Afr. Nord*, Essais sur la Valeur taxinomique et Spécifique des Caractères des Spores et des Revêtements: 340 (1967).

Russula laurocerasi Melzer, *Čas. česk. houb.* 2: 243 (1920).

Russula foetens var. *laurocerasi* (Melzer) Singer, *Annl. mycol.* 40(1/2): 73 (1942).

Distinguishing characters: Cap 4-8cm, at first sub-spherical, then flattened, slimy-sticky, especially at beginning, margin markedly grooved and with small irregular warts. Stem 4-8cm long and 2-5cm thick, fairly stout, equal. Gills first cream then becoming brown, distant and adnexed. Smell like bitter almonds. Flesh whitish, turning reddish. Spores sub-spherical and spiny, 7-9x8-10 µm in size (Fig. 1E-F).

Season: June- July.

Collected from: Dichal nall (Dashkin), District Asrore, alt 3573m, N= 35°30, E=74°53.

Ethnic uses/Importance: Inedible.

Habit/Habitat: Usually in groups on soil in the coniferous trees.

Previous Report from Pakistan: None.

3. *Russula nitida* (Pers.) Fr., *Epicr. syst. mycol.* (Upsaliae): 361 (1838)

Synonymy:

Agaricus nitidus Pers., *Syn. meth. fung.* (Göttingen) 2: 444 (1801)

Russula venosa Velen., *České Houby* 1: 146 (1920)

Distinguishing characters: Cap-2-6cm, at first convex then flattened, cuticle slightly sticky when wet, margin usually markedly grooved. Stem 2-5cm long and 2mm thick, fairly slender, tapering slightly upwards. Gills straw-coloured. Spore print yellowish cream. Smell indistinct. Flesh white. Spores ellipsoid, short spiny, 6-9x8-11µm in size (Fig. 1G-H).

Season: July- August.

Collected from: Lashtang forest, District Astore, alt 2785, N=35°28, E=74°46.

Ethnic uses/Importance: Edible.

Habit/Habitat: Usually in small groups on soil of the mixed damp forest.

Previous Report from Pakistan: None.

4. *Russula olivacea* (Schaeff.) Fr., *Epicr. syst. mycol.* (Upsaliae): 356 (1838)

Synonymy:

Agaricus alutaceus Pers., *Observ. mycol.* (Lipsiae) 1: 101 (1796).

Agaricus alutaceus var. *olivaceus* (Schaeff.) Krombh., *Naturgetr. Abbild. Beschr. Schwämme* (Prague) 8: 25, tab. 69:10 (1843).

Agaricus olivaceus Schaeff., *Fung. Bavar.Palat.*3: tab. 204 (1770).

Russula alutacea var. *olivacea* (Schaeff.) J. Lange, *Dansk bot. Ark.* 4 (no. 12): 44 (1926).

Russula xerampelina var. *alutacea* (Pers.) Quéf., *Fl. mycol. France* (Paris): 341 (1888).

Distinguishing characters: Cap 4-8 cm, at first dome-shaped, then flattened and slightly depressed, cuticle up to one-third peeling, slightly sticky when wet, with concentric cracking on aging. Stem 5-10cm long and 2-5 cm thick, fairly slender, tapering upwards. Gills straw coloured. Spore print ochraceous. Smell indistinct. Flesh white. Spores sub-globose thickly covered with spines, 8-11x7-9µm in size (Fig. 1I-K).

Season: August- September.

Collected from: Mushkin forest (Dashkin), District Asrore, alt 2712m, N=35°28, E=74°47.

Ethnic uses/Importance: Edible.

Habit/Habitat: Usually in groups on soil under beech trees.

Previous Report from Pakistan: None.

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(Received for publication 11 January 2018)