Abstract

Two sabulicolous species Agaricus devoniensis and A. menieri are recorded for the first time in Bulgaria and the Balkan Peninsula. A detailed macro- and microscopic description is given and differences from similar species are briefly discussed. The species are described and illustrated with colour photographs on the basis of collected Bulgarian specimens.

Key words: Agaricus, Balkan Peninsula, fungal diversity, taxonomy

Introduction. Contemporary knowledge on the diversity of Bulgarian Agaricus species is based on years of purposeful field and laboratory investigations made by [1–5].

The article contains new data about species compositions of Bulgarian Agaricus species. Two species new for the country — A. devoniensis and A. menieri, were reported. They are considered presumably to be rare species in many states of Europe, therefore a detailed description and illustrations are presented.
Material and methods. Air-dried studied specimens of the fungi are kept in the Mycological collection of the Agricultural University of Plovdiv (SOA). The samples are documented with colour photographs and detailed description. Fruiting bodies of both species were photographed with SONY Cyber-shot 5.1 Mpix and CANON PowerShot A460 5.0 Mpix in standard JPEG format. Microscopic features are observed and measured in lactophenol under Amplival LM, with magnification ×1000. Measurement values for basidiospores are presented below as follows: min–(mean±1σ)–max.

The taxonomic decisions in the article have been made in conformity with the research of [2,6–13]. The nomenclature of species follows [14].

Description of the species.

**Agaricus devoniensis** P. D. Orton, Trans. Brit. Mycol. Soc., 43, 1960, No 2, p. 173 (Fig. 1).


*Pileus* up to 3–5 cm in diameter, thick-fleshy, initially hemispherical, subsequently applanate or slightly umbonate to flat, whitish, subsequently pale-straw-yellow, dry, smooth, silky-fibrillose. Margin long, inrolled, nearly always covered with grains of sand.

*Gills* free, thin, whitish-pink, subsequently pale red to red-brown, with pale, sterile edge. Gill trama in young carpophores initially regular, latter irregular. *Stipe* 5–7 × 1–1.5 cm, central, cylindrical, initially white, latter pale yellow, smooth to silky-fibrillose. *Ring* with two thin peronate rings, the outer one leaving only hardly visible traces or utterly disappears. *Flesh* white, on cutting at the base of the stipe becoming slightly pale-reddish. *Smell* non-distinctive. *Taste* non-distinctive. *Basidiospores* 5.5–(5.8 ± 0.02)–7 × 5–(5.3±0.02)–5.5 µm, n = 50, ovoid to spherical, brownish, smooth. Spore print brownish. *Basidia* 20–25 × 9–15 µm, 4-sterigmate, clavate. *Sterigmata* 2 µm long. *Cheilocystidia* 20–38(–40) × 7.5–12 µm, clavate, numerous. *Macrochemical reactions*: Cross reaction with Schaeffer’s reagent negative.

*Habitats*. On sandy soil, coastal dunes and grasses in coastal areas. Strictly sabulicolous species, fruiting on sandy soil and coastal dunes [10]. The species should be considered as a strictly psammophilous species referred to the *Ephedro fragilis-Juniperetum macrocarpae*. The basidiomata, single or connate, are not easily observable, apart from the pileus, since they are deeply burrowed in the substrata [15].

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Fig. 1. Macro- and microscopic features (a basidium, b basidiospores) of <i>Agaricus devoniensis</i>. Bar = 5 µm
Fig. 2. Macro- and microscopic features (a basidioma, b cross section of basidioma, c basidiospores) of *Agaricus menieri*. Bar = 5 µm
Humus saprotroph, rare, inedible. May–October.

General distribution. In Europe known from Austria, British Isles, Denmark [16], France, Germany, Hungary, Italy [10,15,17,18], Poland and Spain [19]; Belgium [20]; Sweden [21]; in Asia the species has been recorded in Turkey [22].

Specimens examined. Thracian Lowlands, in sandy soil along the watercourse of Stryama River, near the bridge over the river, above Stryama village, 27.05.2010, leg. & det. M. Lacheva (SOA 60 00288).

Distribution in Bulgaria. Thracian Lowlands.

Note. Metric and macroscopic data of the Bulgarian specimens of A. devoniensis agree with the descriptions of [23] and [10].

Our observations are in conformity with the literature data that A. devoniensis should be considered as a sabulicolous species developing in sandy soil along watercourse [10,15].

Agaricus menieri Bon, Doc. Mycol., 11, 1981, No 44, p. 28 (Fig. 2).


Pileus up to 6–10(–13) cm in diameter, thick-fleshy, initially hemispherical, subsequently applanate or slightly umbonate, dry, smooth, fibrillose or finely cracked, whitish, pale yellowish with a grey-pink shade, eventually pale ochraceous. Margin even, on drying undulate, often with remnants of the veil.

Gills free, thin, whitish-pink, subsequently pale greyish pink to red-brown, with pale, sterile edge. Gill trama in young carpophores initially regular, latter irregular. Stipe 7–10 × 2–3 cm, central, equal, tightly, cylindrical to slightly spindle-shaped, with or without bulbously expanded at the base, white, at first pale yellow, subsequently brownish, silky-fibrillose. Ring broad apical, free standing, double for a collar-like shape on the underside. Flesh white, on cutting at the base of the stipe becoming chrome-yellow. Smell initially slightly of anise, subsequently of carbolic acid. Taste slight bitter. Basidiospores 6–(7.3±0.01) –10 × 5–(5.6±0.01)–6.5 μm, n = 50, broadly ellipsoid, brownish, smooth, relatively large. Spore print brownish. Basidia 20–25 × 8–10 μm, 4-sterigate, clavate. Sterigmata 2–2.5 μm long. Cheilocystidia 8–20 × 8–10 μm, oval or pyriform, numerous. Macrochemical reactions: Cross reaction with Schaeffer’s reagent negative.
Habitats. Strictly sabulicolous species, fruiting on sandy soil and coastal dunes. Basidiomata often completely covered with sand (in association with Helichrysetum or Ammophiletum) \[^{[10]}\], high dunes, on sand, close to plants of Ammophiletum australis and Medicagin marinae-Ammophiletum australis \[^{[13,15]}\]. Humus saprotroph, rare, inedible. June–October.

General distribution. In Europe described in France \[^{[7]}\], Germany, Hungary, Italy \[^{[10,15]}\]; in Asia the species has been recorded in Israel \[^{[13]}\] and Turkey \[^{[22]}\].


Distribution in Bulgaria. Black Sea Coast.

Note. The Bulgarian specimens of A. menieri agree macroscopically with the descriptions of \[^{[7,9,10,13]}\].

Metric data of the Bulgarian specimen are close to those reported in the literature, except for the maximum values of the cheilocystidia in our material, which is bigger than the pointed one (18 µm) in the original description of the species in \[^{[7]}\].

According to our investigation, A. menieri should be considered as a strictly psammophilous species \[^{[10,13,15]}\] – it was almost covered by the sand, when the sample was collected.

Comments. A. devoniensis and A. menieri are the first sabulicolous species reported in Bulgaria.

Agaricus devoniensis P. D. Orton is closely related to the common in Europe A. pseudopratensis (Bohus) Wasser var. niveus Bohus, which sometimes also occurs on sandy soils. It differs in the cap being generally snow-white to pale-cream, single ring and the slightly larger spores \[^{[2,8,10]}\].

Agaricus menieri Bon is similar to A. pilatianus Bohus, known to be common in Europe, which differs in the cap being generally sooty-brownish, ±fibrillose-squamulose and by having smaller spores \[^{[2,10,13]}\].

At present, the known diversity of the genus Agaricus in our country is considered to include fifty species in total \[^{[2-3]}\]. These two new findings contribute to the diversity of Bulgarian mycota, by adding new records of Agaricus. Finally, A. devoniensis and A. menieri exceed the total number of Agaricus species recorded in Bulgaria to fifty-two.

We hope that this study will be useful for creating a database of the Bulgarian Agaricus species.
REFERENCES


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