

Mycena seynii Quél. (Agaricales: Mycenaceae) in Bulgaria

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Abstract: The alien fungus *Mycena seynii* is recorded for the first time in Bulgaria. Within its native range the species is confined to cones of the Mediterranean pines *Pinus brutia*, *P. halepensis*, *P. pinaster* and *P. pinea*. The Bulgarian collection originates from a planted stand of *P. pinaster* and *P. halepensis*, both non-native plants in this country. The fungus was probably introduced in Bulgaria with the cultivation of these conifers in afforested areas. Detailed description and illustrations of the finding are provided, as well as comparison with materials from different localities in Greece. The variability of the basidiospores of the studied Balkan collections is outlined and spore quotient ratio is shown to be useful character for separation of *M. seynii* from the similar species. The distribution of this fungus in Europe is summarised and briefly discussed, with emphasis on cases of introduction along with exotic pine trees.

Key words: Alien fungi, Basidiomycota, *Mycena* section *Rubromarginatae*, *Mycena seynii*, neomycetes, strobilicolous fungi

Introduction

Mycena (Pers.) Roussel is a large genus, comprising some 300 taxa in Europe (ROBICH 2003, 2016). In Bulgaria the genus is scarcely investigated. There are 45 species recorded for the country so far (DENCHEV & ASSYOV 2010, GYOSHEVA et al. 2016). In the autumn of 2016, the author received a *Mycena* collection on cones of *Pinus pinaster* Ait. and *P. halepensis* Mill. from one of his correspondents. Both conifers are exotic trees found as ornamental and landscape plants in Bulgaria. After examination, the fungus was identified as *M. seynii* Quél. This new record for the Bulgarian non-native mycota is discussed here.

Materials and Methods

The materials described in this paper were collected in a man-made mixed pine plantation. Additional fresh collections for comparison were subsequently obtained from different localities in Greece. All specimens are deposited in air-dried state in the Mycological Collection of the Institute

of Biodiversity and Ecosystem Research (SOMF). All specimens were photographed and documented in fresh state. The colour terms in the text below refer to the British Fungus Flora Colour Chart (ANONYMOUS 1969). The microscopic study was held by an AmScope T360B light microscope, equipped with an AmScope MU900 digital camera. The observations were made in 5% KOH on slides. Congo red in ammonia was arbitrarily added in order to highlight some microscopic structures. Melzer's reagent (after the recipe in KIRK et al. 2001) was used to test the amyloid reaction of tissues. Pre-calibrated digital images were used for obtaining measurements of different structures with Piximetre v. 5.9. Data about spores are presented below in the following way: minimum-(average \pm 1 standard deviation)-maximum; 30 mature spores, randomly chosen, were assessed in each specimen studied. The minimum and maximum values are given for the remaining microscopic structures. The description of the species is based on the material from Bulgaria.

Results

Mycena seynii Quél., Bull. Soc. Bot. France, 23: 351, 1877 ("1876"), Figs. 1-6

Pileus up to 35 mm across, conical to campanulate, later more or less flattened, often umbonate, smooth or very shallowly sulcate, faintly translucently striate, matt or somewhat fibrillose or finely scaly in the centre (lens), dry but slightly lubricous when moist, clay pink, pale vinaceous buff, pale vinaceous or pale livid vinaceous with darker centre, with age fading to flesh-colour or pale greyish vinaceous; pileal margin straight or undulate, pink or flesh-colour, edge usually yellowish. Lamellae 20-25, adnate or slightly decurrent with a short tooth, off-white, pale greyish to pale pinkish brownish, especially on drying; lamellar edge purplish brown. Stipe up to 70×5 mm, hollow, fragile, equal or slightly widening towards the base, cylindrical or somewhat compressed, straight to flexuous, curved in the lower part, glabrous, usually shiny, lubricous in wet weather, at the apex often somewhat farinose (lens), whitish to pale clay pink or pale clay buff with vinaceous tint in the upper part, gradually turning more brownish, watery white to dingy whitish below, the base elongated into rooting part in substrate, densely covered with long, abundant, whitish fibrils. Odour faint, not distinctive, agreeable. Taste indistinctive. Basidiospores 9.5-(11.2±0.8)-12.8 × 5.1-(6.0±0.5)-6.9 μm, Q=1.7-(1.9±0.1)-2.2, ellipsoid to elongated, sometimes almond-shaped, smooth, amyloid. Basidia 30-45 × 7-12 μm, clavate, 4-spored; sterigmata up to 5 μm long. Cheilocystidia 21.5-50.5 × 8-12 μm, forming a sterile band, fusiform, clavate, ampuloid, subcylindrical, lageniform to clavate, sometimes bifid or irregular, smooth, occasionally with one to three excrescences at the apex. Pleurocystidia scarce, similar by shape and size to cheilocystidia. Lamellar trama dextrinoid; hyphae 8-20 μm wide. Hyphae of the pileipellis 2-7 μm wide, gelatinised, with yellowish content, smooth or exceptionally with coarse excrescences. Hyphae of the cortical layer of the stipe 1.5-5 μm wide, somewhat gelatinised, smooth, terminal cells 3.5-6.5 μm wide, smooth to coarsely diverticulate. Clamp connexions present in all tissues.

Material examined:

Bulgaria: northeast of the village of Bliznatsi, Varna District, N 43°5'5.9", E 27°53'14.2", ca. 160 m a. s. l., 11.10.2016, on cones of *P. pinaster* and *P. halepensis*, leg. D. Nikolova (SOMF 28210);

Greece: between the villages of Langadi and Skepasto, Nomos Thessaloniki, N 40°50'22.9", E

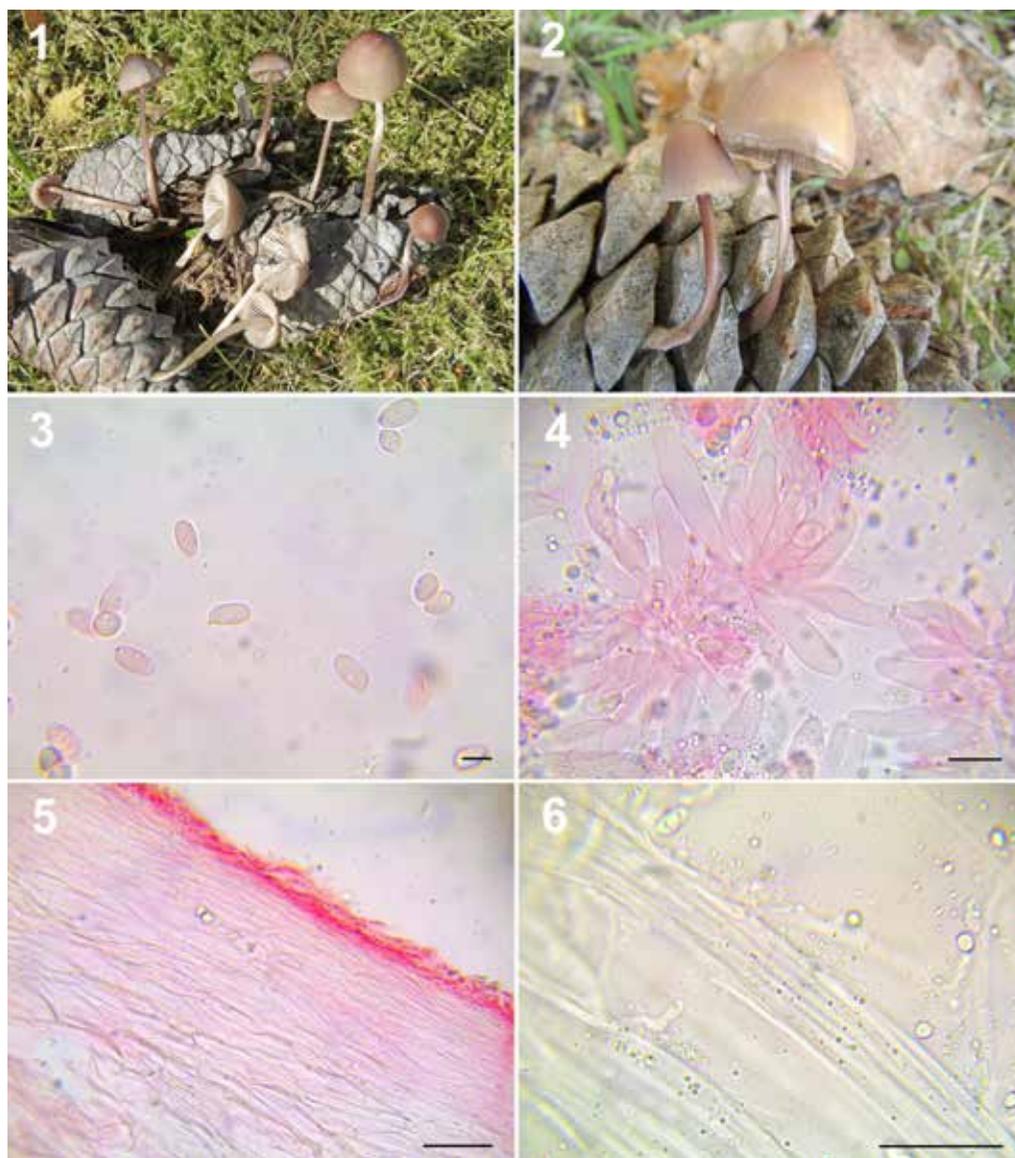
23°31'35.1", ca. 510 m a.s.l., on cones of *P. pinaster*, 29.10.2016, leg. B. Assyov & I. Assyova (SOMF 28214); the dunes of Krioneri, Nomos Chalkidiki, N 40°28'45.9", E 23°49'12.6", ca. 5 m a.s.l., on cones of *P. pinaster*, 29.10.2016, leg. B. Assyov & I. Assyova (SOMF 28230); between Thassos and Panagya villages, Nomos Thassos, N 40°44'25.5", E 24°43'26.6", ca. 350 m a.s.l., on cones of *P. halepensis*, 22.11.2016, leg. B. Assyov (SOMF 28804).

Discussion

The Bulgarian specimen studied matches well the available descriptions in literature (KÜHNER & ROMAGNESI 1974, ARONSEN 2002, ROBICH 2003, ROUX 2006, BOCCARDO et al. 2008). It also agrees with the specimens from Greece, studied for comparison. The species seems very variable what concerns the colours of basidiomata – different shades of clay pink, vinaceous buff, clay buff, fawn, pink, vinaceous, livid vinaceous, with or without lilac or lavender tint, sometimes cinnamon. A white form of this species has been described, *M. seynii* f. *albida* Robich, recorded so far in Italy and Spain (ROBICH 2008, PÉREZ-DE-GREGORIO & CASTILLO 2013). It has not been seen yet in the studied localities in Bulgaria or Greece.

The basidiospores of our specimens are consistently smaller than those reported in the literature (ROBICH 2003, ROUX 2006, BOCCARDO et al. 2008), but still largely overlap with the known range of variability (Table 1). As of present this discrepancy cannot be satisfactorily explained, but apparently the spore size in *M. seynii* is more variable than currently recorded. Notably, the spore quotient ratio in this species has been little explored in mycological literature and the only data were reported by ARONSEN (2002), based on the study of a French collection. Our observations on the available Balkan collections show that this ratio is a stable character, useful for distinguishing of *M. seynii* from the similar species, discussed below. Further studies on material from other parts of the native range are welcome and expected to confirm this assumption.

Mycena seynii belongs to section *Rubromarginatae* Singer ex Maas Geest. (MAAS GEESTERANUS 1980, ROBICH 2003). It is usually easily recognised in the field by its gross morphology and occurrence on cones of particular pine species. The most similar European species is *Mycena rubromarginata* (Fr. : Fr.) P. Kumm. (BREITENBACH & KRÄNZLIN 1991, ROBICH 2003, EMMETT et al. 2008). It occurs on conifer litter or very rarely on broadleaf



Figs. 1-6. Morphological features of *Mycena seynii*. 1, 2 – basidiomata on cones (1 – SOMF 28210, 2 – 28214); 3 – basidiospores; 4 – cheilocystidia; 5 – pileipellis; 6 – hyphae of stipitipellis with diverticulate terminal elements. Scale bars: 10 μ m (Fig. 3), 20 μ m (Fig. 4), 50 μ m (Figs. 5, 6)

wood. The pileus is somewhat similarly coloured as in *M. seynii*, but is more striate. The lamellar edge is distinctly reddish and hence the scientific name. Microscopically *M. rubromarginata* is distinguished by the spores, which are broadly ellipsoid with average quotient 1.4-1.6 (EMMETT et al. 2008). Another similar species is *M. purpureofusca* (Peck) Sacc. It is recognised by the more violet coloured pileus, violet lamellar edge, subglobose to broadly ellipsoid spores with average quotient 1.4-1.6 and scarce clamps (ROBICH 2003, EMMETT et al. 2008).

SACCARDO (1887) introduced the alternative spelling '*M. seynesii*' for *M. seynii*. This orthographic variant is widespread in recent mycological literature (TORREJÓN 2002, BON 2004, LEGON & HENRICI 2005, WALLEYN & VANDEVEN 2006, KAYA 2009, HENRICI

2010, POLEMIS et al. 2012a,b, KONSTANTINIDIS 2014, GÜNGÖR et al. 2015). The International Code of Nomenclature for algae, fungi, and plants (MCNEILL et al. 2012) governs the case and Quélet's original spelling '*seynii*' must be retained according to the provisions of Article 60.7, where *M. seynii* and *M. seynesii* are treated in particular in example 18 of the same article.

Mycena seynii was first described by QUÉLET (1877) on materials from France. It is recorded in a number of other southern European countries, e. g. Croatia, Cyprus, Greece, Italy, Montenegro, Portugal, Spain, and Turkey (PERIĆ & PERIĆ 1996, TKALČEC & MEŠIĆ 2002, TORREJÓN 2002, ROBICH 2003, VINEY 2005, SESLI & DENCHEV 2008, BOCCARDO et al. 2008, LOIZIDES et al. 2011,

Table 1. Comparison of characteristics of basidiospores of *Mycena seynii* from the collections studied and literature

Literature/ Specimens	Spore length [µm]	Spore width [µm]	Spore quotient
ARONSEN (2002)	10.3-14	6-7	1.6-(1.9)-2.2
ROBICH (2003)	10.5-15(-16)	6-7.5(-8)	–
ROUX (2006)	12-14.5	6-7.5	–
BOCCARDO et al. (2008)	12-15	6.5-7	–
SOMF 28210, Bulgaria	9.5-(11.2±0.8)-12.8	5.1-(6.0±0.5)-6.9	1.7-(1.9±0.1)-2.2
SOMF 28214, Greece	9.5-(12.3±1.1)-14.2	5.1-(6.1±0.6)-7.5	1.7-(2.0±0.2)-2.5
SOMF 28230, Greece	9.7-(11.2±0.9)-13.2	5.0-(6.0±0.5)-7.1	1.7-(1.9±0.1)-2.3
SOMF 28804, Greece	8.2-(10.1±0.9)-11.7	4.6-(5.3±0.4)-6.1	1.6-(1.9±0.1)-2.2

POLEMIS et al. 2012a,b, KONSTANTINIDIS 2014). The species is also present in North Africa, namely Morocco (MALENÇON & BERTAULT 1975). It occurs on cones of different species of Mediterranean pines, especially of *P. pinaster*, but also *P. brutia* Ten., *P. halepensis*, and *P. pinea* L. (ROUX 2006, KAYA 2009, POLEMIS et al. 2012a). In Bulgaria, the fungus was discovered in a man-made plantation of *P. pinaster* and *P. halepensis*, both used as landscape trees, the former especially well present along the Black Sea coast (KOSTADINOV et al. 1998). Enough evidence exists for the spreading of the fungus together with culture of *P. pinaster* as it is recorded as an alien in a number of localities in Netherlands (KUYPER et al. 2006) and Belgium (WALLEYN & VANDEVEN 2006). In Britain, apart of this substratum, it was found on cones of *P. radiata* D. Don (LEGON & HENRICI 2005, HENRICI 2010), a species non-native in Europe. This, in itself, is an interesting record as it indicates the ability of *M. seynii* to spread on other pine species not naturally found in its native range. It is notable that the four Mediterranean pines on which cones the fungus occurs, are shown to form a well-defined clade in the multigene phylogenetic analysis of ECKERT & HALL (2006). The clade includes *P. canariensis* C.

Sm., *P. heldreichii* Christ. and *P. roxburghii* Sarg. as well. However, *M. seynii* has not been found on cones of any of those trees, and thus, the relationship is probably spatial rather than phylogenetical. *Pinus halepensis*, *P. pinaster* and *P. pinea* do not occur naturally in Bulgaria and no records exist in Europe on cones of most other species, that are present as native to Bulgaria (*P. heldreichii*, *P. mugo* Turra, *P. nigra* Arn., *P. peuce* Griseb., and *P. sylvestris* L.). A small population of *P. brutia* was recently discovered in the south of the country (TASHEV 2003) and *M. seynii* is known to occur on cones of this species (KAYA 2009, POLEMIS et al. 2012a, KONSTANTINIDIS 2014). At the moment, *M. seynii* is regarded an alien species for the Bulgarian mycota. Further observations are needed to reveal its actual distribution in this country as *P. pinaster* has just been recorded as an alien species in Bulgaria (PETROVA et al. 2017), as well as if a population exists in the only natural stand of *P. brutia*.

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