

The genus *Cystolepiota* (*Agaricaceae*, *Basidiomycetes*) in Israel

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Abstract. The genus *Cystolepiota* is new for Israel. In Israel it is represented by two species: *Cystolepiota bucknallii* and *C. moelleri*. Locations, dates of collections in Israel, general distribution, detailed macro- and micromorphological descriptions and illustrations are given.

Key words: Asia, biodiversity, *Cystolepiota*, taxonomy

Introduction

In spite of the family *Agaricaceae* having been the focus of interest for many studies (e.g. Kühner 1936; Wasser 1980; Bon 1981; Candusso & Lanzoni 1990; Guzmán & Guzmán-Dávalos 1992; Vellinga 2001), the species of Israel have not been studied well. In Israel the family *Agaricaceae* represented by three tribes namely, *Agariceae* Pat., *Leucocoprineae* Singer, and *Lepioteae* Fayod, from which only tribe *Agariceae* Pat. has been detailed examined by Wasser (1995, 1996, 1997, 1998, 2000, 2002). Other tribes of the family have not been well studied and need more detailed examination. Fragmentary data on some species of the tribes *Leucocoprineae* and *Lepioteae* can be found in several papers concerning *Basidiomycota* of Israel (Reichert & Avizohar-Hershenson 1953, 1955, 1959; Avizohar-Hershenson 1967; Binyamini 1973, 1974, 1975, 1976a, b, c, 1984, 1989; Didukh *et al.* 2002, 2004).

While studying the latter tribe, we revealed a number of taxa previously not known for the country. One of them is the genus *Cystolepiota*. It is present in Israel with two species: *Cystolepiota bucknallii* and *C. moelleri*.

Materials and Methods

A species diversity study of the genus *Cystolepiota* in Israel was based on (1) our investigations during the 2002–2006 growing seasons; (2) an extensive study of material from the Tel Aviv University herbarium (TELA) in April 1991; (3) a review of the published literature on the *Basidiomycota* of Israel. The material we collected is kept at the Herbarium of the Institute of Evolution, University of Haifa (HAI, Israel).

The microscopic characteristics were observed with the Carl Zeiss-amplival microscope. Fungal material was mounted on a microscope slide and examined in water using a light/dark field microscope with or without phase contrast at $\times 20$, $\times 40$, and $\times 100$ (oil immersion). For statistical calculations, 20–30 spores were measured for every preparation. Micromorphological characteristics of the specimens were observed using Melzer's reagent, and Cresyl Blue.

Habitat and general distribution of species are given according to Wasser (1980), Moser (1983), Candusso & Lanzoni (1990), Guzmán & Guzmán-Dávalos (1992), and Vellinga (2001). Distribution of the species in Israel is given, using the natural regions of Israel according to Feinbrun-Dothan & Danin (1998).

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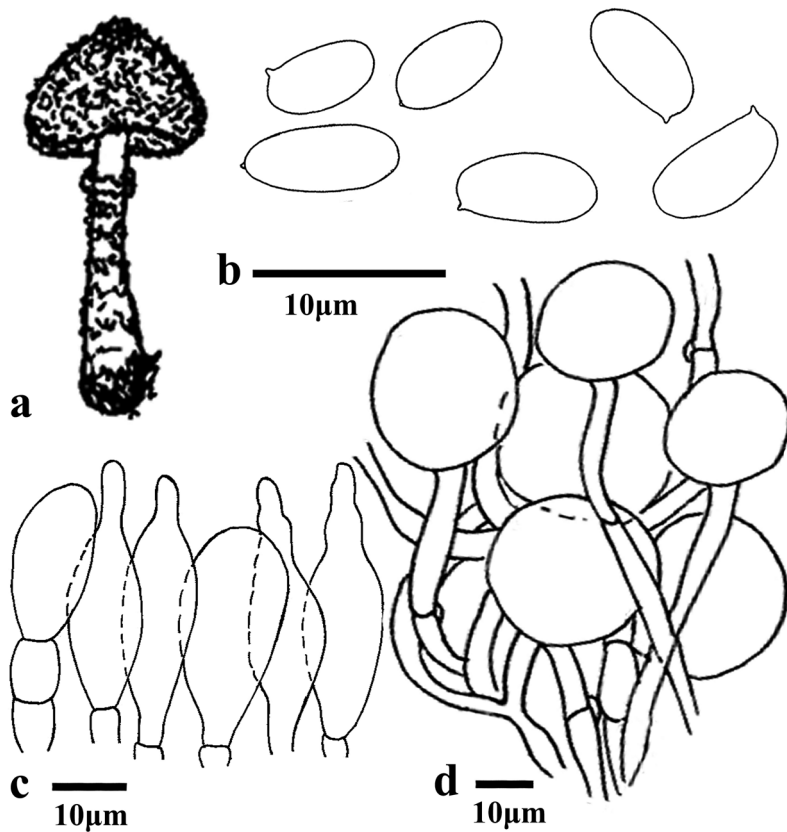


Fig. 1. *Cystolepiota moelleri*: a – basidioma, b – basidiospores, c – cheilocystidia, d – the elements of the pileipellis

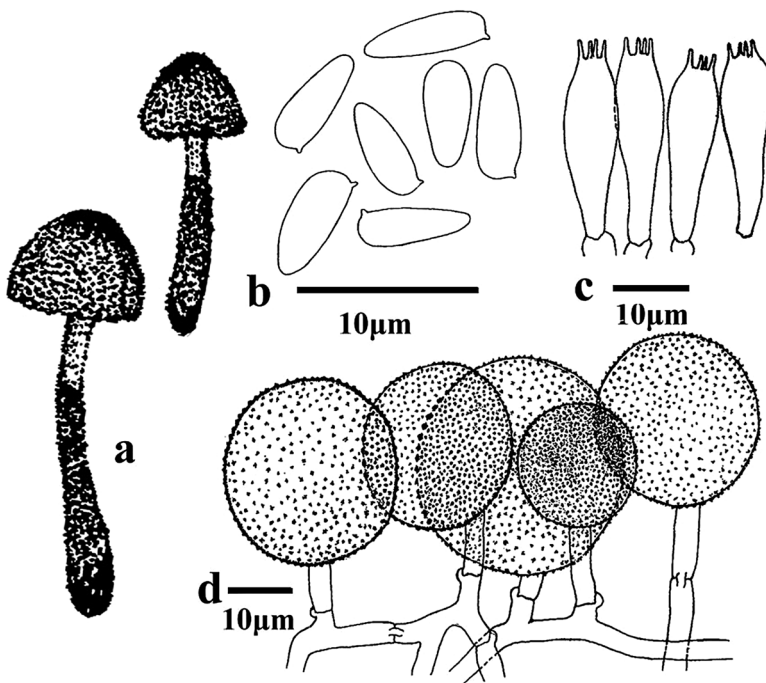


Fig. 2. *Cystolepiota bucknallii*: a – basidiomata, b – basidiospores, c – basidia, d – the elements of the pileipellis

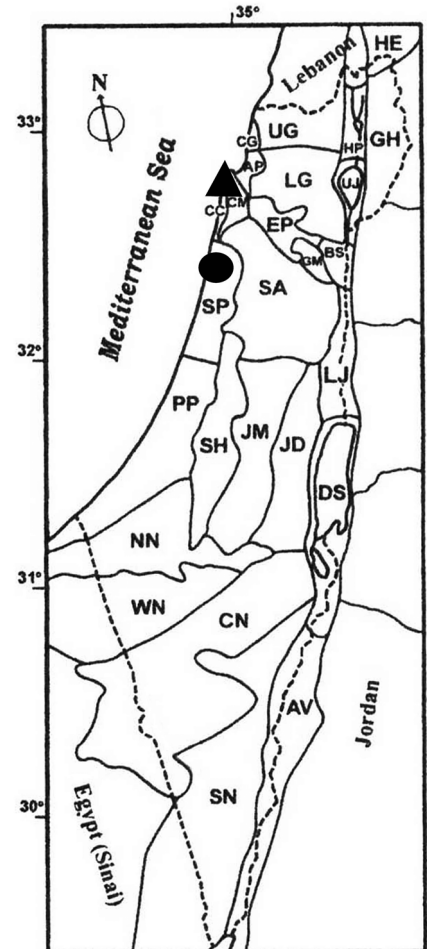


Fig. 3. Distribution of the genus *Cystolepiota* in Israel. Nature regions of Israel: AP – Akko Plain; AV – Arava Valley; BS – Beit Shean Valley; CC – Carmel Coast; CG – Coast Galilee; CM – Carmel Mount; CN – Central Negev; DS – Dead Sea Area; EP – Esdraelon (Yizre'el) Plain; GH – Golan Heights; GM – Gilboa Mount; HE – Hermon Mount; HP – Hula Plain; JD – Judean Desert; JM – Judean Mts.; LG – Lower Galilee; LJ – Lower Jordan Valley; NN – Northern Negev; PP – Philistean Plain; SA – Samaria; SH – Shefela; SN – South Negev; SP – Sharon Plain; UG – Upper Galilee; UJ – Upper Jordan Valley; WN – Western Negev. ● – *Cystolepiota bucknallii*; ▲ – *Cystolepiota moelleri*

Results

Cystolepiota Singer, in Singer & Digilio in Lilloa 25[1951]: 281, 1952.

Lepiota subgen. *Sphaerocystae* Wasser in Ukr. Bot. Zhurn. 35: 517, 1978.

Pulverolepiota Bon in Doc. Mycol. 22(88): 30, 1993.

The taxonomic position of genus *Cystolepiota* varied through time. In Kühner's (1936) and Wasser's classification the genus *Cystolepiota* is included in *Lepiota* (Pers.: Fr.) Gray. Knudsen (1978) transferred sect. *Echinatae* from genus *Lepiota* to genus *Cystolepiota* mainly on the basis of the presence of spherocysts. On the basis of further studies on more numerous species belonging to this section, later Knudsen (1980) revised his opinion and retained this section in the genus *Lepiota*. According to his revised concept the presence or absence of intermediate cells is considered to be an important separating character between *Lepiota* and *Cystolepiota*. Bon (1993) applied the narrowest genus concept of all, excluding members of sect. *Echinatae* and transferring them to a separate genus, *Echinoderma* (Locq. ex Bon) Bon. Johnson (1999) and Johnson & Vilgalys (1998) elucidated the phylogenetic relationships of *Lepiota* s. lat. They concluded that *Lepiota* consists of an assemblage of paraphyletic lineages, with the two *Cystolepiota* species and *L. aspera* (as *L. acutesquamosa*) forming a monophyletic clade. Vellinga (2003) suggested to reconsider the recognition of separate genera for *Cystolepiota*, sect. *Echinatae*, *Melanophyllum* and *Pulverolepiota*.

Cystolepiota is closely related to the genus *Melanophyllum* Velen., from which it differs mainly in the coloration of the spores. From *Lepiota* sect. *Echinatae* it differs by the structure of the veil: only thin hyphae and globose (or inflated), relatively loosely arranged elements, agglutinated to form pyramidal squamules in *Lepiota* sect. *Echinatae*. Furthermore, in most *Cystolepiota* species the spores are uninucleate, whereas they are binucleate in *Lepiota* sect. *Echinatae* (Singer 1986; Vellinga 2001). The genus *Pulverolepiota* Bon was suggested for *Lepiota pulverulenta*, a species resembling *Cystolepiota*, but differing in the elongate inflated elements of the pileus covering, the absence clamp connections, and the bi-nucleate, rough spores. However, nowadays this genus is considered synonym of the genus *Cystolepiota*.

Section *Cystolepiota*

Cystolepiota moelleri Knudsen, Bot. Tidsskr. 73: 134, 1978. **Fig. 1**

Pileus 2-3 cm in diam., hemispheric, campanulate, convex, later on with a small obtuse umbo, in young specimens pink, pinkish-purple, darker in the center, with floccose-squamulose surface, with velar remnants at the margin when young. **Lamellae** free, thin, crowded, ventricose, at first white, later with pinkish tint. **Stipe** 2-5 × 0.2-0.4 cm, cylindrical, slightly widening towards the base, hollow, whitish in annular zone, pinkish or concolorous with the pileus towards the base, with same type of covering as the pileus. **Ring** not membranous, quickly disappearing. **Context** whitish in pileus and in the

central part of the stipe, brownish-vinose at the base of the stipe. **Spore print** white.

Basidiospores 4.0-6.0 × 2.5-3.0 μm, average size 4.5-5.6 × 2.7-3.0 μm, Q=1.6-2, elliptic or elliptic-subcylindric, not dextrinoid, with pink inner wall in Cresyl Blue. **Basidia** 4-spored, (16-) 20-25 × 5.5-7.5 μm, clavate. **Cheilocystidia** 20-35 (-40) × 7-11 (-14) μm, mostly clavate, subventricose, or subfusiform, often with excrescence at apex, seldom capitate. **Hymenophoral trama** regular. **Pileipellis** made up of round spherocysts 20-60 μm in diam., with brownish pigment, joined with cylindrical thin-walled hyphae 1-5 μm in diam. **Stipitipellis** made up of cylindrical, globose to ellipsoid elements, sometimes brown colored. **Clamp-connections** present in all tissues.

Specimen examined: ISRAEL: CM, Mt. Carmel National Park, Haifa University, under *Pinus halepensis*, 4 Mar 2002, leg. S.P. Wasser, det. M. Didukh (HAI-519) (Fig. 3).

Habitat: gregarious or solitary, saprotrophic, on the soil, in mixed deciduous forests.

General distribution: Europe (Italy, Spain, France, Denmark, the Netherlands), Asia (Israel), and North America (USA).

Notes. *Cystolepiota moelleri* is new for Israel and for the Asian mycobiota. According to Vellinga (2001), it macroscopically resembles *Lepiota pseudoasperula*, but it is microscopically quite distinct because of the non-dextrinoid spores and the clavate cheilocystidia that are often provided with an apical excrescence.

Section *Pseudoamyloideae* Singer & Cléménçon

Cystolepiota bucknallii (Berk. & Broome) Singer & Cléménçon, Nova Hedwigia 23[1972]: 238, 1973. **Fig. 2**

Pileus 1.5-2 cm in diam., thin-fleshed, umbonate, hemispheric, later convex-plane, plane, with an obtuse umbo, grey, with pink and ochre hues, pale-lilac, covered with white pruina, with flake-like remnants of general veil at the edge. **Lamellae** free, thin, frequent, white, later on pale creamish with yellow hue. **Stipe** 4-6 × 0.2-0.5 cm, central, cylindrical, sometimes slightly curved, whitish in upper part, purple-violet in the lower part, dark-violet later on, covered with mealy pruina. **Ring** evanescent. **Context** white in pileus; in stipe concolorous with surface. Odor pleasant. **Spore print** white.

Basidiospores 7.5-9.0 × 2.5-4.0 μm, average size 7.8-8.0 × 2.8-3.7 μm, Q=3.0-2.3, elongated-ellipsoid, with slight superhilar depression, smooth, weakly brownish in Melzer's reagent, pinkish in Cresyl Blue. **Basidia** 4-spored, 21-24 × 5-6 μm, clavate. **Cheilo-** and **pleurocystidia** are absent. **Hymenophoral trama** regular. **Pileipellis** made up of globose to ellipsoid elements, often with slightly rugulose surface and with brownish intercellular pigment, 20-43 μm in diam. **Stipitipellis** made up of attached globose and ellipsoid elements, like those on pileus. **Clamp-connections** present.

Specimen examined: ISRAEL: SP, Tel Aviv, Hayarqon park, on lawn under *Carmarina*, 20 Feb 1974, leg. N. Binyamini (as *Lepiota lilacina*), rev. M. Didukh & S.P. Wasser (TELA-N 74 422) (Fig. 3).

Habitat: gregarious or solitary, saprotrophic, on the soil, often in mixed deciduous forests.

General distribution: Europe (British Isles, Switzerland, France, Italy, Germany, the Netherlands, Hungary, Czech Republic), Asia (Israel), and North America (USA).

Notes. *Cystolepiota bucknallii* is very rare for Asian mycobiota. It is recorded for the first time in Israel. It was found just once in 1974, but was never published. This species is known from mostly temperate regions of Europe and North America where it is very rare and occurs in mixed or deciduous forests (Wasser 1980; Vellinga 2001).

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