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A contribution to the taxonomy and species diversity of the *Agariceae* tribe (Higher Basidiomycetes) of Israel mycobiota

Abstract

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A taxonomic study of the *Agariceae* Pat. tribe (Higher Basidiomycetes) of Israel is given. The *Agariceae* tribe is represented by 38 species and infraspecific taxa related to the three genera *Melanophyllum* Vel., *Agaricus* L. : Fr. emend. P. Karst. and *Gyrophragmium* Mont. Three species, viz. *Agaricus bonii* S. Wasser, *A. nevoi* S. Wasser and *A. herinkii* S. Wasser were described earlier as new to science. *Melanophyllum haematospermum* (Bull. : Fr.) Kreisel, *Agaricus aestivalis* Moell. var. *flavotactus* (Moell.) Moell., *A. bitorquis* (Quél.) Sacc., *A. campestris* L. : Fr. var. *floccipes* (Moell.) Pil., *A. geesteranii* Bas et Heinem., *A. gennadii* (Chat. et Boud.) P. D. Orton var. *microsporus* (Bohus) S. Wasser, *A. impudicus* (Rea) Pil., *A. praeclaresquamosus* Freeman, *A. pequinii* (Bond.) Konr. et Maubl., *A. silvaticus* Schaeff. var *pallens* Pil., *A. xanthoderma* Gen. var. *lepiotoides* R. Mre, *A. vaporarius* (Pers.) Cappelli, *A. lanipes* (Moell. et J. Schaeff.) Sing. are new to Israel and some of them to Asia or the Near East. Synonyms, detailed description, locations and dates of collection in Israel, peculiarities, general distribution as well as taxonomic remarks to some taxa are given.

Introduction

The *Agariceae* Pat. tribe, in Israel, has not been critically studied hitherto, and no inventory of the species is available. Fragmentary data on some species of the tribe are to be found in a number of publications devoted to the Higher Basidiomycetes of Israel (Reichert & Avizohar-Hershenzon 1953, 1955, 1959, Avizohar-Hershenzon 1961, 1964, 1968, Dring & Rayss 1963, Kenneth & Avizohar-Hershenzon 1971, Avizohar-Hershenzon & Binyamini 1972, 1974, Binyamini 1973a, 1973b, 1974, 1975, 1976 a, 1976b, 1976c, 1980, 1982, 1984,1989, Moser & al. 1977, Wasser & Binyamini 1992). There is also one paper by Avizohar-Hershenzon (1961) which is especially devoted to species of the *Agaricus xanthoderma*-group in Israel. In his papers on the Agaricales s.l. of Israel (1975, 1980, 1984), Binyamini has provided generalized data on 22 species and infraspecific taxa from the *Agariceae* tribe (21 taxa of *Agaricus* and one of *Gyrophragmium*).

As a result of our own investigation, the knowledge of the *Agariceae* tribe of Israel has been significantly increased: one genus (*Melanophyllum*) and 16 species and infraspecific taxa have been added to the Israel Mycobiota (some of which being new for Asia or to the Near East). Furthermore 3 species new to science were recently described, based on Israeli material (Wasser 1995, 1996). The total number of taxa of the *Agariceae* tribe from Israel presently reaches 38 items.

Materials and methods

The scientific analysis of the *Agariceae* tribe diversity in Israel is based on 1) our investigations during the growing seasons of 1991 and 1993 to 1997 (Wasser & al. 1995, Wasser 1995, 1996), 2) the processing of extensive material (with eventual redetermination) kept in the following herbaria: Tel-Aviv University, Israel (TELA), Botanical Museum of Copenhagen, Denmark (C), Royal Botanic Gardens, Kew, UK (K), University of Michigan, Ann Arbor, USA (MICH), Narodni Museum v Praze, Praha, Czech Republic (PR), Termeszettudomanyi Museum, Budapest, Hungary (BP), as well as 3) the review of the complete published literature of Higher Basidiomycetes of Israel. The *Agariceae* material collected by us in Israel is kept at the Herbarium of the Institute of Evolution, University of Haifa (HAI) and at the Herbarium of the M. G. Kholodny Institute of Botany (KW), National Academy of Sciences of Ukraine (numbers of herbarium samples stored in KW Herbarium are given in the book edited by Minter & Dudka 1996).

Distribution of species is given using the natural regions of Israel according to

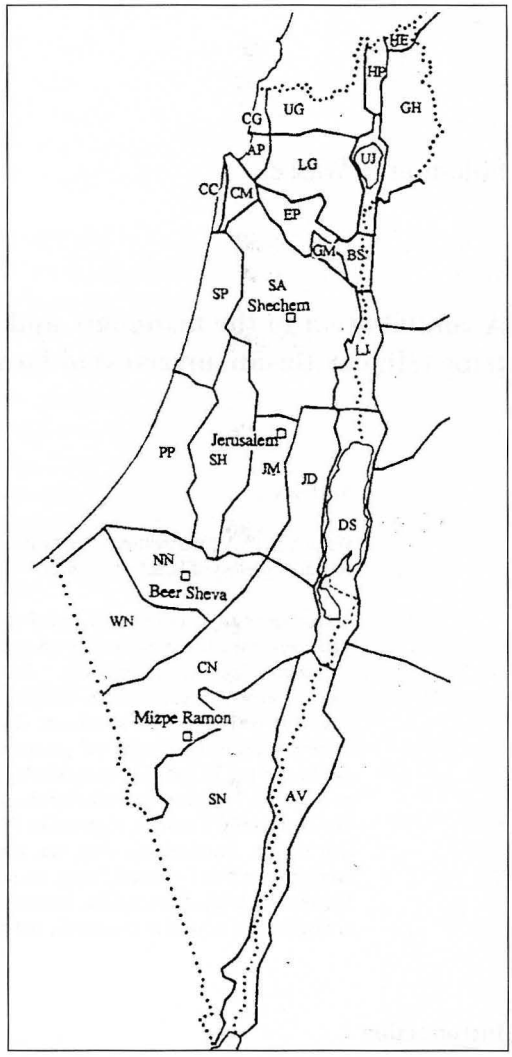

Fig.1. Map of natural regions of Israel: AP - Akko Plain; AV - Arava Valley; BS - Beit Shean Valley; CC - Carmel Coast; CG - Galilee Coast; CM - Carmel Mts.; CN - Central Negev; DS - Dead Sea Area; EP - Esdraelon Plain; GH - Golan Heights; GM - Gilboa Mts.; HE - Hermon; HP - Hula Plain; JD - Judean Desert; JM - JM - Judean Mts.; LG - Lower Galilee; LJ - Liwer Jordan Valley; NN - Northern Negev; PP - Philistean Plain; SA - Samaria; SH - Shefela; SN - Southern Negev; SP - Sharon Plain; UG - Upper Galilee; UJ - Upper Jordan Valley; WN - Western Negev (Zohary & Heinbrun-Dothan,1966-1986).

Zohary & Feinbrun-Dothan 1966-1986 (Fig. 1).

The species concept and definitions of intraspecific taxa in the *Agariceae* tribe are according to Wasser (1985, 1989, 1993) and follow the compromise definitions adopted at the Lausanne symposium in 1976 (Clémençon 1977).

Description of taxa

Synonyms, detailed descriptions of new taxa, locations and dates of collections in Israel, ecological peculiarities, distribution, as well as taxonomic remarks are given below.

Tribe ***Agariceae*** Pat., *Hym. Eur.*:75 (Agarices), 1887; Henn. in Engl. a. Pr., *Nat. Pl. Fam.* 1: 230, 1898.

Genus ***Melanophyllum*** Vel., *Ceske Houby* 3: 569, 1921 (Latin diagnosis, *Opera Bot. Cech.* VI: 219, 1949).

1. *Melanophyllum haematospermum* (Bull. : Fr.) Kreisel, *Fedd. Repert.* 95(9-10): 700, 1984 (Fig. 2).

Basionym: *Agaricus haematospermum* Bull., *Herbier de la France* tab. 591/1: 698, 1793.

Description and illustration: Wasser 1989: 11-13, Pl. Ia; XIII, 1a-d; XXIX, 4-6. Candusso & Lanzoni 1990: 72-76, Pl. 1a.

Pileus 1-2.5 cm diam., thin-fleshy (1-2 mm), globose-campanulate, campanulate, later convex, in young specimens dark brown with pink tinge, later especially when drying,

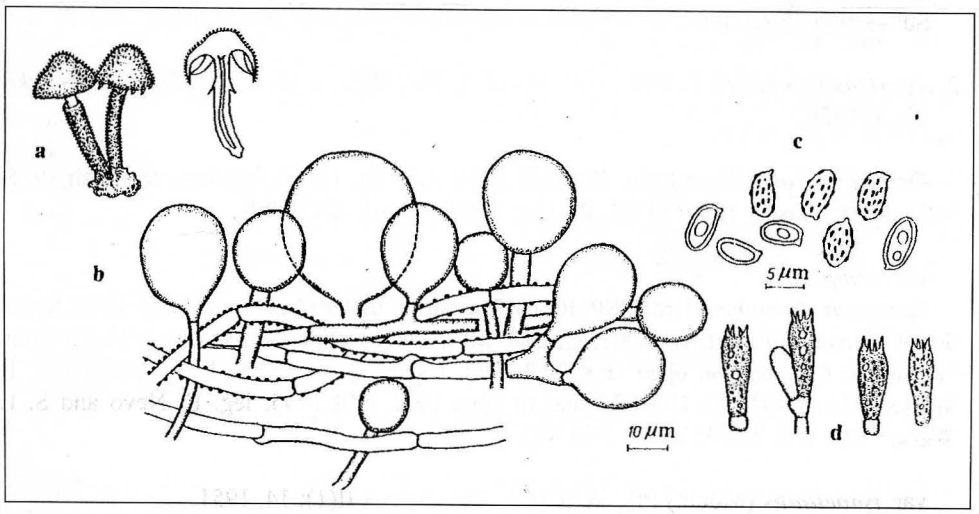

Fig. 2. *Melanophyllum haematospermum*: a- fruit bodies, b- elements of pileal cuticle, c- spores; d- basidia (HAI, N01.12).

smoky-brown, sometimes black with olive tinge, granular with detersile punctate scales; margin with remnants of the universal veil. Pileal scales consisting of globose-elongate, almost polyhedric, 20-30μm wide, smooth, thin-walled, cells. Gills free, crowded (20-25 gills per cm), with an even edge, devoid of anastomoses, carmine-wine-greenish-brown, wine-brown, on drying brown or almost black. Gill trama regularmade of cylindric thin-walled, clamped hyphae, 10-22 μm diam. Basidia 4-spored, 14-20 × 5-6 μm, clavate-cylindrical, hyaline, thin-walled. Sterigmata 2-2.5 μm long. Spore print olive-green, when drying greyish-brown, pale-brownish-red. Spores 4-6.5 × 2.5-4 μm, pale green-brown (under microscope umber-sepia), ellipsoid, ovoid, almost reniform, with lateral apiculus, thin-walled, rugose. Stipe 2-4 × 0.3-0.5 cm, central, even, sometimes curved (often with reddish rhizoids at the base), fistulose, the upper part (one third) purple-red, the lower part (two thirds) covered by granular reddish-brown floccose remnants of the universal veil. Flesh white in pileus, dark brown at the base of the stipe, with a strong fruity odor, turning unpleasant in old carpophores (like *Cortinarius camphoratus* Fr.); taste pleasant.

Specimens examined: Israel, SP: Tel-Aviv, Park Hayarkon N, on lawn under *Cupressus* trees, 2.11.1972, leg. N. Binyamini, det. S. P. Wasser (TELA, N72.343a); CM: Mt Carmel National Park, under *Quercus calliprinos* Webb, 2.1.1995 , leg. E. Nevo, det. S. P. Wasser (HAI, N01.12).

General distribution: Europe (everywhere); Asia (Japan, Israel, Russia); North America (USA), Caribbean (Cuba); South America (Argentina); Africa (Algeria, Morocco, Ghana); Australia; New Zealand; New Guinea.

Note: new species for the Biota of Israel. Litter saprotroph; rare; having no food value; cosmopolitan.

Genus **Agaricus** L. : Fr. emend. Karst., *Bidr. Finl. Nat. Folk.* 32: XXV, 1879.
Subgenus ***Agaricus***
Section ***Agaricus***
Subsection ***Rufescentes*** (J. Schaeff. & Moell.) Wasser, *Ukr. Bot. J.* 33(3): 250, 1976.

2. ***Agaricus campestris*** L. : Fr., *Syst. Mycol.* 1: 281, 1821, s. str. J. Lge, *Dansk Bot. Arkiv* 12: 9, 1926.

Description and illustration: Cappelli 1984: 128, fig. 10, Pl. 9; Moser & Jülich 1985-1996, III, 5; Wasser 1989: 21-23, Pl. 1, c; XXIII, 4, a-d; XXX, 8-9.

var. ***campestris***

Specimens examined: Israel, SP: Ramat Hasharon, under *Cupressus,* 11.11.1978, leg. et det. N. Binyamini (TELA, N78.358); CM: Mt Carmel National Park, Lower Nahal Oren, "Evolution Canyon", in open land 7.12.1994, leg. E. Nevo and S. P. Wasser, det. S. P. Wasser (HAI, N02.25); UG: Tabgha, in open land, 4.01.1995, leg. E. Nevo and S. P. Wasser, det. S. P. Wasser (HAI, N03.42).

var. ***isabellinus*** (Moell.) Pil., *Acta Mus. Nat. Prag.* VII(1): 14, 1951.

Specimens examined: Israel, SP: Ramat Hasharon, in open land, 30.11.1973, leg. et det. N. Binyamini (TELA, N73.190).

var. ***floccipes*** (Moell.) Pil., *Acta Mus. Nat. Prag.* VII(1): 14, 1951. (Fig. 3).

Syn.: *Agaricus floccipes* (Moell.) Bohus emend. Bohus, *Ann. Hist. Nat. Mus. Nat. Hung.* 70: 107, 1978 (non *A. floccipes* Fr. 1836), *A. moellerianus* Bon, Doc. Mycol. 60: 6, 1985.

Pileus smooth or scaly-cracked, often becoming yellow on handling, stipe at the apex floccose-scaly (reminding of *Hebeloma sinapizans* (Paul. : Fr.) Gill.). Ring very narrow and fugacious. Spores 6-7.5 × 4-5.5 µm. Basidia 4-spored, 23-34 × 7-9 µm. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, GH: near Afiq, in open land, 4.01.1995, leg. E. Nevo and S. P. Wasser, det. S. P. Wasser (HAI, N01.28); HP: Dan Natural Preserve, Tel Dan, in open land, 31.01.1996, leg. E. Nevo and S. P. Wasser , det. S. P. Wasser (HAI, N03.46).

General distribution: Europe (everywhere); Asia (everywhere); North America (Canada, USA, Mexico); South America (Brazil, Bolivia, Columbia, Argentina, Chile, Venezuela); Africa (Algeria, Egypt, Zaire, Nigeria, Morocco, Kenya, SA Republic); Australia; New Zealand; Antarctica.

Note: Agaricus campestris var. *floccipes* is a new variety for the Biota of Israel. This species produces campestrin which is effective against Gram positive and Gram negative bacteria. Its inhibition rate against sarcoma 180 and Ehrlich carcinoma amounts to 80% (Ying & al. 1987; Hobbs 1995). Humus saprotroph; frequent; edible; medicinal; cosmopolitian.

3. *Agaricus vaporarius* (Pers.) Cappelli, *Fungi Europaei* 1: 149, 1984. (Fig. 4).

Basionym: Agaricus campestris L. : Fr. var. *vaporarius* Pers., *Syn. Meth. Fung.*: 418, 1801.

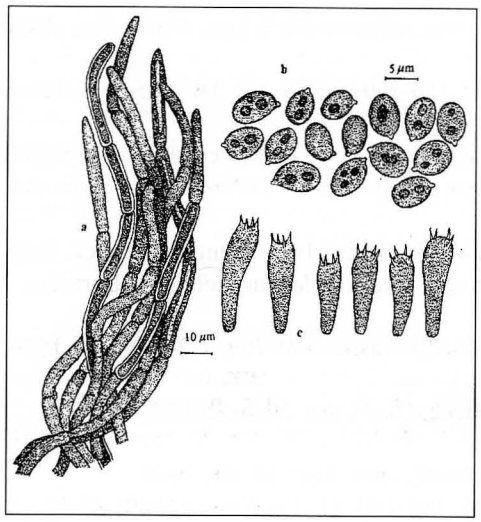

Fig. 3. *Agaricus campestris* var. *floccipes*.: a- elements of pileal cuticle, b- spores, c- basidia (HAI, N01.28).

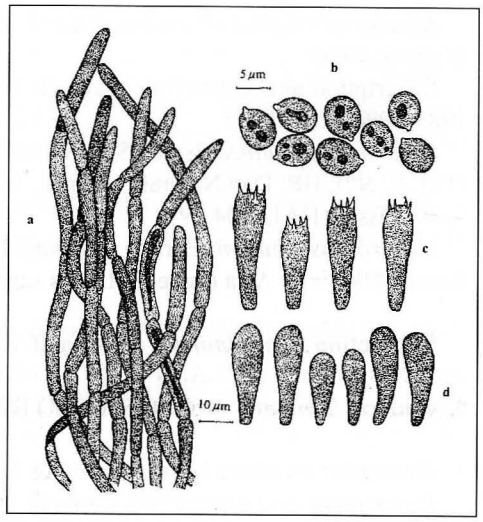

Fig. 4. *Agaricus vaporarius*: a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, N11.28).

Description and illustration: Cappelli 1984: 149-155, fig. 15, pl. 15; Wasser 1989: 25-26, pl. III, a; XXIII 6, a-b.

Pileus 7-15 cm diam., thick-fleshy, firm, convex, later plane, with flat centre, dark chestnut or chocolate-brown, turning paler toward margin, with coarse, brown, adpressed, scales. Gills free, thin, crowded, with even sterile edge, pinkish with reddish tinge, later dark brown. Basidia 4 (sometimes 1-2) spored, 24-36 × 8-10μm, clavate. Sterigmata 3-4 μm long. Cheilocystidia 20-32 × 7-9μm, cylindric to narrowly clavate. Spore-print dark brown. Spores 6-7 × 5-6 μm, pale brown, subglobose, globose, with lateral apiculus, with one or two refractive droplets. Stipe 6-12 × 2.5-5cm, central, cylindric or attenuated at base, solid, whitish, brownish toward the base, sometimes with veil remnants below the ring, seen as an irregular white or brown, scaly zone. Ring relatively thick, 1-2 mm, whitish, pendulous, sulcate from above, with brownish scales beneath, often with furcate edge. Flesh firm, whitish, on breaking becoming pink. Odor acidulous, later unpleasant. Taste in young carpophores sweetish, later repulsive. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, AP: Akko, Park, in open land, 14.12.1994, leg. et det. S. P. Wasser (HAI, N01.19); CM: Mt Carmel National Park, Nahal Nesher, Horshat Ha'Arbaim, in open land in grass, 22.01.1996, leg. et det. S. P. Wasser (HAI, N11.28).

General distribution: Europe (everywhere); Asia (Israel).

Note: It is recorded for the first time for Israel. *A. vaporarius* is related to *A. subperonatus* (J. Lge) Sing. from which it differs in color of cut flesh, in size and shape of spores and cheilocystidia (Wasser 1980, 1989; Cappelli 1984). Humus saprotroph; rare; edible; euryholarctic; Eurasian.

4. *Agaricus subperonatus* (J. Lge) Sing., *Lilloa* 22: 432, 1951 (1949). (Fig. 5).

Basionym: *Psalliota hortensis* (Cke) J. Lge var. *subperonata* J. Lge, *Dansk Bot. Arkiv* 4(12): 8, 1926.

Description and illustration: Cappelli 1984: 156-159, pl. 16, fig. 16; Moser & Jülich 1985-1996, III, 6.

Specimens examined: Israel, SP: Ramat Hasharon, 30.11.1974, leg. et det. N. Binyamini (TELA, N?); HP: Dan Natural Preserve, Tel Dan , in grass, 31.01.1996, leg. E. Nevo, det. S. P. Wasser (HAI, N04.29).

General distribution: Europe (Norway, Denmark, British Isles, Hungary, France, Italy, Russia, Ukraine); Asia (Israel). Humus saprotroph; rare; edible; euryholarctic; Eurasian.

Subsection *Sanguinolenti* (J. Schaeff. & Moell.) Wasser, *Ukr. Bot. J.* 33(3): 250, 1976.

5. *Agaricus lanipes* (Moell. & Schaeff.) Hlavacek, *Cas. Cesk. Houb.* 26: 57, 1949.

Basionym: *Psalliota lanipes* Moell. & J. Schaeff., *Ann. Myc.* 36: 65, 1938.

Description and illustration: Cappelli 1984: 186-190, pl. 23; Wasser 1989: 37-38, pl. VII, a; XXIV, 4a-c.

Pileus 5-10 cm diam., thick-fleshy, convex, later convex-applanate, depressed in the

centre, in young carpophores chocolate-brown or nut-brown, later covered with wide, fibrillose, chocolate-brown, adpressed scales on a paler brownish-reddish background, with thin involute, later straight, sometimes undulating margin, which on rare occasions may bear remnants of the veil. Gills free, thin, crowded, pinkish with reddish tinge or dark brownish with a pale sterile edge. Basidia 4-spored, 20-28 × 3.5-4 µm, clavate. Cheilocystidia 15-30 × 8-15 µm, abundant, arranged in clusters, vesiculose-clavate. Spore print dark brown. Spores 5.5-6.5 × 3.5-4 µm, brownish, ovoid, with 1-3 refractive droplets. Stipe 4-6 × 2-3 cm, shorter than diam. of pileus, central, cylindric, swollen at the base, whitish above the ring, glabrous, fibrillose, beneath the ring with one-two disrupting layers, sometimes covered with floccose-scaly bloom, at the base with mycelial cords, the bulb turning tawny in color on handling. Ring apical, simple, narrow, whitish above, concolorous with pileus below. Flesh whitish, staining pink on exposure, later becoming brownish in the upper part. Smell faint or slightly of almonds. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, UG: Mt Meron Natural Preserve, in coniferous and deciduous oak (*Quercus boissieri* Reuter) forests, 31.01.1996, leg. E. Nevo and T. Pavlicek, det. S. P. Wasser (HAI, N04.61); CM: Mt Carmel National Park, Nahal Nesher, Horshat Ha'Arbaim, under *Pinus halepensis* Mill., 30.03.1996, leg. et det. S. P. Wasser (HAI, N05.63).

General distribution: Europe (Denmark, France, Germany, The Netherlands, Italy, Czech Republic, Romania, Hungary, Ukraine, Russia); Asia (Uzbekistan, Israel).

Note: Agaricus lanipes is a new species for the Biota of Israel. Very close is *A. luteolorufescens* P. D. Orton (Dennis, Orton & Hora 1960), which Cappelli (1984) considers as a synonym. Type material of *A. luteolorufescens* was studied (K, sub *Cupresso macrocarpa*, Friston Sussex, 17.11.1957, leg. et det. P. D. Orton, rev. S. P. Wasser, 2.08.1993).

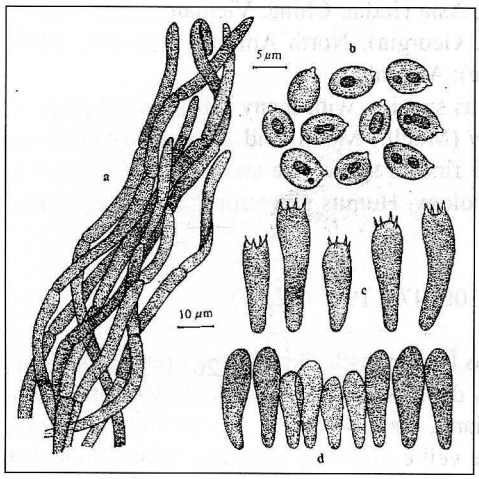

Fig. 5. *Agaricus subperonatus* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, N04.29).

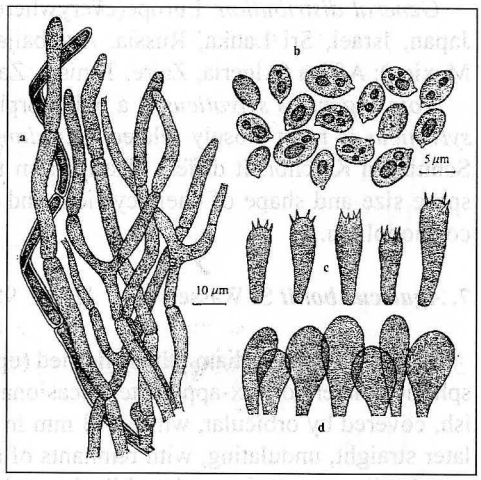

Fig. 6. *Agaricus silvaticus* : a- elements of pileal cuticle, b- spores, c- basidia, d-cheilocystidia (TELA, N74.516).

Analysis showed that *A. luteolorufescens* is distinct from *A. lanipes* in smaller spores, fibrillose-squamose cap, colours of flesh in pileus and in stipe, and in the cap not being depressed at the centre. Humus saprotroph; rare; edible; euryholarctic; Eurasian.

6. *Agaricus sylvaticus* Schaeff., *Fungorum Icones*: tab. 242, 1770: Fr., *Syst. Mycol.* 1: 282, 1821. (Fig. 6).

Description and illustration: Cappelli 1984: 160-164, pl. 17; Moser & Jülich 1985-1996, III, 3; Wasser 1989: 42-44, pl. VIIIa; XXV, 2a-c.

var. **sylvaticus**

Specimens examined: Israel, PP: Mikve Israel, under *Casuarina*, 23.12.1974, leg. et det. N. Binyamini (TELA, N74.516); CM: Mt Carmel National Park, Horshat Ha'Arbaim, in *Pinus halepensis* Mill., 7.01.1995, leg. et det. S. P. Wasser (HAI, N03.92); SP: Kibbutz Shefayim, Park, 13.04.1996, leg. et det. S. P. Wasser (HAI, N06.37).

var. **pallens** Pil., *Acta Mus. Nat. Prag.* VIIB(1): 67, 1951.
Syn.: *Agaricus annae* Pil., *Acta Mus. Nat. Prag.* VIIB(1): 132, 1951.

Pileus 5-8 cm in diam., thin-fleshy, ochraceous-brown at the centre, for the rest covered with ochraceous adpressed scales at a whitish background. Spores 7.3-9. 5 × 4.5-5.5 mm, brown, ellipsoid. Basidia 4-spored, 20-30 × 7-9 mm, clavate. Cheilocystidia 20-30 × 9-11 mm . Stipe 8-12 v 1-1.8 cm, whitish, at the base with floccose-scaly scurfiness. Flesh white, on exposure more or less intensely red, then brown.

Specimens examined: Israel, LG: Carmiel, in *Pinus halepensis*, 3.03.1997, leg. et det. S. P. Wasser (HAI, N09.01); Czech Republic, Karlstejn, in Picetis prope Kral. Studanka, 3.8.1950, leg. Pilatova, det. A. Pilat (PR, N649548, Typus).

General distribution: Europe(everywhere); Asia (India, China, Vietnam, Iran, Turkey, Japan, Israel, Sri Lanka, Russia, Azerbaijan, Georgia); North America (Canada, USA, Mexico); Africa (Algeria, Zaire, Tunisia, Zaire); Australia.

Note: Agaricus sylvaticus is a polymorphous species, with many infraspecific taxa. *A. sylvaticus* is most closely related to *A. langei* (Moell.) Moell. and *A. haemorrhoidarius* Schulz. in Kalchbr. It differs clearly from the first in spore size and from the second in spore size and shape of cheilocystidia and ecology. Humus saprotroph; not rare; edible; cosmopolitan.

7. *Agaricus bonii* S. Wasser, *Doc. Mycol.* 98-100: 470, 1995 (Fig. 7).

Pileus 4-12 cm in diam., thick-fleshed (up to 1-2 cm thick), in young carpophores hemispherical, later convex-applanate, occasionally depressed in the center, whitish, later greyish, covered by orbicular, white, 1-3 mm in diam., granular scales. Margin thick involute, later straight, undulating, with remnants of the veil covered by orbicular, white, up to 3-4 mm in diam. granular scales. Pileal cuticle consisting of hyaline, greyish, thin-walled, cylindrical, septate hyphae, without clamps, 3-6 µm in diam. Gills free, crowded, whitish, pale pink, later dark brown with pale sterile edge. Gill trama regular, consisting of cylin-

dric, thin-walled hyphae 4-11 µm in diam. Basidia 4-spored, 22-33 × 6-9 µm, clavate. Sterigmata 2-4 µm long. Cheilocystidia 25-31 × 7-9 µm, cylindrical, clavate, thin-walled. Spore-print dark brown. Spores 5-7.5 × 3.8-4.7 µm, pale brown, ellipsoid, ovoid-ellipsoidal, with small apiculus, with 1-2 or without refractive droplets. Stipe 3-8 × 0.8-2 cm, central, cylindrical, narrowing toward the base, solid, later fistulose only in the centre, whitish, whitish-greyish, with 1/2 stipe covered by orbicular, white, up to 5 mm in diam. granules. Ring apical, simple, white, thin, quickly disappearing. Flesh white, unchanging on exposure, then becoming pink in stipe and in the peripheral layers of pileus, becoming pale yellow on drying. Odor and taste pleasant fungal. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, CM: Mt Carmel National Park, Nahal Nesher, under *Quercus calliprinos* Webb., 5.12.1994, leg. et det. S. P. Wasser (HAI, Typus); University of Haifa, Park, in open land, in grass, 7.01.1995, leg. et det. S. P. Wasser (HAI, N03.75), 10.11.1996, leg. et det. S. P. Wasser (HAI, N05.16).

Note: Agaricus bonii, so far endemic to Israel, is most closely related to *Agaricus campestris* L. : Fr. var. *floccipes* (Moell.) Pil. but differs in three striking features: 1) the presence of very specific granules on the surface of pileus and stipe, 2) presence of cheilocystidia and 3) lack of more or less lemon yellow colour when touched.

Section ***Duploannulatae*** S. Wasser, *Ukr. Bot. J.* 33(3): 250, 1976, ss. *Doc. Mycol.* 98-100: 469, 1995 (incl. Sect. *Chitonioides* Romagn. and Sect. *Magici* Bas and Heinem.).

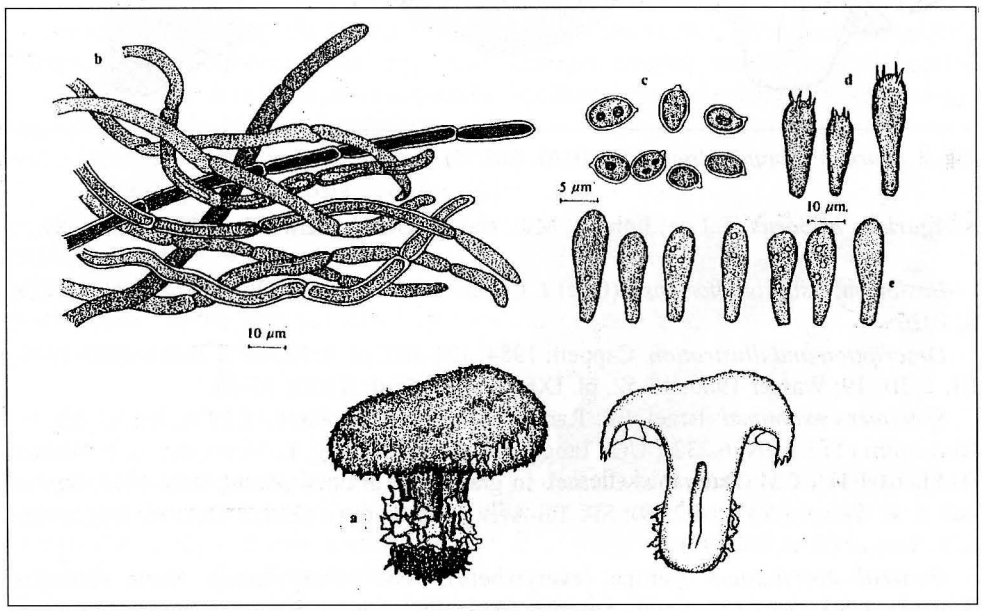

Fig. 7. *Agaricus bonii*: a- fruit bodies, b- elements of pileal cuticle, c- spores, d- basidia, e- cheilocystidia (HAI, Typus).

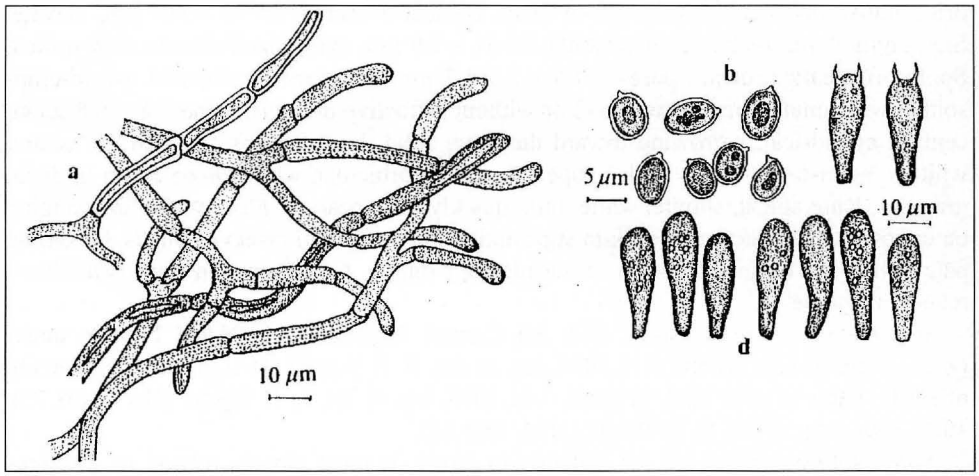

Fig. 8. *Agaricus bisporus* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, N02.69).

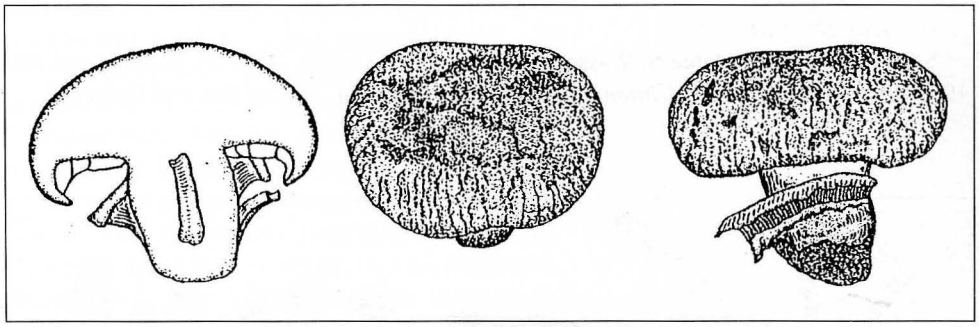

Fig. 9. *Agaricus bitorquis* : fruit bodies (HAI, N05.78).

8. *Agaricus bisporus* (J. Lge) Imbach, Mitt. Naturf. Ges. Luzern. 15, 1946: 15 (Fig. 8).

Basionym: *Psalliota hortensis* (Cke) J. Lge fo. *bispora* J. Lge, *Dansk Bot. Arkiv*, 4(12): 8, 1926.

Description and illustration: Cappelli 1984: 121-125, pl. 7; Moser & Jülich 1985-1996, III, 1; III, 19; Wasser 1989: 48-52, pl. IXb; XXV, m5a-d; XXXI, 15-18.

Specimens examined: Israel, SP: Ramat Hasharon, on lawn, 6.11.1976, leg. et det. N. Binyamini (TELA, N76.233); UG: Tabgha, in grassfields, leg. E. Nevo, det. S. P. Wasser (HAI, N02.11); CM: Daliyat-el-Carmel, in grassfield, in open place, 14.02.1995, leg. et det. S. P. Wasser (HAI, N02.69); SP: Tel-Aviv, Park, in open field, 7.03.1996, leg. et det. S. P. Wasser (HAI, N05.97).

General distribution: Europe (everywhere); Asia (everywhere); North America (Canada, USA, Mexico); South America (Argentina, Chile); Africa (Algeria, Morocco, Zaire), Australia.

Note: Malloch (1976) having studied the type material of *Agaricus brunnescens* Peck

considered *A. bisporus* to be a synonym. *Agaricus bisporus* is the most highly cultivated mushroom in the world. Approximately 2 million tons were cultivated in 1995, throughout the world, representing 37% of world mushroom production. The main producers are China, France and the Netherlands (Chang 1996, Royse 1997). The hot water extract of carpophores contains polysaccharides, the inhibition rate of which against the growth of sarcoma 180 in white mice reaching 90%; against Ehrlich carcinoma up to 100%. It is resistant to Gram positive and Gram negative bacteria (Ying & al. 1987). According to Toth & Gannet (1993), *A. bisporus* contains carcinogenic compounds, most notably agaritine, which is chemically related to hydrazines. While these compounds are known to possess carcinogenic properties, tests show that one might have to consume as much as 350gr of fresh mushrooms daily for 50 years to get a significant risk of initiating tumor growth. Some authors (Breene 1990, Hobbs 1995) say that during the storage period of commercially-available *A. bisporus,* the carcinogenic hydrazines were reduced up to 47% after 1 week and up to 76% after 2 weeks, and that cooking only reduced them by an average of 25%. The carpophore contains 8 essential amino acids, as well as vitamins and mineral salts, and is therefore undoubtedly a "wholesome food". Humus saprotroph; common; a good edible species cultivated on a commercial scale; medicinal; cosmopolitan.

9. *Agaricus bitorquis* (Quél.) Sacc., *Syll. Fung.* 5: 998, 1887 (Fig. 9-10).

Basionym: *Psalliota bitorquis* Quél., *C. R. . Ass. Fr. Avanc. Sci.,* 12: 500, 1884.

Description and illustration: Cappelli, 1984: 93-96, fig. 1, pl. 1; Wasser 1989: 52-54, pl. X, a; XXV, 6a-e.

Pileus 3-10 cm diam., thick-fleshed (up to 2 cm), convex then plane, sometimes flattened in the centre, white to pale grey, matt, glabrous, smooth, sometimes in the centre with very slightly developed adpressed scales, fibrillose toward the margin, which is involute, thin, slightly grooved, sometimes with remnants of the veil. Gills free, thin, crowded, pink, later dark brown, with paler sterile edge. Basidia 4-spored, 26-46 × 6-10 µm, clavate. Cheilocystidia 23-37 × 8-15 µm, abundant, broadly ovoid, with 1-2 refractive droplets. Spore print dark brown. Spores 5-6.2 × 3.5-5 µm, pale brown, round, broadly ovoid, with lateral apiculus, smooth. Stipe 4-6 × 1.5-3 cm, central, cylindrical, narrowing toward the base, solid, dense, concolorous with the cap, smooth, fibrillose, with ring attached at the centre of the stipe. Ring double and separated in two parts, an upper thick, pendulous ring, striate above and a lower, thin, narrow, sheathing peronate

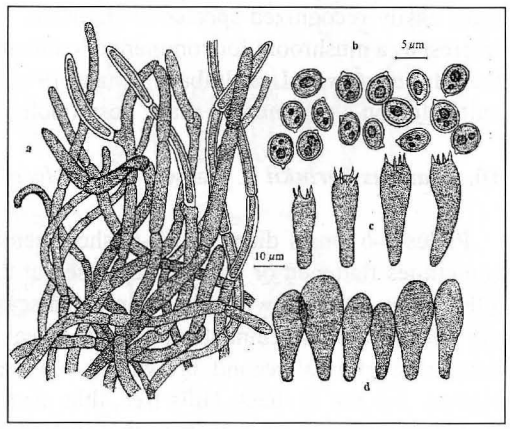

Fig. 10. *Agaricus bitorquis*: a - elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, N05.78).

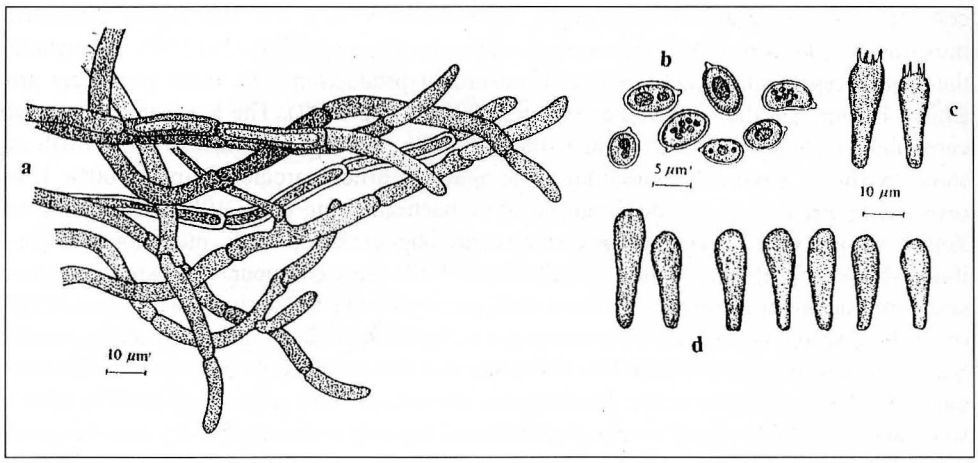

Fig. 11. *Agaricus herinkii* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, Typus).

ring. Flesh firm white, pale pink on exposure (reddish in the stipe). Smell acidulous. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, CM: Mt Carmel National Park, University of Haifa, Park, in grassfield, 23.12.1994, leg. et det. S. P. Wasser (HAI, N01.16), 7.11.1996, leg. et det. S. P. Wasser (HAI, N05.78); AP: Akko, Park, 23.02.1995, leg. et det. S. P. Wasser (HAI, N02.19); LG: Migdal Ha' Emeq, Park, 5.03.1996, leg. et det. S. P. Wasser (HAI, N05.37).

General distribution: Europe (everywhere); Asia (Israel, India, China, Mongolia, Shri Lanka, Japan, Turkey, Iran, Uzbekistan, Kazachstan, Tadjikistan, Vietnam); North America (Canada, USA, Mexico); South America (Argentina, Chile, Venezuela), Caribbean (Cuba, Trinidad and Tobago); Africa (Algeria, Morocco, Zaire); Australia.

Note: Owing to the habit and the presence of a double ring, *A. bitorquis* is one of the most easily recognized species of *Agaricus*. In recent years *A. bitorquis* has become of interest as a mushroom for commercial cultivation. Commercially grown, but much less so than *A. bisporus* (J. Lge) Imbach (Chang 1996). Humus saprotroph; common; good edible; cultivated on a commercial scale; cosmopolitan.

10. *Agaricus herinkii* S. Wasser, *Czech Mycol.* 48(4): 238-239, 1996 (Fig. 11).

Pileus 3-6 cm in diam., thick-fleshed, hemispherical, later convex, convex-expanded, sometimes flattened or slightly depressed at the centre, pale brownish-pinkish or brown, silky, shiny, covered with small appressed scales which are pale-brown, thin, radial, margin frequently with remnants of the veil. Pileal cuticle (and probably universal veil cuticle) consisting of hyaline and brownish, thin-walled, cylindrical, septate hyphae, without clamps, 3-5 µm in diam. Gills free, thin, densely crowded, pink, later brown. Gill trama regular, consisting of cylindric, thin-walled hyphae, colourless in water, 4-7(8) µm in diam. Basidia 4-spored, 22-25 × 7-8 µm, clavate. Sterigmata 2-3 µm long. Cheilocystidia 23-30 × 6-8 µm, abundant, cylindric, clavate. Spore-print brown. Spores 5-7.5 × 3-4.5 µm,

light brown, ovoid-ellipsoid, ellipsoid, with refractive droplets, with lateral apiculus. Stipe 2-4.5 × 1. 2-1.8 cm, central, erect, cylindrical, white, without ring, with basal, pink, pale brownish-pink volva, covered with small appressed scales. Flesh compact, dense, white, on exposure turning reddish. Odor and taste acid. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, CM: Mt Carmel National Park, Nahal Nesher, Horshat Ha'Arbaim, under *Pinus halepensis* and *Quercus calliprinos*, 7.11.1994, leg. et det. S. P. Wasser (HAI, Typus).

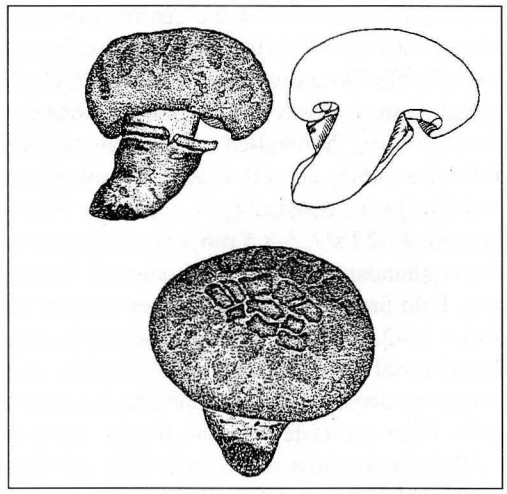

Fig. 12. *Agaricus nevoi* : fruit bodies (HAI, Typus).

Note: A. herinkii, so far endemic to Israel, is closely related to *Agaricus nevoi* S. Wasser, *A. pratulorum* Romagn. and *A. gennadii* (Chat. & Boud.) P. D. Orton, but differs in colour, shape, size and surface of volva, color of flesh on exposure, and in spore size (Cappelli 1984, Romagnesi 1986, Wasser 1989, 1995, 1996).

11. Agaricus nevoi S. Wasser, *Doc. Mycol.* 98-100: 472, 1995 (Fig. 12-13).

Pileus 5-7 cm diam., thick-fleshed (up to 2 cm), hemispherical, later convex, convex-

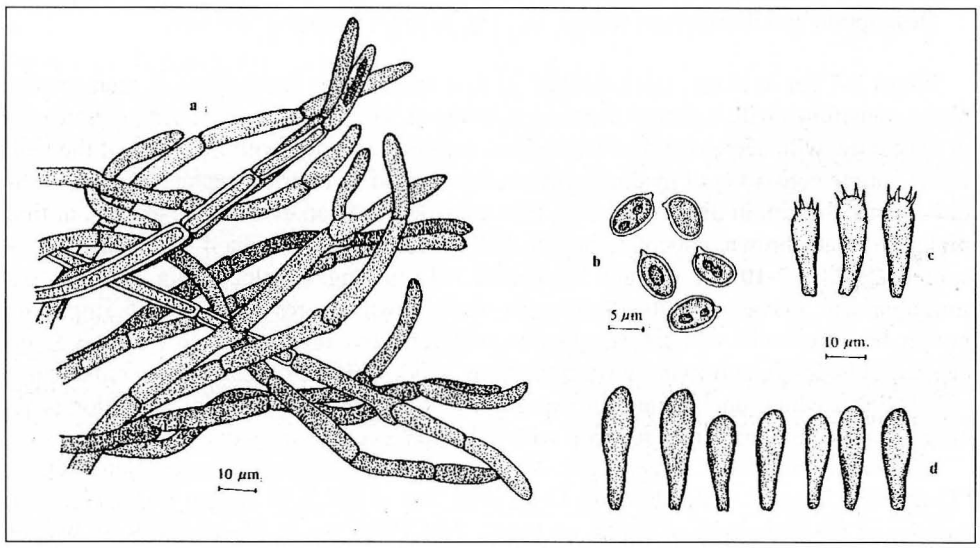

Fig. 13. *Agaricus nevoi*: a- elements of pileal cuticle, b- spores, c- basidia, d-cheilocystidia (HAI, Typus).

expanded, sometimes at the centre with a small depression, whitish, pale-greyish, silky, shiny, covered with wide, adpressed scales which are greyish, sometimes pale-brown, thin radially, fibrillose toward the margin which often bears remnants of the universal veil. The pileal diam. is always larger than the length of the stipe. Pileal cuticle consisting of hyaline, greyish, thin-walled cylindrical, septate hyphae, without clamps, 4-7 µm in diam. Gills free, thin, densely crowded, pink, later dark brown with whitish sterile edge. Gill trama regular, consisting of cylindric, thin-walled hyphae, 5-8 µm in diam. Basidia 4-spored, 24-27 × 7. 5-8.5 µm, clavate. Sterigmata 3-4 µm long. Cheilocystidia 26-33 × 6.5-9 µm abundant, clavate, short-clavate. Spore-print dark brown. Spores (6)7-8.5 × 4.5-5.5 µm, light brown, ellipsoid, with or without refractive droplets, with lateral apiculus. Stipe 4-6 × 1.8-2.2 cm, central, erect, narrowing toward the base, solid, white, without ring, with broad basal volva, whitish, whitish-pink, covered with wide thin appressed scales. Flesh compact, dense, white, unchanging on exposure, often becoming slightly pink above the gills. Odor and taste pleasant, fungal. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, CM: Mt Carmel National Park, under *Pinus halepensis*, 14.12.1994, leg. et det. S. P. Wasser (HAI, Typus).

Note: Agaricus nevoi, so far endemic to Israel, is most closely related to *A. pratulorum* Romagn., *A. gennadii* (Chat. & Boud.) P. D. Orton and *A. volvatus* (Pears.) Heinem., but differs in shape, size and surface of volva, colour of flesh on exposure and in spore size (Cappelli 1984, Romagnesi 1986, Wasser 1989, 1995, 1996).

12. *Agaricus gennadii* (Chat. & Boud.) P. D. Orton var. ***microsporus*** (Bohus) S. Wasser, *Agarik. Grib. SSSR*: 65, 1985 (Fig. 14).

Basionym: Agaricus gennadii (Chat. & Boud.) P. D. Orton ssp. *microsporus* Bohus, *Ann. Hist. -Nat. Mus. Nat. Hung.* 67: 38, 1975.

Description and illustration: Bohus, l.c., Fig. I, 1975; Wasser 1989: 110.

Pileus 3-7 cm in diam., thick-fleshed, at first spherical or hemispherical, then convex plane, sometimes with a central depression, white or whitish, sometimes dirty ochraceous in the centre, with adpressed fibrillose scales, margin frequently with remnants of the veil. Pileal cuticle consisting of hyaline, greyish, thin-walled, cylindrical septate hyphae, without clamps, 3-6 µm in diam. Gills free, thin, crowded, with an even sterile margin, at first pink, later dark brown, chocolate-brown. Gill trama regular. Basidia 4 (sometimes 1-3)-spored, 23-28 × 7-10 µm, clavate. Sterigmata 3-4 µm long. Cheilocystidia 23-33 × 7-10 µm, abundant, clavate, hyaline. Spore print dark brown. Spores 5.7-7.5 × 4-5.5µm, pale brown, broadly ovoid, with lateral apiculus, with refractive droplets. Stipe 2-6 × 1-1.5 cm, central, cylindrical, narrowing toward the base, solid, whitish, fibrous, with whitish basal volva. Flesh white, unchanging on exposure, or becoming slightly pinkish. Odor fugacious. Taste acidulous. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, CM: Mt Carmel National Park, Lower Nahal Oren, "Evolution Canyon", valley bottom, 13.02.1994, leg. et det. S. P. Wasser (HAI, N02.89); campus of the University of Haifa, on lawns, 5.01.1995, leg. E. Nevo, det. S. P. Wasser (HAI, N03.19), 15.11.1996, leg. et det. S. P. Wasser (HAI, N04.98); England, RBG, Kew, under *Sequoiadendron*, leg. E. Brown, 4.06.1987, det. S. P. Wasser, 3.08.1993 (K).

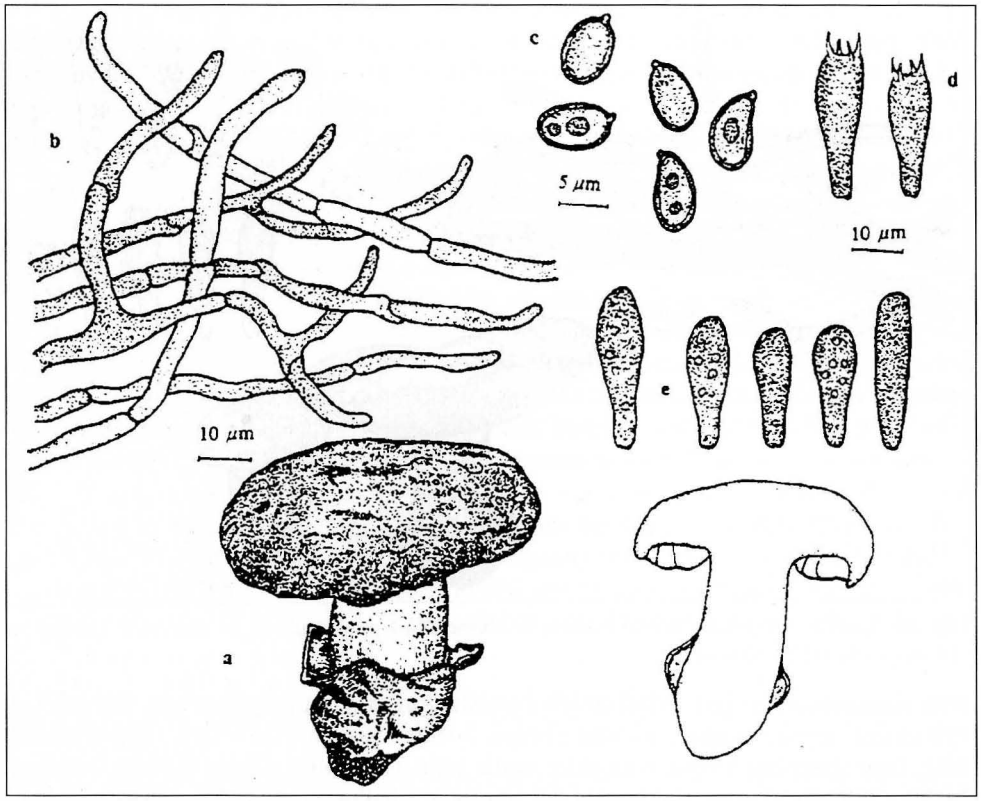

Fig. 14. *Agaricus gennadii* var. *microsporus* : a- fruit bodies, b- elements of pileal cuticle, c- spores, d- basidia, e- cheilocystidia (HAI, N02.89).

General distribution: Europe (British Isles, Russia, Hungary, Italy, France, Ukraine); North Africa (Morocco); Asia (Uzbekistan, Turkmenistan, China, Vietnam, Israel).

Note: Under *Agaricus gennadii,* Bohus (1975) described the new subspecies *microsporus*. Cappelli (1984) reduced it to a synonym of *A. pequinii* (Boud.) Konr. & Maubl. This statement, mostly based on the size of the spores is erroneous in my opinion and I retained this taxon at varietal rank (Wasser 1989). Humus saprotroph; rare; edible; xeromeridional; Eurasian-African.

13. *Agaricus pequinii* (Boud.) Konr. & Maubl., *Icon. Sel. Fung.* Vl: 61, 1937 (Fig. 15).

Basionym: *Chitonia pequinii* Boud., *Bull. Soc. Myc. Fr.* 17: 61, pl. 1, 1901.

Description and illustration: Cappelli 1984:117-120, fig. 8, pl. 6; Moser & Jülich 1985-1996, III, 5.

Pileus 6-10 cm in diam., thick-fleshed, hemisphaerical, later convex-plane, often depressed at the centre, whitish, greyish-white, with scattered membranaceous patches from velar material; margin fibrillose, involute, later expanding, undulating often cracked,

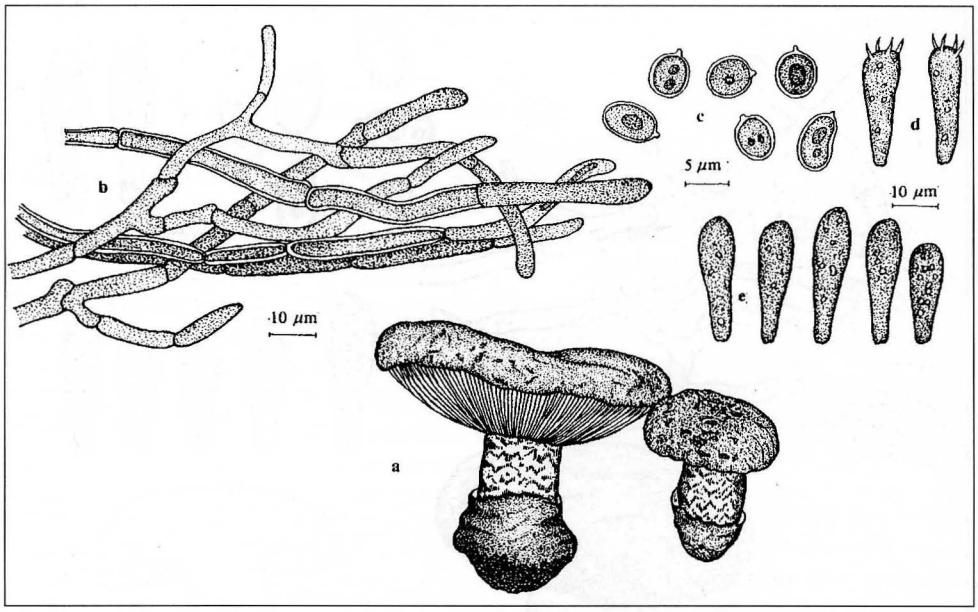

Fig. 15. *Agaricus pequinii* : a-fruit bodies, b- elements of pileal cuticle, c- spores, d- basidia, e- cheilocystidia (HAI, N03.14).

with remnants of the veil. Pileal cuticle consisting of greyish, greyish-white, thin-walled, cylindrical, septate hyphae, without clamps, 3-6 µm in diam. Gills free, thin, crowded, pink, later chocolate brown, with paler sterile edge. Gill trama regular. Basidia 4-spored, 23-29 × 7-9 µm, clavate. Sterigmata 2-3 µm long. Cheilocystidia 23-32 × 7-9 µm, abundant, clavate-fusiform, hyaline. Spore-print dark brown. Spores 5-7 × 4.5-5.5 µm, pale brown, ovoid, rounded with lateral apiculus and refractive droplets. Stipe 4-7 × 1.8-2(2.5) cm, central, equal, in the centre slightly inflated, solid, narrowing toward the base, whitish, below the volva covered with peculiar greyish-purple, adpressed and transversely arranged scales, with basal, membranaceous, whitish, whitish-greyish volva. Flesh white, becoming pink or slightly brown on exposure. Odor and taste faint and agreeable. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, CM: Mt Carmel National Park, campus of the University of Haifa, in park, on lawns, near *Pinus halepensis* trees, 26.11.1994, 13.01.1995, 21.02.1995, 15.11.1996, leg. et det. S. P. Wasser (HAI, N02.67, N03.14, N03.57, N05.41).

General distribution: Europe (Italy, France, Spain, Russia, Hungary, Germany, Ukraine); Asia (Uzbekistan, Israel).

Note: Humus saprotroph; rare; edible; xeromeridional; Eurasian.

14. *Agaricus geesteranii* Bas & Heinem., *Persoonia* 13 (l): 114, 1986 (Fig. 16).

Description and illustration: Bas & Heinem. l.c., pl. 1, 1986.

Pileus 7-12 cm in diam., thick-fleshed, campanulate, semiglobose, later convex, plane, sometimes with a depressed disk, at first with involute, thin inrolled, finally straight mar-

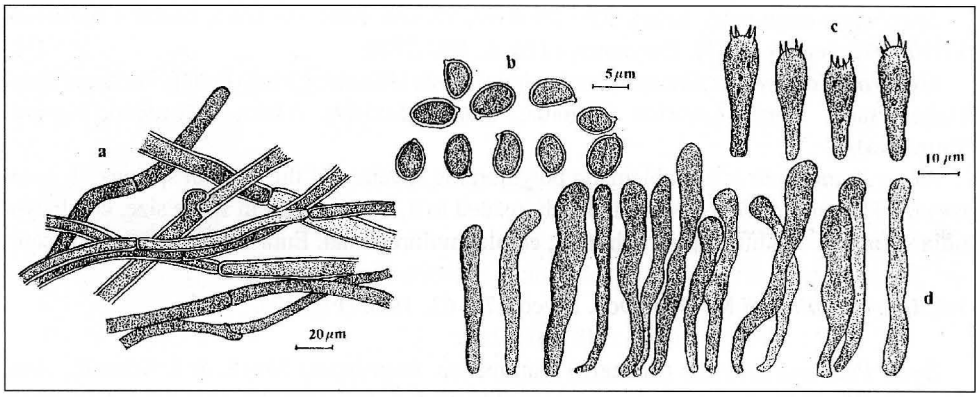

Fig. 16. *Agaricus geesteranii* : a- elements of pileal cuticle, b- spores, c-basidia, d-cheilocystidia (HAI, N03.31).

gin with conspicuous, 5 mm thick, pinkish-brown, red-brown, with fibrillose purple-brown scales. The entire surface of pileus is covered with a veil, which later disappears; margin frequently with remnants of the veil. Pileal cuticle consisting of brown, pinkish-brown, thick-walled cylindrical hyphae, without clamps, (3)5-13(16) mm in diam. Gills free, thin, crowded, narrowing toward the margin of pileus, with an even edge, white, later pinkish, then reddish-brown, brown. Gill trama regular, consisting of cylindric, thin-walled hyphae, 4-9 mm in diam. Basidia 4-spored, 29-36 × 8-11 mm, clavate. Sterigmata 2-3 mm long. Cheilocystidia 40-95 × 6-11 µm, 46-70 × 3-9.5 µm, clavate, lageniform, filiform, often capitate, thin-walled, hyaline. Spore-print dark-brown. Spores (6.5) 7-8 × 4.5- 5.5 mm, pale brown, ovoid, ovoid-ellipsoid, with apiculus and 1-3 refractive droplets. Stipe 4-12 × 1.5-3 cm, central, cylindrical, sometimes curved, often narrowings toward the base, solid, concolorous with the cap, volval layer breaking up into rings (1-3) and volval remnants. Flesh whitish, becoming yellow, then purple-brown on exposure. Odor of anise. Taste sweetish. Cross reaction with Schaeffer's reagent positive (purple-brown).

Specimens examined: Israel, GH: Masa'da, oak forest, under *Quercus calliprinos* trees, 4.1.1995, leg. E. Nevo, det. S. P. Wasser (HAI, N03.31), 20.1.1995, leg. et det. S. P. Wasser (HAI, N03.37).

General distribution: Europe (The Netherlands); Asia (Israel).

Note: Agaricus geesteranii is a very rare species only known from 3 localities in the Netherlands (Bas & Heinemann, 1986) and one in Israel (Wasser 1995, 1996). Humus saprotroph; very rare; ? edible; nemorous; Eurasian.

Subgenus ***Flavoagaricus*** S. Wasser, *Ukr. Bot. J.* 33(3): 250, 1976.
Majores Fr., *Hymen. Eur.:* 211, 1874.
Subsection ***Flavescentes*** (J. Schaeff. & Moell.) S. Wasser, *Ukr. Bot. J.* 33(3): 250, 1976.

15. *Agaricus augustus* Fr., *Epicr.:* 212, 1836, non ss. Ricken, *Die Blätterpilze*: 235, 1915.

Description and illustration: Cappelli 1984: 284-287, pl. 49; Wasser 1989: 61-63, pl. XI,b; XXVI, 3a-e; XXXII, 19-20.

Specimens examined: Israel, SP: Tel-Aviv, Yarkon Park, on lawn, under *Cupressus*, 17.10.1972, leg. et det. N. Binyamini (TELA, N72.218).

General distribution: Europe (everywhere); Asia (Russia, China, Israel, Turkmenistan, Uzbekistan); North America (Canada, USA, Mexico); Africa (Morocco, Kenya, Tanzanya).

Note: A. augustus is a problematic polymorphic species. Of the African species, *A. heterocystis* Heinem. & Goos. is most closely related to it, but it differs in spore size, cheilocystidia, odor, etc. Humus saprotroph; rare; edible; multiregional. Eurasian-American-African.

16. *Agaricus albertii* M. Bon, Doc. Mycol. 72: 63, 1988 (Fig. 17).

Syn.: *Psalliota arvensis* (Schaeff.) Kumm. ssp. *macrospo*ra Moell. & J. Schaeff., *Ann. Myc.* 36: 78, 1938, *Agaricus macrosporus* (Moell. & J. Schaeff.) Pil., *Act. Mus. Nat. Prag.* VIIB(1): 9, 1951, non Montagne 1837.

Description and illustration: Cappelli 1984: 284-287, pl. 49; Wasser 1989: 64-66, pl. XVII,a; XXVI, 5a-c; XXXIII, 26.

Specimens examined: Israel, SP: Beit Dagan, in grassfield, in open place, 29.03.1984, leg. U. Cohen, det. N. Binyamini (TELA, N?); SP: Netanya S., *Eucalyptus* trees, 26.12.1974, leg. et det. N. Binyamini (TELA, N?), as *Agaricus xanthoderma* (rev. S. P. Wasser 6.04.1991); Denmark, Priorskov, autumn 1949, leg. et det. F. H. Moeller; Bornholm, 4.10.1947, leg. et det. F. H. Moeller; Orebjerg., Fredshoy, Horns herred, 5.11.1946, leg. L. Ferdinand, det. F. H. Moeller (C, L. 45/75-N21-3).

General distribution: Europe (everywhere), Asia (Russia, Georgia, China, Israel).

Note: A. albertii is morphologically related to *A. arvensis* Schaeff. from which it clearly differs in spore size. It is also very closely related to *A. macrosporoides* Bohus, *A. stramineus* (Moell. & J. Schaeff.) Moell., *A. excellens* (Moell.) Moell., and *A. kuehnerianus* Heinem. of the group *Macrosporus* ss. Moell. (Moeller 1951: 176). Of the North American species, *A. crocodilinus* Murr. is most closely related to *A. albertii*, and is also characterized by large spores: 8-11 × 5.5-7; 12-16 × 7-8 mm (Smith 1940). Humus saprotroph; rare; edible; euryholarctic. Eurasian.

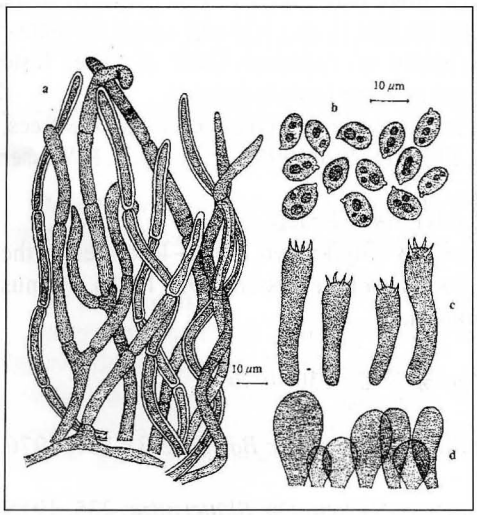

Fig. 17. *Agaricus albertii* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (TELA, N?).

17. *Agaricus sylvicola* (Vitt.) Sacc., *Syll. Fung.* V: 998, 1887.

Basionym: *Agaricus campestris* L. : Fr. var. *sylvicola* Vitt., *Fung. mang.*: 43, 1845.

Description and illustration: Cappelli 1984: 262-265, pl. 42; Wasser 1989: 73-74, pl. XIVa; XXVII, 2a-b.

Specimens examined: Israel, UG: Baram

Forest, *Quercus* trees, 5.12.1973, leg. et det. N. Binyamini (TELA, N72.211); UG: Mt Meron Natural Preserve, in *Quercus calliprinos* and *Q. boissieri,* 31.01.1996, leg. E. Nevo and S. P. Wasser, det. S. P. Wasser (HAI, N04.49).

General distribution: Europe (everywhere); Asia (Russia, Georgia, China, Israel, Japan, Vietnam); North America (Canada, USA); Africa (Algeria, Morocco, Kenya, Zaire).

Note: A. sylvicola is most closely related to *A. essettei* Bon and *A. macrocarpus* (Moell.) Moell. from which it differs in habit, shape of cheilocystidia and spore size (Wasser 1989). Humus saprotroph; rare; edible; multiregional. Eurasian-American-African.

18. *Agaricus essettei* Bon, *Doc. Myc.* 49: 56, 1983

Synonym: *Agaricus abruptibulbus* Peck ss. auct. europ., non ss. Peck.

Description and illustration: Cappelli 1984: 269-272, pl. 44; Wasser 1989: 76-77, pl. XVIb; XXVII,4a-b.

Specimens examined: Israel, GH: Masa'da, 11.12.1972, leg. N. Binyamini, det. M. Moser (TELA, N72.318); HP: Dan Natural Preserve, Tel Dan, grows solitary, in mixed forest, 31.01.1996, leg. E. Nevo, det. S. P. Wasser (HAI, N03.17); LG: Carmiel, park, in mixed forest, grows solitary, 15.04.1996, leg. et det. S. P. Wasser (HAI, N06.03).

General distribution: Europe (Finland, Denmark, British Isles, The Netherlands, Russia, Estonia, France, Germany, Austria, Switzerland, Poland, Ukraine, Hungary, Romania, Moldova); Asia (Russia, Israel, Japan, Georgia, Uzbekistan, Turkmenistan); North America (Canada, USA).

Note: A. essettei is most closely related to *A. macrocarpus* (Moell.) Moell. and *A. sylvicola* (Vitt.) Sacc. from which it differs in the habit, cheilocystidia and spore size (Cappelli 1984, Wasser 1989). Humus saprotroph; rare; edible; euryholarctic. Eurasian-American.

19. *Agaricus nivescens* (Moell.) Moell., *Friesia* 4: 204, 1952 (Fig. 18).

Basionym: *Psalliota nivescens* Moell., *Friesia* 4: 155, 1950.

Description and illustration: Cappelli 1984: 235-237, pl. 35; Wasser 1989: 79-80, pl. XV, b; XXVII, 6a-c.

Specimens examined: Israel, SP: Ramat Hasharon, on lawn, 10.11.1972, leg. et det. N. Binyamini (TELA, N72.255); HP: Dan Natural Preserve, Tel Dan, grows solitary or in groups, in meadows, 31.01.1996, leg. et det. S. P. Wasser (HAI, N06.28); Denmark, Krenkerup, 1949, leg. et det. F. H. Moeller; Graenge,1.08.1944, leg. et det. F. H. Moeller (C, 45/74-N24-2).

General distribution: Europe (British Isles, Denmark, Belgium, The Netherlands,

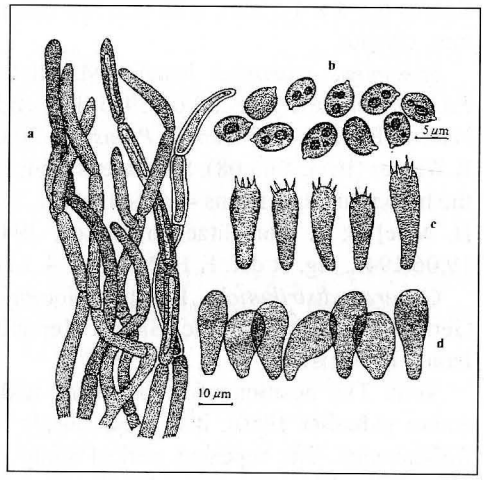

Fig. 18. *Agaricus nivescens* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (TELA, N72.255).

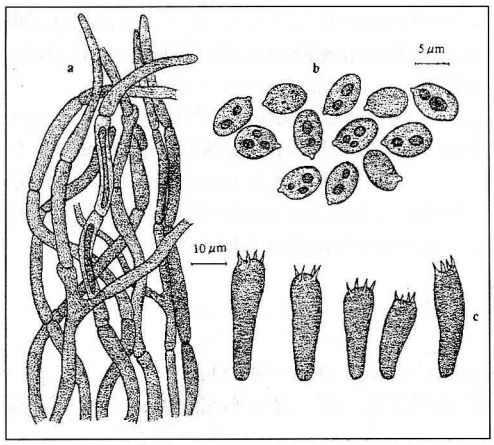

Fig. 19. *Agaricus aestivalis* var. *flavotactus* : a- elements of pileal cuticle, b- spores, c- basidia (HAI, N02.51).

Austria, France, Italy, Hungary, Russia, Ukraine); Asia (Russia, Israel); Africa (Morocco).

Note: According to its author (Moeller 1952), *A. nivescens* is most closely related to *A. arvensis* Schaeff. from which it differs in the habit, spore size, etc. Humus saprotroph; rare; edible; nemoral. Eurasian-African.

20. *Agaricus aestivalis* (Moell.) Pil., *Acta Mus. Nat. Prag.* VIIB(1): 25, 1951.

Basionym: *Psalliota aestivalis* Moell., *Friesia* 4: 50, 1950.

Description and illustration: Cappelli 1984: 275-278, pl. 46; Wasser 1989: 80-82, pl. XVI, a-b; XXVII, 7a-b; XXXIII, 25.

var. ***aestivalis***

Specimens examined: Israel, SP: Tel-Aviv, Hayrkon Park, on lawn, 6.11.1972, leg. et det. N. Binyamini, (TELA, N72.250).

var. ***flavotacta*** (Moell.) Pil., *Act. Mus. Nat. Prag.* VIIB(1): 25, 1951 (Fig. 19).
Basionym: *Psalliota aestivalis* Moell. var. *flavotacta* Moell., *Friesia* 4: 51, 1950.

Pileus 5-8 cm diam. Stipe 4-9 × 1-2 cm cylindric or slightly swollen below. On handling the whole carpophore turns yellow, on exposure flesh staining mainly at the stipe base. Spores 6.5-8 × 4-5 mm, with one-two refractive droplets. Basidia 4-spored, 24-36 × 8-10 mm, clavate.

Specimens examined: Israel, CM: Mt Carmel National Park, Horshat Ha'Arbaim, in *Pinus halepensis* forest, 3.01.1995, leg. et det. S. P. Wasser (HAI, N02.51); HP: Tel Dan Natural Reserve, Tel Dan, in *Pinus* sp., 20.03.1996, leg S. P. Wasser and E. Nevo, det. S. P. Wasser (HAI, N03.08). Specimens from Denmark (deposited at C; respective number of the herbarium specimens 45/74-N1-4): 1. Nyborg, Bollevaenge, 12.06.1946, leg. et det. F. H. Moeller; 2. Korselitze hovedskov, 1946, leg. et det. F. H. Moeller; 3. Korselitze, 19.06.1949, leg. et det. F. H. Moeller; 4. Locality ? 17.07.1947, leg. et det. F. H. Moeller.

General distribution: Europe (Norway, Sweden, Denmark, British Isles, France, Germany, Czech Republic, Slovak Republic, Ukraine, Hungary, Russia); Asia (Russia, Israel, Uzbekistan).

Note: The position of *A. aestivalis* within the genus is disputable. According to its author (Moeller 1950), it is most closely related to *A. arvensis* Schaeff., of the section *Rubescentes*. The repeated critical study of herbarium specimens from Denmark (see above, specimens examined) leads to place *A. aestivalis* in the subsection *Flavescentes* as it is most closely related to *A. arvensis* Schaeff., *A. chionodermus* Pil. and *A. wasseri* Bon & Courtec. (Pilat 1951, Cappelli 1984, Wasser 1989). In certain specimens from C herbar-

ium , the stipe enlarges into a small bulb toward the base. Statistical analysis of the spores showed that their size is 7.7-8.6 × 4.3-6.1 mm, therefore larger to some extent than given in Moeller's diagnosis (1950). Humus saprotroph; rare; edible; boreal. Eurasian.

21. ***Agaricus arvensis*** Schaeff., *Fungorum Icones*: pl. 310-311, 1770: Fr., *Syst. Mycol.* 1: 282, 1821, ss. restr. J. Lge, ss. Moell., *Friesia* 4: 61-62, 1952 (Fig. 20).

Description and illustration: Cappelli 1984: 225-230, pl. 33; Moser & Jülich 1985-1996, III, 7; Wasser 1989: 85- 86, pl. XVIII; XXVIII, 2a, c.

Specimens examined: Israel, SP: Tel-Aviv N., on grass, 8.2.1985, leg. Bar-Peled, det. N. Binyamini (TELA, N85.205); Mikve Israel, under *Eucalyptus*, 23.12.1974, leg. et det. N. Binyamini (TELA, N74.517); CM: Mt Carmel National Park, Nahal Nesher, Horshat Ha'Arbaim, in grass, 30.01.1995, leg. et det. S. P. Wasser (HAI, N03.12); CM: Daliyat-el-Carmel, in grassfield, in open place, 14.02.1995, leg. et det. S. P. Wasser (HAI, N02.399); AP: Akko, Park, 09.03.1996, leg. A. Dornstein, det. S. P. Wasser (HAI, N06.05).

General distribution: Europe (everywhere); Asia (Tajikistan, Kirghizstan, Uzbekistan, Russia, Georgia, Azerbaijan, Armenia, Vietnam, China, Sri Lanka, Japan, Israel); North America (Greenland, Canada, USA, Mexico); Caribbean (Trinidad, Cuba); South America (Chile); Africa (Morocco, Libya); Australia.

Note: A. arvensis is a polymorphic species, closely related to *A. fissuratus* (Moell.)

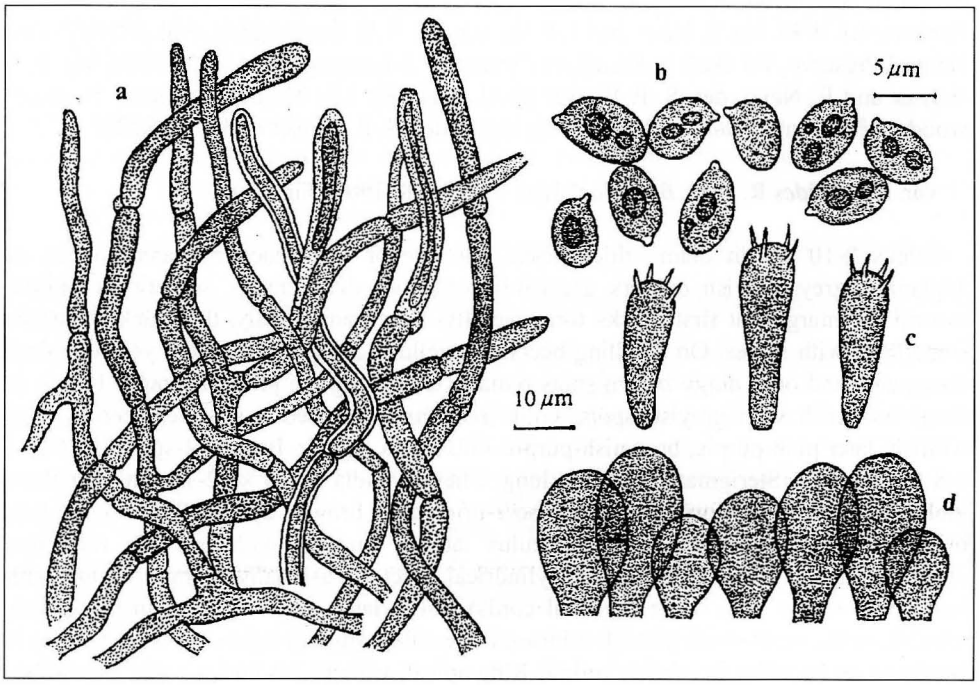

Fig. 20. *Agaricus arvensis* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, N 06.05).

Moell., *A. nivescens* (Moell.) Moell. and *A. osecanus* Pil. Knudsen (1992) considers the last two species as synonyms. *A. arvensis* is known as a medicinal species. According to Ying & al. (1987) when prepared into "Tendor-easing powder", it cures lumbago and pain in legs, numbed limbs and discomfort in tendons and veins. It is resistent to Gram positive and Gram negative bacteria. The inhibition rate of this species against sarcoma 180 and Ehrlich carcinoma is up to 100%. Humus saprotroph; frequent; edible; medicinal; cosmopolitian.

Subsection ***Xanthodermatae*** (Sing.) S. Wasser, *Ukr. Bot. J.* 33(3): 250, 1976.

22. *Agaricus xanthoderma* Genevier, *Bull. Soc. Bot. Fr.* 23: 31, 1876, ss. S. Wasser, *Ukr. Bot. J.* 33(5): 495, 1976, non ss. Bohus, *Ann. Hist. Nat. Mus. Nat. Hung.* 66: 80-81, 1975.

Description and illustration: Cappelli 1984: 313-314, pl. 59, 61; Wasser 1989: 88-89, pl. XIX a.

var. ***xanthoderma***

Specimens examined: Israel, PP: Rehovot, under bushes, among decayed leaves, solitary or in small group of 2-3 specimens, 2.11.1948, 12.11.1951, 13.12.1957 (Hershenzon-Zehara 1961)[1]; UG: Iron Forest, mixed wood of *Quercus* and *Pinus*, 29.12.1989, leg. student, det. N. Binyamini (TELA, N89.410); GH: near Masa'da, in wood of *Quercus calliprinos*, 4.1.1995, leg. E. Nevo and S. P. Wasser, det. S. P. Wasser (HAI, N01.33); HP: Dan Natural Preserve, Tel Dan, in *Eucalyptus*, group of 2-4 carpophores, 31.01.1996, leg. S. P. Wasser and E. Nevo, det. S. P. Wasser (HAI. N04.18); LG: Migdal Ha'Emeq, in mixed wood of *Pinus* and *Quercus*, 15.03.1996, leg. et det. S. P. Wasser (HAI, N06.54).

var. ***lepiotoides*** R. Mre, *Bull. Soc. Myc. Fr.* 24: 58, 1909 (Fig. 21).

Pileus 2-10 cm in diam., thick-fleshy, globose or hemispherical, later convex or applanate, grey, greyish or dark greyish-brown, with deep cracks, sometimes smooth toward the margin; at first cracks form radially, later transversally, the cracked surface sometimes with scales. On handling becoming yellow, 2-6 hours later the yellow colour disappears and only dingy-brown spots remain. On drying the pileus becomes brown or dingy-brownish with greyish spots. Gills free, thin, crowded, with even sterile edge, whitish, later pink-purple, brownish-purple. Gill trama regular. Basidia 4-spored, 20-28 × 7-8 µm, clavate. Sterigmata 3-3.5 µm long. Cheilocystidia 20-35 × 12-19 µm, abundant, globose-ovoid or pyriform, hyaline. Spore-print dark brown. Spores 5-7 × 3.3-4 µm, brownish, ellipsoid-ovoid, ovate, apiculus lateral, smooth, with one-two refractive droplets. Stipe 6-17 × 1-2 cm, central, cylindrical, erect, occasionally slightly twisted, with basal bulb (often with white mycelial cords), solid, later often fistulose in the centre, whitish, in the centre with pinkish-crimson tinge, silky, smooth (often the stipe surface is cracked), on handling becoming yellow. Ring apical, wide (1-1.5 cm), simple, infundibuliform, toward the edge enlarged, white (along the edge yellowish), grooved above, with

[1] Investigation of herbarium samples cited in Avizohar-Herhenzon's paper (1961) as *A. meleagris* var. *fibrillosus*

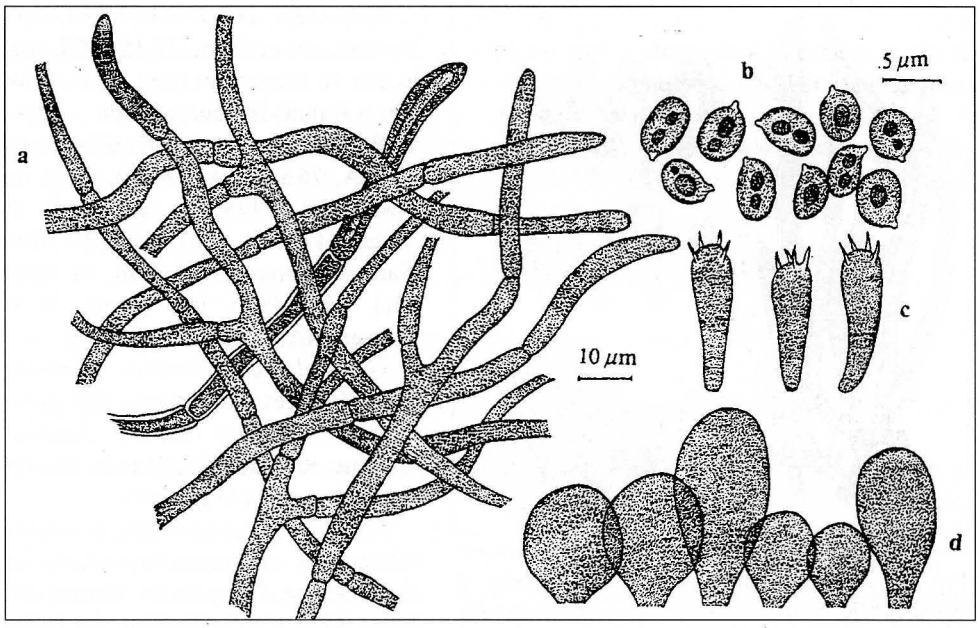

Fig. 21. *Agaricus xanthoderma* var. *lepiotoides* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, N01.85).

small brownish scales beneath. Flesh white, on exposure at the base of the stipe staining yellowish-orange. Odor of carbolic acid. On drying odor pleasant, fungal. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, SP: Tel-Aviv, Yarkon Park N, under *Casuarina*, on lawn, 20.09.1973, leg. et det. N. Binyamini [reidentified by S. P. Wasser, April 1991, it was defined as *A. meleagris* var. *obscuratus* (TELA, N73.127)], AP: Akko, park and gardens in grass, 27.12.1994, leg. et det. S. P. Wasser (HAI, N01.87), 19.02.1995, leg. et det. S. P. Wasser (HAI, N03.59).

General distribution: Europe (everywhere); Asia (Russia, Kirghizstan, Uzbekistan, Kazachstan, China, Israel, Vietnam, Azerbaijan, Armenia, Georgia, Turkey, Japan), North America (Canada, USA, Mexico), South America (Argentina, Bolivia, Brazil, Venezuela, Chile), Africa (Algeria, Morocco), Australia.

Note: A. xanthoderma contains the antibiotic psalliotin (4-hydroxybenzene-diazonium), which was separated from cultured fluid. It is active against Gram positive bacteria (Dornberger & al. 1986, Ying et &. 1987). Humus saprotroph; frequent; toxic; medicinal; cosmopolitian.

23. *Agaricus phaeolepidotus* (Moell.) Moell., *Friesia* 4: 204, 1952 (Fig. 22).

Basionym: *Psalliota phaeolepidota* Moell., *Friesia* 4: 170, 1952.

Description and illustration: Cappelli 1984: 336-338, pl. 64; Moser & Jülich 1985-1996, III,18; Wasser 1989: 94, pl. XXVIII, 4 a-c.

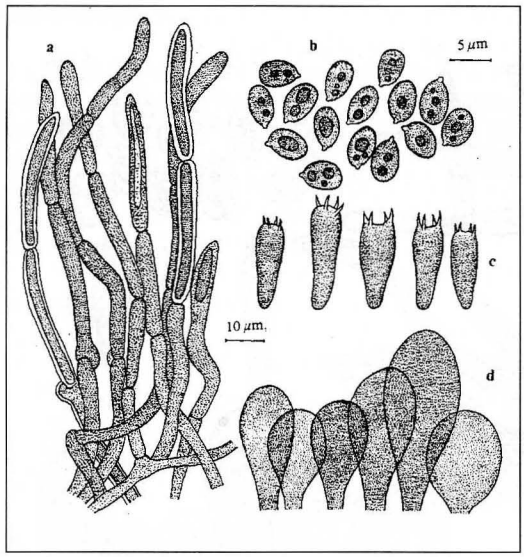

Fig. 22. *Agaricus phaeolepidotus*: a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (TELA, 71.190).

Specimens examined: Israel, SP: Ramat-Gan, on lawn, 18.10.1971, leg. et det. N. Binyamini (TELA, 71.190); SP: Ramat-Hasharon, on lawn, 7.10.1976, leg. et det. N. Binyamini (TELA, 76.216); AP: Akko, Park, on lawn, 29.12.1995, leg. et det. S. P. Wasser (TELA, N01.41); HP: Dan Natural Preserve, Tel Dan, in open land, 31.01.1996, leg. et det. S. P. Wasser (HAI, N03.85).

General distribution: Europe (British Isles, Denmark, Belgium, Hungary, Italy, France, Austria, Ukraine, Russia), Asia (Russia, Israel), South America (Argentina).

Note: A. phaeolepidotus is closely related to *A. praeclaresquamosus* Freeman and *A. moelleri* S. Wasser, differing from both of them in the shape and size of cheilocystidia and in some macroscopic characters. Humus saprotroph; rare; toxic; nemorose. Eurasian-American.

24. *Agaricus moelleri* S. Wasser, *News of Taxonomy of Lower Plants* XI: 169, 1974.

Basionym: A*garicus meleagris* J. Schaeff. var. *terricolor* Moell., *Friesia* 4: 208, 1952.

Syn.: *Agaricus meleagris* J. Schaeff. var. *obscuratus* (R. Mre) Heinem., *Bull. Soc. Myc. Fr.* 71(3): 397, 1965.

Description and illustration: Cappelli 1984: 333-335, pl. 63 (as *A. praeclaresquamosus* Freeman var. *terricolor* (Moell.) Bon & Cappelli, *Doc. Mycol.* 52, 1983); Wasser 1989: 96-98, pl. XXVIII, 6a-c.

Specimens examined: Israel, SP: Hadera, under *Eucalyptus* trees, 4.12.1977, leg. N. Binyamini, det. M. Moser (TELA, N.M.72.344), Tel-Aviv, Park Hayarkon, 20.10.1977, leg. et det. N. Binyamini (TELA, N72.224); GH: Masa'da, oak forest under *Quercus calliprinos*, 4.01.1995, leg. S. P. Wasser and E. Nevo, det. S. P. Wasser (HAI, N03.02).

General distribution: Europe (Denmark, Switzerland, Russia, Ukraine, Hungary, Czech Republic); Asia (Israel); Africa (Morocco).

Note: A. moelleri differs from *A. placomyces* Peck in the dark grey cap scales (like *Tricholoma terreum* (Schaeff. : Fr.) Kumm.), the cap cuticle structure, with many short, inflated hyaline cells and long, slender, brown cells. There is no concensus in opinions concerning the distinction between *A. placomyces* and *A. praeclaresquamosus* Freeman, to which *A. moelleri* is very closely related. Critical and systematic studies of the type, paratypes and herbarium material, collected and determined by Moeller (C), Peck (MICH), Pilat (PR), as well as the analysis of available literature leads to considering *A. placomyces* (without cystidia) and *A. praeclaresquamosus* (with cystidia) as independent species, and

A. moelleri, a recently developing species, originating from *A. praeclaresquamosus* as an ancestor. Humus saprotroph; rare; toxic; nemorose. Eurasian-African.

25. *Agaricus menieri* Bon, *Doc. Mycol.* 49: 56, 1983.

Basionym: *Psalliota ammophila* Menier, *Bull. Soc. Sci. Nat. de l'Ouest* III. 2: 67, 1893.
Description and illustration: Bon, l.c.: 28; Cappelli 1984: 346-348, pl. 67.
Specimens examined: Israel, PP: Rehovot, solitary, stipe very deeply immersed in sandy soil, 28.11.1951, 20.12.1951, 1.12.1952, 15.1.1953, 20.11.1954, 15.12.1954, 21.12.1955, leg. et det. Hershenzon-Zehara (1961); UG: Baram Forest, *Quercus* trees, 12.12.1983, leg. N. Binyamini et L. Prusbul, det. N. Binyamini (TELA, N83.238); SP: Tel- Baruch, 5.2.1984, leg. R. Raday, det. N. Binyamini (TELA, N84.252).
General distribution: Europe (British Isles, France, Italy, Hungary), Asia (Israel).
Note: A. menieri is a strictly sand-inhabiting species, fruiting on coastal dunes. *A. menieri* is closely related to the European species *A. pilatianus* Bohus, which differs mainly in the cap being generally sooty brownish, more or less fibrillose-squamulose and in the smaller spores (Cappelli 1984).

26. *Agaricus placomyces* Peck, *N. Y. State Mus. Bull.* 29: 40, 1878, ss. Peck, non ss. auct. europ.

Syn.: *Psalliota placomyces* (Peck) P. Henn. in Engl. & Pl., *Nat. Pfl. Fam.* I: 201, 1898.
Description and illustration: Freeman, *Mycotaxon* 8(1): 105-106, 1979; Cappelli 1984: 330, fig. 35, Wasser 1989: 111.
Species examined: Israel, PP: Rehovot, gregarious, in small groups of 2-4 individuals, ruderal, near houses, generally in shade of plants or of walls (Hershenzon-Zehara,1961); USA, Alabama, Montgomery, 16.07.1942, det. A. H. Smith (as *A. sylvaticus,* MICH); Tennessee, Laurel Falls, 22.08.1938, det. A. H. Smith (as *A. subrutilescens,* MICH).
General distribution: Europe (?British Isles, Germany, Hungary, Czech Republic, Ukraine); Asia (Georgia, Russia, Japan, Israel); North America (USA, Mexico); South America (Peru).
Note: A. placomyces is an American taxon which, judging from spore size and the plate by Peck, shows a great resemblance with *A. praeclaresquamosus* Freeman (= *A. meleagris* (J. Schaeff.) Imbach var. *meleagris*). Some agaricologists synonymise the two taxa (in that case *A. placomyces* has nomenclatural priority), but others consider them as separate species (Freeman 1979, Wasser 1989). Israeli specimens of *A. placomyces* have no cheilocystidia. Humus saprotroph; rare; toxic; multiregional. Eurasian-American.

27. *Agaricus praeclaresquamosus* Freeman, *Mycotaxon* 8(1): 90, 1979 (Fig. 23).

Syn.: *Psalliota meleagris* J. Schaeff. var. *meleagris*, *Zeitschr. f. Pilzk.* 4: 28, 1925 (non *Agaricus placomyces* Peck, *N. Y. St. Mus. Bull.* 29:40, 1878, ss. auct. europ., non ss. Peck., ss. S. Wasser 1989: 95).
Description and illustration: Freeman, l.c. :90; Cappelli 1984: 325-333, pl. 62; Wasser 1989: 95, pl. XX; XXVIII, 5a-e.

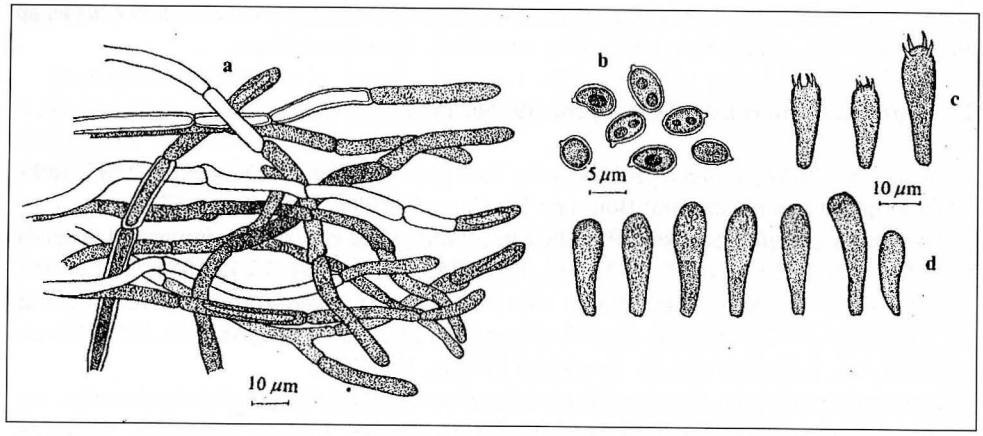

Fig. 23. *Agaricus praeclaresquamosus* : a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (HAI, N02.14).

Pileus 6-10 cm in diam., thick-fleshy, hemispherical, later applanate, often in the centre flattened, greyish-ochraceous-brown or grey-brown, in the centre darker-brown, on handling staining dull yellow. The pileal surface disrupts into adpressed fibrillose, dark brown or ochraceous-brown scales, arranged in more or less regular concentric circles. Gills free, thin, crowded, with whitish sterile edge, whitish-pink, later dark brown or dark chocolate with pinkish tinge. Basidia 4-spored, 26-33 × 6-9 µm, clavate. Sterigmata 2-2.5 µm long. Cheilocystidia 20-33 × 7-10 µm, shape variable, broadly clavate to napiform. Spore-print dark brown. Spores 4.8-5.5(6. 5) × 3.5-4.0(4.5) µm, brownish, ellipsoid to ovoid. Stipe 6-10 × 1-1.2 cm, central, erect, cylindrical, occasionally slightly twisted, with a small bulb, fistulose, whitish, silky fibrillose glabrous, on handling becoming yellow. Ring apical, broad, thin, whitish. Flesh white, on exposure at the base becoming citrine. Odor unpleasant. Cross reaction with Schaeffer's reagent negative.

Specimens examined: Israel, GH: near Masa'da, in *Quercus calliprinos*, 4.01.1995, leg. E. Nevo, det. S. P. Wasser (HAI, N04.06); AP: Akko, Park, in small groups under *Ficus sycomorus* L., 15.02.1995, leg. et det. S. P. Wasser (HAI, N02.14); HP: Dan Natural Preserve, Tel Dan, under *Platanus orientalis* L., 31.01.1996, leg. E. Nevo, leg. S. P. Wasser (HAI, N02.77).

General distribution: Europe (British Isles, Denmark, Belgium, Switzerland, Lithuania, Italy, France, Austria, Hungary, Ukraine, Moldova, Russia); Asia (Russia, China, Japan, Georgia, Israel); North America (USA, Mexico).

Note: A. praeclaresquamosus is identical to *A. meleagris.* But the name *A. meleagris* cannot be used because it is preoccupied by the earlier homonym *Agaricus meleagris* Sow. ex Berk. 1860. That is why Freeman (1979a, 1979b) published the new name *A. praeclaresquamosus*. Humus saprotroph; rare; toxic; euryholarctic. Eurasian-American.

Section **Minores** Fr., *Hymen. Eur.*: 211, 1874.

28. *Agaricus impudicus* (Rea) Pil., *Klic k urcovani nasish hub hribovitych a bedlovitych*: 236, 1952 (Fig. 24).

Syn.: *Psalliota impudica* Rea, *Trans. Brit. Mycol. Soc.* 17: 50, 1932; ? *P. brunneola* J. Lge, *Fl. Ag. Dan.*, VII, 1940; *A. variegans* (Moell.) Moell., *Friesia* 4: 203, 1952, *Agaricus reai* Bon, *Doc. Mycol.* 44: 28, 1981 (nom. inval.).

Description and illustration: Cappelli 1984: 165-171, pl. 18; Moser & Jülich 1985-1996, III, 2; Wasser 1989: 101-102, pl. XXI,b; XXVIII, 8a-c; XXIV, 31-33.

Pileus 5-7 cm in diam., in the centre thick-fleshy, thinner along the margin, hemispherical, later convex-applanate, occasionally with an obtuse low umbo, silky, variously scaly with adpressed fibrillose scales, from a dark brown fibrillose covering to scattered brown scales on a whitish background, with thin, involute, undulating margin with remnants of the veil. Gills free, thin, crowded, whitish, later greyish-chocolate, with pale sterile edge. Basidia 4-spored, 20-24 × 6-8 µm, clavate. Sterigmata 2-2.5 µm long. Cheilocystidia 20-30 × 10-17 µm, vesiculose. Spore-print brown. Spores 4.7-5-5.5 × 3-3.5 µm, pale brown, ovoid or ovoid-ellipsoid, with apiculus and 1-2 refractive droplets. Stipe 5-8 × 0.7-1.5 cm, central, cylindrical, with bulbous base, often ending in a mycelial cord, whitish, above the ring white, below with greyish tinge, fistulose, on handling becoming yellow, fibrillose, glabrous. Ring apical, simple, white, membranous. Flesh white, on exposure unchanging or becoming slightly yellow. Without special odor and taste. Cross reaction with Schaeffer's reagent positive.

Specimens examined: Israel, SP: Hadera, Iron Forest, 2.1.1975, leg. N. Binyamini, det. S. P. Wasser, 15.04.1991 (TELA, N75.100). Denmark, Herb Mus. Bot. Hann. (C): Fyn. Nyborg, Boellevaenge, 22.10.1973, leg. et det. M. Lange, type locality of *A. brunneolus*).

General distribution: Europe (Denmark, British Isles, France, Italy, Hungary, Poland, Jugoslavia, Czech Republic,Ukraine, Russia), Asia (Russia, Israel).

Note: This species is new to the Biota of Israel. The Israeli specimen is preserved in TELA herbarium, but was determined by N. Binyamini as *A. porphyrizon* P. D. Orton. The study of the Israeli material as well as material from Denmark (see above, speciments examined), showed their identity. *A. impudicus* is morphologically related to *A. porphyrizon,* from which it differs in the pileus colour, ecology, size of spores, smell, etc. Research by a number of authors (Moser 1983, Cappelli 1984, Knudsen 1992) showed that *A. variegatus* (Moell.) Moell., *A. reai* Bon and probably *A. brunneolus* (J. Lge) Pil. are synonyms of *A. impudicus*. Humus saprotroph; very rare; edible; nemorose. Eurasian.

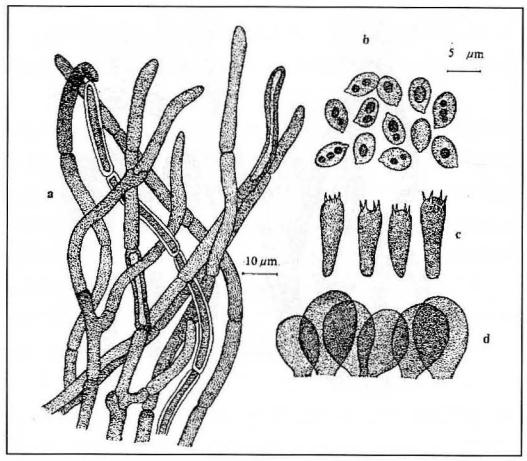

Fig. 24. *Agaricus impudicus*: a- elements of pileal cuticle, b- spores, c- basidia, d- cheilocystidia (TELA, N75.100).

29. *Agaricus lutosus* (Moell.) Moell., *Friesia* 4: 204, 1952 (Fig. 25).

Basionym: *Psalliota lutosa* Moell., *Friesia* 4: 188, 1952.

Description and illustration: Moeller, Friesia 4: pl. XXId, 1952; Cappelli 1984, p. 298-299, pl. 53; Wasser 1989: 103.

Specimens examined: Israel, SP: Rosh Ha'ayin, under *Pinus* and *Eucalyptus,* on lawn, 28. 12. 1974, leg. et det. N. Binyamini.

General distribution: Europe (British Isles, Denmark, The Netherlands, Switzerland, Hungary, France, Italy, Russia, Poland, Ukraine), Asia (Russia, Turkmenistan, Uzbekistan, Georgia, Azerbaijan, Israel).

Note: Humus saprotroph; rare; edible; nemorose. Eurasian.

30. *Agaricus porphyrizon* P. D. Orton, *Trans. Brit. Myc. Soc.* 43(2): 174, 1960.

Syn.: *Agaricus arvensis* Schaeff. var. *purpurascens* Cke, *Handbook of Br. Fungi*, ed. 2: 193, 1883-1891.

Description and illustration: Cappelli 1984: 290-293, pl. 51, fig. 31; Wasser 1989: 100-101, pl. XXIa; XXVIII, 7a-b; XXXIV, 34-36.

Specimens examined: Israel, CM: Mt Carmel National Park, Bet Oren S., 30.12.1975, leg. et det. N. Binyamini (TELA, N75.30); UG: Kibbutz Hannita, in *Pinus halepensis,* 10.03.1993, leg. et det. S. P. Wasser (HAI, N01.21); CM: Daliyat-el-Carmel, Park, in *Pinus* sp. ,14.02.1995, leg. et det. S. P. Wasser (HAI, N05.24).

General distribution: Europe (British Isles, Norway, Denmark, France, Italy, Germany, Czech Republic, Hungary, Ukraine); Asia (Russia, Uzbekistan, Turkmenistan, Israel); South America (Argentina); Africa (Morocco, Kenya).

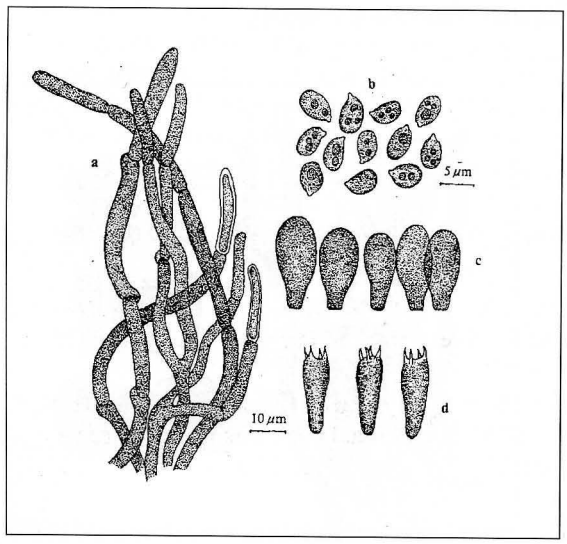

Fig. 25. *Agaricus lutosus* (Moell.) Moell.: a- elements of pileal cuticle, b- spores, c- cheilocystidia, d- basidia (TELA, N?).

Note: A. porphyrizon is most closely related to *A. impudicus* (Rea) Pil. from which it differs in the pileus color, ecology, smell and size of spores. Humus saprotroph; rare; edible; multiregional. Eurasian-American-African.

31. *Agaricus purpurellus* (Moell.) Moell., *Friesia* 4: 204, 1952.

Syn.: *Psalliota purpurella* Moell., *Friesia* 4: 193, 1952; *P. amethystina* Quél. ss. J. Lge, *Dansk Bot. Arkiv*, 4(12): 10, 1926; *Agaricus rubellus* ss. Decary, *Bull. Soc. Myc. Fr.*, 43:Atlas, tab. 22, 1927.

Description and illustration:

Cappelli 1984: 305-306, pl. 55; Wasser, 1989: 106-107.

Specimens examined: Israel, SP: Netanya, under *Eucalyptus*, 19.12.1974, leg. et det. N. Binyamini (TELA, N74.503); UG: Kibbutz Hannita, in *Quercus calliprinos,* 8.12.1996, leg. et det. S. P. Wasser (HAI, N06.52).

General distribution: Europe (British Isles, Denmark, France, Italy, Germany, Russia, Belarus, Moldova, Ukraine, Poland, Czech Republic, Hungary); Asia (Russia, Azerbaijan, Japan, Israel); North America (Canada, USA); Carribean (Trinidad, Tobago); South America (Argentina, Bolivia, Venezuela).

Note: Litter saprotroph; rare; edible; multiregional. Eurasian-American.

32. Agaricus semotus Fr., *Monogr. Hymen. Suec.* II: 347, 1863.

Syn.: *Psalliota rubella* Gill. fo. *pallens* J. Lge, *Dansk Bot. Arkiv* 4(12): 10, 1926; *P. amehystina* Quél., *Fl. Myc. Fr.*:71, 1888, non ss. J. Lge.

Description and illustration: Cappelli 1984: 300-304, pl. 54; Wasser 1989: 104-106, pl. XX e-d.

Specimens examined: Israel,UG Baran Forest, 5.12.1973, leg. H. Talx, det. N. Binyamini, as *A. rubellus* fo. *pallens* (TELA, N73.213), rev. S. P. Wasser, 19.04.1991.

General distribution: Europe (everywhere), Asia (Russia, Kazakhstan, Israel, China, Turkey, Azerbaijan, Kazakhstan), North America (Canada, USA), South America (Argentina, Chile), Africa (Algeria , Morocco).

Note: A. semotus is a rather variable species both in colour and size of carpophores. *A. semotus* is most closely related to *A. purpurellus* (Moell.) Moell., from which it differs in habit, and pileus colour, etc. Litter saprotroph; rare; edible; boreal. Eurasian-American-African.

Genus ***Gyrophragmium*** Mont., *Ann. Sci. Nat.* 20, 2: 77, 1843

33. *Gyrophragmium dunalii* (Fr.) Zeller, *Mycologia* 35: 411, 1943.

Basionym: *Montagnites dunalii* Fr., *Epicr.*: 241, 1838; *Montagnea delilei* Mont., Fl. d'Algérie, 1: 369, 1846-1849.

Description and illustration: Pilat 1958: 247-248; Bo Liu 1984: 138-140, fig. 47; Wasser 1989: 108-109, pl. XXII.

Specimens examined: Israel, SP: Kibbutz Shefayim, Park, in sandy soil, 13.04.1996, leg. et det. S. P. Wasser (HAI, N06. 77); CN: Muchtesh Ramon, in sandy soil,13.03.1997, leg. E. Ivanitskaya, det. S. P. Wasser (HAI, N10.01).

Distribution: Europe (Portugal, France, Spain, Italy, Czech Republic, Russia, Ukraine), Asia (Russia, Kazakhstan, Uzbekistan, Tadjikistan, China, Israel, Vietnam), Africa (Egypt, Algeria, Morocco, Ghana), North America (Canada, USA, Mexico), South America (Argentina).

Note: Gyrophragmium dunalii is frequent in Israel in sandy habitats (Binyamini 1984). Humus saprotroph; frequent in same region; it is not an important edible mushroom; multiregional. Eurasian-American-African.

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