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The delimitation of the genus *Leccinum*

Vymezení rodu *Leccinum*

Josef Šutara

The International Botanical Congress in Berlin 1987 accepted a change of Art. 63 of the nomenclatural rules. According to the new, changed wording of Art. 63 the generic name *Leccinum* is now legitimate. This fact is respected by the author of this paper and therefore *Leccinum* is here used as a correct name for the genus in question.

The genus *Leccinum* S. F. Gray (*Boletaceae*) is distinguished from the other boletes by a peculiar arrangement of the surface tissues of the stipe. This peculiar type of the stipe covering is here described. The differences between the stipe coverings of the genera *Leccinum* and *Boletus* Fries are discussed in detail. A list of the examined material with notes on some species is appended. The following new combinations are proposed: *Leccinum depilatum*, *Leccinum fragrans*, *Leccinum luteoporum*, *Leccinum niveum*, *Leccinum pseudoscabrum* and *Leccinum rufescens*.

Mezinárodní botanický kongres v Berlíně 1987 přijal změnu čl. 63 nomenklatorických pravidel. Podle nového, změněného znění čl. 63 je rodové jméno *Leccinum* nyní legitimní. Tato skutečnost je respektována autorem tohoto článku, a proto je tu *Leccinum* používáno jako správné jméno pro zde diskutovaný rod.

Rod *Leccinum* S. F. Gray (*Boletaceae*) je odlišen od ostatních hřibů zvláštním uspořádáním povrchových tkání třeně. Tento zvláštní typ třeněvého pokryvu je zde popsán. Detailně jsou prodiskutovány rozdíly mezi třeněvými pokryvy rodů *Leccinum* a *Boletus* Fries. Je připojen seznam studovaného materiálu s poznámkami k některým druhům. Jsou navrženy následující nové kombinace: *Leccinum depilatum*, *Leccinum fragrans*, *Leccinum luteoporum*, *Leccinum niveum*, *Leccinum pseudoscabrum* a *Leccinum rufescens*.

Although the majority of mycologists have been of the view that members of the genus *Leccinum* S. F. Gray 1821 form a natural and homogeneous group of closely related species, the taxonomic opinions on the rank and delimitation of this group have been very different. Some authors have not accepted the genus in question and have treated it merely as a subgenus. Of course, these authors have usually overlooked or underestimated some significant anatomical differences between this genus and the other boletes. Such an arrangement of the surface tissues of the stipe as occurs in *Leccinum* is present in no other European genus. Unfortunately, this type of the stipe covering was not yet described in more detail. Therefore it is not very surprising that the anatomical differences between *Leccinum* and the other boletes are not widely known. An attempt to explain some aspects of the matter will be made in this paper. Especially it is necessary to clarify the limit between *Leccinum* and the most closely related genus *Boletus* Fries 1821.

The International Botanical Congress in Berlin 1987 accepted a change of Art. 63 of the nomenclatural rules (see Greuter et McNeill 1987 and McNeill 1987). According

to the new, changed wording of Art. 63 the generic name *Leccinum* is now legitimate. This fact is respected by the author of this paper and therefore *Leccinum* is here used as a correct name for the genus in question.

The stipe covering of the *Leccinum* type

The genus *Leccinum* belongs to a great group of the boletes with a fertile surface of the stipe. Except for the basal part, the stipe of the *Leccinum* species is covered with a caulohymenium which is composed of caulobasidioles, caulocystidia and fertile caulobasidia (fig. 1a). The caulohymenium is (17) 20–30 (35) μm thick. (Note: According to Lohwag and Peringer 1937, Lohwag 1941 and some other authors, the caulohymenium of the boletes has been called "the hymeniderm").

Immediately beneath the caulohymenium there is a narrow zone of small cells which is here termed "the caulosubhymenium" (fig. 1 b). The thickness of this caulosubhymenium is roughly (10) 20–30 (40) μm .

Note: In youth the caulosubhymenium is predominantly composed of short cells. In this stage this layer is mostly well differentiated. During development, however, the caulosubhymenial cells gradually grow and elongate their shape. In this way the caulosubhymenium gradually changes into a filamentous layer which is not very distinct from the lateral stratum of the stipe. In old age the change of the caulosubhymenium is so great that in many old specimens this layer becomes entirely indistinguishable.

The trama in the inner portion of the stipe (i. e. the stipe trama proper) (figs. 1 d and 2 d) is non-gelatinous, densely arranged, consisting of hyphae which are predominantly parallel or subparallel to the longitudinal stipe axis. This stipe trama in *Leccinum* does not differ essentially from that in the other related boletes. What is, however, remarkable in this genus is a peculiar arrangement of a marginal layer near the stipe surface. In the marginal layer the hyphae diverge conspicuously from the longitudinal stipe trama proper and curve towards the caulohymenium. Beneath the caulohymenium and caulosubhymenium the run of the hyphae is more or less anticlinal. This partly divergent and partly anticlinal layer is here called 'the stipe lateral stratum of the *Leccinum* type' (fig. 1 c). The trama of this lateral stratum is non-gelatinous and in the anticlinal part it is mostly densely arranged in a parallel or subparallel way, with hyphae touching one another (fig. 1-c 2). The thickness of the stipe lateral stratum in the *Leccinum* species is (150) 200–1000 (2000) μm .

Note: The term 'stipe lateral stratum' is taken from Lohwag and Peringer (1937) who described a similar layer (originally 'Stiellateralstratum') in a number of the *Boletus* species. The stipe lateral stratum in *Boletus*, however, is different from the one in *Leccinum*. For this reason, it is necessary to distinguish the stipe lateral stratum of the *Boletus* type from the stipe lateral stratum of the *Leccinum* type.

In early youth the stipe surface of the *Leccinum* species is not disrupted. In this developmental stage also the stipe lateral stratum forms a compact, not disrupted layer (fig. 1). This stage, however, is only transient. By the elongation and expansion of the stipe during the growth of carpophores, the surface layers of the stipe soon disrupt into characteristic particles. The particles are composed of clusters and fascicles of the hyphae of the disrupted lateral stratum ending up by fragments of the caulohymenium (fig. 2). This disrupted stipe covering appears macroscopically as a typical scabrous ornamentation.

Note: As can be seen, the characteristic stipe ornamentation of the *Leccinum* species is a result following from the growth of the stipe and above all from the peculiar characters of the stipe lateral stratum. The stipe surface of the *Leccinum* type disrupts in the typical way just for the reason that the stipe lateral stratum is arranged anticlinally (i.e. perpendicularly to the direction

of the elongation and expansion of the stipe) and is non-gelatinous (not cohesive), with hypæ which are not interwoven, but predominantly parallel or subparallel to one another.

It is known that the macroscopical appearance coincides in a high measure with the microscopical characters. One of the characters which very influences the appearance of the scabrous ornamentation is the thickness of the stipe lateral stratum. The *Leccinum* species whose stipe ornamentation is fine have a stipe covering with a comparatively thin lateral stratum. On the other hand, the species whose stipe ornamentation is coarse possess a stipe covering with a thick lateral stratum.

Note: The smaller measurements of the lateral stratum of the *Leccinum* type occur in these species: 150–350 μm in *Leccinum luteoporum*, (150) 200–300 (350) μm in *Leccinum fragrans*, (160) 200–380 μm in *Leccinum pseudoscabrum*, (150) 200–600 μm in *Leccinum duriusculum*, 320–450 μm in *Leccinum subglabripes*, and (200) 240–460 (640) μm in *Leccinum depilatum*. The following thicknesses of the stipe lateral stratum were found in the other *Leccinum* species: 280–500 μm in *Leccinum rotundifoliae*, 300–610 (740) μm in *Leccinum niveum*, 290–700 (1200) μm in *Leccinum scabrum*, 300–620 μm in *Leccinum griseum*, 350–540 (1200) μm in *Leccinum piceinum*, 420–700 μm in *Leccinum percandidum*, and (350) 450–800 (1600) μm in *Leccinum aurantiacum* (the type species of *Leccinum*). The thickest lateral stratum, measuring 500–1000 (2000) μm , was observed by the author in *Leccinum rufum*.

In the course of the examination of the stipe covering it is important to keep in mind that the lateral stratum of the *Leccinum* type is not equally thick in various parts of the stipe. This layer is thickest somewhere in the middle part or in the lower third of the stipe. (Note: The above quoted measurements of the stipe lateral stratum of the *Leccinum* species were taken just from the places where this layer was best developed). Upwards and downwards from this zone the stipe lateral stratum is gradually thinner and thinner. Therefore the stipe ornamentation appears most coarse in the middle part or in the lower third of the stipe and is usually finer at the apex.

The macroscopical appearance of the stipe surface is also much dependent on the pigmentation of the stipe scabrosities. As concerns this pigmentation, the species of the genus *Leccinum* may be arranged into three groups. The first group includes species whose stipe scabrosities are dark coloured through almost all the development, i. e. from early youth till old age. The dark colouration is caused by dark pigment which is developed in caulohymenial cells of these species already in a very young stage. A typical representative of this group is *Leccinum rufescens*.

Species of the second group possess the stipe scabrosities which are at first pallid and gradually darken. In this group the caulohymenial cells are initially colourless or almost so. The dark pigmentation develops in these cells only in later developmental stages. Such a gradual formation of the dark pigment in the course of the ontogenetic development is a very characteristic feature of many *Leccinum* species. The most typical representative of this group is *Leccinum rufum* whose stipe scabrosities are at first white, then gradually darken and finally become brown-black or black.

The stipe ornamentation of the third group remains pale through all the development. This group includes such species as *Leccinum fragrans*, *Leccinum depilatum*, *Leccinum rotundifoliae*, *Leccinum subglabripes*, partly also *Leccinum niveum* and some others. These species have caulohymenial cells which permanently lack the dark pigment. Therefore their stipe ornamentation is less conspicuous and seemingly different from the stipe covering of the other *Leccinum* ones. The inconspicuous stipe scabrosities of *L. fragrans*, *L. depilatum* and *L. subglabripes* has been undoubtedly a reason why these species have been placed by some taxonomists in the genus *Boletus* sensu stricto. In this case, however, the somewhat different macroscopical appearance of the stipe ornamentation has been evidently overestimated

because the microscopical construction of the stipe covering in these species is the same as in the other members of *Leccinum*. This stipe covering is sufficiently different from the anatomical configuration of the stipe in the genus *Boletus*. Between these *Leccinum* species on the one hand and the members of *Boletus* on the other hand there exists a distinct limit. As regards the anatomical characters, the species *L. fragrans*, *L. depilatum* and *L. subglabripes* undoubtedly belong to the genus *Leccinum*.

Material examined

Species with the stipe covering of the *Leccinum* type

The following abbreviations are used in the list of the examined material: JŠ = herb. J. Šutara; SNR = State Nature Reserve (státní přírodní rezervace).

Leccinum aurantiacum (Bull.) S. F. Gray, Nat. Arr. Brit. Pl. 1: 646, 1821.

Boletus aurantiacus Bulliard, Herb. Fr. t. 236, 1785.

Boletus sanguinescens Velenovský, České houby 2: 701, 1922.

Leccinum quercinum Pilát et Dermek, Hřibovité huby p. 151, 1974.

Specimens examined. Czechoslovakia: — "Vršíček" near Bilina, 4 and 12 Sept. 1979, V. Šlajchrt, 5 and 8 Aug. 1981, J. Šutara, JŠ 211, 529, 1585, 1587. — Lipí near Manětín, 25 Aug. 1978, 30 Aug. 1980, 1 Aug. 1981, J. Šutara and M. Šutarová, JŠ 056, 242, 1547. — Blatno u Jesonice, 5 Oct. 1979, 6 Oct. 1980, 18 Sept. 1981, J. Šutara, JŠ 359, 528, 1842. — Mašov, "Sedmihorky" near Trutnov, 19 June 1946, H. Schmidt, PRM 521031 (the type specimen of *Leccinum quercinum*).

Note: Although *Leccinum aurantiacum* (*Boletus aurantiacus*) and *Leccinum rufum* (*Boletus rufus*) are usually treated as identical, some observations indicate that these taxa are two separate species. The differences between these species are best perceptible in youth. In young specimens of *L. aurantiacum* (i.e. in the stage in which the pileus begins to open) the scabrosities of the stipe are red, red-brown or dark brown and the pores are ochreous, ochreous-brown or brown. On the other hand, in young carpophores of *L. rufum* both the scabrosities and the pores are white or whitish. In *L. rufum* the stipe scabrosities gradually darken only in later developmental stages and are never so red as those in *L. aurantiacum*. In mycological literature the epithet *aurantiacus* has been often used for the species with the whitish stipe scabrosities. Such a concept of this specific epithet, however, does not correspond with the type plate of *Boletus aurantiacus* on which the stipe ornamentation is red (see Bulliard, pl. 236, 1785). It is worthy of mention that in Schaeffer's original illustration of *Boletus rufus* the stipe surface of the young specimens is white (see Schaeffer, pl. 103, 1763).

As concerns *Leccinum quercinum*, I came to the conclusion that this species is identical with *Leccinum aurantiacum*.

Leccinum depilatum (Redeuilh) Šutara comb. nov.

Boletus depilatus Redeuilh, Bull. Soc. Mycol. Fr. 101: 389, 1985 (basionym).

Specimens examined. Czechoslovakia: — Lysá nad Labem, Sept. 1949, A. Lukavec, PRM 647825. — Božice, "Hoja" near Znojmo, 29 Aug. 1971, F. Kotlaba, PRM 717049. — Kuřim, "Zlobico", 4 Sept. 1951, F. Šmarda, BRNM 265678. — "Čebinka" near Kuřim, 17 Aug. 1954, F. Šmarda, BRNM 265688. — Lednice, 20 May 1950, F. Šmarda, BRNM 265679.

Note: *Leccinum depilatum* (*Boletus depilatus*), a recently described species, is related to the other members of the section *Luteoscabra*. Macroscopically *L. depilatum* resembles *Leccinum fragrans* (*Boletus fragrans*), but microscopically it is well distinguished by a characteristic construction of the pileus cuticle. In *L. fragrans* the pileus cuticle is composed of a filamentous trichodermium, while in *L. depilatum* this cuticular layer consists of a subcellular epithelium. The species *Leccinum subglabripes* whose pileus cuticle is also composed of an epithelium differs from *L. depilatum* in some macroscopical characters and microscopically in the width of spores. In *L. subglabripes* the spores are 11–14 (18) × 3–4.5 (5) μm, while in *L. depilatum* 11–16 × (4.5) 5–6.5 (7.7) μm.

Leccinum duriusculum (Schulz. ap. Fr.) Singer, Amer. Midl. Nat. 37: 122, 1947, sensu orig.

Boletus duriusculus Schulz. ap. Fr. 1874, non sensu Singer 1947.

Boletus duriusculus Schulzer ap. Fries, Hymen. Europ. p. 515, 1874.

ŠUTARA: LECCINUM

Specimens examined. Czechoslovakia: — Lanžhot "U přívoza", 15 Aug. 1968, A. Dermek, PRM 663764. — Vlastiboř, "Ježárka" near Soběslav, 9 and 12 Aug. 1962, F. Kotlaba, PRM 572230, 566842. — Between Útěchov and Bilovice near Brno, 18 Aug. 1974, A. Vágner, BRNM 265580. — SNR "Chotínske piesočiny" near Komárno, 2 Oct. 1983, J. Hlaváček et al., JŠ 2614. — "Vršíček" near Bílina, 22 Aug. 1979, 3 Oct. 1981, V. Šlachrt, 17 Aug. 1984, J. Zimmermann, JŠ 169, 2011, 2794.

Leccinum fragrans (Vittadini) Šutara comb. nov.

Boletus fragrans Vittadini, *Funghi mangerecci* p. 153, 1833 (basionym).

Boletus impolitus Fries, *Epicrisis* p. 421, 1838.

Specimens examined. Czechoslovakia: — Praha, Kinského sady, 24 June 1961, E. Wichanský, PRM 682521. — Teplice "Písečný vrch", 15 July 1971, J. Glonková, LIT 3'19/1148. — "Kapansko" Čejkovice near Hodonín, 28 Aug. 1981, J. Slavíček and K. Kult, JŠ 1704. — "Doubravka" near Teplice, Aug. 1983, J. Biber, JŠ 2536. — Františkovy lázně, 11 Sept. 1982, P. Rojtkovič and J. Šutara, JŠ 2079, 2080.

Note: *Boletus fragrans* (*Leccinum fragrans*) is generally considered as a species with a brown pileus and a slightly bluing flesh, and *Boletus impolitus* as a species with a paler pileus and an unchanging flesh. These small differences are undoubtedly of minor importance. Moreover, it turned out that these two species cannot be separated from each other, as all kinds of transitions are observed. That is why *B. impolitus* is here treated as conspecific with *L. fragrans*.

Leccinum griseum (Quélet) Singer, *Pilz. Mitteleurop.* 6: 89, 1967, sensu orig. *Gyroporus griseus* Quélet 1902, non sensu Singer 1967.

Boletus melaneus (Smotlacha) Smotlacha, Čas. Čes. Houbařů (Mykol. Sbor.) 29: 110, 1952.

Leccinum variicolor Watling, *Notes Roy. Bot. Gard. Edinb.* 29: 268, 1969.

Leccinum thalassinum Pilát et Dermek, *Hřibovitě huby* p. 146, 1974.

Specimens examined. Czechoslovakia: — Lipí near Manětín, 13 Sept. 1975, 22 Sept. 1979, J. Šutara, JŠ 462, 446. — Blatno u Jesenice, 1 Oct. 1978, B. Aubrecht and J. Šutara, JŠ 460. — SNR "Hůrky" north of Plzeň, 24 Sept. 1983, J. Šutara, JŠ 2657. — "Brezina" near Tatranská Štřba, 6 Sept. 1980, J. Kuthan and J. Šutara, JŠ 284. — Gbely, 19 Aug. 1968, A. Dermek, PRM 663765 (the holotype of *Leccinum thalassinum*).

Notes: *Leccinum griseum* is probably the only European species of the genus *Leccinum* whose dominant colour of the pileus is grey. The pileus of this species is moreover spotted in a characteristic manner (especially in younger specimens). This peculiar colouration was well described by Quélet (1902) in his original description of *Gyroporus griseus*: "... gris, quelquefois marbré de blanc et de gris ..."

As some characters of *L. griseum* are rather variable (e.g., the oxidation of the flesh, the intensity of the colouration, etc.), it is not very surprising that this species was described under more names, for example, as *Leccinum variicolor*, *Leccinum thalassinum* and *Boletus melaneus* (= *Boletus scaber* var. *melaneus*). The first specific name used for this species, however, is obviously *Gyroporus griseus*.

Leccinum luteoporum (Bouchinot ap. Barbier) Šutara comb. nov.

Boletus luteoporus Bouchinot ap. Barbier, *Bull. Soc. Mycol. Fr.* 20: 91, 1904 (basionym).

Boletus nigrescens Richon et Roze, *Atl. Champ.* p. 1888, non Pallas 1788.

Krombholzia crocipodia ("Letellier") sensu Gilbert, *Bolets* p. 177, 1931, non orig. *Boletus crocipodius* Letellier 1838 (nom. dubium).

Specimens examined. Czechoslovakia: — Chlumeč nad Cidlinou, 20 Sept. 1946, M. Deyl, 15 July 1956, R. Kovanda, RPM 648066, 648067. — "Černoháj" near Vodňany, 12 Aug. 1938, J. Herink, PRM 499786. — Rožďalovice not far from Nymburk, 15 July 1950, A. Pilát, PRM 648065. — "Jezerka" near Lovosice, 18 Sept. 1977, J. Biber, LIT 3776/565. — Nemčice near Topolčany, 20 July 1979, V. Paulovič, JŠ 152.

Note: This species has been sometimes connected with the specific epithet *crocipodius*. This epithet, however, cannot be applied to this taxon, as was pointed out by some authors, e.g., by Singer (1967). *Boletus crocipodius* Letellier (1838) is based only on Letellier's colour plate (pl. 666), without any written description. Specimens designated on this original plate as figs. A, C, D, E can hardly be considered as conspecific with *Leccinum luteoporum* because they are depicted with dominant red-brown colour on the stipe surface (figs. A, C) and without the darkening of the flesh on a section (figs. D, E). The specimens in Letellier's fig. A even show a red-brown subcuticular layer in the cracks of the areolate-disrupted pileus surface. Many features better correspond with *Xerocomus chrysenteron* or with some of its allied species. Of course, a precise identification seems to be very problematic. It is not also impossible that Letellier's table is a mixture of two

or three species. For these reasons, the name *B. crokipodius* Letell. is here treated as a nomen dubium. In each case, however, Letellier's illustration represents a *Xerocomus* rather than *Leccinum luteoporum*. In this connection it may be cited Fries's opinion on Letellier's *B. crokipodius*: "Non determinandus; videtur *B. subtomentoso affinis* ..." (Fries 1874).

Leccinum niveum (Fries) Šutara comb. nov.

Boletus niveus Fries, Observ. Mycol. 1: 111, 1815 (basionym).

Leccinum lolopus (Rostkovius) Watling, Trans. Brit. Mycol. Soc. 43: 692, 1960.

Specimens examined. Czechoslovakia: — Soběslavská (Borkovická) blata, 13 Sept. 1982, F. Kotlaba, JŠ 2086. — Lipí near Manětín, 17 Sept. 1983, J. Šutara, JŠ 2564. — "Velká Holná" near Jindřichův Hradec, 24 Aug. 1983, J. Šutara, JŠ 2317. — SPR "Hůrky" north of Plzeň, 24 Sept. 1983, F. Mika, JŠ 2661.

Leccinum percandidum (Vasilkov) Watling, Trans. Brit. Mycol. Soc. 43: 691, 1960.

Boletus percandidus Vasilkov, Sovet. Botan. p. 27, 1944.

Leccinum rosotinctum Watling, Notes Roy. Bot. Gard. Edinb. 29: 267, 1969.

Specimens examined. Czechoslovakia: — "Vršíček" near Bilina, Sept. 1978, 22 Aug. 1979 L. Urbánek, JŠ 055, 171.

Leccinum pleecinum Pilát et Dermek, Hřibovité huby p. 153, 1974.

Specimens examined. Czechoslovakia: — Petříkov near České Budějovice, 28 Oct. 1976, Z. Kluzák, CB 903. — Krasetín near Český Krumlov, 11 June 1978, S. Bauer, CB 1476. — Frymburk near Český Krumlov, 26 June 1977, S. Bauer, CB 1061. — "Velká Holná" near Jindřichův Hradec, 25 Aug. 1983, L. Záměstný, JŠ 2394.

Leccinum pseudoscabrum (Kallenb.) Šutara comb. nov.

Boletus pseudo-scaber Kallenb., Pilz. Mitteleurop. 1: 117, 1935 (basionym).

Leccinum duriusculum (Schulz. ap. Fr.) Singer sensu Singer, Amer. Midl. Nat. 37: 122, 1947, non orig. *Boletus duriusculus* Schulzer ap. Fries 1874.

Leccinum griseum (Quélet) Singer sensu Singer, Pilz. Mitteleurop. 6: 89, 1967, non orig. *Gyroporus griseum* Quélet 1902.

Boletus scaber var. *carpini* R. Schulz in Michael, Führ. Pilzfr. 1: 95, 1924.

Boletus carpini (R. Schulz) Pearson, Naturalist p. 96, 1946.

Specimens examined. Czechoslovakia: — Srbsko, "Bubovický potok" near Beroun, 9 Aug. 1944, J. Herink and J. Kubička, PRM 520436. — Turnov, "Ve struháček", 1 Sept. 1946, J. Kubička, PRM 520745. — Černolice near Dobřichovice, July 1944, A. Pilát, PRM 648000. — Vysoké Tatry, "Vážecké lúky", 4 Sept. 1980, J. Kuthanová, JŠ 360. — Milý near Louny, 25 Aug. 1984, E. Skála, JŠ 2797.

Notes: Secretan's name *Boletus pseudoscaber* was published validly neither by Secretan (cf. Voss et al., Art. 23. 6, Ex. 10) nor by some of later authors. According to the nomenclatural rules, thus, *Boletus pseudoscaber* Kallenbach (1935) is not a later homonym but is a legitimate name which should be fully accepted.

This species has been sometimes named *Leccinum griseum*. Such an application of the epithet *griseum*, however, does not correspond with Quélet's original concept of *Gyroporus griseum*. It is also necessary to mention that the epithet *carpini*, often applied to this species, was first used at the specific level (as *Boletus carpini*) only in 1946 (see Pearson 1946). From these facts it is obvious that Kallenbach's *pseudoscaber* is the first valid specific epithet for the species in question.

Leccinum rotundifoliae (Singer) Smith, Thiers et Watling, Mich. Botan. 6: 128, 1967.

Specimens examined. Sweden: — Torne Lappmark, Kiruna, Abisko, 27 July 1943, S. Lundell, PRM 518250.

Leccinum rufum (Schaeff.) Kreisel, Boletus Schr. Reihe 1: 30, 1984.

Boletus rufus Schaeff., Fung. Bavar., index p. 75, 1774.

Boletus versipellis Fries, Boleti p. 13, 1835.

Leccinum aurantiacum (Bull.) S. F. Gray sensu Pilát et Dermek, Hřibovité huby p. 149, 1974 et auct. plur., non orig. *Boletus aurantiacus* Bulliard 1785.

Specimens examined. Czechoslovakia: — Braňany near Most, 1 Aug. 1979, 12 July 1980, 1 Sept. 1982, J. Šutara, 5 June 1983, B. Aubrecht, JŠ 022, 253, 2023, 2025. — "Vršíček" near Bilina, 30 Aug. 1979, 25 Sept. 1980, 1 Sept. 1981, J. Šutara, 24 July 1981, 5 Sept. 1981, V. Šlajchrt, 7 Oct. 1981, L. Urbánek, JŠ 235, 431, 1514, 1863, 1922, 1923. — Mutějovice not far from Rakovník, 25 Sept. 1984, B. Aubrecht, JŠ 3014.

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Leccinum rufescens (Konrad) Šutara comb. nov.

Boletus rufescens Konrad, Bull. Soc. Linn. Lyon p. 151, 1932 (basionym).

Boletus versipellis sensu Smotlacha, Věst. Král. Spol. Nauk 8: 57, 1912, non Fries 1835.

Leccinum testaceoscabrum Singer, Amer. Midl. Nat. 37: 123, 1947 (not validly published, no Latin diagnosis).

Specimens examined. Czechoslovakia: — Braňany near Most, 11 Sept. 1981, J. Šutara, 5 June 1983, B. Aubrecht, JŠ 1816, 2154. — Blatno u Jesenice, 12 Sept. 1980, J. Šutara and M. Šutarová, JŠ 313. — "Želenický vrch" near Bílina, 5 Oct. 1981, J. Šutara, JŠ 1905–07.

Sweden: — Upland, Bodkyrka parish, "Vardsätra skog", near Uppsala, 4 Sept. 1941, S. Lundell, PRM 648084.

Leccinum scabrum (Bull.: Fr.) S. F. Gray, Nat. Arr. Brit. Pl. 1: 647, 1821.

Specimens examined. Czechoslovakia: — Braňany near Most, 1 Sept. 1982, 16 Sept. 1983, J. Šutara, JŠ 2029, 2544. — "Želenický vrch" near Bílina, 4 Oct. 1984, J. Šutara, JŠ 3023. — Markvarec not far from Louny, 10 Oct. 1981, B. Aubrecht and J. Šutara, JŠ 1968. — Lipí near Manětín, 17 Sept. 1983, J. Šutara, JŠ 2566.

Leccinum subglabripes (Peck) Singer, Mycologia 37: 799, 1945.

Specimens examined. Canada: — Bear Island, L. Tamagani, T. F. R., Ontario, 2 Aug. 1937, R. F. Cain, PRM 496533.

U.S.A.: — Langford, Erie County, N. Y., 7 Sept. 1968, E. Both, PRM 704845.

The stipe covering of the *Boletus* type

The *Boletus* type of the stipe covering consists of a fertile caulohymenium, a less distinct caulosubhymenium, and a loosely arranged lateral stratum. The caulohymenium in *Boletus*, like the one in *Leccinum*, covers a predominant part of the stipe and is composed of caulobasidioles, caulocystidia and fertile caulobasidia (figs. 3 a and 4 a). The thickness of the caulohymenium is (17) 20–30 (35) μm .

Note: In youth the caulohymenial layer is rather similar to the hymenium of the tubes. Of course, in later developmental stages the caulohymenium gradually disrupts into small fragments or gradually changes into a somewhat disorganized layer. The fragments of the disrupted caulohymenium on the stipe surface of the *Boletus* species appear macroscopically as a flocculose-furfuraceous or finely squamulose ornamentation. (For a further discussion on the caulohymenial layers of the boletes, see Šutara 1987a and 1987b).

The caulosubhymenium (figs. 3b and 4b) is sometimes distinct and sometimes indistinct. The caulosubhymenial layer (if differentiated) is roughly 5–20 μm , rarely up to 30 μm thick.

A typical part of the stipe covering of the *Boletus* species is a special layer which is here called 'the stipe lateral stratum of the *Boletus* type' (figs. 3c and 4c). This layer is analogous in many regards with the lateral stratum occurring in the boletoid hymenophore. The stipe lateral stratum of the *Boletus* type is more or less divergent, rather frequently gelatinized, composed of hyphae which are loosely interwoven, not touching one another. An important character of this lateral stratum is also the fact that in normal conditions this layer does not disrupt during the growth of the stipe. The boletoid lateral stratum is usually best developed in the upper part of the stipe where it is 20–80 (100) μm thick. In the mid-portion of the stipe this layer is mostly thinner and in the lower half it is thinnest or is not present at all.

Notes: In the course of the individual development of a stipe the lateral stratum of the *Boletus* species may very change. Especially the thickness and the gelification of this layer are characters which are much dependent on age of carpophores. The boletoid lateral stratum of the stipe is usually most gelatinized in younger, half-grown specimens. In this stage it is mostly also best developed. Later this lateral stratum changes into a non-gelatinous layer which becomes gradually thinner and thinner, and finally it disappears entirely.

The development of the boletoid stipe lateral stratum, as in many other gelatinized layers, is also influenced by conditions in which the carpophores grow. In unfavourable conditions the stipe lateral stratum of the *Boletus* type may be very thin or may be utterly undeveloped.

The stipe trama proper beneath the boletoid lateral stratum (figs. 3d and 4d) is non-gelatinous, densely arranged, with hyphae touching one another, more or less parallel to the longitudinal stipe axis.

The stipe covering of the *Boletus* type occurs in two main modifications which are not sharply limited from each other. In the first case the stipe surface is more or less reticulate (fig. 4). In the second case it is flocculose-furfuraceous, minutely squamulose or almost glabrous, i. e. non-reticulate (fig. 3). In the reticulate stipe the surface layers are raised in the lamellar ridges of the reticulation. (For a detailed description of the reticulate stipe covering, see Lohwag and Peringer 1937). In the non-reticulate stipe the surface layers are more or less plane. Despite of the somewhat different macroscopical appearance, however, the microscopical construction of the reticulate and non-reticulate stipes is very similar. As mentioned above, both these modifications of the boletoid stipe covering are essentially composed of the same layers, viz., of the caulohymenium, caulosubhymenium and boletoid lateral stratum.

Note: In many *Boletus* species the squamulose and reticulate appearance may be present on the same stipe simultaneously. In some species even the stipe surface may be sometimes reticulate and sometimes non-reticulate. This has been observed by me, e.g., on carpophores of *Boletus radicans*. The transitional forms indicate that the reticulate and non-reticulate stipe ornamentations of the true *Boletus* species are not two different types but only two morphological forms of the one type of the stipe covering.

Material examined

Species with the stipe covering of the *Boletus* type

Boletus aereus Bulliard, Herb. Fr. t. 385, 1789: Fries, Syst. Mycol. 1, p. 393, 1821.

Specimens examined. Czechoslovakia: — Kohoutovice near Brno, 7 Aug. 1965, A. Vágner, BRNM 236110. — Klentnice near Mikulov, 31 July 1957, K. Kříž, BRNM 236125. — Zdravá Voda near Žarnošice, 2 and 4 Aug. 1974, K. Kříž, BRNM 265699, 265773.

Boletus appendiculatus Schaeffer, Fung. Bavar., index p. 86, 1774.

Specimens examined. Czechoslovakia: — Mochovce near Levice, 5 Aug. 1975, V. Holubová, PRM 775391.

Boletus calopus Persoon, Syn. Fung. p. 513, 1801: Fries, Syst. Mycol. 1, p. 390, 1821.

Specimens examined. Czechoslovakia: — "Sedmihůrky" near Teplice, 5 Sept. 1974, A. Marek, LIT 3719/171. — Vysoké Tatry, "Vážecké lúky", 4 Sept. 1980, J. Šutara, JŠ 285.

Boletus edulis Bulliard, Herb. Fr. t. 60, 1781–82: Fries, Syst. Mycol. 1, p. 392, 1821.

Specimens examined. Czechoslovakia: — "Vršíček" near Bilina, 13 Aug. 1985, J. Karchňák, JŠ 3088. — "Kaňkov", Braňany near Most, 9 Sept. 1985, M. Šutarová, 11 Sept. 1985, J. Šutara jun., JŠ 3146, 3151. — "Velká Holná" near Jindřichův Hradec, 25 Aug. 1983, R. Curová, JŠ 2344. — Lipí near Manětín, 29 Oct. 1976, J. Šutara, JŠ 638.

Boletus erythropus Persoon, Observ. Mycol. 1: 23, 1796.

Specimens examined. Czechoslovakia: — Hetov near Bilina, 5 July 1971, A. Marek, LIT 3719/173. — "Vršíček" near Bilina, 3 Aug. 1977, J. Šíp, JŠ 058. — Vysoké Tatry, Vážecké lúky, 4 Sept. 1980, J. Kuthan and J. Šutara, JŠ 282. — Tis u Blatna, north of Plzeň, Jelinek, JŠ 316. — "Svinské čelo" near Liberec, 31 May 1986, J. Sedláček et al., JŠ 3126.

Boletus frostii Russell in Frost, Bull. Buff. Soc. Nat. Sc. 2: 102, 1874.

Specimens examined. U.S.A.: — Massachusetts, Deerfield Dump, 15 Aug. 1978, R. E. Halling, PRM 833580.

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Boletus gentilis (Quélet) Bigeard et Guillemin, Fl. Champ. Sup. Fr. p. 386, 1909.

Xerocomus cramesinus Gilbert, Bolets p. 137, 1931.

Specimens examined. Czechoslovakia: — "Bělě" near Kuřim, 4 Sept. 1951, F. Šmarda, BRNM 265460. — Domanín near Třeboň, 20 Aug. 1977, J. Kubička, CB 1515. — České Budějovice vicinity, 15 Sept. 1982, JŠ 2127. — Klec near Třeboň, 13 Sept. 1979, R. Frejlichová, CB 1758.

Boletus junquilleus (Quélet) Boudier, Icon. Mycol. 1: t. 148, 1906.

Specimens examined. Czechoslovakia: — Starý Poddvorov near Hodonín, 3 Aug. 1965, V. Skalník and F. Šmarda, BRNM 267708. — Sklenařice near Jablonec nad Jizerou, July 1972, Ž. Vodsedálek, BRNM 265822.

Boletus lignicola Kallenbach, Pilz. Mitteleurop. 1: 57, 1929.

Pulveroboletus lignicola (Kallenb.) Dick et Snell, Mycologia 57: 451, 1965.

Specimens examined. Czechoslovakia: — Hády near Brno, 20 Aug. 1978, M. Strnad, 1 Sept. 1979, V. Strnadová, BRNM 235934, 235935. — Věžovatá Pláně near Český Krumlov, 25 Sept. 1982, V. Bicha, CB 3375. — Netolice near České Budějovice, 9 Oct. 1982, J. Tondlová, CB 3376. — Lužické hory, Dolní Podluží, 27 July 1985, L. Hruška, JŠ 3141.

Boletus luridus Schaeffer, Fung. Bavar., index p. 78, 1774; Fries, Syst. Mycol. 1, p. 391, 1821.

Specimens examined. Czechoslovakia: — Most, 30 June 1980, M. Froliková, JŠ 317. — "Kaňkov", Braňany near Most, 30 July 1977, J. Šutara jun., JŠ 059. — "Velký vrch" near Louny, 11 Aug. 1984, E. Skála et al., JŠ 2769.

Boletus moravicus Vacek, Stud. Bot. Českoslov. 7 (1): 36, 1946.

Xerocomus moravicus (Vacek) Herink, Čes. Mykol. 18: 198, 1964.

Specimens examined. Czechoslovakia: — Žarošice not far from Brno, 25 Aug. 1949, V. Vacek, PRM 203551. — Zdravá Voda near Žarošice, 26 July 1961, 1 Sept. 1960, 19 Sept. 1963, F. Šmarda, BRNM 265530, 265531, 265540. — Valtice near Břeclav, M. Konečný, BRNM 265479. — Sezimovo Ústí, 10 Sept. 1981, 20 Aug. 1982, 17 Sept. 1982, V. Pravda, CB 3436—37.

Boletus pinophilus Pilát et Dermek, Hříbovitě huby p. 100, 1974.

Boletus pinicola (Vittadini) Venturi, Mic. Agro Bresce. p. 39, 1845—60, non Swartz 1810.

Specimens examined. Czechoslovakia: — Štichovice near Manětín, 19 Aug. 1984, J. Zecha, JŠ 2800. — Hadačka near Kralovice, north of Plzeň, 21 June 1986, L. Stcklásek, JŠ 3139.

Boletus pulverulentus Opatowski, Wieg. Arch. Natur. 2: 27, 1836.

Xerocomus pulverulentus (Opat.) Gilbert, Bolets p. 116, 1931.

Specimens examined. Czechoslovakia: — Rychlebské hory, Tomíkovice, 1 Aug. 1963, K. Kříž, BRNM 265815. — České Budějovice, "Malý jez", 15 Sept. 1977, J. Klusák, CB 1127. — Litvínov, 5 July 1977, 23 Sept. 1978, V. Paulovič, JŠ 041—42.

Boletus queletii Schulzer, Hedwigia 24: 143, 1885.

Specimens examined. Czechoslovakia: — Veverská Bítýška not far from Brno, 8 Aug. 1954, K. Kříž, BRNM 265835.

Boletus radicans Persoon, Syn. Fung. p. 507, 1801; Fries, Syst. Mycol. 1, p. 390, 1821.

Boletus abidus Roques, Hist. Champ. p. 70, 1832, non Schaeff. 1774.

Specimens examined. Czechoslovakia: — "Velký vrch" near Louny, 11 Aug. 1984, T. Šutara, 7 Sept. 1985, A. Machulková, JŠ 2785, 3144.

Boletus retipes Berkeley et Curtis, Grevillea 1: 36, 1872.

Pulveroboletus retipes (Berk. et Curt.) Singer, Amer. Midl. Nat. 37: 9, 1947.

Specimens examined. U.S.A.: — North Carolina, Bear Pen, 9 Aug. 1934, A. H. Beers, PRM 487628.

Boletus reteulatus Schaeffer, Fung. Bavar., index p. 78, 1774.

Specimens examined. Czechoslovakia: — "Želenický vrch" near Bilina, 5 June 1986, J. Šutara, E. Skála and L. Hruška, JŠ 3129, 3130. — "Velká Holná" near Jindřichův Hradec, 27 Aug. 1983, M. Šutarová, JŠ 2395.

Boletus rhodoxanthus (Krombh.) Kallenb., Zeitschr. Pilzk. 5: 31, 1925.

Specimens examined. Czechoslovakia: — Bilovice nad Svitavou, 30 July 1974, L. Ptáček, BRNM 265697. — Žlív near České Budějovice, 24 Aug. 1977, J. Kotlín, CB 1144. — Sezimovo Ústí, 17 Aug. 1979, V. Pravda, 2 Aug. 1982, M. Malá, CB 1781, 3386.

Boletus rhodopurpureus Smotlacha, Čas. Čes. Houbařů 29: 31, 1952.

Specimens examined. Czechoslovakia: — Kohoutovice near Brno, 23 July 1970, E. Šalovec, BRNM 265731. — Střelice near Brno, 16 July 1979, F. Hroudný, BRNM 265746. — Čejkovice near České Budějovice, 24 July 1979, Z. Havlík, CB 1779.

Boletus satanas Lenz, Schwämme p. 67, 1831.

Specimens examined. Czechoslovakia: — "Velký vrch" near Louny, 31 Aug. 1985, L. Hruška, 14 Aug. 1986, E. Skála, JŠ 3091, 3142.

Tylophilus felleus (Bull.: Fr.) P. Karst., Rev. Mycol. 3: 16, 1881.

Specimens examined. Czechoslovakia: — Markvarec south-west of Louny, 10 Sept. 1983, B. Aubrecht and J. Šutara, JŠ 2423. — Lipí near Manětín, 12 Sept. 1981, 17 Sept. 1983, J. Šutara, JŠ 1809, 2569.

Note: The delimitation and circumscription of the genus *Tylophilus* P. Karst. is not very clear, as can be seen from the fact that this question has been solved by various authors in very different ways (cf., e.g., Singer 1947, 1975, Smith and Thiers 1968, 1971, McNabb 1967, Corner 1972, etc.). This taxonomic problem undoubtedly requires a further study and clarification. Nevertheless, as regards the limit between the genera *Leccinum* and *Tylophilus*, we may state that the stipe covering of *Tylophilus felleus* (the type species of *Tylophilus*) is similar to the configuration of the stipe in *Boletus sensu stricto*. In other words: The stipe covering of the type species of *Tylophilus* is different from the stipe structure in *Leccinum* essentially in the same way as the stipe covering of the true *Boletus* species.

Differences between the stipe coverings of the *Leccinum* and *Boletus* type

The stipe coverings of the *Leccinum* and *Boletus* type differ especially in some characters of the stipe lateral stratum. The different characters may be summarized in the following points:

(1) *The difference in the thickness.* The lateral stratum of the *Leccinum* type is (150) 200–1000 (2000) μm thick. The stipe lateral stratum of the *Boletus* type is much thinner. In the *Boletus* species this layer measures 20–80 (100) μm . In unfavourable conditions and in very young or very old specimens the boletoid lateral stratum of the stipe is not developed at all.

(2) *The difference in the tendency to disrupt.* During growth of the stipe, the stipe lateral stratum in *Leccinum* disrupts into very characteristic fascicles of hyphae. These fascicles ending up by the fragments of the caulohymenium form typical stipe scabrosities. On the other hand, the stipe lateral stratum of the *Boletus* type is much more cohesive. In the *Boletus* species with a squamulose stipe, the particles on the stipe surface are composed only of fragments of the disrupted caulohymenium. The lateral stratum beneath these islands of the caulohymenium remains not disrupted.

(3) *The difference in the arrangement.* In the *Boletus* species the hyphae of the stipe lateral stratum are more or less interwoven (not parallel) and are arranged loosely, not touching one another. The stipe lateral stratum in *Boletus* (although divergent) is not so conspicuously anticlinal as that in *Leccinum*. In the *Leccinum* species the hyphae of the stipe lateral stratum are predominantly parallel or subparallel and are usually arranged densely, touching one another. During the development the lateral stratum of the *Leccinum* type changes into a disrupted and rather disorganized

layer. This layer in *Leccinum*, however, is clearly different from the stipe lateral stratum of *Boletus* as well as in this disrupted and disarranged stage.

(4) *The difference in the gelification.* A character of the stipe lateral stratum common to most *Boletus* species is a tendency to gelatinize in a certain developmental stage and in sufficiently favourable conditions. On the other hand, the stipe lateral stratum of the *Leccinum* species is permanently non-gelatinous.

(5) *The difference in the macroscopical appearance.* The characteristic scabrous stipe covering of the genus *Leccinum* is usually different from the stipe ornamentation of the *Boletus* species as well as macroscopically. In substance it is possible to agree with Singer (1975) who has stated: "*Leccinum* is easily recognized even in the field by its macroscopical characters."

Note: It is necessary to admit that the stipe surface of a few *Leccinum* species could seem to be macroscopically rather similar to the stipe ornamentation in the genus *Boletus sensu stricto*. From the taxonomic view point, however, it is very important that these seemingly similar coverings of the stipe are sufficiently distinguished by their microscopical features. For example, *Leccinum fragrans*, *Leccinum depilatum* and *Leccinum subglabripes* seem to be macroscopically similar to some members of the genus *Boletus*, nevertheless, their separation from the true *Boletus* species by means of the microscopical characters makes no greater difficulties.

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Kniha vyšla v sérii „Biologičeskije povrežděnije“ a je výsledkem práce tří akademických pracovišť s významným podílem Botanického ústavu akademie věd Litevské SSR.

V úvodu se probírají různá druhy výrobků a hmot a otázky jejich narušování mikroskopickými houbami. Pak následuje kapitola o faktorech působících na ekologii mikroskopických hub. Hlavním obsahem knihy jsou popisy 360 druhů hub zjištěných a sledovaných na různých substrátech z umělých hmot především v pobaltských republikách, ale i v jiných částech SSSR. V záhlaví této nejobsáhlejší části knihy jsou odkazy na literaturu (která autorům posloužila při studiu a určování popisovaných hub), a to jak na práce obecně metodické, tak na publikace taxonomické a určovací pomůcky. Houby jsou seřazeny abecedně. U každého druhu je uveden v současné době užívaný platný název, systematické zařazení houby, synonyma a pak následuje podrobný popis houby v kultuře na umělé živné půdě, mikroskopické znaky, optimální nebo i mezní hodnoty teplot pro její růst a na jakém substrátu a kde v přírodě byla houba nalezena. Většina popisů je doprovázena obrázky, buď perokresbami, nebo dokonale provedenými reprodukovými mikrofotografiemi z optického nebo elektronového mikroskopu. Knihu uzavírá obsáhlý seznam literatury uvádějící 437 literárních pramenů, z toho 315 ze sovětské literatury a 122 zahraničních.

Podnětem k výzkumu uvedených hub a napsání této knihy bylo usnesení XXVII. sjezdu Komunistické strany SSSR o prodloužení životnosti výrobků národního hospodářství SSSR, protože odpady z umělých hmot (zvláště pak rozmanité obaly, jako pytle, lahve apod.) jsou v přírodě mírného pásma velmi odolné vůči biologickému rozkladu a stávají se někde vážným problémem v ochraně životního prostředí. Jsou též nebezpečným hořlavým materiálem a při spalování vznikají jedovaté zplodiny pro člověka, zvířata i rostliny a korodující jak součásti spalovacích zařízení, tak kouřem i kovové součásti staveb, ploty atd. všude, kam se vzduchem a srážkami dostanou. Proto v průmyslově vyspělých zemích se při výrobě umělých hmot v novější době přihlíží k dvěma aspektům: 1) vyrábět takové hmoty, jež odolají biologickému rozkladu a zajistí tak co nejdelší trvanlivost výrobků (např. kabelů, izolačních materiálů apod.), 2) obaly z umělých hmot vyrábět tak, aby po splnění časově vymezeného účelu se v přírodě rozložily na neškodné látky a pokud možno takové sloučeniny, které by mohly organismy v přírodě zužitkovat při látkové přeměně. I když druhý aspekt v recenzované knize není přímo uveden, ze seznamu literatury je patrné, že autoři sledovali i v tomto směru nové trendy hospodářského vývoje.

Protože houby popisované v knize žijí převážně v půdě (mnohé z nich jsou i příležitostně patogenní pro semena, plody nebo jiné části rostlin, většina však je v přírodě velmi významná při rozkladu nejrozmanitějších rostlinných zbytků i pozůstatků živočišného původu, účastní se na rozkladu lesní hrabanky, kompostů apod.), má kniha mnohem širší význam a poslouží jako výběrná pomůcka i v rozmanitých oborech zemědělství, lesnictví, zahradnictví, semenářství i v obalové technice apod. Je tištěna na křídovém papíře a je velmi cenným i reprezentačním přínosem v literatuře moderní aplikované mykologie.

Antonín Přihoda

Contribution to the ecology of *Peronospora violacea* Berk.

Příspěvek k ekologii druhu *Peronospora violacea* Berk.

Jana Horáková and Vladimír Skalický

Peronospora violacea Berk. is an obligate floricolous *Peronospora*. All floricolous parasitic fungi of the family *Peronosporaceae* belong to the genus *Peronospora* Corda, probably to only one evolutionary complex; of the foliicolous parasitic species, *Peronospora destructor* (Berk.) Casp. is their closest relative. It is impossible to distinguish individual microspecies within *P. violacea* Berk. on the basis of host plants; three new host species were found. The systemic infection of the *Knautia* species by both indirect and direct methods (replanting, histological proof of mycelium) was demonstrated. The data on oospores were corrected and completed. Basing on the revision of all materials preserved in the Czechoslovak public herbarium collections, a map of distribution of this species in Czechoslovakia was compiled and evaluated. A special chapter is devoted to the problems of nomenclature.

Peronospora violacea Berk. je obligátní květní peronosporou. Všechny květní parazitické houby z čeledi *Peronosporaceae* patří do rodu *Peronospora* Corda, a to pravděpodobně do jediného vývojového okruhu; z listových zástupců je jim nejbližší *Peronospora destructor* (Berk.) Casp. Podle hostitelských rostlin nelze morfologicky odlišit rozdílné mikrospécie v rámci druhu *P. violacea* Berk.; soubor hostitelských rostlin byl rozšířen o 3 další. Prokázána systémová infekce druhů rodu *Knautia* nepřímými i přímými metodami (přesazení, histologický důkaz mycelia). Byly upřesněny údaje o oosporách. Na základě revize veškerého materiálu v československých veřejných herbářích byla nakreslena mapa rozšíření druhu v ČSSR a vyhodnocena. Samostatná kapitola byla věnována nomenklatorické problematice.

Introduction

Peronospora violacea Berk. is an obligate floricolous *Peronospora*. In contrast to other groups of fungi (e. g. *Clavicipitaceae*, *Ustilaginales*), the floricolous pathogens are rare in the family *Peronosporaceae*. Under the term of floricolous pathogen an ecological group of fungi with the elective sporulation in the flower organs is understood. The majority of representatives of the family *Peronosporaceae* are the foliicolous biotrophic parasites and/or the parasites of all green parts of the plant; some of them are also able to attack non-green flower organs with different degrees of frequency. From the ecological point of view, the biotrophic parasites of the family *Peronosporaceae* can be divided into four groups:

1) Obligate floricolous parasites (exclusively some species of the genus *Peronospora* Corda).

P. violacea Berk. on the flowers of the family *Dipsacaceae*, *P. stigmaticola* Raunkiär on the flowers of the genus *Mentha*, *P. corollae* Tranzschel on the flowers of the genus *Campanula* (it is not impossible that the floricolous parasite of *Linaria vulgaris* L. also belongs here). The conidiophores or oospores of these species were found exclusively on non-green flower organs.

2) Facultative floricolous parasites (exclusively some species of the genus *Peronospora*).

Peronospora radii De Bary on ligulate flowers of *Asteraceae*, exceptionally also on involucral bracts and upper leaves, and *P. tranzscheliana* Bachtin on flowers, exceptionally also on the upper bracts of the genus *Melampyrum*.

3) Parasites of green parts of plants, passing also into the flower organs. A number of species belong to this group, predominantly of the genus *Peronospora*. Here, in the course of the systemic infection, the mycelium passes into the flower organs, where the conidiophores sometimes are formed, but the production of oospores comparatively frequent. *Peronospora parasitica* (Pers.:Fr.) Fr. and related microspecies on *Brassicaceae* may serve as typical examples furthermore *Peronospora rumicis* Corda, *P. fagopyri* Elenov, *P. bulbocapni* Beck (see Skalický 1964), *P. grisea* Ung. and the related microspecies on *Veronica*, *Plasmopara densa* (Rabenh.) Schroet. especially at the systemic infection of species of the genus *Odontites*, and a number of others.

4) Obligate parasites of the green parts of plants, predominantly of leaves.

In the genera *Plasmopara* Schroet. or *Bremia* Regel, an infection confined to the leaves or other green parts of plants is much more frequent than in the genus *Peronospora* Corda, which may be also connected with the way of infection (see p. 17). The differences from the above groups is not clean-cut; the examples are given on the basis of our own experiences. It is not impossible that some representatives of this group also can exceptionally infect the flower organs. To this group belong the majority of species of the genus *Peronospora* on the family *Rosaceae* except for *P. sparsa* Berk. and *P. rubi* Rabenh. (see Skalický 1983), *P. alta* Fuckel, *P. sordida* Berk. et Br., *P. knautiae* Fuck. ex Schroet., *P. dipsaci* Tul. ex De Bary, *Plasmopara pusilla* (De Bary) Schroet., *Plasmopara umbelliferarum* (Casp.) Schroet. ex Wartenw. s. l., *Pseudoperonospora cubensis* (Berk. et Curt.) Rostowz., *Plasmopara leptosperma* (De Bary) Skal., *Bremia lactucae* Regel, etc.

Nomenclature

In name *Peronospora violacea* Berk. possesses certain nomenclatural problems. Berlese et De Toni (1888) pointed out that a *Peronospora* parasitizing on flowers had been given for the first time in the paper by Léveillé (1846: 298) under the name *Botrytis violacea* Léveillé. Léveillé describes from the material of Museum national d'histoire naturelle in Paris a fungus whose conidiophores are forked, non-partitioned ("continuis") and conidia ovate, smooth, violet. This fungus was collected on the ligulate flowers of *Chrysanthemum segetum* L. (= *Pyrethrum arvense*), but also on living leaves of *Lathyrus palustris* L. The author emphasizes its similarity to the smut *Ustilago violacea* (Pers.) Magn., and thus he presents an indirect evidence for the choice of lectotype of the fungus on the flowers. Though we have not studied the authentic material as yet, it is evident from the description and protologue that the today's species *Peronospora radii* De Bary is involved. Another species collected on the leaves of *Lathyrus palustris* is apparently *Peronospora lathyri-palustris* Gäum. Judging from the citation of synonyms, Gäumann (1923) is also of the same opinion, but he did not see the authentic material and took probably the data on *Botrytis violacea* Léveillé only from the work by Berlese et De Toni (1888: 254). The fact that the name *Peronospora violacea* Berk. not is related to a follicolous *Peronospora*, but to a floricolous one, analogously as *Botrytis violacea* Léveillé, evokes the following doubt:

Is the conspicuous coincidence of the specific epitheton „*violacea*“ only casual, or did Berkeley know about the existence of *Botrytis violacea* Léveillé and only made a new combination? In Berkeley's herbarium a number of sheets collected by Léveillé have been preserved (Stafleu et Cowan 1979), so that it's evident that these two mycologists were in scientific contact. Berkeley (1860: 349) mentions 13 species of the genus *Peronospora* from England, which, with a single exception, *Peronospora macrospora* Casp., possess identical epithets in the genus *Botrytis*, without quoting any basionym. In the case of the new combinations *Peronospora violacea*

Berk. is not a nomen nudum, and should be cited as *Peronospora violacea* (Lév.) Berk. with all consequences, i. e. it should cover other species, viz. probably *P. radii* De Bary, which would become a synonym. However, it would be necessary to select a lectotype in the sense of the original Lévillé's conception, not in the sense of the conception changed by Berkeley. Both Berlese et De Toni (1888) and Fischer (1892) solve this situation in a reverse way, i. e. they prefer the new Berkeley's conception. Berlese et De Toni (1888:254) might be quoted: "Exsistit *Botrytis violacea* Lév., quae verisimiliter est mera forma *Peronosporae violaceae* Berk. et cuius diagnosis ita sonat: ..." Fischer (1892:457) writes: "In Saccardo's Sylloge 7.1, p. 254 wird gezeigt, dass Berkeley's *Peronospora violacea* bereits früher von Lévillé als *Botrytis violacea* beschrieben worden ist, so dass dieser Name als Synonym beizufügen wäre."

The suspicion is really great; however, any direct or indirect evidence is missing both in this and in the later papers by Berkeley demonstrating that Berkeley was aware of the existence of *Botrytis violacea* Lév. and that he only re-combined it into the genus *Peronospora*. A number of names of the genus *Peronospora* is taken over from the paper by Caspary (1855) where, however, *P. violacea* is not mentioned at all. The fact that some doubts regarding the species *P. violacea* existed is documented by the later paper by Berkeley et Broome (1878:28), where the authors write as follows: "As some doubt has been expressed about this species, which was found June 30, 1859, it has been thought advisable to give a figure." It is possible that even a direct proof for this well-grounded suspicion might be found in the protologue (e. g. in the sheet of June 30, 1859, he could write the original name — *Botrytis violacea* Lév., or possibly in some hand-written remarks or letters, if these have been preserved), but we have not had any opportunity to examine this material. Berkeley (1860) expresses his reluctance to use the generic name *Peronospora* Corda because the generic diagnosis was based by Corda only upon the knowledge of the conidial stage (Corda did not observe any oospores). Therefore Berkeley could use at least provisionally in the label of his material the traditional name *Botrytis violacea* Lév., if he knew it, or on the contrary the homonymous epitheton *B. violacea* Berk., if he did not know Lévillé's name. It is also possible that Berkeley later realized that *Peronospora violacea* (Lév.) Berk. was not identical with his fungus and therefore he described his fungus as *Peronospora violacea* Berk. (in Cooke 1871:597) and later (Berkeley et Broome 1878:tab. 3/5) he even illustrated it.

That's why we abide by the traditional interpretation, i. e. that *P. violacea* Berk. is a floricolous *Peronospora* exclusively on the representatives of *Dipsacaceae*. In this case, *P. violacea* Berk. (1860) is a nomen nudum (Gäumann 1923: 239 erratum), and the first description of Berkeley was published by Cooke in 1865, as found by Gustavsson (1959a:206). Therefore the citation in the work by Kochman et Majewski (1970:266), viz. *Peronospora violacea* Berk. ex Cooke, evidently is incorrect, and correct is *P. violacea* Berk. in Cooke, which, after all, results from the Cooke work (1871: 597).

Symptoms of the disease

The floricolous species of *Peronospora* have attracted attention by their symptoms as early as since the 1850 s. The morphological changes in flowers were classed among the fungal galls (mycocecidia). The knowledge of them was summarized for the first time by Rostrup (1885), recently it was elaborated by Buhr (1956). The research of this type was completed both morphologically and anatomically by Molliard (1895), who in addition analysed the disease caused by *P. violacea* Berk. His work is supplemented with instructive drawings. Of the floricolous species of *Peronospora* he chiefly paid attention to the mycocecidia caused by *P. violacea* Berk. on *Virga pilosa* (L.) Hill and *Knautia arvensis* (L.) Coult. and by *Peronospora radii* De Bary on *Tripleurospermum inodorum* (L.) C. H. Schultz. The other mycocecidia discussed by him are caused by other fungal groups. Not only the hypertrophy and hyperplasy of organs is classified as fungal galls by Molliard (1895), but also any morphological changes characterized by enlargement, lengthening, or other alternation of the respective organ as well as by its shortening or pathologic changes of certain tissues (e. g. atrophy of the anthers, of the maternal pollen cells, or alteration of the tissues of the embryo sac). Molliard presented in his study a good picture of the maximum changes provoked by the fungal infection. However, weaker cases of the disease are omitted in his paper. Also Prell (1943)

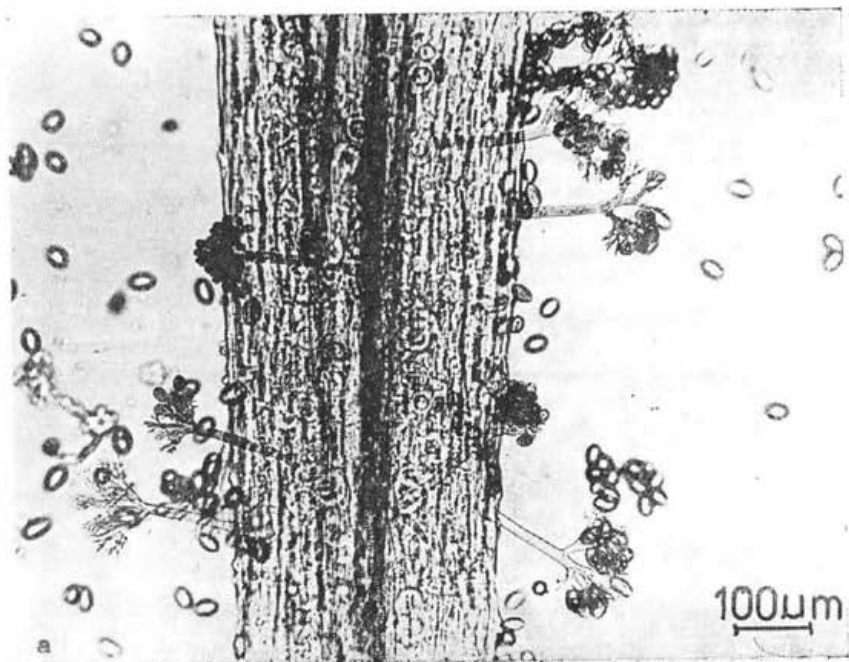
dealt with the same field of problems, but he did not complete the detailed description of flower changes given by Molliard in any substantial respect. Therefore we will confine ourselves to emending and completing Molliard's observations, especially as regards the cases of slighter infections.

Not only in the species studied by Molliard, but also in all representatives of the family *Dipsacaceae* the symptoms of the disease caused by *P. violacea* Berk. manifest themselves analogously. On the living material we examined the symptoms of the disease in *Knautia arvensis* (L.) Coult., *K. kitaibelii* (Schult.) Borb., and *K. dipsacifolia* Kreutz.; in other representatives of the family *Dipsacaceae*, we studied the exsiccate material only. The changes of the calyx, as drawn by Molliard and ascribed to the influence of the fungus, were not found in any material; in the calyx we did not find the mycelium of the *Peronospora* either. The corollas are morphologically altered in comparison with the healthy ones. The buds of infected corollas are inflated and in the cases of heavier infection more pallid than in the healthy ones at the same stage of development. In comparison with the simultaneously blooming corollas of healthy plants at the same locality, the infected corollas open with a retardation. We confirm the Molliard observation concerning the morphological uniformity of all infected corollas in the case of heavier infection. Both in the peripheral and in the central flowers all the corolla teeth are elongated (lingulate). In the cases of slighter infection we also observed formation of slightly radiating peripheral flowers. The elongation of the corolla teeth results after the opening of flowers in a rather dishevelled appearance of the blooming capitulum especially in the genera *Knautia* and *Scabiosa*. If the infection is slighter, the colour of the healthy ones, at heavier infection the corollas are more pallid. The colour of flowers, however, is also influenced by the density of the conidiophore coat and by the rather early formed mass of oospores. The dense tangle of conidiophores with markedly pigmented conidia is responsible for the greyish violet shade of corollas infected in this way. In the withered and almost dry, more heavily infected corollas, there is also an ochraceous tinge caused by ripening oospores appears. Brownish to variously dark shades in the dry flowers, however, also are caused by mycelia and conidiophores of fungi belonging to family *Dematiaceae*, first of all to the genera *Alternaria* and *Cladosporium*.

While in the healthy flowers of host plants the stamens are exerted, in the case of infection they are underdeveloped and therefore hidden in the coronal tubule. Another flower disease, sometimes confused with this one, is caused by the smut species *Ustilago floscolorum* (DC.) Fr. and *U. scabiosae* (Sow.) Winter; in the cases, however, the stamens are exerted and the chlamydo-spores are formed in the hypertrophic anthers at the total suppression of development of pollen grains. After the pollen sacs are open, the light brownish violet mass of chlamydo-spores is loosened and comes into all flower parts in the form of flour-like dust. Molliard (1895) mentions shortly the symptoms caused by the smut *Ustilago floscolorum*, but he does not compare both diseases. In the stamens infected with *Peronospora* he describes and draws only the cases of heavy infection, by which the pollen grain development is totally suppressed. In the cases of slighter infection, as observed by us, even in the infected flowers a limited pollen grain production went on, and the filaments weren't always so much shortened as drawn by Molliard. The petaloidy of stamens was described e. g. by Rostrup (1885), Plowright (1892),

Molliard (1895), Lind (1913), or Prell (1943); it did not occur in the material examined by us.

The styles in the cases of heavy infection do not exceed the elongated ends of corollas. Most frequently, however, the style and with stigmas conspicuously protruding from the flowers are observed most frequently. Often at the mere lens magnification a thinner or denser coat of conidiophores on the style is observable. The styles can be darker coloured, if a mass of ripening



1. Style of *Knautia arvensis* (L.) Coult. with conidiophores and oospores of *Peronospora violacea* Berk.

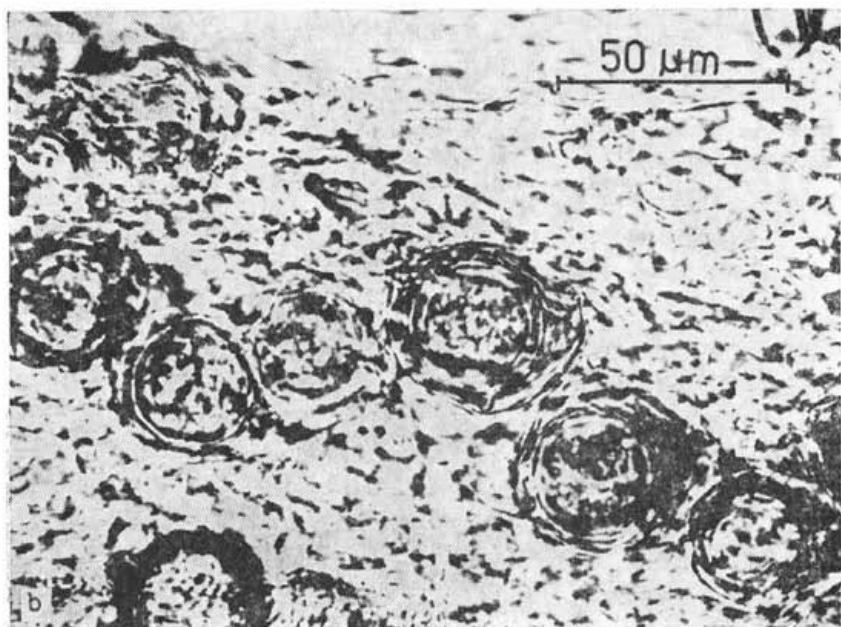
oospores occurs in them. Molliard and other authors report that the production of achenes in all cases has been suppressed under the influence of the pathogen. We observed the formation of oospores in all organs of the pistil including the ovary wall. However, owing to the mowing at the locality we failed to find out whether (at least in some flowers affected with slighter infection) the achenes ripened.

Anatomy of the host plant and infection by *Peronospora*

The green parts of the plants are covered with the epidermis perforated by stomata. These are in individual species distributed in regular ways, e. g. in the bifacial leaves of terrestrial plants they occur predominantly on the lower side of the blade. The conidiophores therefore penetrate through the stomata to the surface first where the stomata are most densely concentrated. Only

exceptionally they penetrate to the surface at the contact of two neighbouring epidermal cells; and just the floricolous species of *Peronospora* are capable to penetrate intercellularly. The coloured flower organs bear either none or only few stomata. A denser agglomeration of conidiophores on the flower organs is connected with their anatomy.

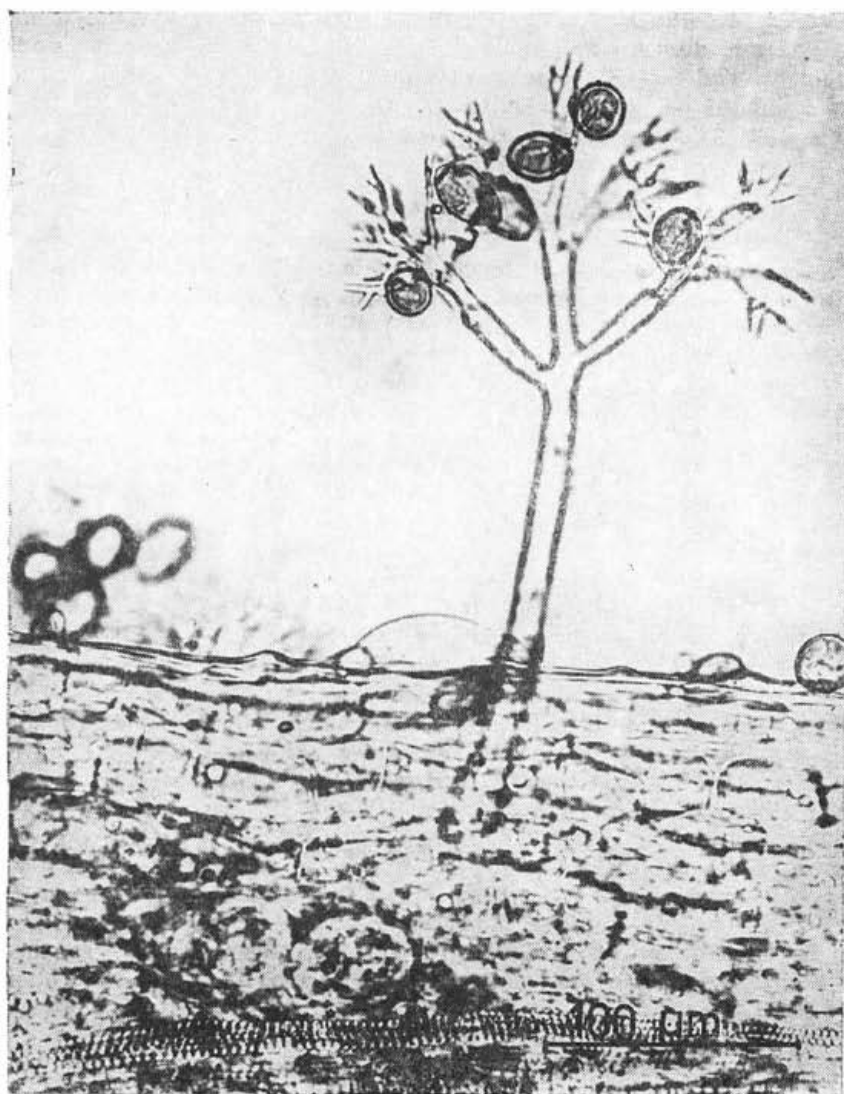
The directly germinating conidia (conidiosporangia) possess the enzymatic capacity to hydrolyse the cell wall cellulose and to infect the host in this way; the zoospores, on the contrary, at the indirect germination of sporangia are limited to the penetration of the germ tube through the stomata or through



2. *Peronospora violacea* Berk. — oospores in the style tissue of *Knautia arvensis* (L.) Coult.

other natural openings into the host plant. Probably that's why among the floricolous pathogens of the temperate zone no representatives of other genera of the family *Peronosporaceae* than of the genus *Peronospora* are found, in which the direct germination of conidia occurs. In the floricolous species of *Peronospora* predominantly the conidia (infection at the contact of cells or through the stigma) or the plants infected already in the past year represent the source of infection.

Concerning *Peronospora violacea* Berk., we examined its host plants of the genus *Knautia*, in which the infected capitula were found. The hyphae of the pathogen were discovered in the rhizomes and in the stem — here in scarce cells belonging to the xylem part of the vascular bundles. In comparison with the quantity of hyphae of *Peronospora parasitica* (Pers.: Fr.) Fr. with the haustoria in the intercellular tissues of the stem of *Capsella bursa-pastoris* (L.) Med., the amount of hyphae of *P. violacea* Berk. in the stems of *Knautia* species is negligible, so that they can be easily overlooked. They serve appa-



3. *Peronospora violacea* Berk. — conidiophore and conidia protruding from the style of *Knautia arvensis* (L.) Coult.

rently only to transfer infection from the rhizome to the flowers during the growth of the host plant and nowhere they cause e. g. the hypertrophy of stem (as *P. parasitica*) or a rather conspicuous distortion of the stem below the flower [as e. g. *P. arborescens* (Berk.) Casp. or sometimes also *P. radii* De Bary]. Only Molliard (1895: 237) describes and illustrates (tab. 3/14) a slightly distorted stem of *Knautia arvensis* (L.) Coult. just below the inflorescence and ascribes this alteration to the influence of the fungus *P. violacea* Berk. The mycelium also does not influence the height of the plant (no sti-

mulative or inhibitive effects upon the elongating growth), as it is known in the systemic diseases caused by other downy mildews, rusts, or smuts. It may be concluded that *P. violacea* Berk. influences the anatomy as well as the general habit of the host to a quite insignificant degree, except for the non-green flower organs, as discussed in the foregoing chapter.

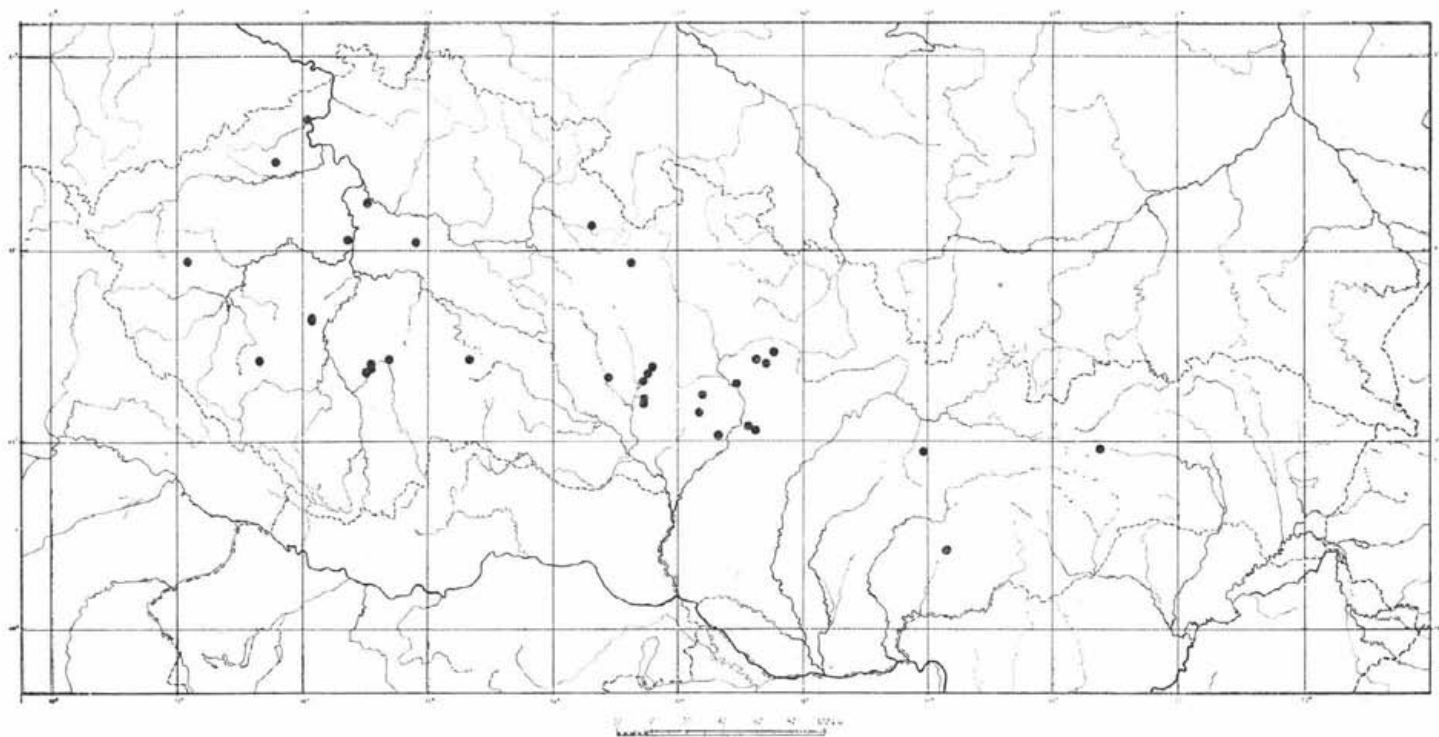
Remarks on the morphology of *Peronospora violacea* Berk.
and of other floricolous species of *Peronospora*.

We have omitted the description of *P. violacea* Berk. in the present paper, referring to good descriptions e. g. in the books by Kochman et Majewski (1970) or by Novotelnova et Pystina (1985). We have a different opinion only in the case of the description of oospores.

In the foliicolous species of *Peronospora* it is possible in most cases (in accordance with Gustavsson's principle 1- Gustavsson 1959b: 52) to regard the morphologically close types on the host plants belonging to the same family also as evolutionarily related. Some authors designate these evolutionary complexes with binomial names as collective (aggregate) species. The individual microspecies are sometimes biometrically discernible; in other cases, on the contrary, they cannot be recognized from each other statistically.

A classic case is represented by *Peronospora parasitica* agg. on the species of various genera of the family *Brassicaceae*. Sometimes, however, several mutually unrelated species or aggregate species of downy mildews on the host plants belonging to one family can be found e. g. *Plasmopara pusilla* (De Bary) Schroet. and *Peronospora conglomerata* Fuck. on the representatives of the family *Geraniaceae* or several evolutionary complexes of *Peronospora* on the representatives of the family *Fabaceae*. Analogously, *Peronospora violacea* Berk. is not closely related to the foliicolous species of *Peronospora* on host plants of the family *Dipsacaceae*, as Schröter (1874) erroneously assumed. The Gustavsson principle mentioned above does not apply to the cases of the families in which the floricolous species of *Peronospora* occur. It is likely that all floricolous species of *Peronospora* (possibly except for *P. radii* De Bary) form a single complex with a morphologically analogous shape of conidiophores (\pm straight, branches \pm straight as well, dichotomously branched, at least the branches of the last rank include an acute, in *P. radii* exceptionally up to a right angle), with characteristic conidia (narrow obovoid to ellipsoidal, at the base mostly with a wart-like outgrowth, greyish violet) and with the uniform type of oospores with an irregularly wrinkled exospore ("*Leiothecae*"). A rather isolated species *Peronospora destructor* (Berk.) Casp. represents morphologically the most similar and probably also evolutionarily closest among the foliicolous species of *Peronospora*. The evolutionary isolation and morphological distinctiveness is evident especially in the parasites on *Asteraceae*, where the representatives of more genera of *Peronosporaceae* can be found but *Peronospora radii* De Bary is neither similar nor related to any of them. A number of species with \pm straight conidiophore branches are known, the coloration of conidia also can be corresponding, but none of them possesses the characteristic shape of markedly elongated conidia with the basal outgrowth.

The disintegration or persistence of the oogonial wall in the time of ripeness is a character which in some species of *Peronospora* is not clean-cut. Clear differences exist only between the group *Leiothecae* and *Calothecae*.



Map of the distribution of *Peronospora violacea* Berk. in Czechoslovakia.

Basing on the studies of the oospores of *P. violacea* Berk., we can confirm that the oogonium wall is not hyaline but — owing to its relatively greater thickness — light ochraceous. This corresponds well with the drawing in Berlese's work (Berlese 1898: tab. 23) as well as with Gäumann's classification among the group *Parasiticae*. When the oospores are ripe, the oogonium is only sometimes preserved, but in other cases the oogonial cover is not observed in the ripe oospores, which would suggest the classification among the group *Effusae*. Within the limits of the group *Leiothecae* it is evidently another species of intermediary position. Its classification among the group *Reticulatae* (e. g. Jačevskij et Jačevskij 1931) is erroneous. The greatest differences in the dimensions of oogonia with oospores are most strongly influenced by the variability of the size of oogonium and by the thickness of the exospore wall; these characters are evidently most dependent upon the character of tissues in which the oospores are enclosed. The oospores are therefore questionable for the taxonomic use and are, as Gustavsson (1959b: 45, 52) aptly remarks, "schematic", because they do not reflect truly the taxonomic relations between the species. The value of oospores for the infrageneric division of *Peronospora* is usually overemphasized; even closely related taxa are classed into rather remote units. The groups *Leiothecae* and *Calothecae* would be well-founded, but only about in the rank of series or sections, not higher.

The host plants

A complete list of host plants is presented here, on which *P. violacea* Berk. has been collected as yet. The new host plants are marked with an asterisk before their names:

Knautia arvensis (L.) Coult. (incl. var. *rumelica* — cf. Klika 1926), *K. kitaibelii* (Schult.) Borb., **K. drymeia* Heuff., *K. dipsacifolia* Kreutz. (= *K. sylvatica* auct.), *K. sarajevensis* (Beck) Szabó, *Scabiosa columbaria* L., **S. ochrolauca* L., *Succisa pratensis* Moench, *Virga pilosa* (L.) Hill (= *Dipsacus pilosus* L.).

P. violacea Berk. was collected in Czechoslovakia on all host plants given above, excepting *Knautia sarajevensis*, *Scabiosa columbaria*, and *Succisa pratensis*.

The conidiophores and conidia of this species are so distinct in the genus *Peronospora* Corda that a misidentification is not likely even on the basis of morphological characters, in spite of considerable variability in some characters. The height of conidiophores and their width at the basis is especially variable, but not their characteristic branching, especially as regards the branches of the last rank. The conidia are also rather uniform in their colour, basal outgrowth, elongated shape as well as in their considerably large size. Among the material of *P. violacea* Berk. collected on individual host plants, about the same range of variability was found as in the materials collected on the most frequent host plant *Knautia arvensis* (L.) Coult. in various parts of the distribution area and measured by various authors. The infection experiments proving the contagiousness to various host plants have been made neither by us nor by other authors. The informative measurements (mostly $n = 50$) and ascertainment of variability of individual characters were made on collected materials of all host plants, and the literature data were added in the cases, when they clearly referred to the respective host plant species only. To make our measurements comparable with the literature data, we have only present-

ed in the table below an assortment of comparable characters. We have arrived at the conclusion that not even the biometrics of all materials accessible to us would result in the differentiation of statistically significant differences in correlation with the materials taken from various host plants. The differences of *P. violacea* Berk. on *Knautia arvensis* (L.) Coult. in various collections are often greater than among the collections from host plants belonging to remotely related genera. The height of conidiophores is probably most dependent on the character of tissues from which the conidiophores penetrate on the surface. In order to preserve the morphological homogeneity, in floricolous *P. corollae* Tranzschel all collections on *Campanulaceae* and *Scrophulariaceae* have been included.

Remarks to the ecology of *Peronospora violacea* Berk.

The present study is mainly devoted to the ecology of *P. violacea* Berk. The ecological interpretation of its distribution area, however, has been included in the chapter on the distribution, the direct proofs of the mycelium of this fungus in the host plants with the ecological consequences have been included in the chapter on the anatomy of the host plants. That's why we deal only with the group of problems not mentioned elsewhere. The data on the source of the systemic infection are of observational character in the older works. Schröter (1874) investigated a locality of *P. violacea* Berk. on *Virga pilosa* (L.) Hill in the environs of Karlsruhe for several years. He stated the coincidence of the infection of these biennials in the first and second year. The infection was so heavy that the fungus became responsible for the sterility of flowering individuals. By this circumstance the author also explains the fact that the plant disappeared from the locality in the next year. Prell (1943) observed *P. violacea* Berk. on the perennial plant *Knautia arvensis* (L.) Coult. He found out that either whole plants with infected flower heads or whole plants with normal flower heads existed separately. However, he does not exclude the possibility that from the rhizome which is common with the infected plant, also a normally flowering and fertile stem could grow up.

Another proof was made by Dr. J. Stěpánek during his taxonomical elaboration of species of the genus *Knautia* L. He replanted in 1977 the perennial plants of *K. dipsacifolia* Kreutz. from the Vel'ká Fatra Mts. (valley Gaderská dolina) into the experimental garden of the Botanical Institute of the Czechoslovak Academy of Sciences at Průhonice. The plants were transferred from a locality which had been infected with *P. violacea* Berk. before, which manifested itself in the experimental garden in the course of the next year by the total infection of all flower heads. To secure a better rooting, the stems after replantation were cut down, so that the only possible organs where the fungus had hibernated must have been the infected rhizomes and/or the innovation buds. In 1978, the plants flowered with analogous symptoms of the disease as in *Knautia arvensis* (L.) Coult.

We observed a locality of *P. violacea* Berk. on *Knautia arvensis* (L.) Coult. for three years (A meadow on the bank of the Lužnice river in the vicinity of the summer camp of the Charles University situated near the gamekeeper's lodge "Liška" not far from the village Dobronice near Bechyně). At the beginning of June every year we found the same plants with conidiophores of the fungus in the flowers, in the end of June already with developed oospores. We did not observe any dying of plants infected in the foregoing year.

Host plant	Size of conidia (μm)	Mean values	Q (length : width)	Length of conidiophores (μm)	Mean values
<i>Knautia arvensis</i>	I 23-35 \times 17-21	29.4 \times 19.2	1.53		
2 measured specimens	II 25-38 \times 16-22	33.9 \times 19.5	1.74	145-320	162.8
<i>Knautia arvensis</i> -Berlese et De Toni (1888)	30-39 \times 17-19				
<i>Knautia arvensis</i> -Gäumann (1923 : 240)	28.8-41.6 \times 9.6-24.0	35.2 \times 19.2	1.83		
<i>Knautia arvensis</i> -Prell (1943)	25-39 \times 15-21	33 \times 19		110-320	214
<i>Knautia arvensis</i> -Kochman et Majewski (1970)	28-40 \times 17-23			140-320	
<i>Knautia arvensis</i> -Novotelnova et Pystina (1985)	30-45 \times 17-24			150-350	
<i>Knautia arvensis</i> -Stanjavičene (1984)	32.4-43.2 \times 18.9-24.3	36.1 \times 21.4	1.69	150-350	
<i>Knautia kitaibelii</i>	29-39 \times 17-21	34.1 \times 19.5	1.75		
<i>Knautia drymeia</i>	32-40 \times 17-21	36.2 \times 19.6	1.85		
<i>Knautia dipsacifolia</i>	25-38 \times 16-22	32.1 \times 18.5	1.74	163-283	233
<i>Knautia sarajevensis</i>	25-41 \times 15-22	36.5 \times 19.2	1.90		
<i>Scabiosa ochroleuca</i>	28-41 \times 10-22	34.6 \times 18.2	1.90		
<i>Succisa pratensis</i>	34-40 \times 18-23	37.1 \times 20.1	1.85		
<i>Virga pilosa</i>	31-44 \times 19-25	36.1 \times 21.4	1.69	113-340	264.9
<i>Virga pilosa</i> -Schröter (1874)	33-39 \times 17-19	34 \times [18]	1.89		

The ratio of the branched part to the whole conidiophore varied from 0.56 in *Knautia arvensis* to 0.70 in *Virga pilosa*. All undesigned measurements are original (measured by authors of this paper), the others are cited in literature.

The ways by which the conidia are spread also belong to the ecological problems. The spreading by wind is doubtlessly the main way, too. On the other hand, the opinion Raunkiär's (Raunkiär 1893) is to be verified; this author expressed it in his study on the floricolous *Peronospora stigmaticola* Raunkiär, and Gustavsson (1959b) generalized this possibility to all floricolous species of *Peronospora*: in this opinion, the pollinating insects can be the vectors of conidia from one flower to another.

An interesting ecological question represents the mutual relation of various biotrophically parasitic fungi. It may be spoken of a frequent common occurrence of two pathogens on the same host plant and even of the combined diseases caused by them. For example, the species *Plasmopara pygmaea* (Ung.) Schroet. and *Tranzschelia fusca* (Relh.) Diet. on *Anemone nemorosa* L. or *T. pruni-spinosae* (Pers.) Diet. on *A. ranunculoides* L. are often found together. The linkage of the occurrence of *Peronospora alchemillae* Otht to the leaves of *Alchemilla* sp. div. attacked with the systemic infection of *Trachyspora intrusa* (Grev.) Arth. is so strong that over a half of collected materials of this relatively rare downy mildew is connected with the opened uredia of this rust (Skalický 1983). An example of the closest colligation of downy mildews, where the both pathogens are completing each other synergically to form one combined disease, is presented by *Peronospora parasitica* (Pers.: Fr.) Fr. (or by closely related microspecies) and *Albugo candida* (Pers.: Fr.) O. Kuntze, both in the inflorescences and in individual flowers. In the true floricolous species of *Peronospora* no combination with other biotrophic parasites has been observed by us or reported by other authors so far; only J. Müller gathered on the same host plant *Peronospora violacea* Berk. on flowers and *P. knautiae* Fuck. ex Schroet. on leaves and bracts. In the other pairs of floricolous and foliicolous downy mildews or of other floricolous biotrophic parasites the simultaneous occurrence has not been observed so far. In the case of more or less rare species it may be objected that an insufficient material is at disposal for this statement. However, it concerns also the relatively common species *Peronospora radii* De Bary on the anthodia and *Plasmopara leptosperma* (De Bary) Skal. on green parts of *Tripleurospermum inodorum* (L.) C. H. Schultz. It would be necessary to prove this relation experimentally, if the antagonism should be suggested here.

The ecological function of oospores is unclear still of *P. violacea* Berk. as well as of other floricolous downy mildews. In almost all flower organs (corolla, stamens, pistil), not excluding the ovaries of *Knautia arvensis* (L.) Coult., lots of oospores are formed. If all infected flowers weren't sterile, the oospores in the achenes might be the source of primary infection of seedlings of this host plant (and analogously of other host plants belonging to family *Dipsacaceae*), as it is known in the facultative foliicolous downy mildews infecting also the flowers (especially in the annual plants).

Another unsolved question is connected with this problem: How and when do the oospores germinate and which organs of the *Knautia* plants are they able to infect and in which stage of development? This is not known in other floricolous species of *Peronospora* either, and it is also impossible to set up an acceptable work hypothesis on the basis of analogy. It is sure that besides the perennial mycelium in the rhizomes and in the innovation buds, *P. violacea* Berk. survives the unfavourable winter season also by means of oospores. It is also unknown if also in this species the dormancy of a part of oospores

in the litter exists for several successive years, analogously as in some other downy mildews; however, it may be supposed.

Distribution of *Peronospora violacea* Berk.

Stanjavičene (1984) has compiled the distribution diagnoses ("Arealdiagnose" according to Meusel et al.) for all species of the family *Peronosporaceae*. She evaluates the distribution area of *P. violacea* Berk. correctly as submeridional up to temperate European with a distinct oceanity.

A true picture of its distribution area is given, in spite of the fact that several outpost localities in Scandinavia are in the boreal zone; however, these localities are situated in the maritime part of Norway, i. e. they are under the direct influence of the Gulf Stream (Ramsfjell 1960). A more frequent occurrence (or at least the older data on it) is known from all West European countries from the Pyrenean to the Scandinavian peninsulas. As the oceanity gradually decreases from west to east. This quantitative gradient is also evident in the distribution of this species in Czechoslovakia (an absolute majority of localities in the Czech Socialist Republic, in the Slovak Socialist Republic it occurs only sporadically, though the spectrum of host plants in Slovakia is wider than in the Czech part of the state). The occurrence of this species is known from Yugoslavia (Lindtner 1957), 1 collection originated from Bulgaria (Klika 1926), but it is not known from Hungary and until quite recently from Roumania, too (T. Rayss, T. and O. Săvulescu didn't know this species from their country) — the first data, not localized precisely, were given only by Constatinescu et Negrean (1983).

It is quite possible that the wider distribution of *P. violacea* Berk. in Czechoslovakia and probably also in other countries was climatically favoured by relative moister springs and begins of summers flowering time of host plants as well as by milder winters preserving of hibernating mycelium in the course of several last years. This species certainly was not overlooked, as is assumed by Kochman et Majewski (1970) in the neighbouring Poland. The students dealing with these parasitic fungi were aware of it and at their excursions they searched for it in the whole territory of Czechoslovakia (e. g. Zacha, Skalický), but first in the recent years they found it more frequently in various regions of Czechoslovakia. At the same time we observed an increased occurrence of another floricolous species, *Peronospora radii* De Bary. Horáková (1985) therefore included her observations of both species (and on the basis of materials collected abroad also of *P. stigmaticola* Raunkiär) in the special part of her thesis, though not the spring species, but the downy mildews with special ecology were involved.

The revised specimens of *Peronospora violacea* Berk. in Czechoslovakia

Wherever the name of host plant is omitted, it is *Knautia arvensis* (L.) Coult. meant implicitly. In all other cases the names of host plants are given.

Some localities of herbarium specimens mentioned below were published in various mycofloristic contributions, especially in those by Bubák, Baudyš, or Picbauer. As we haven't found any other localities of *P. violacea* Berk. which weren't documented by herbarium collections, we don't quote here these

contributions, but directly the specimens and the herbaria, using the abbreviations of herbaria according to the Index Herbariorum.

Bohemia: 1. Highland Tepelské vrchy: Krsy, Skalický 9. VII. 1979 PRC; 2. Milčice near Nepomuk, along the road to Pačejov, Skalický 9. VII. 1986 PRC; Třebenice near Libochovice Bubák 25. VII. 1900 PRC on *Scabiosa ochroleuca*; 4. Ústí n. L. Thümen in summer 1872 (Thümen Fungi austr. no. 834) PRM; 5. Kojetice near Neratovice, lydite hill S of the village, Skalický 8. VI. 1975 PRC; 6. Prague 5: between Holyně and Nová Ves, Horáková 19. VI. 1986 PRM; 7.—8. Milín near Příbram, at the railway station and farther along the railway line towards Tochovice, Skalický et Horáková 14. VII. 1985 PRC; 9. Dobronice near Bechyně, bank of the Lužnice River below the village, Horáková 5. VI. 1985 PRC; 10. Dobronice, meadow adjacent to the gamekeeper's lodge "Liška", Skalický et Horáková 30. V. 1985 PRC; 11. Řepeč near Tábor, at the lonely house "U Rybáka", Skalický 16. VI. 1986 PRC; 12. Slavňovice near Tábor, meadow on bank of Lužnice River, Horáková 5. VI. 1985 PRC; 13. Tábor, in the botanical garden, Bubák 14. VII. 1910 (Sydow Phycom. et Protom. no. 184) BRNU on *Knautia arvensis* var. *lutea*; 14. Kostelec n. Černými lesy: between the lonely house "Truba" and the village Přehvozdi, Skalický 16. VII. 1978 PRC; 15. Proseč pod Křemešником, near the lonely house "Na Horách" towards the village Nemojov, Horáková 18. VIII. 1985 PRC; 16. Záměl near Vamberk, in the vicinity of the State Nature Reserve "Zámělský borek", Skalický 7. VI. 1981 PRC; 17. Lanškroun, near the fishpond Malý, W of the town, Skalický 4. VII. 1970 PRC.

Moravia: 18. Between Tišnov and Březina, Picbauer 2. VI. 1926 BRNM; 19. Valley Josefské údolí near Adamov, Müller 15. VII. 1985 herb. J. Müller; 20. Rudice, meadow above the karstic swallow hole "Rudické propadání", Müller 14. VIII. 1985 herb. J. Müller on *Knautia drymeia*; 21. Karstic swallow hole "Krasovské propadání" near Ostrov, Müller 26. VI. 1985 herb. J. Müller on *Knautia kitaibelii*; 22. Brno - Maloměřice: W foot of hill Hády, 250 m, Müller 2. VIII. 1987 herb. J. Müller on *Scabiosa ochroleuca*; 23. Brno - Maloměřice: shallow valley at W foot of hill Hády, 240 m, Müller 2. VIII. 1987 herb. J. Müller on *Knautia kitaibelii* with *P. knautiae* Fuck. ex Schroet.; 24. Pornice, meadow near the lonely house "Švábsko", H. Zavřel 17. VI. 1956 BRA; 25. Brankovice, NW border of the forest "Žaroušky", Horáková 8. VII. 1987 PRM on *Knautia kitaibelii*; 26. Syrovín, inside the village and grassy slopes 1 km N from the village, Horáková et Skalický 7. VII. 1987 PRM; 27. Hradčovice, Horáková 11. VII. 1987 PRM on *Knautia kitaibelii*; 28. Javorovec near Uherské Hradiště, on the hill Rovina, Horáková 10. VII. 1987 PRM on *Knautia kitaibelii*; 29. Forest "Zámeček" near Kroměříž, H. Zavřel 6. VIII. 1955 BRA on *Virga pilosa*; 30. Grassy balk W of the village Lípová near Bystřice p. Host., H. Zavřel 16. VII. 1949 BRNM on *Scabiosa ochroleuca*; 31. S slope of the hill Chlum near Slavkov p. Host., H. Zavřel 13. VI. 1950 BRNM; 32. Balk W of the village Všechnovice, H. Zavřel 22. VI. 1943 BRNM, BRA.

Slovakia: 33. Veľká Fatra Mts.: valley Gaderská dolina, J. Stěpánek 1976 PRC on *Knautia dipsacifolia*; 34. Krupina, along the road from Sása to Bzovská Lehotka, Skalický 31. V. 1983 PRC; 35. Slovenský raj (Slovakian Paradise), meadow in the village Hrabušická Pila, Skalický 17. VI. 1979 PRC.

The prevailing part of the localities is situated in the planar to supracolline belts, only 6 of them are in the submontane belt. The host plants of the family *Dipsacaceae* in Czechoslovakia are distributed up to the subalpine belt. In the subalpine belt the representatives of the family *Peronosporaceae* occur quite exceptionally, in the supramontane belt they are also rare. This phenomenon is probably caused by the circumstance that the season is too short for their whole individual development. Basing on the map of distribution in Czechoslovakia, it is likely that even the climatic conditions of the montane vegetation belt are not favourable for *P. violacea* Berk. As this species has not been found so far in Hungary and only recently it was found in South Slovakian lowlands and the warmest hilly regions, which we had visited in the optimum time period for collecting, it seems probable that even the ecological conditions of these regions are not suitable for it. The cartograms of the commonly distributed downy mildews with a wide amplitude point rather

to the research intensity in individual territories of Czechoslovakia, by which the general picture of distribution is considerably distorted. The agglomeration of localities of many fungi in the environs of Prague and Brno is particularly conspicuous. Of course, the cartogram of *P. violacea* Berk. also reflects the insufficient research intensity in Czechoslovakia, because the number of 17 localities from Bohemia, 15 from Moravia and 3 from Slovakia doubtlessly will increase. In spite of this, in the environs of Prague, which from the viewpoint of downy mildew research is most intensively explored, this species, *P. violacea* Berk., occurs rarely, and in the environs of Brno an absence is to be observed southwards from Brno, though many collectors of downy mildews (e. g. Baudyš, Müller, Picbauer, Zacha, Zimmermann) worked in this territory. Besides the above warm regions of southern Slovakia, these regions of Bohemia and Moravia will belong to those where the occurrence of *P. violacea* will be very rare or where the species even will be quite absent. We present here a cartogram of *P. violacea* Berk. also for the reason that even on the basis of the recent state of knowledge it is possible to evaluate it mycogeographically and to interpret it cautiously from the viewpoint of ecology, too.

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Cytochemical demonstration of enzymes in hyphae of mycelial cultures of macromycetes (Ascomycotina and Basidiomycotina)

I. Esterases and glycosidases

Cytochemický průkaz enzymů v hyfách myceliových kultur makromycetů (Ascomycotina a Basidiomycotina)

I. Esterázy a glykosidázy

Jaroslav Klán, Dana Baudišová and Karel Beneš

Esterases (carboxyl esterase, alkaline and acid phosphatases, aryl sulphatase) and glycosidases (α - and β -glucosidases, α - and β -galactosidases, β -xylosidase and β -glucuronidase) were found in hyphae of 19 mycelial cultures of 16 species of macromycetes by cytochemical methods in situ. The results were evaluated qualitatively at cellular level. α -glucosidase and β -galactosidase can be used for chemotaxonomical purposes.

V hyfách 19 myceliových kultur 16 druhů makromycetů byly cytochemickými metodami in situ stanoveny esterázy (karboxylová esteráza, alkalická fosfatáza, kyselá fosfatáza, arylsulfatáza) a glykosidázy (α -glukosidáza, β -glukosidáza, α -galaktosidáza, β -galaktosidáza, β -xylosidáza a β -glukuronidáza). Lokalizace enzymů byla stanovena kvalitativně na celulózní úrovni. Chemotaxonomicky lze využít α -glukosidázu a β -galaktosidázu.

Introduction

Cytochemical localization of enzymes in fungi has been studied in situ only in true moulds (*Mastigomycotina*, *Zygomycotina*), filamentous fungi and yeasts (*Ascomycotina*), and in imperfect fungi (*Deuteromycotina*). A review of relevant works up to 1972 was published by Reiss (1973). Macromycetous basidiomycetes were represented here only by several references dealing with in vitro proof of enzymes in the fruit bodies. It became clear that the spot tests of the fruit bodies can be used as auxiliary taxonomic characteristics (Marr 1979, 1984; Micka et Klán 1980; Frank 1986 a, b; Marr et al. 1986). More frequent are the studies of the production of extracellular enzymes by mycelial cultures of macromycetes owing to both the chemotaxonomic reasons (Taylor 1974, 1977; Stalpers 1978) and their industrial importance (Wilson et Niederpruem 1967). Unfortunately, some of the mentioned papers are not quite satisfactory from the technical point of view. Acid phosphatase was determined cytochemically in the basidia of *Lyophyllum* and *Calocybe*. It was present in lysosomes which correspond to siderophilic granules known in these two genera (Cléménçon 1974). Nehemiah (1973) found acid phosphatase in basidia of *Coprinus comatus*. Using Gomori reaction, Wilson et al. (1970) detected acid phosphatase, arylsulphatase and deoxyribonuclease in mycelial cultures of some micromycetes and of *Agaricus campestris* and *Fomes annosus*, where these enzymes were found in lysosomes. Cytochemical works published later concerned only yeasts, moulds and filamentous fungi (Pugh et Cawson 1977; Toth et al. 1980; Aliaga et Ellzey 1984; Rosing 1984; Cornford et al. 1985). As far as known to the authors, cytochemical studies with hyphae of mycelial cultures of basidiomycetes are rare. The aim of the present work is to fill up this gap, mainly with regard to the chemotaxonomical value of the results.

Material and methods

We studied mycelia from cultures of 16 species of fungi from five orders of different taxonomic level: from the subphyllum *Ascomycotina* we selected the order *Pezizales*, while other orders (*Auriculariales*, *Aphylophorales*, *Agaricales*, *Nidulariales*) belong to *Basidiomycotina*.

The species under study are as follows:

Pezizales:

Urnula craterium (Schw.) Fr., No. 127;

Auriculariales:

Auricularia auricula-judae (Bull.: St.-Am.) Wettst., No. 95;

Aphylophorales:

Fomitopsis pinicola (Sw.: Fr.) Karst., No. 108/2; *Laetiporus sulphureus* (Bull.: Fr.) Murr., No. 92/1, No. 92/2; *Piptoporus betulinus* (Bull.: Fr.) Karst., No. 15/1; *Polyporus rhizophilus* Pat., No. 25/2, No. 25/3; *Trametes hirsuta* (Wulf.: Fr.) Pilát, No. 69;

Agaricales:

Bolbitius vitellinus (Pers.) Fr., No. 48; *Collybia peronata* (Bolt.: Fr.) Sing., No. 4/2; *Coprinus comatus* (Müll. in Fl. Dan.: Fr.) S. F. Gray, No. 56/1; *Flammulina ononidis* Arnolds, No. 37/1; *Hypholoma fasciculare* (Huds.: Fr.) Kumm., No. 41/2; *Marasmius alliaceus* (Jacq.: Fr.) Fr., No. 62; *Pleurotus eryngii* (DC.: Fr.) Quél., No. 31/1, No. 31/2;

Nidulariales:

Cyathus olla (Batsch): Pers., No. 110; *Cyathus striatus* (Huds.): Pers., No. 30.

The cultures used were from the collection of macromycetes cultures, Institute of Toxicology and Forensic Chemistry of the Charles University (Klán et Štípek 1987). The mycelia were cultivated on malt agar (Imuna) containing 3.5% malt extract, 0.5% bactopectone, and 1.3% agar. They were kept in a thermostat in the dark at 25 °C.

Aerial mycelia of four-week-old cultures were used. A sterile polyamide gauze (fibre diameter 0.1 mm, mesh size 0.5 mm) was placed on the surface of the colony and the mycelium was allowed to grow through it. Some experiments were also made with pieces of mycelium taken by a sterile needle from the colony. Beside generative hyphae, skeletal hyphae, as far as available, have also been studied, and, in *Laetiporus sulphureus*, also the chlamydozoospores.

The hyphae were used either fresh or fixed by Baker's calcium formol (1 h at 4 °C) and washed in 5% ethanol renewed several times.

On the basis of the methods developed for animal tissues (Lojda et al. 1979) and plant tissues (Beneš et Opatrná 1964; Beneš 1971; Beneš et Hadačová 1980), the following standard procedure (simultaneous azocoupling reaction) was used: 2.5 mg substrate was dissolved in 0.5 ml dimethylformamide and 9.5 ml buffer was then added containing 10 mg diazonium salt. The following substrates and diazonium salts were used: 1-naphthyl acetate, 1-naphthyl phosphate, 6-bromo-2-naphthyl sulphate, 6-bromo-2-naphthyl- α -D-glucopyranoside, 6-bromo-2-naphthyl- β -D-glucopyranoside, 6-bromo-2-naphthyl- α -D-galactopyranoside, 6-bromo-2-naphthyl- β -D-galactopyranoside, 6-bromo-2-naphthyl- β -D-glucuronide, 6-bromo-2-naphthyl- β -D-xylopyranoside, Fast blue BB salt pro histo or Fast blue RR salt pro histo (all from Lachema, Brno). For acid phosphatase 0.1 M acetate buffer, pH 5.5, was used, for alkaline phosphatase 0.01 M borate buffer, pH 9.2, for all other enzymes 0.1 M phosphate buffer; aryl sulphatase, α -glucosidase, β -galactosidase and β -glucuronidase were determined at pH 5.5, β -glucosidase, α -galactosidase and β -xylosidase at pH 6.4, carboxyl esterase at pH 7.5. These pH values are optimal as determi-

Tab. 1. Results of simultaneous azocoupling reactions of non-fixed samples

Species (year of isolation)	1	2	3	4	5	6	7	8	9	10
<i>Urnula craterium</i> (1985)	+	-	-	+	-	+	+	-	+	+
<i>Auricularia auricula-judae</i> (1982)	+	-	+	+	+	+	+	+	+	+
<i>Fomitopsis pinicola</i> (1985)	+	-	+	+	+	+	+	+	+	±
<i>Laetiporus sulphureus</i> (1982)	+	-	+	+	+	+	+	-	+	+
<i>Laetiporus sulphureus</i> (1985)	+	-	+	+	+	+	+	-	+	+
<i>Piptoporus betulinus</i> (1981)	+	-	+	+	-	+	+	-	+	+
<i>Polyporus rhizophilus</i> (1980)	+	-	+	+	+	+	+	-	+	+
<i>Polyporus rhizophilus</i> (1983)	+	-	+	+	+	+	+	-	+	+
<i>Trametes hirsuta</i> (1982)	+	-	+	+	+	+	+	+	+	+
<i>Bolbitius vitellinus</i> (1978)	+	-	+	+	±	+	+	-	+	+
<i>Collybia peronata</i> (1985)	+	-	+	+	+	+	+	-	+	-
<i>Coprinus comatus</i> (1981)	+	-	+	+	+	+	+	+	+	+
<i>Flammulina ononidis</i> (1981)	+	-	+	+	-	+	+	+	+	+
<i>Hypholoma fasciculare</i> (1985)	+	-	+	+	+	+	+	-	+	+
<i>Marasmius alliaceus</i> (1975)	+	-	+	+	-	+	+	-	-	+
<i>Pleurotus eryngii</i> (1975)	+	-	+	+	-	+	+	-	+	+
<i>Pleurotus eryngii</i> (1981)	+	-	+	+	-	+	+	-	+	+
<i>Cyathus olla</i> (1984)	+	-	+	+	+	+	+	+	+	±
<i>Cyathus striatus</i> (1981)	+	-	+	+	+	+	+	+	+	+

+	positive reaction	1. carboxyl esterase	6. β -glucosidase
±	disputable reaction	2. alkaline phosphatase	7. α -galactosidase
-	negative reaction	3. acid phosphatase	8. β -galactosidase
		4. aryl sulphatase	9. β -glucuronidase
		5. α -glucosidase	10. β -xylosidase

ned in preliminary experiments. Controls without substrate were run simultaneously.

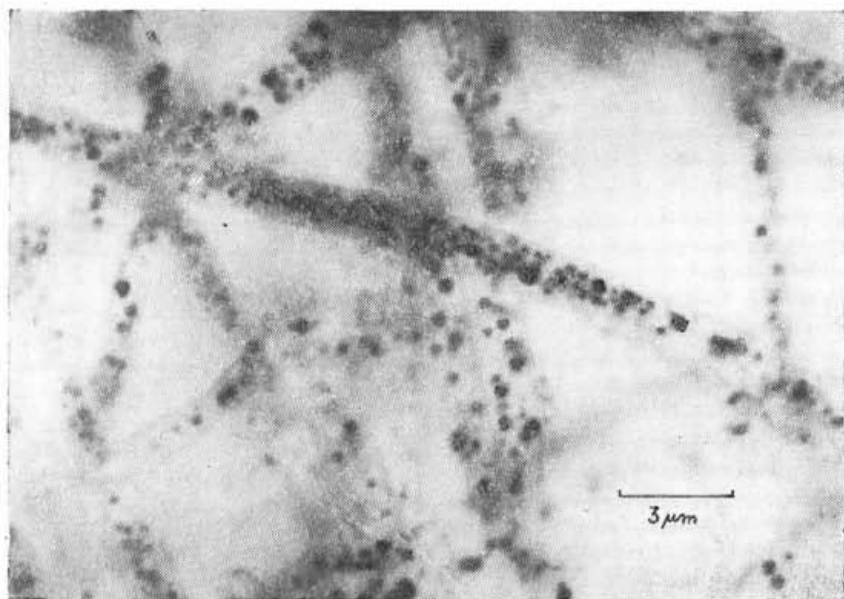
After 60 min. incubation (15 min with carboxyl esterase) at 25 °C in the dark, the mycelium was transferred into the same buffer as used for preparing the incubation medium and observed with a microscope at a magnification 300× or 1000× (oil immersion). In the case of positive reaction, granuli were observed in the hyphae; in the case of carboxyl esterase and acid phosphatase they were brown-black (Table 10, F8 according to the colour scale of Kornerup et Wanscher 1984), in other cases ruby red (Table 12, 8E) to dark ruby red (Table 12, 8F), well discernible from the yellow-brown coloration of the blank. The substrates were relatively stable; their eventual decomposition was manifested by an intense coloration of the incubation medium, which was of similar shade as the positive reaction. The coloured precipitate can be filtered off.

Besides simultaneous azocoupling, the postcoupling procedure was carried out for comparison. The incubation medium was without the diazonium salt, and the azocoupling was performed after the mycelium had been transferred

into a buffered diazonium salt solution where it was allowed to react for 15 min.

Results and discussion

It can be seen from Table 1 that carboxyl esterase, aryl sulphatase, acid phosphatase, β -glucosidase, and α -galactosidase were detected in all cultures studied, whereas alkaline phosphatase was not detected at all. Besides, aryl sulphatase was also found in chlamydospores of *Laetiporus sulphureus*.



Microphotograph of cytochemical reactions for carboxyl esterase in hyphae *Coprinus comatus*.

α -glucosidase was found in eleven species. Its presence in *Bolbitius vitellinus* was uncertain. In *Polyporus rhizophilus*, the activity was very weak. The chlamydospores of *Laetiporus sulphureus* were negative. In *Trametes hirsuta* the activity was localized mainly in generative hyphae with clamps; it was much weaker in skeletal hyphae.

α -galactosidase was found in all species under study, although there were quantitative differences. In *Urnula craterium* it was active only at pH 6.4, whereas in *Piptoporus betulinus* it was significantly more active at pH 5.5. In *Laetiporus sulphureus*, at both pH values mentioned, the activity was localized in hyphae and not in chlamydospores. *Pleurotus eryngii* and *Hypholoma fasciculare* were only slightly active.

β -galactosidase was found in seven species. The generative hyphae were active in *Trametes hirsuta*, the skeletal ones only exceptionally. This may be caused by increased thickness of the wall hindering the transport of the

substrate and diazonium salt. In *Fomitopsis pinicola*, the skeletal hyphae are nearly without lumen and only the generative hyphae were active here.

β -glucuronidase was not found in *Marasmius alliaceus* at pH 6.4. A low but distinct activity was observed in *Hypholoma fasciculare*, *Pleurotus eryngii*, and *Bolbitius vitellinus*. The hyphae of *Laetiporus sulphureus* were fairly active, but not the chlamydo-spores. *Trametes hirsuta* revealed a high activity in both generative and skeletal hyphae.

β -xylosidase was found in thirteen species. It was disputable in two species and negative in one (*Collybia peronata*). This enzyme should be studied further.

Evaluating the results of the demonstration of various glycosidases, we must keep in mind that their substrate specificity is overlapping, especially in the case of synthetic substrates. It should be stressed that the designation of the enzymes used here is based only on the application of particular substrates of this kind.

When studying different strains of the same species, we found that their enzyme activities were the same. Thus, under the given conditions, the patterns of activity seem to be constant for a given species.

From the chemotaxonomic point of view, α -glucosidase and β -galactosidase, and perhaps β -xylosidase as well, are worth to be considered, since only there the desider qualitative differences in enzyme patterns were found. In a group of the 16 species tested for the presence or absence of α -glucosidase and β -galactosidase, five species were negative and six positive in both cases, four species contained α -glucosidase only and one β -galactosidase only.

Since no data relating to the problem studied were found in the literature it seems worth to evaluate even some methodical aspects of our work.

No essential differences in the enzyme activity were found between fixed and non-fixed samples. In *Urnula craterium*, acid phosphatase was found in the fixed mycelium only. In *Piptoporus betulinus*, α -glucosidase and β -galactosidase were also found in the fixed mycelium. Therefore, it is more convenient to use fixed and non-fixed materials simultaneously.

Simultaneous azocoupling and postcoupling reactions led to essentially identical results. The former is more suitable, especially if the samples are also evaluated at subcellular level.

The influence of the age of the culture (days from the beginning of the given passage) was studied in the cases of β -galactosidase and β -glucuronidase in *Flammulina ononidis* and *Pleurotus eryngii*. The hyphae cultured for 1, 11 and 28 days were compared. The highest activities were found in the oldest cultures. On the other hand, no differences in enzyme activity were found in isolates of various origin kept in culture for different periods (various number of passages).

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Type studies of polypores described by A. Pilát — II.

Studie o typech chorošů popsaných A. Pilátem — II.

František Kotlaba and Zdeněk Pouzar

The paper deals with 38 taxa of polypores newly described by A. Pilát, the type material of which is preserved in herbarium PRM*).

Je pojednáno o 38 taxonech chorošů popsaných jako nové A. Pilátem, jejichž typový materiál je uložen v herbářích PRM.

Coriolus maublancii Pilát, Bull. Soc. Mycol. Fr. 48: 17, 1932.

Holotype: USSR, Sibiria, distr. Barnaul, *Populus tremula*, 15. III. 1930, leg. Dravert, [det. A. Pilát], PRM 80750(!)

Pilát himself (1938) identified this species with *Leptoporus immittis* Peck, a species known now as *Tyromyces stipticus* (Pers.: Fr.) Kotl. et Pouz. Our study of the type material (11. 3. 1988), however, revealed that it is in fact a quite different polypore, viz *Dichomitus squalens* (P. Karst.) Reid = *Trametes squalens* P. Karst. as the skeletal hyphae are thick-walled, strikingly dextrinoid and strongly dichotomously branched. In *Dichomitus squalens* the skeletal hyphae are mostly amyloid but varying sometimes to the dextrinoid reaction — and this last reaction is the case in the type material of *Coriolus maublancii*. The substrate is evidently not *Populus tremula* but judged by the small remnants of bark is most probably *Pinus* sp.

Coriolus subradula Pilát, Bull. Soc. Mycol. Fr. 34: 366, 1936.

Holotype: USSR, Sibiria, Wasjuganje, *Betula verrucosa*, IX. 1934, leg. [B. I.] Krawtzev, W 15, det. A. Pilát, PRM 811661 (!).

The type is predominantly represented by resupinate white carpophores, although there is one portion with a small thin pileus up to 1.3 mm broad, with glabrous surface; the generative hyphae are clamped, skeletal hyphae are either branched or unbranched, spores ovoid, small, thin-walled, inamyloid and indextrinoid, $3.5-4.2 \times 2-3 \mu\text{m}$. The type is identical with the rather common polypore *Antrodiella semisupina* (Berk. et Curt.) Ryv. = *Tyromyces semisupinus* (Berk. et Curt.) Murrill which, however, in most instances has slightly broader spores.

Gloeoporus thompsonii Pilát, Atlas hub evropských 3/1: 152, 1937 (invalidly published, due to the lack of a Latin diagnosis).

Holotype: Canada, Sandy Inlet, L. Temagami, T. F. R., Ont., on *Populus tremuloides* — old log, Aug. 21, 1931, leg. G. F. Thompson, Univ. of Toronto, Crypt. Herb. 2508, det. L. O. Overholts as *Polyporus semipileatus*, [det. A. Pilát], PRM 37027 (!).

This is micro- and macroscopically quite typical *Gelatoporia pannocincta* (Romell) Niemelä = *Gloeoporus pannocinctus* (Romell) J. Erikss., having i. a. dark line in a section through the carpophore (rev. already 8. 1. 1978 by the second author, Z. P., and 11. 3. 1988 by both authors).

Grifola obducta ssp. *osseocolorata* Pilát, Bull. Soc. Mycol. Fr. 88: 340, 1973.

Holotype: Mongolia borealis, vallis silvatica Zajsan, ad declivia borealia

*) For the introduction and the first part of this revision see Čes. Mykol. 42: 129—136, 1988.

montium Bagd-ül versus meridionem ab oppido Ulan-Bator, ad ligna *Laricis sibiricae*, alt. 1300–2000 m, 29. VII. 1965, leg. M. Deyl et J. Soják, det. A. Pilát, PRM 712500(!).

Old, in one part of the carpophore slightly rotten, but otherwise typical *Osteina obducta* (Berk.) Donk = *Grifola ossea* (Kalchbr.) Pil. (rev. 11. 3. 1988 by F. Kotlaba and Z. Pouzar).

Heteroporus biennis f. glabra Pilát, Ann. Mycol. 38: 71, 1940.

Holotype: China, prov. Szechwan, leg. V. P. Lang, Fungi of China, Herbarium University of Nanking, Field No. 2630, Herbarium No. 2836, det. A. Pilát, PRM 807535(!).

This is not a poroid fungus but a *Lentinus* sp. with true, but mostly torn (serrated) lamellae (rev. 18. 3. 1988 by F. Kotlaba and Z. Pouzar).

Irpex raduloides Pilát, Bull. Soc. Mycol. Fr. 52: 308, 1937 = *Trametes raduloides* (Pil.) Pilát, Atlas hub evropských 3: 325, 1940.

Holotype: USSR, Asia orientalis, Schkotowo, *Acer manshuricum*, 28. V. 1935, [leg.] Nedorjezowa, Or. 25, [det. A. Pilát], PRM 25032(!).

The type was revised 17. 7. 1963 by S. Domański who noted "eundem ut fungum *Irpex lacteus* (Fr. ex Fr.) esse videtur", and 1. 11. 1969 by Z. Pouzar as *Irpex tulipiferae* (Schw.) Schw. Domański (1964b) was the first to publish the identity of this, Pilát's species. The correct name is *Irpex lacteus* (Fr.: Fr.) Fr. = *I. tulipiferae* (Schw.) Schw. with encrusted cystidia and generative hyphae lacking clamps (rev. 16. 3. 1988 by F. Kotlaba and Z. Pouzar).

Leptoporus caesius f. dealbata Pilát, Bull. Soc. Mycol. Fr. 49: 259, 1934.

Holotype: USSR, Sibiria, distr. Tomsk, *Salix* sp., 5. X. 1930, leg. et det. Lawrow as *Polyporus hirsutus* v. *puberulus*, Siberian Agricultural Academy, Phytopathological Laboratory, Omsk, Pl. 18 Kr., rev. [det.] A. Pilát, PRM 33881(!).

The type specimen is identical with *Tyromyces lacteus* (Fr.) Murrill = *T. tephroleucus* (Fr.) Donk with narrow spores and thick-walled, slightly amyloid hyphae in the dissepiments (rev. 16. 3. 1988 by F. Kotlaba and Z. Pouzar).

Leptoporus caesius var. rhenanus Pilát, Atlas hub evropských 3/1: 173, 1937 (invalidly published, due to the lack of a Latin diagnosis).

Holotype: Federal Republic of Germany, Taubertal pr. Rheins, 3. II. 1937, leg. Sponheimer 5102, det. A. Pilát, PRM 486197(!).

The carpophores are slender and pale reminiscent of *Tyromyces caesius* (Schrad.: Fr.) Murrill but the spores are narrower (not exceeding 1 μ m) — hence it is *Tyromyces subcaesius* A. David (rev. 16. 3. 1988 by F. Kotlaba and Z. Pouzar).

Leptoporus carpatorossicus Pil. ex Pilát, Sborník Nár. Mus. Praha 9B: 102, 1953.

Holotype: USSR, Carpatorossia, ad ramos *Fagi silvaticae* L., Žamer prope Kobylecká Polana, VII. 1929, leg. et det. A. Pilát, PRM 36867(!).

The type was studied by S. Domański (17. 7. 1963) who considered it to be an independent species ("bonam speciem esse videtur"). Our own study (16. 3. 1988), however, revealed this fungus to be identical with *Tyromyces kmetii* (Bres.) Bond. et Sing.; the spores, conical cystidioles, smooth surface of the pileus and dentate pores agree well with other collections of this polypore (the colour of pileus surface is very pale but the carpophore is young).

Leptoporus jacksonii Pilát, Atlas hub evropských 3/1: 188, 1938 (invalidly published, due to the lack of a Latin diagnosis).

Lectotype: Canada, on *Betula*, woods S. of Aurora, Ont., 15. X. 1932, leg. et det. H. S. Jackson, Univ. of Toronto, Crypt. Herb. 3477, as *Polyporus chioneus*, rev. [det.] A. Pilát, PRM 37029(!).

According to our revision of the type material (18. 3. 1988), this is *Tyromyces chioneus* (Fr.: Fr.) P. Karst. and was originally identified by the collector, H. S. Jackson, as such. The hyphae are inamyloid and the spores a little broader than in the similar species *T. lacteus* (Fr.) Murrill.

Leptoporus lowei Pil. ex Pilát, Sborn. Nár. Mus. Praha 9B: 101, 1953.

Holotype: USSR, Carpatorossia, in silvis mixtis virgineis in valle rivi Berlebaš prope vicum Trebušany, alt. 800–1000 m s. m., *Picea excelsa*, VIII. 1937, leg. et det. A. Pilát, PRM 487991(!).

The type material was revised by J. L. Lowe (1.1961) as *Polyporus fragilis* but later published (Lowe 1975) as an independent species; S. Domański, however, revised it on 17. 7. 1963 with result that he considered it a good species ("Bonam... speciem esse videtur") — see also Domański 1964a. Our revision (19. 3. 1988) confirmed that it is an independent species *Tyromyces lowei* (Pil. ex Pil.) Bond. The valid combination was published by Bondarcev (1953) as his book appeared in fact later (probably in 1954), i. e. after Pilát's valid publication of the name *Leptoporus lowei* Pilát 1953; for citation of the incorrect basionym, Art. 33.2 of the Code (1983) could be applied.

Leptoporus micantiformis Pilát, Bull. Soc. Mycol. Fr. 51: 358, 1936.

Holotype: USSR, Sibiria, Wasjuganje, ad corticem *Populi tremulae*, 15. VIII. 1934, leg. [B. I.] Krawtzev, W. 4, det. A. Pilát, PRM 38285(!).

The type was revised in 1985 by T. Niemelä who noted that it was "Closely allied to, or conspecific with *Polyporus resinascens* Rom. Not *P. aneirinus* Sommerf.". We have compared with the type a large number of specimens of *Poria resinascens* from the standpoint of micro- as well as macroscopical structure and also came to the conclusion that it is identical with *Ceriporiopsis resinascens* (Romell) Domañ. (rev. 16. 3. 1988 by F. Kotlaba and Z. Pouzar). A similar conclusion was reached also by Parmasto (1963) who considered it a form of this species.

Leptoporus minusculoides Pil. ex Pilát, Sborn. Nár. Mus. Praha 9B: 100, 1953.

Lectotype: USSR, Carpatorossia, in silvis mixtis virgineis in valle rivi Berlebaš prope vicum Trebušany, alt. 800–1000 m s. m., *Picea excelsa*, 20. VIII. 1937, leg. et det. A. Pilát, PRM 488458(!).

Bondarcev (1953), Lowe (1957, 1975) and some other polyporologists consider this polypore as an independent species, only Jülich (1986) relegated it to synonymy (with a question mark) under *Postia ceriflua* (Berk. et Curt. in Berk.) Jülich=? *Leptoporus revolutus* (Bres.) Bourd. et Galz. Our study of the lectotype of *Leptoporus minusculoides* (18. 3. 1988) confirmed the opinion that it differs from *Tyromyces cerifluus* by constantly smaller carpophores (less than 1 cm broad), thin-walled, inamyloid hyphae in tube trama and slightly larger spores. Hence *Tyromyces minusculoides* (Pil. ex Pil.) Bond. should be classified as an independent species.

Leptoporus wynnei f. *ellipsospora* Pil. ex Pilát, Bull. Soc. Mycol. Fr. 52: 306, 1937.

Lectotype: USSR, Sajany, Arasuk, *Pinus sibirica*, 1. IX. 1932 [leg. B. I.] Krawtzev, Pl. y. 25 [det. A. Pilát] PRM 25107(!).

This taxon was originally described on the basis of a fungus studied from one collection from Great Britain [Brettenham, Suffolk, on rotten fallen trunk, 1935, leg. A. A. Pearson, sent by E. M. Wakefield, det. A. Pilát, PRM 611292 (!)], and named *Polyporus wynnei* f. *ellipsospora* (Svensk Bot. Tidskr. 30: 232, 1936) but invalidly published due to the lack of a Latin diagnosis. The Latin diagnosis was published a year later (see above) where two collections are cited, i. e. the one from Great Britain and a new one from Sajany (USSR). These two collections represent, however, two quite different polypores. Nevertheless, the Latin diagnosis from the year 1937 refers solely to the Siberian collection, the characters of the British collection not being included as the spores are given $3-4 \times 2-3 \mu\text{m}$, whereas the spores from British collection in the description from the year 1936 are given as $(3.75-4)-4.5(-5) \times 2.25-2.5 \mu\text{m}$. Hence the collection from Sajany should be designated as the lectotype of *Leptoporus wynnei* f. *ellipsospora*. According to our revision of the type material (made on 16. 3. 1988), Krawtzev's collection from Sajany (PRM 25107) in fact represents *Antrodiella semisupina* (Berk. et Curt.) Ryv. = *Tyromyces semisupinus* (Berk. et Curt.) Murrill, whereas Pearson's collection from Great Britain is a quite different species. Romagnesi (1944) and Donk (1974) considered *Leptoporus wynnei* f. *ellipsospora* to be an independent species, viz. *Leptoporus ellipsosporus* (Pil. ex Pil.) Romagn. However, as mentioned above, this name should be typified by the collection from Sajany; hence the British and French fungus has no available name. For this reason we are describing it formally below as a new species (for a full description of the macrocharacters see Lundell et Pilát 1936, as *Polyporus wynnei* f. *ellipsospora*):

Tyromyces wakefieldiae Kotlaba et Pouzar spec. nov.

Syn.: *Leptoporus wynnei* f. *ellipsospora* Pilát in Svensk Bot. Tidskr. 30: 232, 1936 (invalidly published).

Carposomata parva, pileata, dimidiata usque flabelliformia, ad basim attenuata, pilei 5-9 mm lati (in diam.), 6-13 mm longi et 2-3 mm crassi, caro sicco alba, firma, secundum Wakefield (epistula ad Pilát 15. II. 1936) in carposomatibus vivis coeruleo-olivaceis, superficies sericea, pallide brunnea, haud zonata, laevis; poris denticulatis, polygonatis, 2-4 per 1 mm. Systemate hypharum monomiticum; pili superficiei pilei usque 35 μm longi et 4.5-6.5 μm lati, lignicolori, cylindracei, apice obtusi, tenuiter tunicati (tunica usque 0.5 μm lata); hyphae tramae pilei 3-5.5 μm latae, praecipue crasse tunicatae (tunica usque 1.5 μm crassa), solum nonnullae tenuiter tunicatae et nonnullae usque oblitteratae cum canaliculo pertenui, cum fibulis numerosis, ramificatae, hyalinae, haud amyloideae; hyphae tramae dissepimentum tubularum 1.8-3 μm latae, tenuiter tunicatae usque crasse tunicatae (sed non oblitteratae) cum tunica laeviter amyloidea sed acyanophila, cum fibulis numerosis, ramificatae, hyalinae; cystidia nulla; sporae $(4-4.5)-5.3(-6.3) \times (2.3-2.5)-3(-3.3) \mu\text{m}$, ovoideo-ellipsoideae cum apiculo prominente, laeves, hyalinae, non amyloideae, haud dextrinoideae, acyanophilae, laeviter crasse tunicatae.

Holotypus: Anglia, Suffolk, Brettenham, ad truncum iacentem putridum, XI. 1935, leg. A. A. Pearson (misit E. M. Wakefield), PRM 611292 (sub nomine *Leptoporus wynnei* f. *ellipsospora* Pil.).

Carpophores individual, pileate, mostly dimidiate, attenuate to the base, pilei 5-9 mm in diam., 6-13 long and 2-3 mm thick, flesh white, according to Wakefield staining blue when fresh, pileus surface satiny, brownish, not

zonate, smooth; pores denticulate, polygonal, 2–4 per 1 mm. Hyphal system monomitic with ramified, richly clamped hyaline hyphae; context hyphae 3–5.5 μm wide, mostly thick-walled (wall up to 0.5 μm), inamyloid; tube trama hyphae 1.8–3 μm wide, thin- to thick-walled, slightly amyloid but acyanophilous; cystidia none; spores (4–)4.5–5.3(–6.3) \times (2.3–)2.5–3(–3.3) μm , ovoid-ellipsoid, smooth, hyaline, inamyloid, indextrinoid, acyanophilous, rather thick-walled.

This is a very significant polypore with silky brown pileus surface, blueing flesh and rather thickened walls of spores. We are classifying it in the genus *Tyromyces* P. Karst. s. l. where it has, however, a somewhat isolated position. According to our knowledge, it seemed to be very rare as it was published only from one locality in Great Britain (evidently on broadleaved trees) and from one site in France (on a stump of *Picea abies*). However, in a letter of 8. 8. 1988, Dr. D. A. Reid (Kew) wrote us: "In fact it is well known to me and is really quite a common species here — although not often showing the blue colour. However, I have seen collections which do show the feature quite strongly. It is also my impression that it varies considerably in frequency from year to year. Some seasons it being very common indeed and another quite infrequent. However on the whole it would describe it as common in South East England". It should be searched especially in Western Europe.

Polyporellus arcularius f. grisea Pilát, Beih. Bot. Centralbl. 56B: 28, 1936; Atlas hub evropských 3/1: 78, 1936 (on both places invalidly published, due to the lack of a Latin diagnosis).

Holotype: USSR, mons Hoverla prope Bogdan, Rossia Subcarpatica, ad ligna *Fagi (sylvaticae)*, VI. 1930, leg. A. Hilitzer, det. A. Pilát, PRM 497735(!).

According to the revision of H. Kreisel (10. V. 1963 — see also Kreisel 1963) it is *Polyporus brumalis* (Pers.): Fr., an identification confirmed also by our revision of 26. 1. 1988.

Polyporellus arcularius f. infundibuliformis Pilát, Bull. Soc. Mycol. Fr. 52: 306, 1937.

Holotype: USSR, Asia orientalis, Possjet, *Betula schmidtii*, 26. VII. 1935, [leg. L. V.] Ljubarsky, Or. 11, [det. A. Pilát], PRM 25046(!).

Kreisel (1963) was of the opinion that it could be a good species but according to our revision (26. 1. 1988) it is typical *Polyporus arcularius* (Batsch): Fr.

Polyporellus arcularius var. minutipora Pilát, Bull. Soc. Mycol. Fr. 49: 256, 1934.

Holotype: USSR, Asia orientalis, distr. Amur, *Quercus mongolica*, 1928, [leg. B. I.] Krawtzew, Pl. 108, [publ. in Pilát errore 1926!], [det. A. Pilát], PRM 808913(!).

According to the revision of H. Kreisel in 1963 (see also Kreisel 1963) it is "*Polyporus spec. (nov.?)*, intermedier zwischen *P. ciliatus* und *P. brumalis*", but according to our revision (26. 1. 1988) it is identical with *Polyporus ciliatus* Fr.: Fr.

Polyporus arcularius var. mongolicus Pilát, Ann. Mycol. 38: 69, 1940.

Holotype: China, Mongolia centralis, IX. 1917, leg. E. Licent, no. 773, det. A. Pilát, PRM 500882(!); fragmentum holotypi PRM 808923(!).

Kreisel (1963) considered it a possibly independent species (without a name)

but according to our revision (26. 1. 1988) it is a somewhat deviating *Polyporus brumalis* (Pers.): Fr. with smaller pores and tomentum on the pileus surface.

Polyporellus arcularius f. olivascens Pilát, Bull. Soc. Mycol. Fr. 51: 352, 1936.

Holotype: USSR, Asia, Sajany, Arasuk, *Lonicera coerulea*, 20. VIII. 1932, [leg. B. I.] Krawtzew, Pl. 2008, [det. A. Pilát], PRM 808909(!).

According to the revision of H. Kreisel in 1963, it is "*Polyporus brumalis*, subspec.??? poris magnis significatus", published (Kreisel 1963) as *Polyporus brumalis* var. *megalopora* Kreisel. We are, however, of the opinion that it is a normal *Polyporus brumalis* (Pers.): Fr. with somewhat larger but glabrous pores (rev. by us on 26. 1. 1988).

Polyporellus arcularius f. umbilicatus Pilát, Beih. Bot. Centralbl. 56B: 27, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Holotype: Boreček (near Rokycany), IV. 1926, leg. K. Cejp, det. A. Pilát, PRM 808995(!).

Two larger specimens with a membranaceous limb exceeding pileus margin. According to our revision (26. 1. 1988) it is the common *Polyporus ciliatus* Fr.: Fr., a large form, considered by some authors as a distinct species, *P. lepideus* Fr., or a taxonomic form, *P. ciliatus* f. *lepideus* (Fr.) Kreisel.

Polyporellus elegans subf. circumpurpurascens Pilát, Beih. Bot. Centralbl. 56B: 72, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Lectotype: USSR, Hoverla, ad ligna faginea, 1928, leg. et det. A. Pilát, PRM 497779(!).

This is a small specimen of *Polyporus varius* (Pers.): Fr. (with darker pileus margin). Some authors (e. g. Gilbertson et Ryvarden 1987) in addition to *P. varius* recognize another species, viz. *Polyporus elegans* (Bull.) Trog, on the ground of the smaller pileus without radial striations on the surface and smaller spores. On the basis of the study of rich material from Europe we failed to confirm the specific value of these characters in this polypore.

Polyporellus elegans f. squamigerus Pilát, Beih. Bot. Centralbl. 56B: 70, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Lectotype: USSR, Žámer, Kobylecká Polana, ad truncum *Fagi (sylvaticae)*, VII. 1929, leg. et det. A. Pilát, PRM 497777(!).

According to our revision (26. 1. 1988) it is *Polyporus varius* (Pers.): Fr., a specimen in which the pileal surface is cracked to small scales.

Polyporellus elegans f. umbilicatus Pilát, Beih. Bot. Centralbl. 56B: 70, 1936 (invalidly published, due to the lack of a Latin diagnosis).

This is normal *Polyporus varius* (Pers.): Fr. with a small mamelon at the centre of the pileus (revised by us on 26. 1. 1988).

Polyporellus elegans subf. undulatus Pilát, Beih. Bot. Centralbl. 56B: 73, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Holotype: USSR, Žámer, Kobylecká Polana, ad ramos *Fagi (sylvaticae)*, VII. 1929, leg. et det. A. Pilát, PRM 497784(!).

This is again *Polyporus varius* (Pers.): Fr. with somewhat undulating pileal margin (revised by us on 26. 1. 1988).

Polyporellus melanopus f. brumaliformis Pilát, Beih. Bot. Centralbl. 56B: 78, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Lectotype: USSR, Svidovec, Jalinka, ad ramulum *Fagi (sylvaticae)*, VII. 1930, leg. et det. A. Pilát, PRM 497749(!).

According to the revision of the second author (Z. P., 14. 5. 1971) and both of us (26. 1. 1988) it is typical *Polyporus melanopus* (Pers.): Fr.

Polyporellus melanopus f. costatus Pilát, Beih. Bot. Centralbl. 56B: 78, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Lectotype: Czechoslovakia, Rychmburk, leg. J. Zvára, det. A. Pilát, PRM 703812(!).

This is *Polyporus melanopus* (Pers.): Fr. with somewhat more strikingly costate pileus surface (rev. by us on 26. 1. 1988).

Polyporellus melanopus f. laevis Pilát, Beih. Bot. Centralbl. 56B: 78, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Lectotype: Czechoslovakia, Mnichovice, 1914, leg. J. Velenovský, det. A. Pilát, PRM 703807(!).

According to the revision of the first author (F. K., 10. 5. 1971) and both of us (26. 1. 1988) it is typical *Polyporus melanopus* (Pers.): Fr. with quite smooth pileus surface.

Polyporellus melanopus f. squamulatus Pilát, Beih. Bot. Centralbl. 56B: 78, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Lectotype: Czechoslovakia, Ondřejov, 1905, leg. J. Velenovský, det. A. Pilát, PRM 703815(!).

This is again *Polyporus melanopus* (Pers.): Fr. as revised by the first author (F. K., 10. 5. 1971) and later by both of us (26. 1. 1988).

Polyporellus picipes f. carpaticus Pilát, Beih. Bot. Centralbl. 56B: 63, 1936 (invalidly published, due to the lack of a Latin diagnosis).

Holotype: USSR, Žámer, Kobylecká Polana, ad ramos *Fagi (sylvaticae)* dejectos, VII. 1929, leg. et det. A. Pilát, PRM 497750(!).

According to our revision (26. 1. 1988) it is normal *Polyporus badius* (S. F. Gray) Schw. = *P. picipes* Fr., carpophores with thin pilei.

Polyporellus squamosus ssp. granuliquamosus Pilát, Bull. Soc. Mycol. Fr. 51: 353, 1936.

Holotype: USSR, Sibiria, distr. Narym, *Salix* sp., X. 1933, [leg. B. I.] Krawtzev 3052, [det. A. Pilát], PRM 809166(!).

Following our revision (12. 2. 1988) we discovered that it represents *Polyporus chozeniae* (Vasil'k.) Parm. as it has distinctly smaller spores ($10-13.5 \times 4-5 \mu\text{m}$) and a different pileal surface in contrast with *P. squamosus* (compare Parmasto 1974, Vasil'kov 1967).

Polyporellus varius f. melanopodiformis Pilát, Bull. Soc. Mycol. Fr. 49: 257, 1934.

Holotype: USSR, Sibiria, distr. Tara, *Abies sibirica*, 1928, [leg. K. E.] Murashinsky, Pl. 55, [det. A. Pilát], PRM 163609(!).

According to our revision (26. 1. 1988) it is *Polyporus badius* (S. F. Gray) Schw. = *P. picipes* Fr., a small, thin carpophore with long slender stipe.

Poria lunulispora Pilát, Bull. Soc. Mycol. Fr. 51: 381, 1936.

Holotype: USSR, Sibiria, Wasjuganje, ad ligna *Pini sibiricae*, 27. IX. 1934, leg. [B. I.] Krawtzev, W. 123, [det. A. Pilát], PRM 34274(!).

Pilát (1936–42) later considered this polypore to be only a form of *Poria lenis* f. *lunulispora* (Pil.) Pil. We revised the type on 17. 2. 1988 and reached the conclusion that it is *Diplomitoporus lenis* (P. Karst.) Gilb. et Ryv. = *Poria lenis* (P. Karst.) Sacc. with typical spores and cystidia (cystidioles).

Poria nathorst-windhahlii Pilát in Nathorst-Windhahl, Bot. Not. 1949: 208.

Holotype: Sweden, an der Unterseite morchen, schattig und etwas feucht liegenden Laubholzteile, Wästergötland, Göteborg, Naturparken, 29. VI. 1947, [leg.] T. Nathorst-Windhahl (Fungi succici 4378). [det. A. Pilát], PRM 203760(!).

According to the revision of S. Lundell (1949) it is *Poria viridans*; our revision (17. 2. 1988) confirmed that it is *Ceriporia viridans* (Berk. et Br.) Donk — a pale, dirty light ochre form.

Poria overholtsii Pilát, Stud. Bot. Čech. 3: 2, 1940.

Lectotype: USA, Stone Valley, Huntingdon Co., Pa., on *Quercus* sapling, July 10, 1921, leg. L. O. Overholts, 7645, [det. A. Pilát], PRM 809653(!).

A distinct species (revised by us on 19. 2. 1988) *Diplomitoporus overholtsii* (Pil.) Gilb. et Ryv. distinguished by large spores and narrow skeletal hyphae.

Poria subvermispora Pilát, Stud. Bot. Čech. 3: 2, 1940.

Holotype: USA, Mountain Grove, Missouri, fallen *Quercus alba*, April 16, 1922, coll. A. S. Rhoads, ex herb. L. O. Overholts 8821, [det. A. Pilát], PRM 200515(!).

According to our revision (29. 2. 1988) it is an independent species *Ceriporopsis subvermispora* (Pil.) Gilb. et Ryv.

Poria turkestanica Pilát, Bull. Soc. Mycol. Fr. 52: 319, 1937.

Holotype: USSR, Kazakstan, Alma-Ata, *Picea schrenkiana*, IX. 1935, [leg. B. I.] Krawtzev, Pl. y. 84, [det. A. Pilát], PRM 25151(!).

Lowe (1.1961) revised the type material and observed "Same structure as *Poria viridans* and appears to be one of the color varianta of *Poria rhodella*, *P. griseoalba* etc.". According to our revision (19. 2. 1988) it is *Ceriporia viridans* (Berk. et Br.) Donk — a pale ochre form.

Trametes quercina* f. *lenzitoidea Pilát, Atlas hub evropských 3—1: 330, 1940.

This is a nomen novum for *Lenzites reichardtii* Schulzer in Thümen 1880 (= *L. warnieri* Dur. et Mont. in Mont.) and as such it should be typified with the same type specimen, which was distributed in exsiccati Mycotheca universalis no. 1501 together with the Latin diagnosis.

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Klíč k určování druhů rodu *Drechslera* Ito sensu lato zjištěných na území Československa

Key to the species of *Drechslera* Ito sensu lato on the territory of Czechoslovakia

Michal Ondřej

Klíč k určování zástupců rodu *Drechslera* Ito sensu lato byl sestaven pouze pro druhy zjištěné na území Československa. Základem rozlišování jednotlivých druhů v klíči je velikost a tvar konidií. Klíč doplňuje seznam 21 zjištěných druhů na 34 hostitelských rostlinách.

The key to *Drechslera* Ito sensu lato is arranged only for species found on the territory of Czechoslovakia. The individual species are distinguished on the basis of their conidium size and shape. The list of 20 species having been observed on the 34 host plants is included.

Základem rozlišování druhů rodu *Drechslera* Ito sensu lato Subramanian et Jain (1966), Ellis (1971) v uvedeném klíči, je velikost a tvar bazální jizvy, tvar, šířka a délka konidií. Anamorfní rod *Drechslera* v širším pojetí je komplex, zahrnující geneticky a morfologicky rozdílné teleomorfy: *Cochliobolus* Drechsler, *Pyrenophora* Fr. a *Setosphaeria* Leonard et Suggs. Existence rozdílných teleomorfů úzce souvisí s morfologickými rozdíly u jednotlivých anamorf. Shoemaker (1959) klasifikuje zástupce s cylindrickými konidii a se schopností klíčit z každé buňky konidie (tzv. laterální klíčení) v rodě *Drechslera*. Pro anamorfní druhy s větvenými konidii, které mají schopnost klíčit pouze na koncích konidie (tzv. bipolární klíčení), vytvořil Shoemaker (1959) nový rod *Bipolaris*. Pro anamorfní druhy s vyniklou bazální jizvou vytvořil Leonard a Suggs (1974) rod *Exserohilum* (Sivanesan 1985). Rozdělení na rody *Drechslera*, *Bipolaris* a *Exserohilum* je nutné akceptovat, protože jim odpovídají i rozdílné teleomorfy: *Pyrenophora*, *Cochliobolus* a *Setosphaeria* (Sivanesan 1984, 1985).

Z praktických důvodů je klíč sestaven pro zástupce všech tří rodů — *Drechslera*, *Bipolaris* a *Exserohilum*. V klíči jsou uvedeny pouze druhy, které byly na území Československa sbírány, a které jsou dokladovány herbářovým materiálem.

Studium druhů rodu *Drechslera* sensu lato je ztěžováno tím, že tyto houby na listových skvrnách a na odumírajících listech trav sporulují často v omezeném množství, i když konidiofory jsou hojně zastoupeny. Jednotlivé druhy je možné rozlišit jen podle konidií. K přípravě mikroskopických preparátů se osvědčilo rozmixovat napadené listy v malém množství vody. Z listové drtě se pak vymačká voda, obsahující konidie pro mikroskopické studium. Způsob klíčení konidií se zjišťuje ve vlhké komůrce u čerstvého materiálu (ne staršího 1–2 roky).

Klíč druhů rodů *Drechslera*, *Bipolaris* a *Exserohilum* nalezených na území Československa:

- | | |
|--|----|
| 1. a) Šířka konidií do 15 μm | 2 |
| b) Šířka konidií nad 15 μm | 10 |
| 2. a) Velikost bazální jizvy 2,2–3(–4) μm | 3 |
| b) Velikost bazální jizvy (3–)4– 5(–6) μm | 6 |

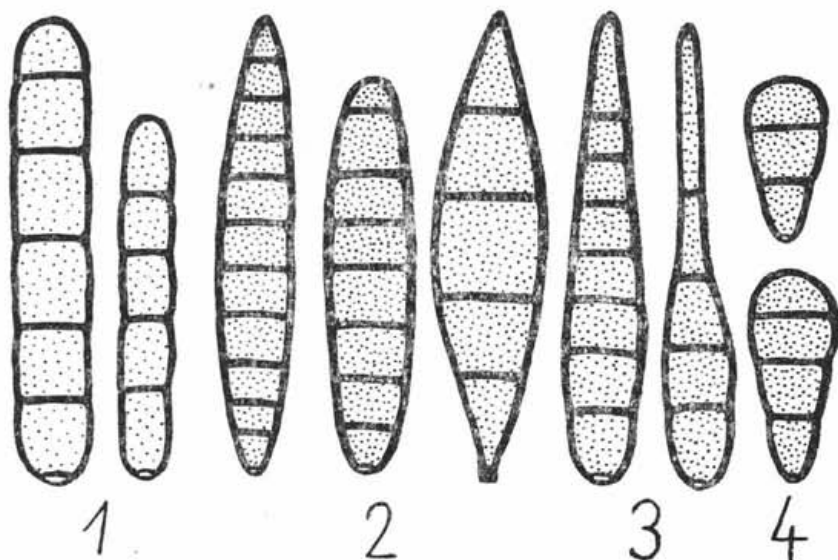
Tabulka I. Naměřené hodnoty u konidií

Druh	Rozměry konidií μm	Velikost bazální jizvy μm	Počet distosept
1. <i>D. avenae</i>	60–125 × 15–20	4–7,5	3–5–7
2. <i>D. biseptata</i>	18–33(40) × 8–16(20)	2,5–3	1–3–4
3. <i>D. bromi</i>	90–190 × 15–21	2,5–4	4–5–7
4. <i>D. cactivora</i>	20–70 × 8–14	3–5	1–4–5
5. <i>D. dactylidis</i>	48–125 × 10–15	4–5	4–7–14
6. <i>D. dictyoides</i>	50–150 × 12–18(20)	3–5	2–5–9
7. <i>D. erythrospila</i>	50–120 × 10–17	3–5	4–6–9
8. <i>D. flavispora</i>	30–50(75) × 8–13	2,5–3	3–5–8
9. <i>D. fugax</i>	50–85(95) × 18–23(26)	4–5	2–5–6
10. <i>D. graminea</i>	45–80(90) × 13–18	4–5,5	2–5–6
11. <i>D. holci</i>	60–185 × 11–18	4–6,5	5–9–14
12. <i>D. phlei</i>	49–105 × 10–16(18)	2,5–4	3–5–8
13. <i>D. poae</i>	75–140 × 15–24	3–5	5–8–13
14. <i>D. siccans</i>	50–140 × 13–22	5–8	3–6–9
15. <i>D. spicifera</i>	20–36(40) × 9–13(14)	2,5–3,5	2–3–4
16. <i>D. teres</i>	50–120 × 15–23	4–8	2–5–7
17. <i>D. triseti</i>	50–95(120) × 12–15(18)	4–5,5	3–6–8
18. <i>D. tritici-repentis</i>	78–145 × 13–20	2,5–3	4–7–15
19. <i>B. cynodontis</i>	30–75 × 10–16	2,4–5	3–6–9
20. <i>B. sorokiniana</i>	52–104 × 13–24	2,5–4	5–8–12
21. <i>E. turcicum</i>	91–107 × 20–23(25)	2,5–3	4–5–6

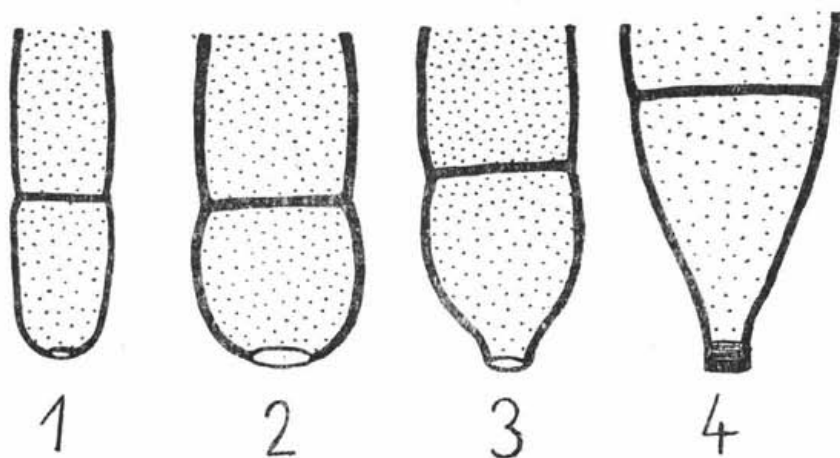
3. a) Délky konidií do 40 μm 4
 b) Délka konidií nad 40 μm 5
4. a) Tvar konidií cylindrický *D. spicifera* (Bainier) von Arx
 b) Tvar konidií kyjovitý *D. biseptata* (Sacc. et Roum.)
 Richardson et Fraser
5. a) Tvar konidií cylindrický *D. flavispora* Ondřej
 b) Tvar konidií opak kyjovitý *D. phlei* (Graham) Shoem.
 c) Tvar konidií větvenovitý *Bipolaris cynodontis*
 (Marignoni) Shoem.
6. a) Délka konidií nejvýše do 80 μm *D. cactivora* (Petrač) M. B.
 Ellis
 b) Délka konidií nad 80–100 μm 7
7. a) Počet distosept (přehrádek) konidií do 8–10 8
 b) Počet distosept (přehrádek) konidií nad 8–10 9
8. a) Tvar konidií cylindrický *D. triseti* Ondřej
 b) Tvar konidií mírně větvenovitý až
 opak kyjovitý *D. erythrospila* (Drechsler)
 Shoem.
9. a) Konidie dosahují délky nejvýše do
 100–130 μm, tvar konidií mírně vět-
 venovitý až opak kyjovitý *D. dactylidis* Shoem.
 b) Konidie dosahují délky nad 100–
 –130 μm, tvar konidií cylindrický *D. holci* Ondřej

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10. a) Šířka bazální jizvy 2,5– 3(–4) μm 11
 b) Šířka bazální jizvy (3–)4– 5(–8) μm 14
 11. a) Délka konidií nejvýše do 100–110 μm , tvar konidií vřetenovitý 12
 b) Délka konidií nad 100–110 μm , tvar konidií cylindrický 13



1. Tvar konidií: 1 — cylindrický, 2 — vřetenovitý, 3 — opak kyjovitý, 4 — kyjovitý.



2. Rozdílné tvary bazálních buněk konidií: 1 — protažený, 2 — isodiametrický, 3 — kónický, 4 — zúžený s vyniklou bazální jizvou (exserohilum).

12. a) Bazální a apikální buňky zaoblené,
bazální jizva zřetelně nevyniklá *Bipolaris sorokiniana* (Sacc.)
Shoem.
- b) Bazální a apikální buňky zúžené,
bazální jizva nápadně vyniklá *Exserohilum turcicum* (Pass.)
Leonard et Suggs.
13. a) Bazální buňka kónická *D. tritici-repentis* (Died.)
Shoem.
- b) Bazální buňka zaoblená *D. bromi* (Died.) Shoem.
14. a) Tvar konidií vřetenovitý 15
- b) Tvar konidií cylindrický 16
- c) Tvar konidií opak kyjovitý 19
15. a) Šířka apikální buňky je větší než
její délka, délka apikální buňky nej-
výše do 14 μm *D. poae* (Baudyš) Shoem.
- b) Šířka apikální buňky je menší než
její délka, délka apikální buňky nad
14 μm *D. fugax* (Wallr.) Shoem.
16. a) Délka bazální buňky je větší než její šířka 17
- b) Bazální buňka je isodiametrická (délka a šířka dosahují stejných
hodnot) 18
17. a) Parazituje na *Avena* *D. avenae* (Eidam) Sharif
- b) Parazituje na *Hordeum* *D. teres* (Sacc.) Shoem.
18. a) Velikost bazální jizvy 5–8 μm *D. siccans* (Drechsler) Shoem.
- b) Velikost bazální jizvy 4–5 (–5,5) μm *D. graminea* (Rabenh.)
Shoem.
19. a) Parazituje na *Festuca* *D. dictyoides* (Drechsler)
Shoem. f. sp. *dictyoides*
Shoem.
- b) Parazituje na *Lolium* *D. dictyoides* (Drechsler)
Shoem. f. sp. *perennis* (Brav.
et Graham) Shoem.
(= *D. andersenii* Sharif)

Seznam druhů a jejich hostitelů, zjištěných
na území Československa:

1. Drechslera avenae (Eidam) Sharif, Studies on graminicolous species
of *Helminthosporium*, Teheran, p. 72, 1963.
Teleomorfa: *Pyrenophora avenae* Ito et Kuribayashi apud Ito, Proc. Imp. Acad.
Japan 6: 354, 1930.
Hostitel: *Avena sativa* L.
2. Drechslera biseptata (Sacc. et Roum.) Richardson et Fraser, Trans. Br.
mycol. Soc. 51: 148, 1968.
Hostitel: *Festuca rubra* L., *Agrostis tenuis* Sibth., *Nardus stricta* L., *Holcus
mollis* L., *Phleum pratense* L.
3. Drechslera bromi (Died.) Shoem., Can. J. Bot. 37: 881, 1959.
Teleomorfa: *Pyrenophora bromi* (Died.) Drechsler, J. Agric. Res. 24: 672, 1923.
Hostitel: *Bromus inermis* Leyss
4. Drechslera cactivora (Petra) M. B. Ellis, Dematiaceous Hyphomyce-
tes, Kew, p. 432, 1971.
Hostitel: *Echinocereus pentalophus* (D. C.) Rümpl.

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5. *Drechslera dactylidis* Shoem., Can. J. Bot. 40: 820, 1962.
Teleomorfa: *Pyrenophora dactylidis* Ammon., Phytopathol. Z. 47: 256, 1963.
Hostitel: *Dactylis glomerata* L.
6. *Drechslera dictyoides* (Drechsler) Shoem., Can. J. Bot. 37: 881, 1959.
Teleomorfa: *Pyrenophora dictyoides* Paul et Parberry, Trans. Br. Mycol. Soc. 51: 707, 1968.
Hostitel: *Festuca pratensis* Huds., *Festuca rubra* L., *Festuca arundinacea* Schreb. — (f. sp. *dictyoides* Shoem., Can. J. Bot. 40: 821, 1962).
Lolium perenne L. — [f. sp. *perennis* (Brav. et Graham) Shoem., Can. J. Bot. 40: 821, 1962; syn. = *Drechslera andersenii* Scharif, Studies on graminicolous species of *Helminthosporium*. PhD thesis Univ. of London, 1959.]
7. *Drechslera erythrospila* (Drechsler) Shoem., Can. J. Bot. 37: 880, 1959.
Teleomorfa: *Pyrenophora erythrospila* Paul, Trans. Br. Mycol. Soc. 59: 97, 1972.
Hostitel: *Agrostis tenuis* Sibth.
8. *Drechslera flavispora* Ondřej, Čs. Mykol., Praha, 42: 86, 1988.
Hostitel: *Deschampsia flexuosa* (L.) Trin., *Nardus stricta* L., *Agrostis tenuis* Sibth., *Calamagrostis arundinacea* (L.) Roth.
9. *Drechslera fugax* (Wallr.) Shoem. apud Hughes in Can. J. Bot. 36: 765, 1958.
Hostitel: *Festuca ovina* L.
10. *Drechslera graminea* (Rabenh.) Shoem., Can. J. Bot. 37: 881, 1959.
Teleomorfa: *Pyrenophora graminea* Ito et Kuribayashi, apud Ito in Proc. Imp. Acad. Japan, 6: 353, 1930.
Hostitel: *Hordeum murinum* L., *Arrhenatherum elatius* (L.) Presp., *Hordeum distichon* L.
11. *Drechslera holci* Ondřej, Čes. Mykol., Praha, 42: 88, 1988.
Hostitel: *Holcus mollis* L.
12. *Drechslera phlei* (Graham) Shoem., Can. J. Bot. 37: 881, 1959.
Hostitel: *Phleum pratense* L.
13. *Drechslera poae* (Baudyš) Shoem., Can. J. Bot. 40: 827, 1962; = *Helminthosporium vagans* Drechsler, J. Agric. Res. 24: 688, 1923.
= *Helminthosporium poae* Baudyš, Lotos 64: 87, 1916.
Hostitel: *Poa pratensis* L.
14. *Drechslera siccans* (Drechsler) Shoem., Can. J. Bot. 37: 881, 1959.
Teleomorfa: *Pyrenophora lolii* Dovaston, Trans. Br. Mycol. Soc. 31: 251, 1948.
Hostitel: *Festuca pratensis* Huds., *Festuca ovina* L., *Lolium multiflorum* Lam., *Lolium perenne* L., *Arrhenatherum elatius* (L.) Presl.
15. *Drechslera spicifera* (Bainier) von Arx, The genera of fungi sporulating in pure culture, p. 222, 1970.
Teleomorfa: *Cochliobolus spicifer* Nelson, Mycologia 56: 198, 1964.
Hostitel: *Anthoxanthum odoratum* L., *Linum usitatissimum* L.
16. *Drechslera teres* (Sacc.) Shoem., Can. J. Bot. 37: 881, 1959.
Teleomorfa: *Pyrenophora teres* Drechsler, J. Agric. Res. 24: 656, 1923.
Hostitel: *Hordeum distichon* L.
17. *Drechslera triseti* Ondřej, Čes. Mykol., Praha, 42: 85, 1988.
Hostitel: *Trisetum flavescens* (L.) P. Beauv.
18. *Drechslera tritici-repentis* (Died.) Shoem., Can. J. Bot. 37: 880, 1959.
Teleomorfa: *Pyrenophora tritici-repentis* (Died.) Drechsler, J. Agric. Res. 24: 667, 1923.
Hostitel: *Elytrigia repens* (L.) Desv., *Holcus mollis* L., *Lolium multiflorum* Lam., *Secale cereale* L., *Triticum aestivum* L., *Apera spica-venti* (L.) P. Beauv., *Bromus* sp.
19. *Bipolaris cynodontis* (Marignoni) Shoem., Can. J. Bot. 37: 883, 1959; = *Drechslera cynodontis* (Marignoni) Subram. et Jain, Curr. Sci. 35: 354, 1966.
Teleomorfa: *Cochliobolus cynodontis* Nelson, Mycologia 56: 67, 1964.
Hostitel: *Avenastrum versicolor* (Vill.) Fritsch., *Linum usitatissimum* L.
20. *Bipolaris sorokiniana* (Sacc.) Shoem., Can. J. Bot. 37: 884, 1959. = *Drechslera sorokiniana* (Sacc.) Subram. et Jain, Curr. Sci. 35: 354, 1966.
Teleomorfa: *Cochliobolus sativus* (Ito et Kurib.) Drechsler ex Dastur, Ind. J. Agric. Sci. 12: 733, 1942.
Hostitel: *Elytrigia repens* (L.) Desv., *Lolium perenne* L., *Agrostis tenuis* Sibth., *Trisetum flavescens* (L.) P. Beauv., *Festuca arundinacea* Schreb., *Bromus iner-*

- mis Leyss, *Hordeum distichon* L., *Cerum carvi* L., *Linum usitatissimum* L., *Cucumis sativum* L., *Miscanthus* sp.
21. *Exserohilum turcicum* (Pass.) Leonard et Suggs, *Mycologia* 66: 291, 1974;
 = *Bipolaris turcicum* (Pass.) Shoem., *Can. J. Bot.* 37: 884, 1959;
 = *Drechslera turcica* (Pass.) Subram. et Jain, *Curr. Sci.* 35: 355, 1966.
 Teleomorfa: *Setosphaeria turcica* (Luttr.) Leonard et Suggs, *Mycologia* 66: 295, 1974.
 Hostitel: *Echinochloa crus-galli* (L.) P. Beauv., *Zea mays* L.

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Vzácné prvky slovenskej mykoflóry

Seltene Elemente von Pilzflora der Slowakei

Ladislav Hagara

V článku se referuje a diskutuje o 22 zriedkavých, prehliadaných alebo nových druhoch húb nájdených na Slovensku.

Es werden 22 seltene, übersehene oder neue Arten, gefunden in der Slowakei, vorgestellt, charakterisiert und diskutiert.

Pri mykofloristickom výskume Slovenska, predovšetkým jeho západokarpatskej oblasti, sa v ostatných rokoch podarilo nájsť niekoľko desiatok druhov vyšších húb, ktoré zo SSR dosiaľ neboli doložené, prípadne sú známe len z niekoľkých lokalít. O niektorých z nich možno predpokladať, že sú na Slovensku podstatne hojnejšie, než nasvedčujú doterajšie nepočetné nálezy, napr. *Calyprella capula*, *Typhula uncialis*, *Camarophyllus angustifolius*, *Lactarius hortensis*, *Psathyrella leucotephra*, ďalšie vplyvom svojich biologických nárokov majú trvale zúžený areál rozšírenia, napr. *Boletus speciosus*, *Catathelasma imperiale*, iné sú výslovne vzácnym prvkom mykoflóry nielen u nás, ale v celej Európe, napr. *Pachyella violaceonigra*, *Podoscypha multizonata*, *Cortinarius argutus*, *Tricholoma bresadolianum* a druhy *Lyophyllum* uvedené v tomto referáte. V práci uvádzame len zbery herbarizované autorom tohto príspevku. Všetky citované položky sú uložené v herbári Slovenského národného múzea v Bratislave (BRA).

Prehľad a charakteristika vybraných druhov

1. *Pachyella violaceonigra* (Rehm) Pfister;

syn.: *P. barlaeana* (Bres.) Boud.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: ad truncum emortuum udum *Salicis* sp. iuxta rivum „Bystrička“ 1,7 km situ occid. a pago Bystrička (distr. Martin), 530 m s. m., die 21. VIII. 1983, leg. L. Hagara, det. J. Moravec.

Plodnice tvarom a sfarbením pripomínajú niektorých zástupcov rodu *Discina* alebo *Peziza*; sú nápadné rastom na premočenom dreve. Apotécium je v dospelosti široké 34–42 mm, rozložené, poprehýbané, bez stopky; téciom nápadne zvrásnené (najmä okolo stredu), červenohnedé, miestami s čiernastým nádychom, pod lupou jemne zrnité; excipulum sprvu jemne pomúčené, neskôr lysé a lesklé, špinavobelavé; askospóry elipsovité, s 2 kvapkami, jemne bradavičnaté, 22–29,7 × 12–13,6 μm; vrecká účinkom jódu modrej.

P. violaceonigra je dosiaľ známa len z Európy. Všeobecne sa pokladá za mimoriadne zriedkavý druh, doložený ojedinelými nálezmi zo 6 krajín (Švajčiarsko, Taliansko, Francúzsko, Nemecko, Rakúsko a ZSSR). Rovnaký tvar, sfarbenie técie i veľkosť spór má *P. clypeata* (Schw.) Le Gal, ktorá sa však dá ľahko odlišiť podľa hladkého povrchu spór.

2. *Typhula uncialis* (Grev.) Berthier;

syn.: *Pistillaria typhuloides* (Peck) Burt

Loc.: Slovacia, Q 79/69, montes Malá Fatra: ad petiolos foliorum putr. *Petasitis officinalis* iuxta rivum „Bystrička“, 1,7 usque 2,8 km situ occid. a pago Bystrička (distr. Martin), 530 usque 580 m s. m., die 5. VI. 1982, 19. VI. 1982, 9. X. 1983, 30. XII. 1983 et 26. V. 1984, leg. et det. L. Hagara.

Saprofytická huba z čeľade *Clavariaceae*, rastúca skupinovo na hnilých pre-máčaných listových stopkách *Petasites* aj iných bylín od jari do zimy. Na rovnakom substráte možno nájsť podobné druhy *T. sclerotioides* (Pers.) Fr. a *T. coralina* Quél. et Pat., ktoré sa však odlišujú prítomnosťou sklerócia. *T. uncialis* po prvý raz zbieral na Slovensku J. Kubička 20. VII. 1951 pri Zakamennom na Orave. Dosiaľ je málo dokladov o výskyte tejto huby u nás; pravdepodobne sa však vyskytuje všade, kde hojne rastú hostiteľské byliny (*Petasites*, *Epilobium*, *Angelica* a iné).

3. *Podoscypha multizonata* (Berk. et Br.) Pat.

Loc.: Slovacia, Q 70/76, regio tumulosa Trnavská pahorkatina: in ligno putridissimo *Quercus cerris* in silva "Lindavský les" dicta, 1,5 km situ occid. - septent. - occid. a pago Budmerice (distr. Bratislava-vidiek), 220 m s. m., die 5. IX. 1985, leg. L. Hagara, det. Z. Pouzar.

Zriedkavá huba, v Európe známa z ojedinelých nálezov vo Veľkej Británii, NDR, Francúzsku a Taliansku, doložená aj z ázijskej časti ZSSR (Kaukaz, Ďaleký východ). Zobrazujú ju Cetto, č. 1168, Phillips, s. 222, a Davydkinová, obr. 37b. Vzhľadom pripomína niektoré druhy z rodu *Thelephora*, má však dimitický hýfový systém a hladké hyalinné spóry.

Zrastlica nájdená pri Budmericiach mala nie zvyčajný ružicovitý, ale skôr trojrohý tvar. Tvorilo ju vyše 30 krátkostopkatých lyžicovitých až takmer kornútkovitých plodníc so zvlňeným okrajom, na báze pozrastaných a prirastených k prehnitému drevu. Rastie saprofytycky na zemi alebo na zanorených zvyškoch dreva listnatých stromov. Povrch plodníc je lúčovito zvrásnený, mäsovohnedý, na okraji špinavobelavo oinovatený, hyménium takisto zvrásnené, fialovastohnedé, dužina hrubá len 1–2 mm, kožovitá, veľmi pružná, mäsovohnedá, bez osobitého pachu, s horkou chuťou. Hyménium sa účinkom H_2SO_4 a HNO_3 sfarbuje do oranžovohneda, účinkom $FeSO_4$ tmavne do černa-stohneda, miestami s olivovým nádychom.

4. *Boletus speciosus* Frost

Loc.: Slovacia, Q 78/77, regio tumulosa Ipeľská pahorkatina: sub *Quercubus* in silva "Ladia" dicta, 1,8 km situ occid. - merid. - occid. a viculo Kamenný Chotár prope pagum Brhlovce (distr. Levice), 270 m s. m., die 15. VII. 1981, leg. et det. L. Hagara.

Dtto: Slovacia, Q 76/73, montes Strážovské vrchy: sub *Quercubus* in colle "Drieňový vrch", 2 km situ merid. — occid. a pago Nitra (distr. Prievidza), ad dolomítum, 480 m s. m., die 31. VIII. 1986, leg. et det. L. Hagara.

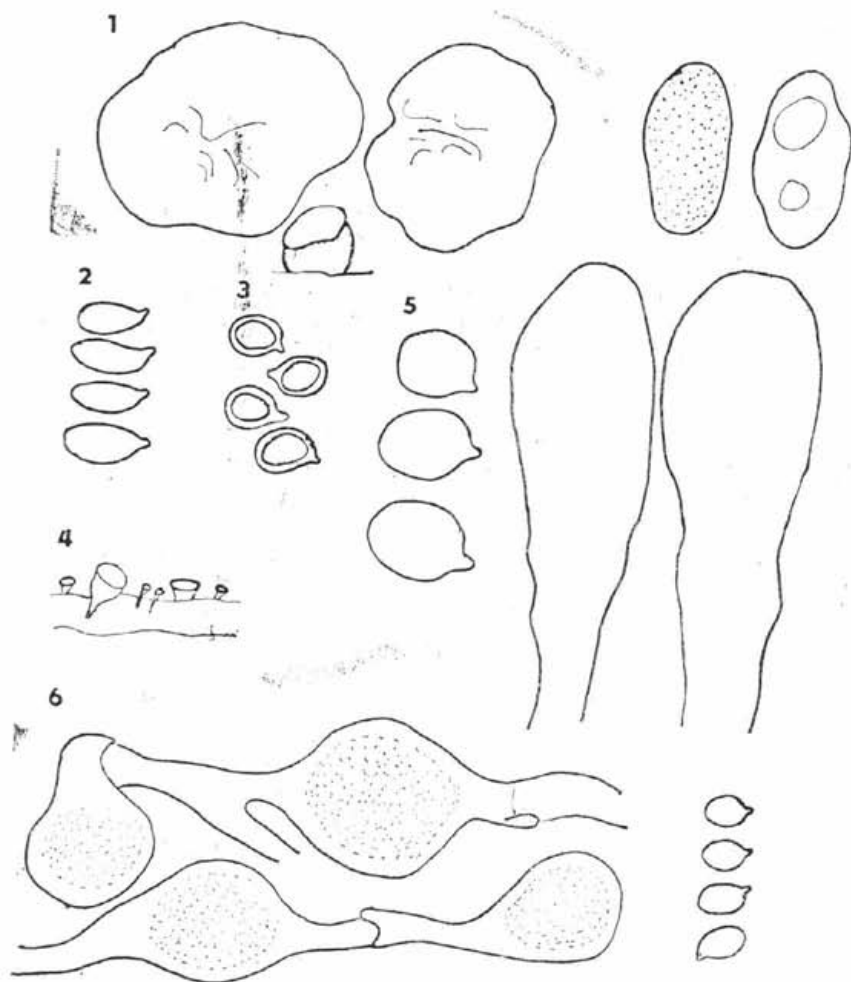
Zriedkavý druh charakterizovaný väčšinou hnedoružovou pokožkou klobúka, žltými a po otláčení modrejúcimi pórmí, drobnou sieťkou a červeným zrnením v dolnej časti trojfarebného hlúbika (vrchol žltý, báza okrová, ostatok červený); dužina je žltá, na reze v klobúku modrie a v báze hlúbika ružovofialovie, čo pokladáme za dôležitý určovací znak. Prítomnosťou staroružového odtieňa na pokožke klobúka sa líši od veľmi blízkeho *B. fechtneri* Vel., ktorý má striebrostosivý klobúk. Farebná premenlivosť oboch týchto druhov je však široká, a tak ich vzájomné odlišenie nie vždy prináša názorovú zhodu.

5. *Camarophyllus angustifolius* Murr.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in pascuo 1,6 km situ occid. a pago Bystrička (distr. Martin), 520 m s. m., die 21. VII. 1984, leg. et det. L. Hagara.

V okruhu *Camarophyllus niveus* (Scop.) Wünsche je niekoľko druhov, ktoré sa v minulosti určovali takmer výhradne ako *C. niveus* alebo *C. virgineus*. Jedným z nich je severoamerický *C. angustifolius*, v Európe po prvý raz iden-

tifikovaný R. Singerom a J. Kuthanom podľa nálezu z Tatranskej Štrby (1974). Opätovné nálezy J. Kuthana potvrdzujú, že nejde o náhodný nález. Tento druh je nápadný trvale suchou, pod lupou až jemne plstnatou pokožkou klobúka, neryhovaným okrajom klobúka (ani zavlhka), drobnými vajcovitými spórami merajúcimi $4,5-6,5 \times 3,5-4,5 \mu\text{m}$ a úzkymi 4-spórovými bazídiami. Podobné druhy *C. borealis* (Peck) Sing., *C. niveus* (Scop.) Wünsche a *C. russo-coriaceus* Berk. et Br. majú klobúk ryhovaný aspoň presvitajúcimi lúpeňmi a lišia sa i podstatne väčšími spórmi $7-12,5 \times 3,5-7,5 \mu\text{m}$. Dospelé plodnice *C. angustifolius* nápadne pripomínajú *Clitocybe ericetorum*, na čo upozornili už Singer a Kuthan (1976).



1. — 1. *Pachyella violaceonigra* — plodnice $\times 1$, askospóry $\times 1500$. — 2. *Typhula uncialis* — spóry $\times 1500$. — 3. *Camarophyllus angustifolius* — spóry $\times 1500$. — 4. *Calyptella capula* — plodnice $\times 2$. — 5. *Xerula melanotricha* — spóry $\times 1500$, cheilocystidy $\times 1000$. — 6. *Clitocybe phaeophthalma* — mechúrikovité bunky na hýfách v pokožke klobúka $\times 1500$, spóry $\times 1500$.

L. Hagara del.

Podľa Clémenceona rastie na zemi v lesoch od jesene do zimy. Nálezy zo Slovenska a NDR však pochádzajú z trávnatých plôch mimo lesa; navyše zber z Bystričky dokazuje aj letnú fruktifikáciu.

Revíziou herbárových dokladov tohto okruhu by sa zrejme našlo nemálo drobnovýtrusných položiek, mýlne určených ako *C. niveus*. Pravda, nové určenie by viedlo k jednoznačnému výsledku len vtedy, ak je k dispozícii aj spoľahlivý opis čerstvých plodníc (farba, prípadné ryhovanie a slizkosť klobúka).

6. *Lactarius hortensis* Vel.

Loc.: Slovacia, Q 85/69, convexum Liptovská kotlina: sub *Corylo avellana* in loco "Krátke" dicto, cca 3,5 km situ orient. - septent. - orient. a pago Východná (distr. Liptovský Mikuláš), 870 m s. m., die 19. IX. 1985, leg et det. J. Kuthan et L. Hagara.

Dtto: Slovacia, Q 87/72, montes Slovenské rudohorie (pars Revúcka vrchovina): sub *Corylo avellana*, cca 1,5 km situ orient. a pago Hanková (distr. Rožňava), cca 600 m s. m., die 21. IX. 1985, leg et det. L. Hagara.

Dtto: Slovacia, Q 79/69, convexum Turčianska kotlina: sub *Corylo avellana* prope receptaculum aquarum, 1,5 km situ occid. - merid. - occid. a pago Bystrička (distr. Martin), 490 m s. m., die 17. VIII. 1986, leg. et det. L. Hagara.

Lahko poznateľný druh z okruhu *Lactarius pyrogalus*, nápadný sivohnedastým, nie vždy zónovaným klobúkom, často aj s prímiesou pleťovej alebo bledoolivovej farby, ďalej riedkymi svetlookrovými lupeňmi, pálivým bielym mliekom a výlučným rastom pod lieskami na kyslých alebo neutrálnych pôdach. Dužina klobúka účinkom KOH hneď zlatožltne, nad lupeňmi až oranžovie; neskôr sa odfarbuje. Táto reakcia je dosť stála a uľahčuje jednoznačné určenie.

Zrejme nejde o zriedkavý, ale len prehliadaný druh. Areál jeho rozšírenia má u nás ešte veľa bielych miest. Podľa nášho názoru rastie všade, kde sa splnia jeho dva základné ekologické nároky — prítomnosť liesky a príslušná kyslosť pôdy. Autorov nález z Bystričky je síce z vápencovej oblasti, no plodnice sa našli na kyslejšom naplavenom substráte pri potoku.

7. *Calyptella capula* (Holmsk.: Fr.) Quél.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: ad caulem putridum herbae incertae (*Urtica dioica*?), 2,1 km situ occid. a pago Bystrička (distr. Martin), 550 m s. m., die 6. VI. 1982, leg. et det. L. Hagara.

Gracilná huba, ktorá má kalíškovité plodnice široké i hlboké 2–3,5 mm, so stopkou dlhou 2–3 mm. vo všetkých častiach belavá, s bezfarebnými hladkými vajcovitými spórmi. Rastie saprofytický na hnijúcej vňati *Solanum tuberosum*, *Urtica dioica*, *Petasites* ap. Jej rozšírenie u nás je preskúmané veľmi nedostatočne. S úspechom sa môže hľadať na kopách hnijúcej vňate zemiarov, v súvislých porastoch žihľavy atď.

8. *Xerula melanotricha* Dörfelt

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in silva mixta (*Picea*, *Abies*) in colle "Dubový diel", 1,9 situ merid.-occid. a pago Bystrička (distr. Martin), ad calcem, 600 m s. m., die 11. VIII. 1984, leg et det. L. Hagara.

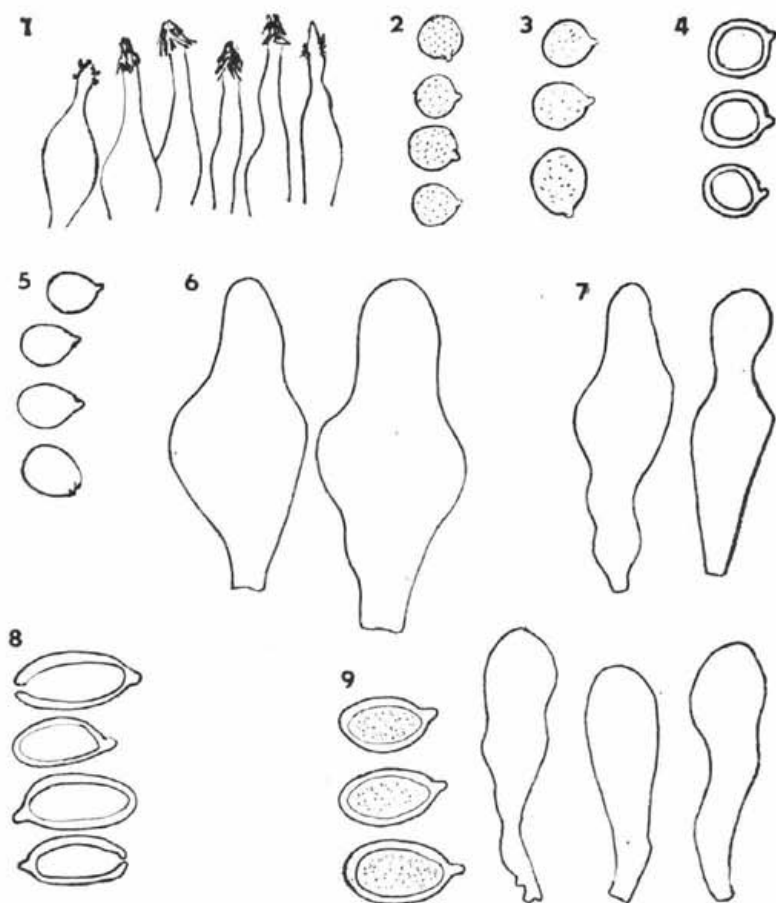
Výrazne kalcifilný druh viazaný na jedľu, zriedkavejšie na smrek, doložený v ČSSR len z niekoľkých lokalít. Charakterizujú ho dlhé makrosety na klobúku (na cit. náleze 0,7–2,2 mm), veľké kyjačkovité cheilocystidy a pleurocystidy (na cit. náleze až $83 \times 36 \mu\text{m}$) a okrúhlasté až oválne spóry (na cit. náleze $8,8-11,8 \times 7,5-8,8 \mu\text{m}$).

9. *Clitocybe phaeophthalma* (Pers.) Kuyper;
syn.: *C. hydrogramma* (Fr.) Kumm.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in strato acuum *Piceae* in colle "Dubový diel", 2,1 km situ occid.-septent.-occid. a pago Turčiansky Peter (distr. Martin), ad calcem, 550 m s. m., die 17. XI. 1982, leg et det. L. Hagara.

Dito: Slovacia, Q 75/81, regio tumulosa Hronská pahorkatina: in robinieto prope pagum Dolný Peter (distr. Komárno), 140 m s. m., die 29. VI. 1985, leg. et det. L. Hagara.

Nehojný druh, navonok nápadný neprijemným pachom. Na Slovensku ho ako prvý zbieral F. A. Hazslinszky a v Čechách pravdepodobne J. Velenovský,



2. — 1. *Melanoleuca spgazzinii* — cheilocystidy $\times 1500$. — 2. *Lyophyllum caerulescens* — spóry $\times 1500$. — 3. *Lyophyllum ovisporum* — spóry $\times 1500$. — 4. *Lyophyllum paelochroum* — spóry $\times 1500$. — 5. *Tricholoma inodermeum* — spóry $\times 1500$. — 6. *Pluteus granulatus* — cheilocystidy $\times 1000$. — 7. *Psathyrella leucotephra* — cheilocystidy $\times 1000$. — 8. *Stropharia hornemannii* — spóry $\times 1500$. — 9. *Cortinarius argutus* — spóry $\times 1500$, cheilocystidy $\times 1500$.

L. Hagara del.

s určitostí až E. Wichanský a M. Svrček s J. Kubičkom. [Svrček (1962), Svrček a Kubička (1964) ut *Clitocybe adirondackensis* (Peck) Sacc.]. Mikroskopicky ho dobre charakterizujú mechúrikovité rozšíreniny na koncoch alebo v priebehu hýf pileocutis. Tieto mechúrikovité bunky, niektorými autormi nazývané fyzalidy, majú zrnitý obsah. Ich tvar a veľkosť sú dosť premenlivé (na cit. zberoch mali rozmery 22×16 až 38×25 μm).

10. **Melanoleuca spegazzinii** (Sacc. et D. Sacc.) Sing.;
syn.: *M. cinerascens* Reid

Loc.: Slovacia, Q 75/80, planitia Podunajská rovina: in robinieto ad terram arenosam graminosam in phasianeto prope pagum Bajč (distr. Komárno), 120 m s. m., die 29. VI. 1985, leg. et det. L. Hagara.

Túto hubu zbieral R. Singer pri svojej návšteve v ČSSR 30. VII. 1974 spolu s K. Křížom pri Dolných Věstoniciach, okr. Břeclav, chatárna časť „Na pís-kach“. Nález z Bajča je prvý na Slovensku. Obe lokality sa nachádzajú na piesočnatej pôde v teplých oblastiach ČSSR. Medzi autorovými početnými zbermi rodu *Melanoleuca* z chladnejších oblastí Slovenska sa tento bledý sub-tilný druh nenachádza.

Plodnice z Bajča majú štihle vretenovité cheilocystidy, na vrchole väčšinou inkrustované háčikovitými alebo harpúnovitými kryštálmi, a elipsovité až široko elipsovité spóry, po dozretí pokryté výraznými izolovanými bradavičkami, merajúce $6,8-8,8 \times 4,8-5,7$ μm . Podobná *M. excissa*, väčšinou autorov pokladaná za kritický či nejasný druh, má podľa Métroda spóry s rozmermi $9-10,5 \times 5,5-7$ μm .

11. **Lyophyllum caerulescens** Clém.;
syn.: *L. crassifolium* (Berk.) Sing.

Loc.: Slovacia, Q 78/77, montes Štiavnické vrchy: in solo frondeo, ad ramos sub terra immersis et ad corticem in querceto puro sub cacumine collis „Husárka“, 1,4 km situ septent. a viculo Tlstý Vrch (inter pagos Žemberovce et Ladzany), distr. Zvolen, 545 m s. m., die 3. VII. 1984, leg. et det. L. Hagara.

Extrémne zriedkavý, vlastne kritický druh, založený na Bresadolovom opise a vyobrazení. Podľa Clémenceona (1986) nejestvuje nijaký herbárový doklad *L. caerulescens*. Ak by sa potvrdilo určenie autora tohto príspevku, exsikát nálezu od Žemberoviec by mal hodnotu typového materiálu. Opis a vyobrazenie 7 plodníc in L. Hagara 1987, pod názvom *L. crassifolium*. Citovaný nález mal okrúhlasté bradavičnaté spóry s rozmermi $5-5,5 \times 4-5$ μm . Druh je nápadný nielen farebnými zmenami rozrezanej dužiny a otlačených lupeňov, ale aj prítomnosťou rizomorf, čo však iní autori neuvádzajú.

12. **Lyophyllum ovisporum** (Lange) Reid

Loc.: Slovacia, Q 89/66, montes Spišská Magura: caespitose ad terram graminosam muscosamque sub *Aceribus* in horto publico iuxta balneas Vyšné Ružbachy (distr. Stará Lubovňa), 630 m s. m., die 7. VII. 1985, leg. et det. L. Hagara.

Zriedkavý druh doložený len z niekoľkých európskych krajín. Trsovým rastom na zemi a tvarom plodníc pripomína hojnejší *Lyophyllum decastes* (Fr.: Fr.) Sing., ba dlho sa pokladal za jeho varietu. Vcelku je však menší, oveľa tmavšie sfarbený, až čiernohnedý, a v dospelosti má vtláčený stred klobúka; od guľatovýtrusného *L. decastes* sa markantne líši aj vajcovitými spórmi.

13. *Lyophyllum paelechroum* Clém.;syn.: *L. immundum* (Berk.) Kühn.

Loc.: Slovacia, Q 80/69, montes Veľká Fatra: in piceto puro ad calcem in colle "Hradište", 1,6 km situ merid.-orient. a pago Turčianske Jaseno (distr. Martin), 590 m s. m., die 11. X. 1984, leg. et det. L. Hagara.

Tento druh sa vykladá nejednotne a vyžaduje si užšiu charakterizáciu. Najvýstižnejšie ho charakterizujú Schweizer Pilztafeln (972) a H. Cléménçon (1986). Ich poňatiu zodpovedá aj opis a vyobrazenie in L. Hagara (1987). Dužina *L. paelechroum* na reze nečernie, ale pomaly šedne; účinkom sulfovanilínu hned' živo červenofialovie. Otláčené lupene výrazne černejú. Klobúk je nápadný prítomnosťou hrboľa a laločnato povykrajovaným, často i vrúbkovaným okrajom.

14. *Catathelasma imperiale* (Fr.) Sing.

Loc.: Slovacia, Q 80/69, montes Veľká Fatra: sub *Juniperis* in silva mixta (*Juniperus*, *Picea*, *Fagus*) in loco "Biely potok" dicto, 2,5 km situ merid.-orient. a pago Turčianske Jaseno (distr. Martin), ad calcem, 650 m s. m., die 4. IX. 1980, leg. et det. K. Tolnay et L. Hagara.

Dtto: Slovacia, Q 79/66, montes Kysucké Beskydy: in piceto sub *Juniperis* in clivo occid. collis "Dedova", 2,8 km situ septent.-orient. a pago Klubína (distr. Čadca), 550 m. s. m., die 14. IX. 1986, leg. et det. J. Kuthan, J. Kuthanová et L. Hagara.

Nápadná huba, v minulosti dosť hojná v niektorých oblastiach severného a stredného Slovenska (Orava, Kysuce, Liptov, Tatry, Turiec, okolie Banskej Bystrice), dnes už aj tam zriedkavá. Vo väčšine európskych krajín sa vôbec nevyskytuje. — Podrobnú správu o rozšírení tohto druhu na Slovensku prinesieme neskôr.

15. *Tricholoma inodermeum* (Fr.) Gill.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in pineto cum *Piceis* juven. ad ripam rivi "Bystrička", 2,5 km situ occid. a pago Bystrička (distr. Martin), 570 m s. m., die 22. XI. 1980, leg. et det. L. Hagara.

Zriedkavý kalcifilný druh, ktorý sa podľa J. Velenovského (1920) hojne vyskytoval v boroch pri Mnichoviciach, Lysé nad Labem a Srbsku. Dnes sa v strednej aj západnej Európe všeobecne pokladá za zriedkavý. Plodnice sú nápadné koreňovito predĺženým, dutým a na báze zahroteným hlúbikom, ako aj zvoncovitým klobúkom s výrazným hrboľom; klobúk i hlúbik pokrývajú červenohnedé vláknité šupiny.

16. *Tricholoma bresadolianum* Clém.

Loc.: Slovacia, Q 76/73, montes Strážovské vrchy: in fageto lucido, solo dolomitico, in clivo occid. collis "Drieňový vrch" (locus "Vlčia jama" dictus), 2,1 km situ merid. a pago Nitrica (distr. Prievidza), 560 s. m., dies 21. IX. 1986, leg. et det. L. Hagara.

Kalcifilný druh, známy podľa niekoľkých nálezov z Francúzska, Talianska, Švajčiarska, NSR a Veľkej Británie. Slovenské nálezisko autor navštívil už 31. VIII. 1986. V dolomitickom masive Drieňova vtedy bohato fruktifikovali vzácné hríbovité huby *Boletus satanas*, *B. regius*, *B. speciosus*, *B. impolitus* a *B. radicans*; priamo na neskoršom nálezisku *T. bresadolianum* rástli desiatky plodníc *Boletus luridus*. V nasledujúcich 3 týždňoch nepršalo a pri exkurzii 21. IX. hojnejšie rástol vlastne len *Hygrophorus cossus* a *H. penarius*. O to viac prekvapil nález asi 15 plodníc *T. bresadolianum*. Väčšina z nich vyrástla akoby v hustom trse, niektoré boli na báze hlúbika pozrastané.

Podrobný opis huby, ktorý prinášajú M. Bon (1984) a A. Marchand (1986), možno rozšíriť o tieto autorove pozorovania: pokožka hlúbika na otlačených miestach tehlovočervené (najmä zamladi), neskôr okrovie; dužina v báze hlúbika na reze často nadobúda bledozelenkastý odtieň a pod oškrabanou pokožkou bázy takmer vždy bledozelenie. Účinkom KOH sivá pokožka klobúka zlatožltne a modrosivé či čiernasté šupinky hnednú. Zato H_2SO_4 , $AgNO_3$ a NH_3 , aplikované na dužinu a pokožku, dávajú negatívne alebo banálne reakcie.

17. **Pluteus granulatus** Bres.

[novšie uvádzaný ako jedno z početných synonym *P. plautus* (Weinm.) Gill.]

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in ligno putrido *Piceae* in colle "Dubový diel", 2,2 km situ occid.-merid.-occid. a pago Bystrička (distr. Martin), cca 600 m s. m., die 21. VII. 1984, leg. et det. L. Hagara.

Dtto: Ibidem, 1,8 km situ occid. a pago Bystrička, cca 550 m s. m., die 22. IX. 1984, leg. K. Tolnay, det. L. Hagara.

Gracilný druh so zrnitým odením na červenohnedej pokožke klobúka a v dolnej časti hlúbika. Roztrúsene sa vyskytuje na celom území ČSSR, rastie však len na dreve ihličnanov.

18. **Phaeolepiota aurea** (Mattuschka: Fr.) R. Mre.

Loc.: Slovacia, Q 80/69, montes Veľká Fatra: sub *Fagis* ad marginem viae silvaticae in clivo occid. montis "Lysec", 3,6 km situ merid.-orient. a pago Turčianske Jaseno (distr. Martin), 690 m s. m., die 6. IX. 1986, leg. et det. L. Hagara.

Krásna, mohutná, svojrázna huba, u nás doložená z viacerých lokalít v Čechách; jej rozšírenie v SSR je zatiaľ veľmi slabo preskúmané. Vzhľadom na jej kontinuálny výskyt v celom miernom pásme Severnej Ameriky a Eurázie možno aj na Slovensku očakávať početnejšie nálezy.

19. **Psathyrella leucotephra** (Berk. et Br.) Orton

Loc.: Slovacia, Q 75/82, regio tumulosa Hronská pahorkatina: ad terram arenosam iuxta basim *Robiniae pseudoacaciae*, 0,5 km situ septent.-orient. a pago Marcelová (distr. Komárno), 140 m s. m., die 14. VIII. 1985, leg. et det. L. Hagara.

U nás dosť zriedkavý alebo nedostatočne známy belavý trsnatý druh, niekedy asi zamieňaný s *P. candolleana* (Fr.: Fr.) R. Mre., odlišiteľný podľa veta, spôsobu rastu, kompaktnosti a tvaru plodnice, sfarbenia lupeňov a veľkosti aj tvaru cheilocystíd a spór.

20. **Stropharia hornemannii** (Fr.: Fr.) Lund. et Nannf.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in humo sub *Pinis* cum *Piceis* in loco "Lazy" dicto, 2,3 km situ occid.-septent.-occid. a pago Bystrička (distr. Martin), 620 m s. m., die 14. X. 1982, leg. et det. L. Hagara.

Huba s charakteristickým odstávajúcim a zvrchu ryhovaným prsteňom, pod ním husto pokrytá vztýčenými šupinami, v severnej Európe a Alpách dosť hojná, v strednej Európe zriedkavá, u nás doložená len z ojedinelých lokalít v Čechách. Spóry cit. nálezu merali $11,2-13,8 \times 6-7,3 \mu m$.

21. **Inocybe abietis** Kühn.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in silva mixta (*Abies*, *Corylus*) supra ripam dextram rivu "Bystrička", 3,4 km situ occid. a pago Bystrička (distr. Martin), cca 650 m s. m., die 3. VII. 1983, leg. L. Hagara, det. J. Stangl.

Relatívne mäsitá, svetlejšie sfarbená vláknicová huba so zvoncovitým klobúkom a výrazným hrboľom, elipsovito-vajcovitými spórmi $9-10 \times 5,5-6,2 \mu m$ a

s inkrustovanými vretenovitými hymeniálnymi cystidami $55-70 \times 14-18 \mu\text{m}$ (merania J. Stangla). V ČSSR ju po prvý raz našiel M. Svrček 4. VI. 1961 v Revniciach pri Prahe, potom 27. VIII. 1967 L. Kubičková pri Domaníne (Třeboňsko) a 17. X. 1970 J. Veselský s J. Kuthanom pri Bruntáli. Podľa J. Stangla je mimoriadne zriedkavým druhom.

22. *Cortinarius argutus* Fr.

Loc.: Slovacia, Q 79/69, montes Malá Fatra: in silva mixta (*Picea*, *Pinus*) ad calcem in colle "Dubový diel", 2,2 km situ occid.-septent.-occid. a pago Turčiansky Peter (distr. Martin), 570 m s. m., die 17. X. 1982, leg. et det. L. Hagara.

Veľmi zriedkavý druh, v Európe doložený ojedinelými nálezmi z NSR, Svédsko, Veľkej Británie a ČSSR; údaje o jeho výskyte v NDR sú podľa domácich autorov neisté. U nás ho zbieral už J. Velenovský v bučinách při Jevanoch.

C. argutus je veľmi nápadný bledým sfarbením lúpeňov, hlúbika, dužiny aj klobúka, nehľuzovitým, zahroteným, často až repovitým hlúbikom, ktorý je zamladi hruboplstnatý, a svietplynovým pachom dužiny. Navonok sa viacerými znakmi podobá na mäsité druhy rodu *Hebeloma* či na niektoré formy *Rozites caperata*. Mikroskopicky ho charakterizujú kyjačikovité cheilocystidy (na cit. zbere $27-30 \times 7-8 \mu\text{m}$) a elipsovité, dlho hladké, v zrelosti jemne bradavičnaté spóry (na cit. náleze $11-12,7 \times 6,2-7 \mu\text{m}$).

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Krásnopórka chlupatá — *Albatrellus hirtus* (Cooke) Donk nalezena v Československu

Albatrellus hirtus (Cooke) Donk found in Czechoslovakia

Vladimír Antonín, Alois Černý, Jiří Mann a Jiří Valter

Během exkurze do rezervace „Polom“ nedaleko Horního Bradla v Železných horách v rámci mykofloristického kursu byla nalezena krásnopórka chlupatá — *Albatrellus hirtus* (Cooke) Donk. Jedná se o první nález tohoto druhu u nás a šestý v Evropě. Je podán podrobný popis podle čerstvého materiálu včetně makrochemických reakcí.

Albatrellus hirtus (Cooke) Donk was found during the excursion in nature reserve “Polom” near Horní Bradlo (Železné hory Mts.), which represents the first locality of this species in Czechoslovakia (the 6th in Europe). A detailed description including macrochemical reactions is given.

V průběhu mykofloristického kursu v Horním Bradle v Železných horách byla na exkurzi do blízké rezervace „Polom“ nalezena velice nápadná chorošovitá houba. Jejím nejnápadnějším znakem byla výrazná chlupatost povrchu klobouku, který svou hnědou barvou kontrastoval s křídově bílými póry. Tato houba byla dodatečně určena jako krásnopórka chlupatá — *Albatrellus hirtus* (Cooke) Donk.

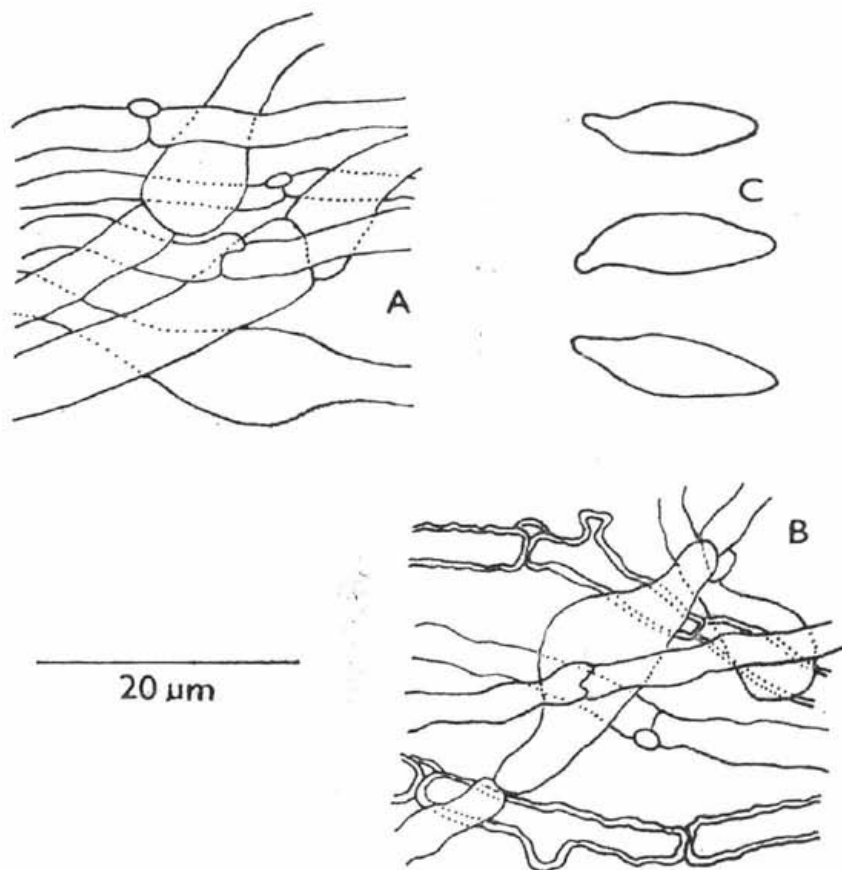
Popis podle nalezených plodnic

Klobouk je 70–90 mm v průměru, jednostranný, s bočním třeněm, okrouhlý až ledvinovitý, u třeně vyhloubený, u mladých plodnic mírně sklenutý, u starších s mírně zvednutým, lehce zvlněným okrajem; povrch je suchý, matný, pokrytý jemnými hnědými chlupy, které přecházejí i na svrchní stranu třeně. Rourky jsou 2–4 mm (u třeně pouze 1 mm) dlouhé, na třeně sbíhající, póry 0,5–0,6 × 0,6–1 mm velké, ale u třeně protažené, dosahující délky až 6 mm, nepravidelně hranaté, různě veliké, místy roztrhané, takže celý hymenofor působí hrboolatým dojmem; póry i rourky jsou křídově bílé. Třeň je 90 × 15 – 20 mm, na průřezu mírně eliptický, k bázi zúžený, rovný nebo nepravidelně zprohýbaný, pružný, tuhý, plný, na bázi někdy šikmo zahrocený, na svrchní straně špinavě bělavý až nahnědlý porostlý bílými chlupy delšími než na klobouku. Dužnina v klobouku mléčně bílá, pod pokožkou slabě zahnědlá, pružná, tuhá, slabě ovocně vonná, chuti po chvíli pryskyřičně hořké, na řezu nemění barvu; ve tření je dužnina světle špinavě šedohnědá, vláknitě tuhá.

Mikroznaky: Výtrusy protáhle vřetenovité, na proximálním konci mírně zakřivené a zašpičatělé, 10–15 × 4–5 μm, často s kapkou, neamyloidní. Basidie 25–45 × (5–)6–8 μm. Dužnina je monomitická, z tenkostěnných, nepravidelných, rozvětvených, zakřivených, přezkatých, hyalinních, 4–13 μm tlustých hyf, místy ztlustlých až na 28 μm v průměru; ve tření jsou přítomny také tlustostěnné generativní hyfy. Pokožka klobouku je tvořena shluky tenkých a dlouhých buněk, (35–)60–200 × 4–5 μm velkých.

Makrochemické reakce dužniny klobouku a rourek — KOH: během 2 minut lososově načervenalé zbarvení, které se nejprve projevuje čarou v místech připojení rourek ke klobouku, kde dosahuje též největší, až lososově červené sytosti; rourky po delší době chromově žluté až světle okrově žluté; dužnina po 15 minutách špinavě žlutá, pouze pod pokožkou klobouku a u připojení rourek zůstává načervenalá. — FeSO₄: do 5 minut

nemění barvu, po 15 minutách rourky slabě šedozelené. — Čpavek: dužnina barvu nemění; rourky po 10 minutách slabě citronově nažloutlé. — Fenol: dužnina slabě špinavě šedofialová, výrazněji pod povrchem klobouku. — Formaldehyd: rourky po 10 minutách slabě nažloutlé, rovněž dužnina těsně pod povrchem klobouku. — Melzerovo činidlo: dužnina ihned tabákově hnědá, v místech slaběji potřených chromově žlutá, rourky chromově žluté. — Anilin:



Albatrellus hirtus (Cooke) Donk — krásnopórka chlupatá. Dužnina klobouku (A), dužnina třeně (B) a výtrusy (C). — Context of the pileus (A), context of the stipe (B), and spores (C).

dužnina po 5 minutách slabě hnědočervená, rourky bledé. — Kyselina octová: dužnina nabírá ihned lehce nahnědlý tón, zvláště pod povrchem klobouku; rourky po 15 minutách vybledají.

Lokality: Železné hory, Horní Bradlo, asi 15 km západně od Hlinska, rezervace „Polom“ cca 1 km jižně od obce, asi 560 m n. m., na pařezu pravděpodobně smrku, 7. IX. 1987 leg. I. Košťálová (na stejném místě sbírali tentýž den také J. Valter, J. Mann a J. Švéda), det. A. Černý a V. Antonín, rev. F. Kotlaba a Z. Pouzar. Exsikáty jsou uloženy v BRNM CB 5002 a PRM 854497–8. Celkově byly nalezeny 2 dospělé a 3 mladé plodnice.

V Evropě byl *Albatrellus hirtus* sbírán vždy na mrtvých kmenech a pařezech smrku a jedle (Jahn 1973), v Severní Americe navíc ještě na *Pseudotsuga*, *Thuja* a *Tsuga* a v Asii na *Picea sajanensis* a *Abies nephrolepis*. Roste vždy v pozdním létě a na podzim (září – říjen). Doposud byl sbírán na třech kontinentech: v Evropě, kde je extrémně vzácný (Jülich 1984), v Severní Americe, kde je vzácný (Overholts 1953) a v Asii na Dálném Východě, kde jsou 4 lokality (Ljubarskij 1962). V Evropě byl poprvé sbírán v 70. letech minulého století na dvou lokalitách v Juře v okolí Neuchâtelu (Francie a Švýcarsko). S velkým časovým odstupem byl nalezen v roce 1969 ve Francii v Pyrenejích a v roce 1975 opět v okolí Neuchâtelu (Keller 1977). Uváděn je též z NSR (Jülich 1984). Zde publikovaný sběr je tedy šestou evropskou lokalitou na území čtvrtého státu.

Krásnopórka chlupatá vytváří jednoleté plodnice. Podle struktury třeně u nalezených exemplářů se zdá, že z jednoho třeně vyrůstá i více plodnic – po odumření jedné plodnice třeně „povyrosté“ a na něm se vytvoří plodnice další.

Systematické postavení tohoto druhu bylo dlouho dosti nejasné, takže byl zařazen postupně do několika rodů (Jahn 1973). Do skupiny krásnopórek jej do rodu *Scutigera* poprvé zařadil Murrill v r. 1915 a mnohem později jej Donk (1971) přeřadil na základě studia amerického materiálu do rodu *Albatrellus*. Stejný názor zastává i Pouzar (1972), neboť krásnopórka chlupatá vykazuje typické znaky rodu *Albatrellus* – má masité, jednoleté plodnice s třeněm a bílou, monomitickou dužninou tvořenou přezkatými, tenkostěnnými, místy nafouklými hyfami. Od ostatních druhů se liší větvenovitými výtrusy, hořkou chutí dužniny a růstem na dřevě. Na základě těchto rozdílných znaků vystavil Nuss (1980) pro tento druh nový monotypický rod *Jahnoporus*. Rozdíly mezi oběma rody jsou však poměrně malé a navíc se také shoduje stavba stěny výtrusů (Keller 1977); proto tento druh uvádíme pod rodovým jménem *Albatrellus*.

Summary

An interesting polypore, *Albatrellus hirtus* (Cooke) Donk, was collected on spruce stump during the excursion in nature reserve "Polom" in Železné hory Mts. (East Bohemia). It represents a new taxon for Czechoslovak fungus flora. A description in Czech after fresh material is given. A macrochemical reactions of pileus context and tube trama is published here for the first time. — KOH: During 2 minutes salmon-reddish colour, which appears at first in form of almost salmon-red line between context and tubes, tubes after longer time chromium-yellow or light ochraceous-yellow, context after 15 minutes dirty yellow, merely a zone under epicutis and between context and tubes remains reddish. — FeSO₄: Up to 5 minutes without change of colour, tubes after 15 minutes light gray-green. — NH₄OH: Context without change of colour, tubes after 10 minutes light lemon-yellowish. — Phenol: Light dirty gray-purple, more prominent under pileus epicutis. — Formaldehyde: Tubes and context under epicutis after 10 minutes light yellowish. — Melzer's reagens: Tubes chromium-yellow, trama immediately tobacco-brown or at places with lighter application of reagens chromium-yellow. — Anilin: Context after 5 minutes light brown-red, tubes pale. — Acetic acid: Context immediately light brownish, especially under pileus epicutis, tubes after 15 minutes become pale.

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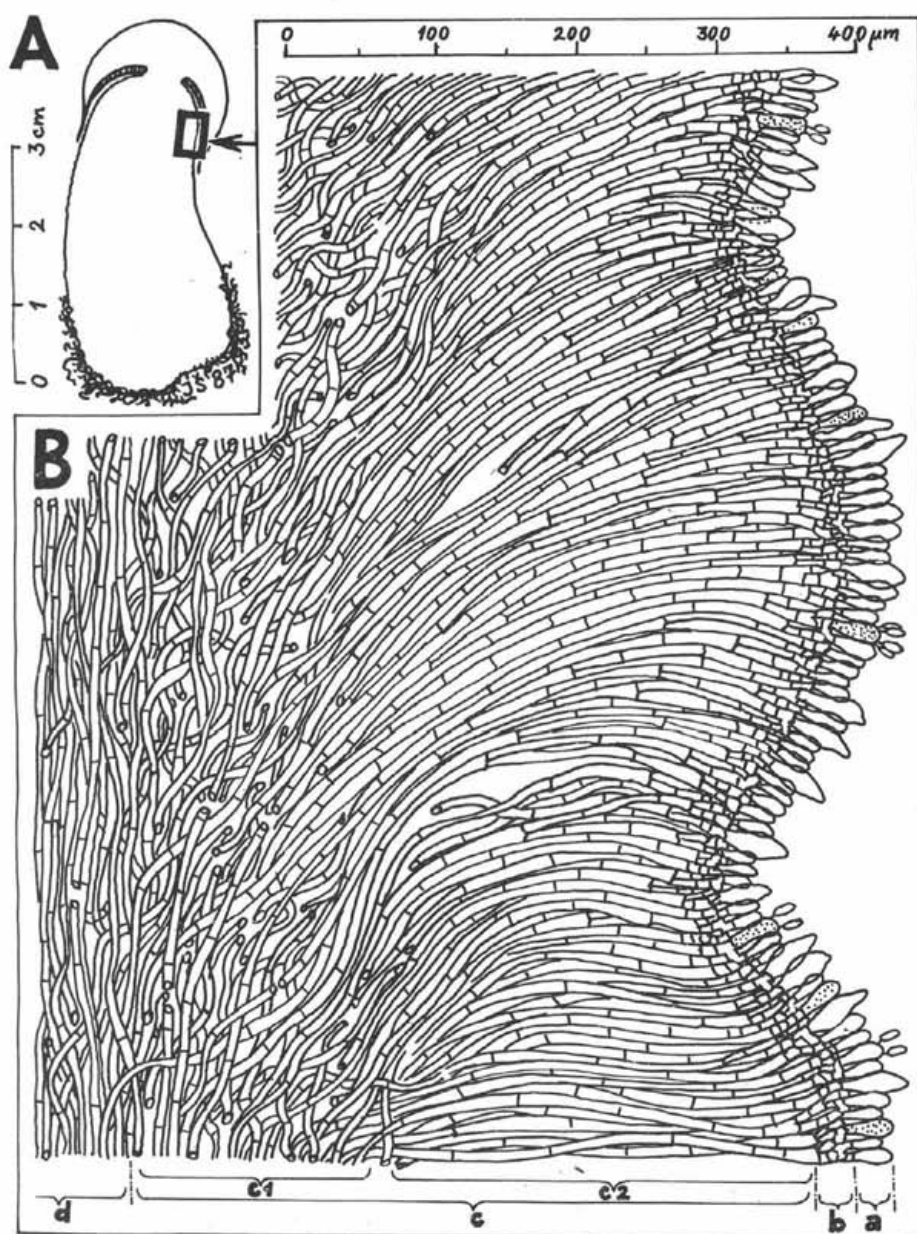
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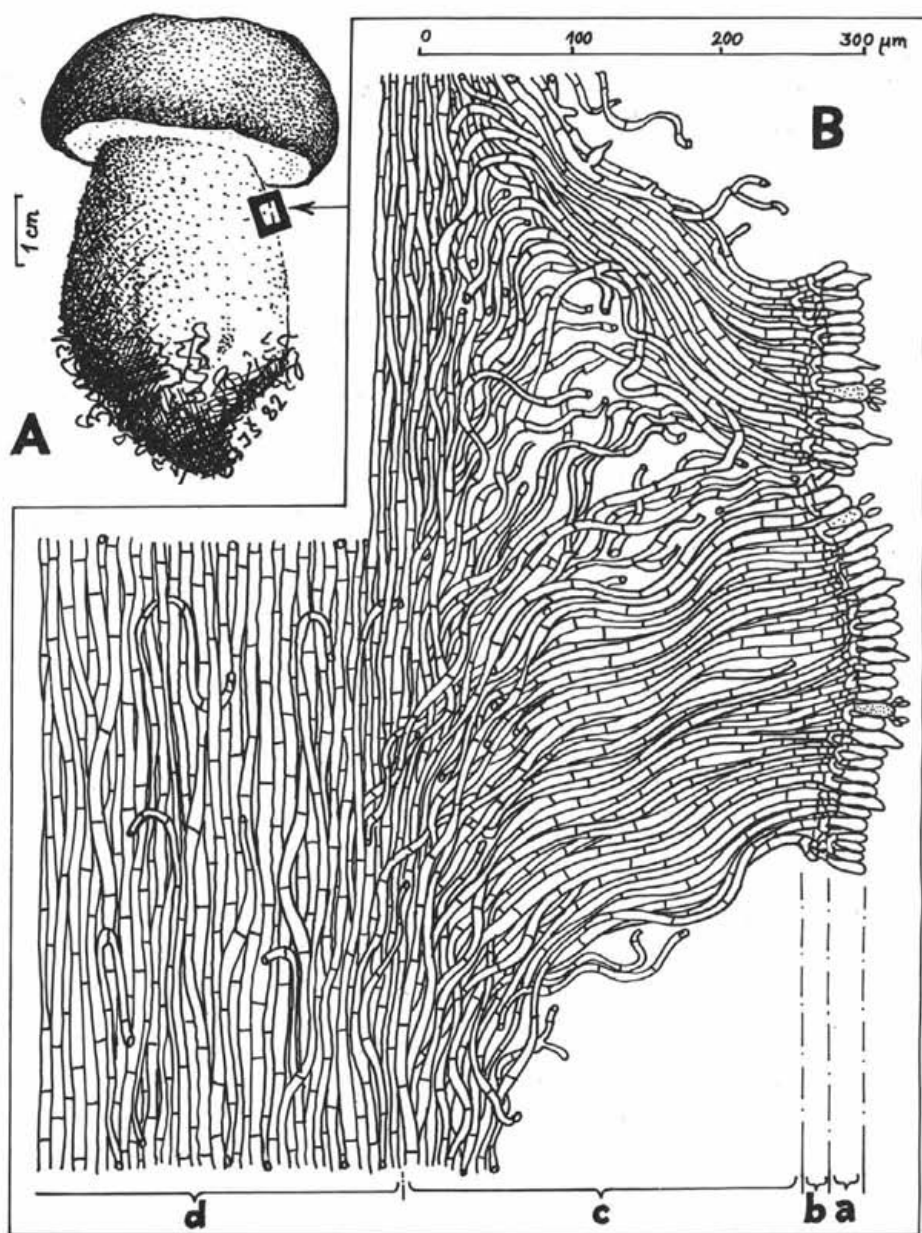
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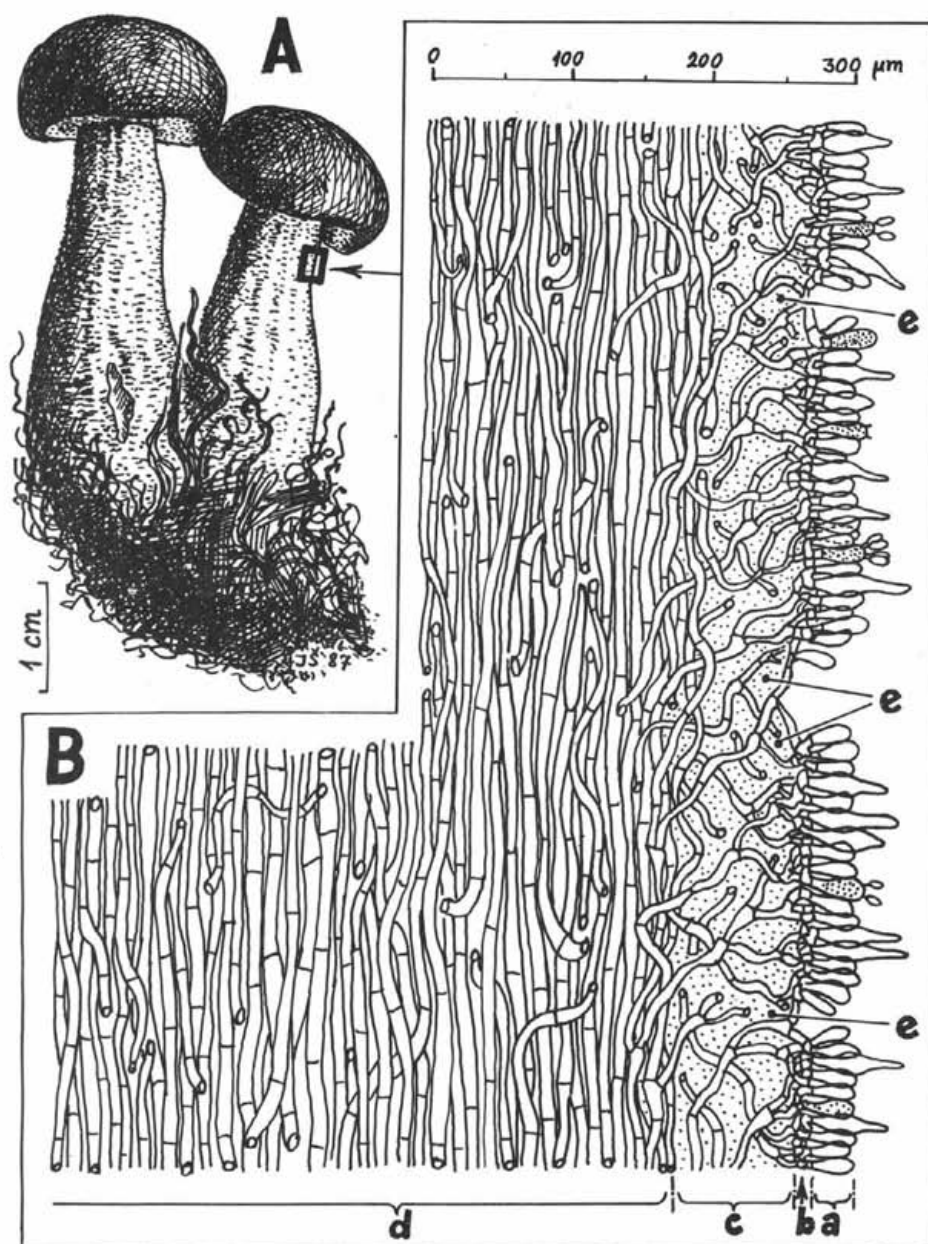
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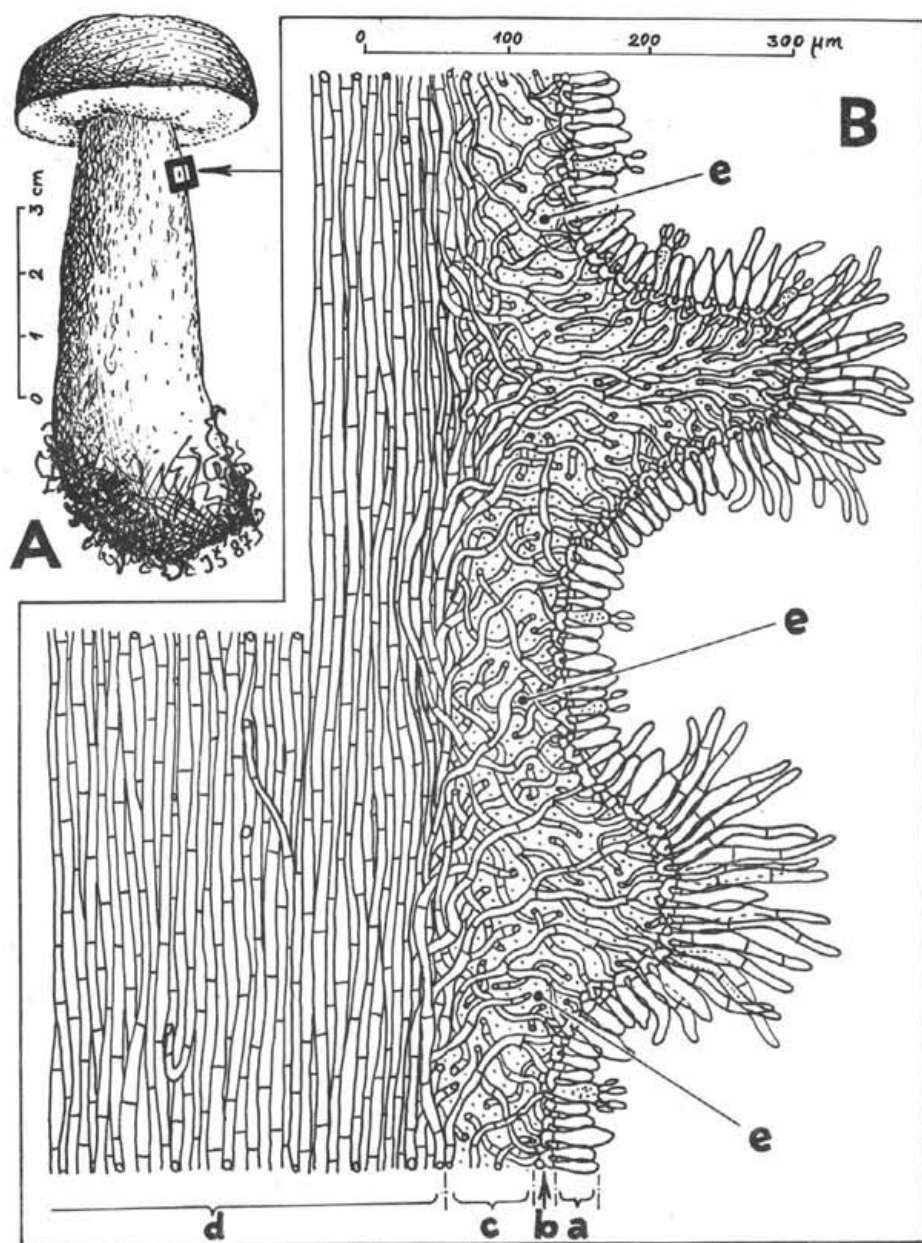
1. *Leccinum rufum*. A — a longitudinal section of a very young specimen (JŠ 3014). B — the stipe covering of the *Leccinum* type in the young, not disrupted stage; a — the caulohymenium; b — the caulosubhymenium; c — the stipe lateral stratum of the *Leccinum* type; c1 — the divergent part of the stipe lateral stratum; c2 — the anticlinal part of the stipe lateral stratum; d — the stipe trama proper.



2. *Leccinum fragrans*. A — a half-grown specimen (JŠ 1704). B — the stipe covering of the *Leccinum* type in the disrupted stage (one particle of the scabrous ornamentation); a — the caulohymenium; b — the caulosubhymenium; c — the disrupted lateral stratum of the *Leccinum* type; d — the stipe trama proper.



3. *Boletus erythropus*. A — half-grown specimens (JŠ 3126). B — the stipe covering of the *Boletus* type with the non-reticulate surface; a — the caulohymenium; b — the caulosubhymenium; c — the gelatinous, loosely arranged lateral stratum of the *Boletus* type; d — the stipe trama proper; e — the gelatinous matter.



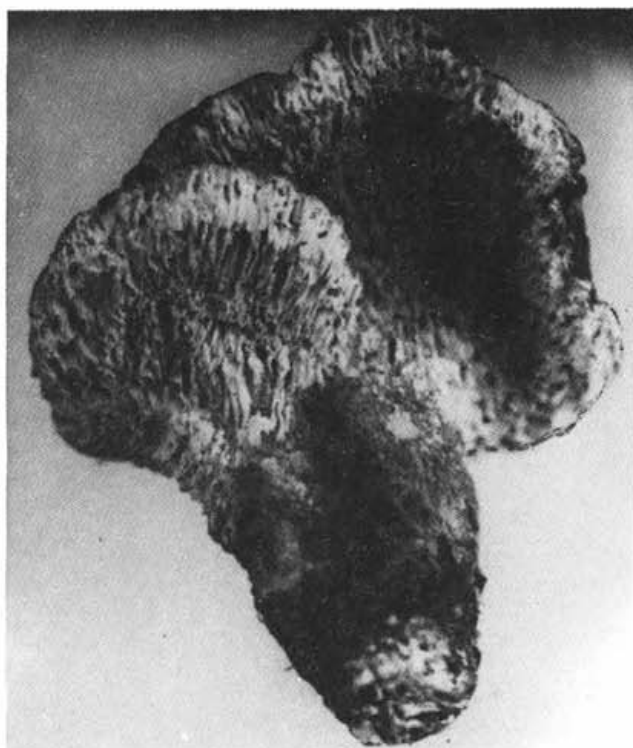
4. *Boletus edulis* (the type species of *Boletus*). A — a half-grown specimen (JŠ 3146). B — the stipe covering of the *Boletus* type with the reticulate surface; a — the caulohymenium; b — the caulosubhymenium; c — the gelatinous, loosely arranged lateral stratum of the *Boletus* type; d — the stipe trama proper; e — the gelatinous matter.



Albatrellus hirtus (Cooke) Donk — krásnooórka chlupatá. „Polom“ u Hor. Bradla, na pařezu smrku (?). 7. IX. 1987. — “Polom” near Hor. Bradlo (Bohemia), on a stump of *Picea abies*(?), 7. IX. 1987. 2.—1× Foto J. Valter



Albatrellus hirtus (Cooke) Donk — krásnopórka chlupatá. „Polom“ u Hor. Bradla, na pařezu smrku (?), 7. IX. 1987. — “Polom“ near Hor. Bradlo (Bohemia), on a stump of *Picea abies*(?), 7. IX. 1987. 2.—1× Foto J. Valter



Albatrellus hirtus (Cooke) Donk — kůsnobórka chlupatá. „Polom“ u Hor. Bradla, na pařezu smrku (?), 7. IX. 1987. — „Polom“ near Hor. Bradlo (Bohemia), on a stump of *Picea abies*(?), 7. IX. 1987. 2, 3X. Foto F. Kotlaba



Albatrellus hirtus (Cooke) Donk — krásnopórka chlupatá. „Polom“ u Hor. Bradla, na pařezu smrku (?), 7. IX. 1987. — “Polom” near Hor. Bradlo (Bohemia), on a stump of *Picea abies*(?), 7. IX. 1987. 2, 3X. Foto F. Kotlaba

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4. Vlastní rukopis, tj. strojopis (30 řádek na stránku po 60 úhozech na řádku, nejvýše s 5 opravenými překlepy, škrty nebo vpisy na stránku), musí být psán černou páskou a normálním typem stroje (ne „perlčkou“); za každým interpunkčním znaménkem (tečkou, dvojtečkou, čárkou, středníkem) se dělá mezera. Při uvádění makro- a mikroznaků se přidržujte tohoto vzoru: (8-10,5-12(-13,5) x 4-5 μm (mezery jsou pouze před a za znaménkem „x“ a před zkratkou míry; jen v angličtině se dělají tečky místo desetinných čárek). Nepřipouští se psaní nadpisů a autorských jmen velkými písmeny, prostrkávání písmen, podtrhávání nadpisů, slov či celých vět v textu apod. Veškerou typografickou úpravu rukopisu pro tiskárnu provádí redakce sama. Autor může označit tužkou po straně rukopisu části, které doporučuje vysadit drobným písmem (petitem) nebo podtrhnout pferušovanou čarou části vět, které chce zdůraznit.

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6. Pravidla citování literatury, jakož i seznam vybraných periodik a jejich zkratek jsou zahrnuty v publikacích, které vyšly jako přílohy Zpráv Čs. botanické společnosti při CSAV - Zpr. Čs. Bot. Společ., Praha, 13 (1978), append. 1: 1-85, et 14 (1979), append. 1: 1-121. (Tyto publikace lze zakoupit v sekretariátu Čs. botanické společnosti, Benátská 2, 128 01 Praha 2.)

7. Při citování ročníku časopisu nebo dílu knihy používáme jen arabské číslice.

8. Druhové latinské názvy se píše s malým písmenem, i když je druh pojmenován po některém badateli, přičemž háčky a čárky se vypouštějí (např. *Sclerotinia veselyi*, *Geastrum smardae*).

9. Při uvádění dat sběrů píšeme měsíce výhradně římskými číslicemi (2. VI. 1982).

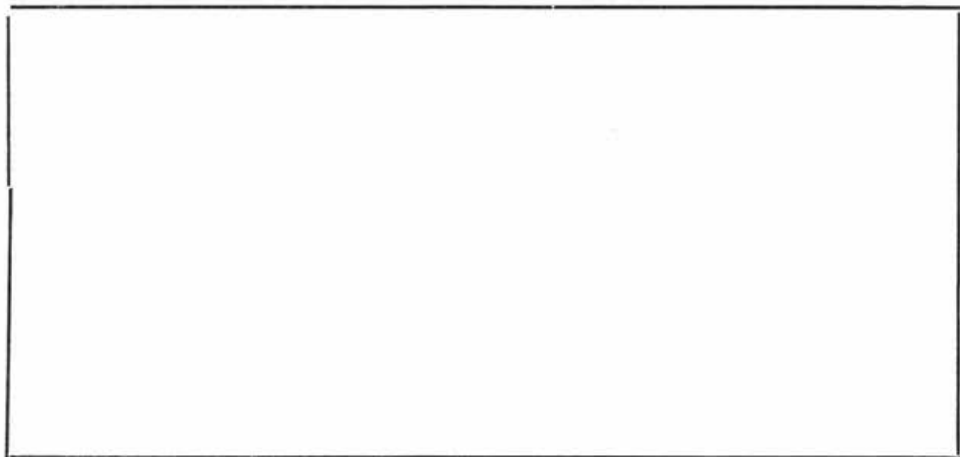
10. Při citování herbářových dokladů uvádějí se zásadně mezinárodní zkratky herbářů (viz Index herbariorum 1981; např. BRA - Slovenské národní múzeum, Bratislava; BRNM - botanické odd. Moravského muzea, Brno; BRNU - katedra biologie rostlin přírod. fakulty UJEP, Brno; PRM - mykologické odd. Národního muzea, Praha; PRC - katedra botaniky přírod. fakulty UK, Praha). Soukromé herbáře citujeme nezkráceným příjmením majitele (např. herb. Herink) a stejně nezkracujeme herbáře ústavů bez mezinárodní zkratky.

11. Při popisování nových taxonů nebo nových kombinací autoři se musí přidržovat zásad posledního vydání mezinárodních nomenklatorických pravidel - viz Holub J. (1968 et 1973): Mezinárodní kód botanické nomenklatury 1966 a 1972. - Zpr. Čs. Bot. Společ., Praha, 3, append. 1, et 8, append. 1; týká se to převážně uvádění typů a správné citace basionymu.

12. Adresa autora nebo jeho pracoviště se uvede až na konci článku pod citovanou literaturou.

13. Ilustrační materiál (kresby, fotografie) k článkům se čísluje průběžně u každého článku zvlášť, a to arabskými číslicemi (bez zkratek obr., fig., apod.) v tom pořadí, v jakém má být uveřejněn. Fotografie musí být dostatečně kontrastní a ostré, perokresby (tuši) nesmí být příliš jemné; všude je třeba uvádět zvětšení. Text k ilustracím se píše na samostatný list.

14. Separáty prací se tisknou na účet autora; na sloupcovou korekturu autor poznamená, žádá-li separáty a jaký počet (70 kusů, výjimečně i více).



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- I. *Leccinum rufum* (Schaeff.) Kreisel
- II. *Leccinum fragrans* (Vitt.) Šutara
- III. *Boletus erythropus* Pers.
- IV. *Boletus edulis* Bull.
- V. — VIII. *Albatrellus hirtus* (Cooke) Donk

Contentus et index nominum generum atque specierum
fungorum vol. 42 (1988) (M. Svrčková et M. Svrček)