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Revision and reclassification of some Chaetosphaeria species

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Réblová M. (1997): Revision and reclassification of some Chaetosphaeria species. – Czech Mycol. 50: 73–83

Revision of the type and other herbarium material of seven species previously placed in *Chaetosphaeria* Tul. et C. Tul. revealed that they need to be transferred to modern genera. Two new species, *Calonectria rajasthanensis* sp. nov. and *Eriosphaeria subtomentosa* sp. nov. are described and a new combination, *Pseudotrichia xanthotricha* (Berk. et Broome) comb. nov. is proposed. Four synonymous names are mentioned under other species names: *Chaetosphaeria patelliformis* Rick is identified with *Byssosphaeria rhodomphala* (Berk.) Cooke and *Chaetosphaeria africana* Saccas, *Chaetosphaeria coffeae* Saccas and *Chaetosphaeria rehmiana* (P. Henn.) Kirschst. are identified with *Melanochaeta hemipsila* (Berk. et Broome) E. Müll., Harr et Sulmont.

Key words: Ascomycetes, *Chaetosphaeria*, revision, taxonomy.

Réblová M. (1997): Revize a systematické zařazení některých druhů rodu Chaetosphaeria. – Czech Mycol. 50: 73–83

Revize typového a dalšího herbářového materiálu sedmi druhů, původně umístěných v rodu *Chaetosphaeria* Tul. et C. Tul., ukázala nezbytnost jejich přeřazení do jiných askomycetových rodů. Jsou popsány dva nové druhy, *Calonectria rajasthanensis* sp. nov. a *Eriosphaeria subtomentosa* sp. nov. a je navržena jedna nová kombinace, *Pseudotrichia xanthotricha* (Berk. et Broome) comb. nov. Jména ostatních studovaných druhů jsou zmíněna v synonymice příslušných taxonů. *Chaetosphaeria patelliformis* Rick je ztotožněna s *Byssosphaeria rhodomphala* (Berk.) Cooke a *Chaetosphaeria africana* Saccas, *Chaetosphaeria coffeae* Saccas a *Chaetosphaeria rehmiana* (P. Henn.) Kirschst. jsou ztotožněny s druhem *Melanochaeta hemipsila* (Berk. et Broome) E. Müll., Harr et Sulmont.

INTRODUCTION

During a revision of *Chaetosphaeria* Tul. et C. Tul. several species were found which did not match the generic concept given by Tulasne and Tulasne (1863) and which was later re-established by Booth (1957, 1958). Study of their type and other herbarium material revealed the necessity to exclude them from *Chaetosphaeria* and transfer them to modern genera. Five genera, i.e. *Byssosphaeria* Cooke, *Calonectria* De Not., *Eriosphaeria* Sacc., *Melanochaeta* E. Müll., Harr et Sulmont and *Pseudotrichia* Kirschst., were found to accommodate the examined species. *Chaetosphaeria immersa* Tul. and *Chaetosphaeria rajasthanensis* Kaur were not validly published and are therefore proposed as new species: *Eriosphaeria subtomentosa* sp. nov. and *Calonectria rajasthanensis* sp. nov. respectively. *Pseudotrichia xanthotricha* (Berk. et Broome) comb. nov. is proposed. Finally, four species are identified with already known taxa and they are included in the synonymy. *Chaetosphaeria patelliformis* Rick is identified with *Byssosphaeria rhodomphala* and *Chaetosphaeria africana* Saccas, *Chaetosphaeria coffeae* Saccas and *Chaetosphaeria rehmiana* (P. Henn.) Kirschst. are identified with *Melanochaeta hemipsila* (Berk. et Broome) E. Müll., Harr et Sulmont.

Material and methods

Herbarium specimens were rehydrated in 3 % KOH and subsequently studied in 100 % lactic acid, cotton blue in lactic acid or Melzer's reagent. The latter, usually used in the study of Basidiomycetes, provided to be a very good optical medium to observe hyaline details (paraphyses, ornamentation and septation of ascospores). Photographs were taken in Melzer's reagent. Abbreviations of the herbaria and institutes which kindly lent the material are cited in accordance with Index herbariorum (Holmgren et al. 1990).

Results and discussion

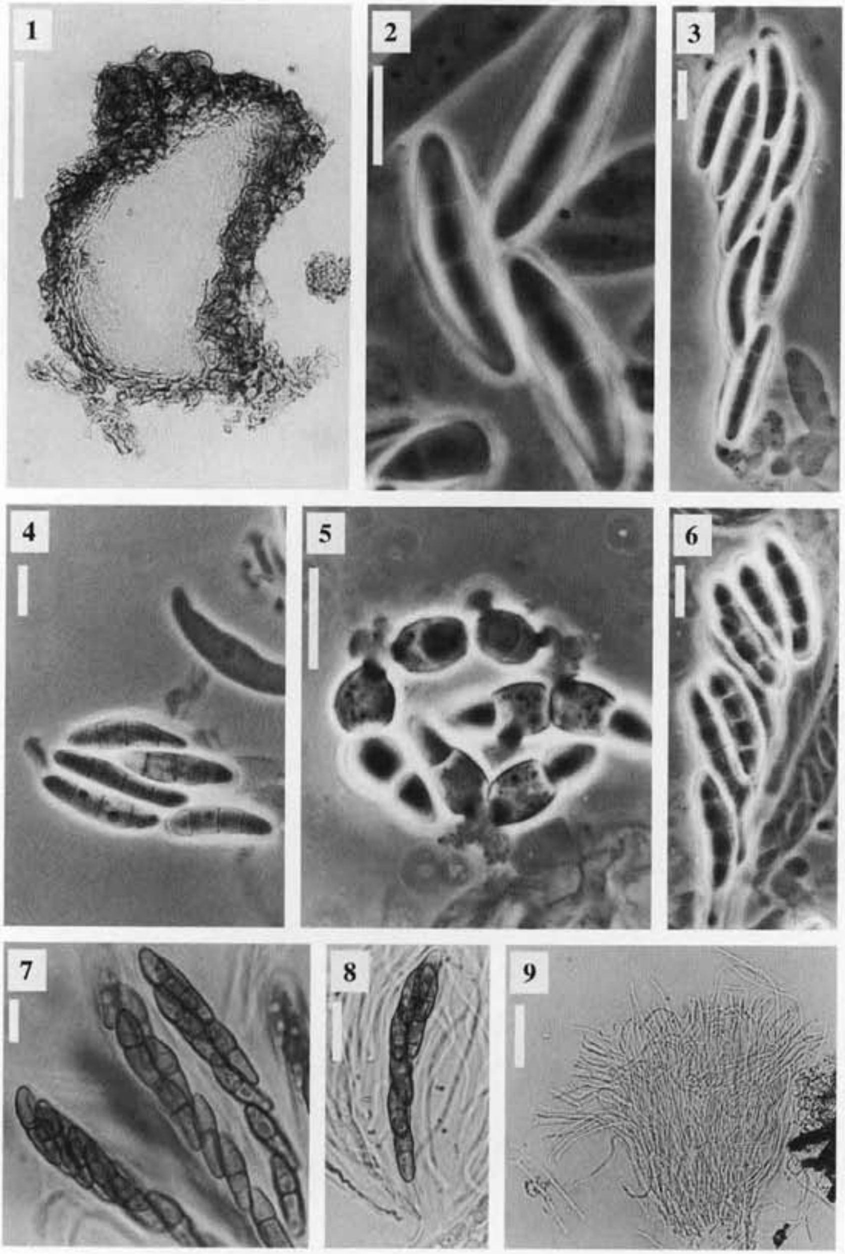
Unless otherwise indicated, accepted names are preceded by an asterisk.

1. *Chaetosphaeria rajasthanensis* Kaur, Indian J. Mycol. Pl. Pathol. 21: 258, 1991. (Not validly published. Arts. 37.1., 37.4.)
* = **Calonectria rajasthanensis** Réblová, sp. nov.

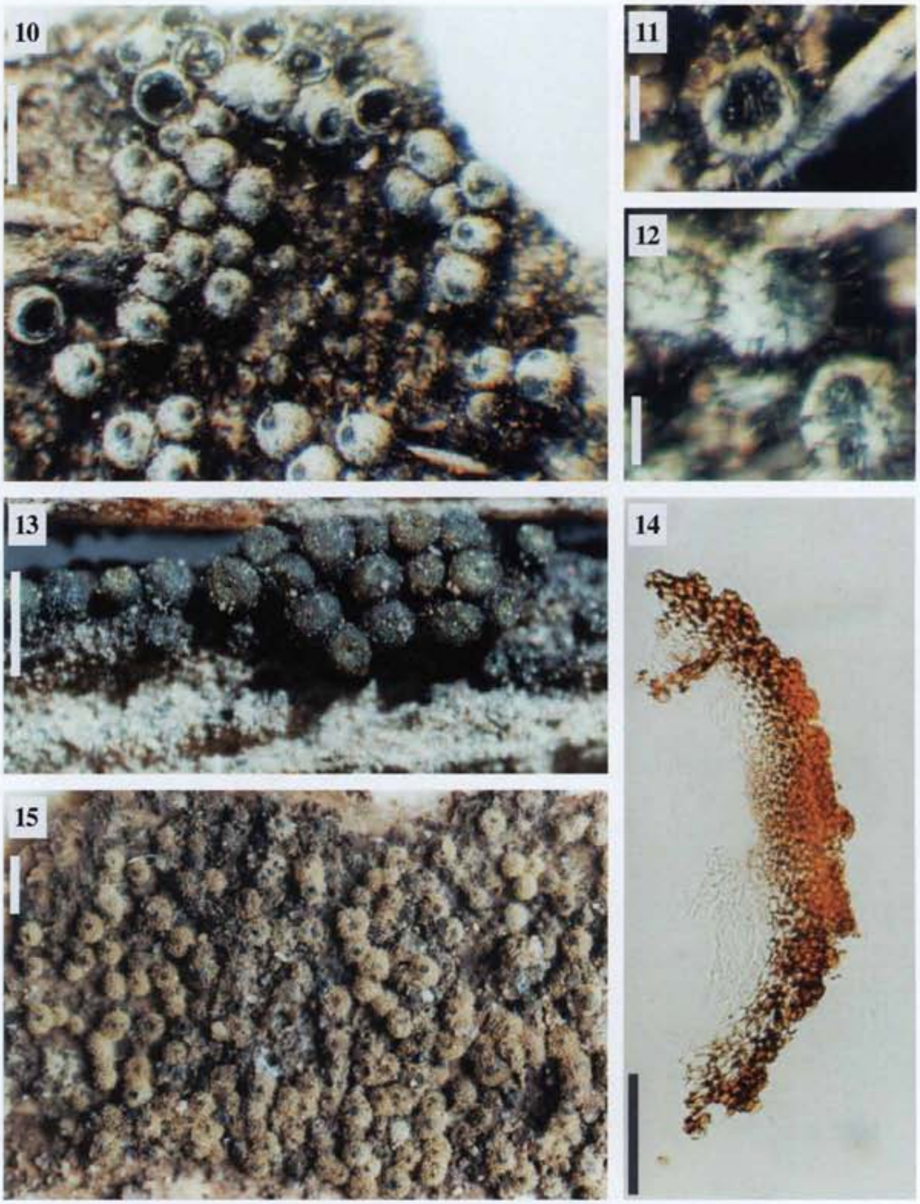
Figs 1-6; 16 a-b.

Ascomata in superficie ligni sparsa, ovoidea, obscre rubro-violacea, 180-210 μm lata, 200-250 μm alta, tuberculata, sicca collabentia undique compressa. Asci 80.8-86.1 × 19.9-25.2 μm, unitunicati, clavati usque cylindracei, 8-spori. Ascosporae 23.7-27.8 × 5.6-7.2 μm, 2-3-seriate, fusiformes, plerumque 3-septatae, sed nonnumquam etiam 5-6-septatae, maturae subtiliter verrucosae.

Holotypus: India, Rajasthan, in colle Abu; ad lignum putridum (*Saccharum*?), 10. IX.1975, leg. K. S. Panwan (IMI 197032).



Figs 1-9. 1-6. *Calonectria rajasthanensis* Réblová (K 197032): 1. vertical section of the ascoma (scale 100 μm), 2. ascospores, 3. ascus with ascopores, 4. ascospores, 5. overripe ascospores, 6. ascus with ascospores (scale 10 μm); 7-9. *Byssosphaeria rhodomphala* (Berk.) Cooke (PACA 12672): 7. asci with ascospores (scale 10 μm), 8. ascus with ascospores (scale 20 μm), 9. trabeculate pseudoparaphyses (scale 10 μm).



Figs 10-15. 10. *Melanochaeta aotearoae* (S. Hughes) E. Müll., Harr et Sulmont (DAOM 93903b): group of ascomata (scale 1000 μm); 11-12. *Melanochaeta hemipsila* (Berk. et Broome) E. Müll., Harr et Sulmont (PC 407): ascomata covered by capitatae hyphae (scale 250 μm); 13-14. *Byssosphaeria rhodomphala* (Berk.) Cooke (PACA 12672): 13. group of ascomata (scale 1000 μm), 14. vertical section of the upper part of the ascoma showing the reddish pulverulence at the top (scale 80 μm); 15. *Pseudotrichia xanthotricha* (Berk. et Broome) Réblová (K 37410): group of ascomata (scale 1000 μm).

Ascomata scattered on the surface of bare wood, developing on small inconspicuous stromata composed of pseudoparenchymatous cells. Ascomata ovoidal, dark reddish-brown to violaceous, 180-210 μm wide and 200-250 μm high, warted, collapsing by lateral pinching when dry. Peridium 23-35 μm wide, consisting of an outer dark reddish-brown layer *textura globulosa*, the cells are large, globose to oval and form prominent pustules 35-40 μm high at the exterior. Inner layer of thinner-walled, flattened, subhyaline cells. Asci unitunicate, 8-spored, 80.8-86.1 × 19.9-25.2 μm, clavate to cylindric, apical opening undifferentiated. Interthecial filaments not observed. Ascospores 2-3-seriate, partially overlapping in the ascus, 23.7-27.8 × 5.6-7.2 μm, fusiform, predominantly 3-septate but occasionally 2 or 3 additional septa may develop. Ascospores becoming slightly verrucose on the surface with increasing age. Some over-ripe ascospores were observed to be strongly constricted.

Holotype: India, Rajasthan, Mt. Abu; on dead wood (*Saccharum*?), 10. IX.1975, leg. K. S. Panwan (IMI 197032).

Note: Kaur (1992) described *Chaetosphaeria rajasthanensis*, but this name was not validly published (Arts. 37.1, 37.4., Code 1994). The correct position of this fungus seems to be in *Calonectria* De Not. The epithet ' *rajasthanensis*' is adopted here in honour of the author's usage.

The genus *Calonectria* was separated from the related *Nectria* Fr.: Fr. and *Ophionectria* Sacc. on the basis of the ascoma wall structure of the type species *Calonectria pyrochroa* (Desm.) Sacc. with a *Cylindrocladium* anamorph (Rossman 1979a, b).

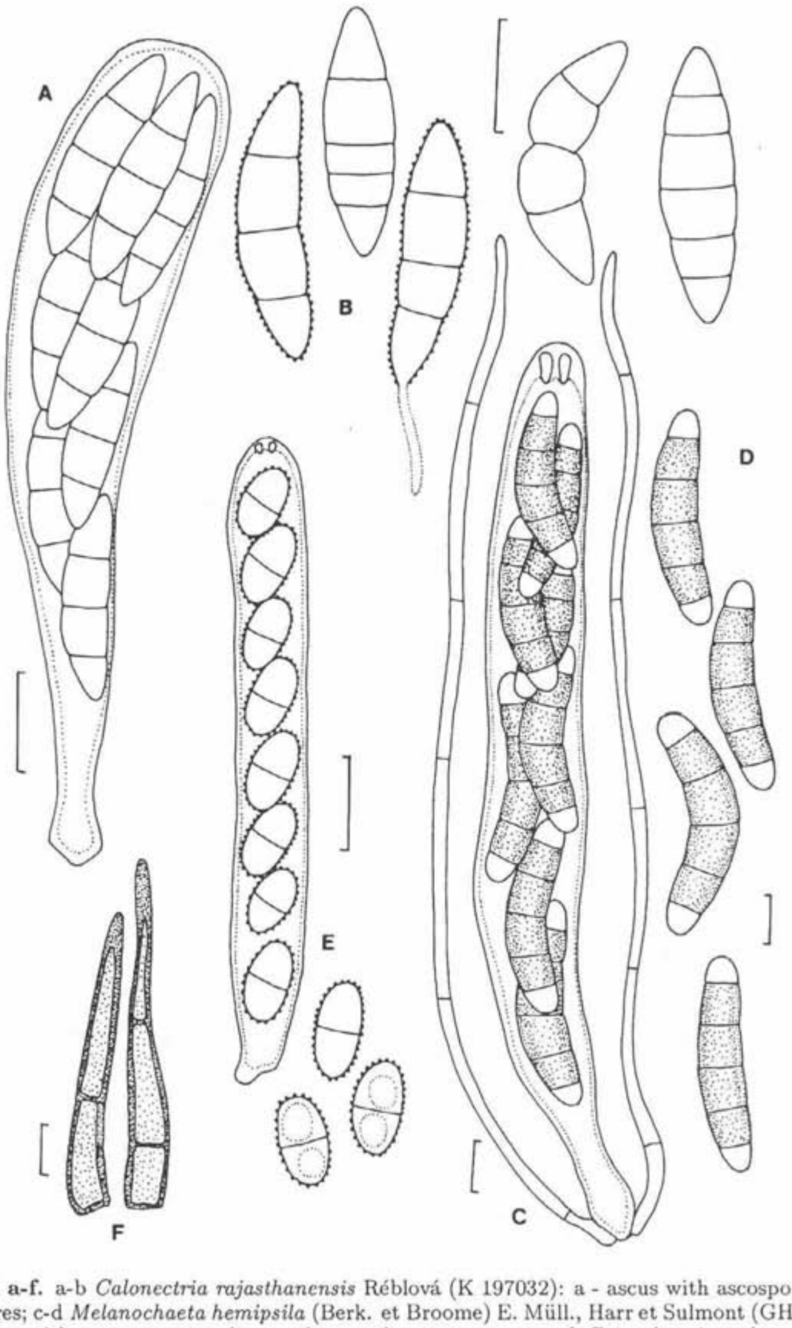
2. *Chaetosphaeria immersa* Tul. sensu Rabenhorst in Hedwigia 5: 189, 1866. (Nomen nudum)
* = **Eriosphaeria subtomentosa** Réblová, sp. nov.

Figs 16 e-f.

Ascomata superficialia, sparsa vel subgregaria, basi parum immersa, globosa vel subglobosa, 150-200 μm lata, subiculo obscuro laxe intricato insidentia. Asci 65.1-80.8 × (6.3-)7-7.3(-8.4) μm, unitunicati, 8-spori. Ascosporae 10.5-11.5 (-12.6) × 4.0-4.2(-5.2) μm, hyalinae, ovoideae, bicellulares, non strangulatae, polis late rotundatis, maturae distincte verrucosae.

Holotypus: Rabenhorst's Fungi europaei No. 925, (Great Britain, Lucknam; ad lignum *Pini* sp., IV.1865, leg. C. E. Broome, PRM 656901).

Eriosphaeria subtomentosa is a lignicolous saprophyte on bare coniferous wood. Ascomata superficial, scattered or in small groups, base slightly im-



Figs 16 a-f. a-b *Calonectria rajasthanensis* Réblová (K 197032): a - ascus with ascospores, b - ascospores; c-d *Melanochaeta hemipsila* (Berk. et Broome) E. Müll., Harr et Sulmont (GH 3080): c - ascus with ascospores and paraphyses, d - ascospores; e-f *Eriosphaeria subtomentosa* Réblová (PRM 656901): e - ascus with ascospores, f - setae growing out of the ascomatal wall (scale 10 μm).

mersed, globose to subglobose, 150-200 μm wide, seated on a sparse dark subiculum. Ascomata bearing septate, dark brown setae up to 90 μm long, 2.0-2.2 μm wide in the middle, tapering and pointed to rather blunt at the top. Ascomatal wall 17-22 μm wide, consisting of compressed, thick-walled cells which become thinner-walled and hyaline towards the interior. Asci unitunicate, 8-spored, 65.1-80.8 × (6.3-)7-7.3(-8.4) μm, rounded at the apex, apical annulus indistinct. Interthecial filaments not observed. Ascospores 10.5-11.5(-12.6) × 4.0-4.2(-5.2) μm, hyaline, oval, 2-celled, non-constricted, broadly rounded at the ends, at maturity distinctly verrucose.

Holotype: Rabenhorst's Fungi europaei No. 925, (Great Britain, Lucknam; on wood of *Pinus* sp., IV.1865, leg. C. E. Broome, PRM 656901).

Note: Although Rabenhorst (1866), in his set of exsiccatae published this species as *Chaetosphaeria immersa* Tul., Casp. II, a print mistake in the literature citation that should probably refer to L. R. Tulasne's and C. Tulasne's Selecta Fungorum Carpologia, Vol. 2. (1863). Nevertheless, those authors did not describe this fungus. The only *Chaetosphaeria* included is *Chaetosphaeria innumera* (Berk. et Broome) Tul. et C. Tul. which is designated as the type of the genus. The only epithet *immersa* mentioned by the authors belongs to *Sphaeria immersa* Sowerb. (Selec. Fung. Carp. 2, 1863: 13) and has no connection to *Chaetosphaeria*. Gams and Holubová-Jechová (1976) revised Rabenhorst's exsiccatae of *Chaetosphaeria immersa* located in the L and K herbaria. In the former they found the *Chloridium botryoideum* (Corda) S. Hughes var. *minutum* (Sacc.) W. Gams et Hol.-Jech. anamorph of *Chaetosphaeria innumera* and the latter contained the *Chloridium pachytrachelum* W. Gams et Hol.-Jech. anamorph of *Chaetosphaeria lentomita* W. Gams et Hol.-Jech. The exsiccate preserved in the PRM herbarium contains an entirely different fungus distinct from *Chaetosphaeria innumera* and *C. lentomita*. Based on its ascoma and ascospore anatomy the fungus is a distinct species of *Eriosphaeria* Sacc. and is described as a new species.

Eriosphaeria vermicularia (Nees: Fr.) Sacc. is closely related to *Eriosphaeria subtomentosa*, but differs in having smaller asci (45-55 × 7-8 μm) and smaller, smooth-walled ascospores (7-9 × 3-4 μm). *Eriosphaeria horridula* (Wall.) Sacc., occurring on decayed wood of deciduous trees, e.g. *Fraxinus* and *Pyrus*, differs in somewhat smaller asci (60-70 × 12-14 μm), slightly thickened at the apex and larger (13-16 × 6-8 μm), smooth-walled ascospores, enclosed by a hyaline, firm epispore (Müller 1953).

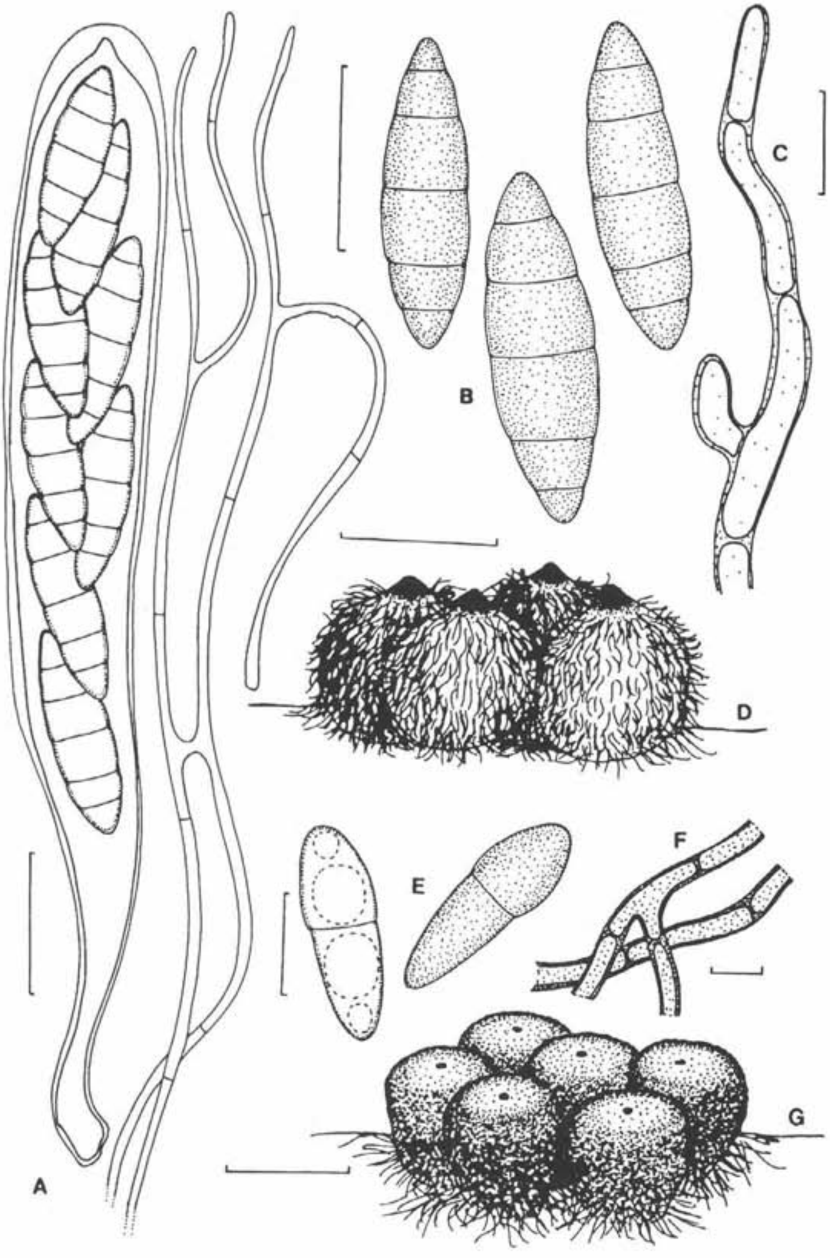
The genus *Eriosphaeria* Sacc. is characterized by small-sized, setose, superficial ascomata, which are sitting without or in a sparse subiculum or on a thin hypostroma; two-celled, oval ascospores and the presence of early dissolving paraphyses. It is well distinct from related genera, i.e. *Chaetosphaeria* with superficial, non-setose ascomata (except for species associated with anamorphs possessing sterile setae), which have hyaline, two- or multi-septate ascospores, a well-developed apical annulus and persistent, rarely later dissolving paraphyses; *Trichosphaerella* Bomm., Rouss. et Sacc., which possesses small, setose ascomata, hyaline, 2-celled ascospores disarticulating into parts and early dissolving paraphyses and *Trichosphaeria* Fuckel with setose ascomata but hyaline, continuous ascospores and early dissolving paraphyses.

3. *Chaetosphaeria xanthotricha* (Berk. et Broome) Sacc., Syll. Fung. 2: 95, 1883.
≡ *Sphaeria (Villosae) xanthotricha* Berk. et Broome, Journ. Linn. Soc., Bot. 14: 127, 1873 (basionym).
* ≡ **Pseudotrichia xanthotricha** (Berk. et Broome) Réblová, comb. nov.
Figs 15; 17 a-d.

Material examined: Sri Lanka, Central Province; indetermined wood of monocotyledon, XII. 1868, leg. Thwaites [K 37410 - holotype of *Sphaeria* (*Villosae*) *xanthotricha* Berk. et Broome].

The fungus is a lignicolous saprophyte. Ascomata superficial, gregarious, globose to subglobose, 400-500 μm wide, covered by a bright yellow layer except for a black, glabrous, conical papilla; ascomatal wall 85-95 μm thick, composed of thick-walled, brown, pseudoparenchymatous cells, the superficial bright layer is 50-75 μm thick, of pale yellow, septate, branched, 3.8-4.2 μm wide hyphae. The hyphae extend slightly over the substratum at the base. Asci bitunicate, 8-spored, 72.4-84.0 $\times$ 10.5-11.5 μm, clavate, stipitate, rounded at the apex. Interthecial filaments are trabeculate pseudoparaphyses, filiform, septate, branching, anastomosing. Ascospores 17.8-19.9 $\times$ 4.2-5.2 μm, biseriate and partially overlapping in the ascus, fusiform, pale brown, (4-)5-septate with the two middle cells larger than the others, constricted at the septa.

Note: *Sphaeria* (*Villosae*) *xanthotricha* was transferred by Saccardo (1883) to *Chaetosphaeria* Tul. et C. Tul. Petch (1917) reviewed the type material and retained the species in *Chaetosphaeria*, but he stated that it would perhaps agree better with *Lasiosphaeria* than with *Chaetosphaeria*. The correct position of Berkeley's and Broome's fungus seems to be in *Pseudotrichia*. This species differs from all the species of *Pseudotrichia* Kirschst. previously described [i.e. *P. guatopoensis* S. M. Huhndorf, *P. mammilata* M. E. Barr, *P. mutabilis* (Pers.: Fr.) Wehmeyer and *P. pachnostoma* (Berk. et Curtis in Cooke) M. E. Barr] in having pale brown, (4-)5-septate, small-sized ascospores. The closest species are *P. mammilata* with 5-septate, light brown, 33-40 $\times$ 5-6 μm large ascospores and *P. guatopoensis* with 3-5-septate, hyaline and 40-52 $\times$ 6.5-8 μm large ascospores



Figs 17 a-g. a-d *Pseudotrichia xanthotricha* (Berk. et Broome) Réblová (K 37410): a - ascus with ascospores and trabeculate pseudoparaphyses, b - ascospores, c - hypha of subiculum (scale 10 μm), d - habit sketch of ascomata (scale 500 μm); e-g *Byssosphaeria rhodomphala* (Berk.) Cooke (PACA 12672): e - ascospores, f - hyphae of subiculum (scale = 10 μm), g - habit sketch of ascomata (scale 500 μm).

enclosed by a sheath. All species were reported from the tropical region of South America except for *P. mutabilis* which is known also from the temperate zone of both Europe and North America (Barr 1984; Huhndorf 1994; Réblová and Svrček 1997). *P. xanthotricha* is reported from the tropical region of Asia. It well confirms the suggestion (Huhndorf 1994) that the genus is probably widespread in tropical regions and research into it should be focused on these areas.

Pseudotrichia viburnicola (Crouan et H. Crouan) Rossman based on *Nectria viburnicola* Crouan et H. Crouan is another species of the genus (Rossman 1987). The species has immersed, dark-brown ascomata erumpent by bright yellow-orange papillae surrounded by a poorly developed clypeus. Ascospores are long-fusiform, hyaline, 5-9-septate, becoming golden-brown with age. The fungus evidently does not match the concept of *Pseudotrichia* and it is better accommodated in *Massarina*, as was previously suggested by Rossman (1979).

According to Barr (1984, 1990), the anamorph of *Pseudotrichia* is unknown. Petch (1917) in his revision of the Ceylon material mentioned the presence of oval, continuous conidia, 5-7 × 3-4 μm large, probably borne on the external hyphae. Those spores, conidiophores nor conidiogenous cells connected to hyphae of the bright superficial layer, have not been observed.

4. *Chaetosphaeria patelliformis* Rick, Broteria, 2(3): 136, 1933.
* = **Byssosphaeria rhodomphala** (Berk.) Cooke, Grevillea 15: 81, 1887.
For full synonymy and description refer to Barr (1984: 32, 1990: 14).

Figs 7-9; 13; 14; 17 e-g.

Material examined: Brazil, Sao Leopoldo; on wood of deciduous tree, 1933, leg. Braun (PACA 12666 - holotype of *Chaetosphaeria patelliformis* Rick). - Brazil, Sao Leopoldo; on wood of deciduous tree, 1933, leg. Braun (PACA 12672). - Brazil, San Salvador; on indetermined wood, 1. IX.1944, leg. Rick (PACA 22536). - Brazil, Sao Leopoldo; on wood of deciduous tree, 1933, leg. Rick (PACA 12670). - Brazil, Sao Leopoldo; on wood of deciduous tree, 1933, leg. Rick (PACA 12676).

Note: All examined specimens agree well with the description of *Byssosphaeria rhodomphala* given by Barr (1984) except for the ascospores which, according to the author, should be occasionally provided by delicate terminal appendages. These characters have not been observed in any of the examined collections.

Byssosphaeria rhodomphala is a well distinguishable taxon having reddish to orange pulverulence around the porus at the flattened top of the ascoma, two-celled, asymmetrically septate brown ascospores (21.0-23.1 × 7.3-8.4 μm), cylindric, bitunicate asci (103.5-135.7 × 12.6-14.7 μm) and trabeculate pseudoparaphyses (1.0-1.5 μm wide). The endotunica of immature asci is distinctly thickened at the top. The fungus is most closely related to *Byssosphaeria xestothele* (Berk. et Curtis) M. E. Barr, which has similar reddish pigmentation around the pore area but 1-3-septate, hyaline, at maturity pale brown, (17-)22-28 × 4-6 μm large ascospores. The allied *Byssosphaeria schiedermayeriana* (Fuckel) M. E. Barr, also possesses bright reddish pigmentation around the porus but ascospores are 1-(3-5)-septate, light brown, (15-)32-42 × 5-8(-9) μm.

The genus *Byssosphaeria* Cooke accommodates a group of fungi separated from *Herpotrichia* Fuckel (Barr 1984). The latter genus has a pleosporaceous centrum and is a member of the Lophiostomataceae, whereas *Byssosphaeria*, which has a melanommataceous centrum, is placed in the Melanommataceae Winter. For differences between these two genera and families see Barr (1984, 1987).

5. *Sphaeria hemipsila* Berk. et Broome, Jour. Linn. Soc., Bot., 14: 126, 1873.
≡ *Lasiosphaeria hemipsila* (Berk. et Broome) Sacc., Syll. Fung. 2: 198, 1883.
≡ *Chaetosphaeria hemipsila* (Berk. et Broome) Petch, Ann. Roy. Bot. Gard., Peradeniya, 6: 336, 1917.
* ≡ **Melanochaeta hemipsila** (Berk. et Broome) E. Müll., Harr et Sulmont, Rev. Mycol. 33: 377, 1969. Figs 11; 12; 16 c-d.
= *Lasiosphaeria rehmiana* P. Henn., Verh. Bot. Ver. Prov. Brandbg. 40: 155, 1898.
≡ *Chaetosphaeria rehmiana* (P. Henn.) Kirschst., Krypt. Fl. Mark. Brandenb. 7: 236, 1911.
= *Chaetosphaeria coelestina* Höhnel, Sitzb. K. Akad. Wiss. Wien, Math.-Natur. Kl. 118 (1): 324, 1909.
= *Chaetosphaeria africana* Saccas, Bull. Inst. Fran. Café et Cacao 16: 69, 1981. (Not validly published. Art. 37.)
= *Chaetosphaeria coffeae* Saccas, Bull. Inst. Fran. Café et Cacao 16: 73, 1981. (Not validly published. Art. 37.)

Material examined: Java, Buitenzorg, Botanical Garden; on bare undetermined wood, 1907, leg. F. Höhnel (GH - holotype of *Chaetosphaeria coelestina* Höhnel). - Central African Republic, Boukoku; on dead bare stem of *Coffea robusta*, leg. A. Saccas (PC 407).

Note: Müller, Harr and Sulmont (1969) described *Melanochaeta hemipsila* based on the type material of *Sphaeria* (*Villosae*) *hemipsila*. As a synonym the name *Chaetosphaeria coelestina* Höhnel was also included, which position in *Melanochaeta* E. Müll., Harr and Sulmont was suggested based on its description and illustration (Höhnel 1909). The revision of the type material of *Chaetosphaeria coelestina* by the present author confirmed its correct position in *Melanochaeta*.

The type material of *Chaetosphaeria africana* Saccas and *Chaetosphaeria coffeae* Saccas from the Central African Republic could not be examined, for it was not traced in the PC herbarium. The only material held in the herbarium was a poor specimen collected by Saccas in Africa and labeled as *Chaetosphaeria* sp. The specimen was identified as *Melanochaeta hemipsila*. The detailed original descriptions and illustrations of *Chaetosphaeria africana* and *Chaetosphaeria coffeae* led me to the conclusion that both belong to *Melanochaeta hemipsila*, and have therefore been included in the synonymy.

The type material of *Chaetosphaeria rehmiana* (P. Henn.) Kirschst. [Africa, Kamerun; on piece of wood imported with Orchid plants to Berlin Botanical Garden.] should be located in the B herbarium. Unfortunately, it has been lost by war incidents. The only surviving element is its original description and illustration (Hennings 1898). These agree well with those of *Melanochaeta hemipsila* (Höhnel 1909; Hughes 1966; Müller, Harr and Sulmont 1968). Therefore, *C. rehmiana* is proposed as a synonym.

The genus *Melanochaeta* was introduced (Müller, Harr and Sulmont 1969) for species with superficial, globose to subglobose ascomata with their surface covered by a greyish to whitish layer consisting of densely interwoven, lightly pigmented hyphae and bearing numerous erect, sterile, capitate setae arising from the dark, melanized ascomatal wall. The asci are unitunicate with a well-developed, non-amyloid apical annulus; ascospores 3-5-septate, middle cells turning brown, terminal cells remaining hyaline to subhyaline. Anamorphs belong to the genus *Sporoschisma* Berk. et Broome. So far, two species have been placed in the genus, i.e. *Melanochaeta hemipsila* with the *S. saccardoii* Mason et S. Hughes in S. Hughes anamorph and *Melanochaeta aotearoae* (S. Hughes) E. Müll., Harr et Sulmont (Fig. 10, made from isotype-DAOM 93903b) with *S. mirabile* Berk. et Broome (Hughes 1966) and *Chalara* sp. synanamorphs (Müller and Samuels 1982). However, the anamorphs are cosmopolitan in distribution (Holubová-Jechová 1973; Hughes 1966; Samuels and Müller 1982), the teleomorphs are known only from Africa (Hennings 1898), French Guiana (Courtecuisse et al. 1996), Java (Höhnel 1909), New Zealand (Hughes 1966) and Sri Lanka (Berkeley and Broome 1873).

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Key to the species of Scutellinia subgen. Geneosperma (Rifai) comb. et stat. nov. (Discomycetes, Pezizales, Pyronemataceae)

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Moravec J. (1997): Key to the species of Scutellinia subgen. Geneosperma (Rifai) comb. et stat. nov. (Discomycetes, Pezizales, Pyronemataceae). – Czech Mycol. 50: 85–97

Geneosperma Rifai (1968), originally created as a monotypic genus with the type species *Geneosperma geneosporum* (Berk.) Rifai [= *Scutellinia geneospora* (Berk.) O. Kuntze, based on *Peziza geneospora* Berk.], is newly combined here and given the new status of a subgenus of the genus *Scutellinia*, subgen. *Geneosperma* (Rifai) comb. et stat. nov.. Besides the type species, the subgenus also comprises two other recently described species, *Scutellinia laevispora* (Korf et Zhuang) comb. nov. (basionym: *Geneosperma laevisporum* Korf et Zhuang 1986), and *Scutellinia totaranuiensis* J. Moravec (1996). *Geneospora* was synonymized with *Scutellinia* by Korf (1972, 1973) but later re-evaluated as a good genus again by Korf and Zhuang (1986), and recently recombined by T. Schumacher (1990) to the rank of section of the genus *Scutellinia*, sect. *Geneospermae* (Rifai) T. Schumacher. The three species have been studied including the ascospore characteristic by using SEM photomicrographs. Despite the peculiar nature of their ascospores well delimiting *Geneosperma* (the ascospores are embedded in a hyaline, membranous sheath which surrounds them in the form of follicles tapering to the apiculi on the ascospore poles), these three species share all other basic features which characterize the genus *Scutellinia*. Therefore, the author keeps the infrageneric conception of *Geneosperma* but simultaneously prefers its subgeneric position proposed here, which better than its rank of a mere section respects the distinction of the ascospores. On the epispore of ascospores of *S. laevispora* (a species originally described as smooth spored) peculiar pulvinate cyanophilic tubercles have been observed and verified by SEM. The ascospore character is discussed. A key to the three so far known species of the subgenus *Geneosperma* and illustrations including SEM of ascospores accompany the paper.

Key words: *Scutellinia* subgen. *Geneosperma* (Rifai) comb. et stat. nov., *Scutellinia laevispora* (Korf et Zhuang) comb. nov., *S. geneospora, S. totaranuiensis*, folliculate ascospores, taxonomy.

Moravec J. (1997): Klíč k určení druhů Scutellinia subgen. Geneosperma (Rifai) comb. et stat. nov. (Discomycetes, Pezizales, Pyronemataceae). – Czech Mycol. 50: 85–97

Geneosperma Rifai (1968), původně vystavený jako monotypický rod s typovým druhem *Geneosperma geneosporum* (Berk.) Rifai [= *Scutellinia geneospora* (Berk.) O. Kuntze, založeném na *Peziza geneospora* Berk.], je zde zařazen do rodu *Scutellinia* s novým statutem podrodu, subgen. *Geneosperma* (Rifai) comb. et stat. nov.. Tento podrod zahrnuje kromě typového druhu další dva nedávno popsané druhy, *Scutellinia laevispora* (Korf et Zhuang) comb. nov. (basionym: *Geneosperma laevisporum* Korf et Zhuang 1986), a *Scutellinia totaranuiensis* J. Moravec (1996). Jméno *Geneosperma* bylo pokládáno za synonymum *Scutellinia* (Korf 1972, 1973), později opět přehodnoceno jako jméno pro opodstatněný rod (Korf and Zhuang 1986), a nedávno T. Schumacher (1990) přeřadil *Geneosperma* do hodnoty sekce rodu *Scutellinia*, sect. *Geneospermae* (Rifai) T. Schumacher. Jmenované druhy byly detailně studovány včetně použití SEM fotomikrografie askospor. Navzdory podivuhodné charakteristice askospor, která dobře vymezuje podrod *Geneosperma* (ornamentované askospory obalené průsvitným blanitým vakem vytvářejícím přívěsky na pólech), tyto 3 druhy sdílejí ostatní hlavní znaky, které charakterizují rod *Scutellinia*. Proto se autor přidržuje vnitrorodového pojetí *Geneosperma* a zároveň upřednostňuje její zde stanovené pojetí v hodnotě podrodu, který lépe zhodnocuje vyjímečnou charakteristiku askospor než v pozici pouhé sekce. Zvláštní cyanofilní polštářkovité tuberkule na episporu askospor *S. laevispora* (původně popsané jako druh hladkovýtrusý) byly pozorovány a ověřeny použitím SEM. Charakteristika askospor je diskutována. Klíč k určení tří dosud známých druhů podrodu *Geneosperma* a ilustrace včetně SEM askospor doplňují příspěvek.

The coarsely ornamented ascospores of *Scutellinia geneospora* (Berk.) O. Kuntze (1891), surrounded by a peculiar hyaline, cyanophilic membranous follicle-like sheath which envelopes the warts of the ornamentation and forms conspicuous apiculi on the ascospore poles, are unique in operculate discomycetes as the membranous sheath develops across the epiplasmic interfaces, so that the eight portions of ascal epiplasm are deposited on the ascospore wall within the follicles. This outstanding character lead Rifai (1968) to create a new genus *Geneosperma* Rifai.

Thus the genus originally accommodated the single species *Geneosperma geneosporum* (Berk.) Rifai [= *Scutellinia geneospora* (Berk.) O. Kuntze – basionym: *Peziza geneospora* Berk., Hook, J. Bot. 3: 203, 1851].

The monotypic genus was not commonly accepted and was considered a synonym of *Scutellinia* (Cooke) Lambotte by Korf (1972, 1973). Later, Korf and Zhuang (1986) described the new species *Geneosperma laevisporum* Korf et Zhuang (1986) based on a collection from New Zealand, and simultaneously reconsidered the synonymy of *Geneosperma* with *Scutellinia*. They again recognized *Geneosperma* as a good genus after the second species was found and extended the originally monotypic genus. Korf et Zhuang (1986) also discussed in greater detail the character of the folliculate ascospores and their delimitation within the asci, and in accordance with Rifai (1968), considered it a leading characteristic which separates the two genera from each other. Recently, Schumacher (1990) recombined *Geneosperma* and stated it to be a mere section of the genus *Scutellinia* sect. *Geneospermae* (Rifai) T. Schumacher (1990). He obviously overlooked Korf and Zhuang's paper with the description of *G. laevisporum*, cited above, and thus maintained only the single (type) species of the section in his monograph of the genus *Scutellinia*. Similarly, when I described a new species of *Scutellinia* from New Zealand under the name *Scutellinia totaranuiensis* J. Moravec (1996), and compared the new species with *Scutellinia geneosperma* based on my examination of the type material (K), I had no idea of the existence of *G. laevisporum*, as I had neither seen the paper by Korf and Zhuang (1986). After the paper and the type material of *G. laevisporum* was sent to me by courtesy of Prof. Korf, Ithaca, I have re-examined and compared all these three closely related species undoubtedly belonging to the genus *Scutellinia* (Cooke) Lambotte, but differing by the remarkable ascospore sheath. In spite of the peculiar characteristic of their ascospores, these three species possess all other basic features which characterize the genus *Scutellinia*, especially the same shape and colour of the apothecia and their identical structure, and the same type of apothecial hairs. Therefore, I consider *Geneospora* congeneric with *Scutellinia*, but at the same time I believe that *Geneospora*, due to the unique nature of its ascospores, deserves a higher position within the genus than Schumacher's concept of it at the rank of a mere section, and that the subgeneric status better respects its unique distinction. Consequently, *Geneosperma* is newly combined here and classified as a subgenus of the genus *Scutellinia*:

Family **Pyronemataceae** Corda emend. Korf (1972)
subfamily **Scutellinioideae** Clements emend. Korf (1972)
tribe **Scutellinieae** (Clements) Pant in Pant et Tewari emend. Korf (1972)
genus ***Scutellinia*** (Cooke) Lambotte (1887)
Scutellinia subgenus ***Geneosperma*** (Rifai) comb. et stat. nov.

Basionym: *Geneosperma* Rifai, Verh. Konninkl. Nederl. Akad. Wetensch. Afd. Nat. 57 (3): 102, 1968.

Species typica: *Peziza geneospora* Berkeley, Hook. J. Bot. 3: 203, 1851, = *Geneosperma geneosporum* (Berk.) Rifai, Verh. Koninkl. Nederl. Akad. Wetensch. Afd. Nat. 57 (3): 102, 1968. = *Scutellinia geneospora* (Berk.) O. Kuntze, Rev. Gen. Pl. 2: 869, 1891.

Species ceterae: *Scutellinia laevispora* (Korf et Zhuang) J. Mor.; *Scutellinia totaranuiensis* J. Mor..

Characteristics of the subgenus *Geneosperma*: The species of this subgenus possess features which characterize the genus *Scutellinia*: apothecia discoid with an orange red hymenium, on the outside and on the margin covered by rigid, brownish, septate, thick-walled hairs which are long or very short, straight or curved, mostly acuminate above and with a bifurcate to multifurcate rooting base. Excipulum clearly differentiated (the ectal excipulum of a textura globulosa-angularis, the medullary excipulum of a textura intricata). Asci operculate, eight-spored. Ascospores ellipsoid, biguttulate or multiguttulate, with a cyanophilic sculpture being ornamented by large cyanophilic warts, crests or tubercles, - but the subgenus is delimited by a peculiar character of the ascospores - they are enveloped by a hyaline, membranous outermost follicular sheath which forms apiculi on the ascospore poles, as the ascospores are embedded in the ascus within the follicles.

Such an ascospore character is quite unique in operculate discomycetes. The follicle-like apiculate sheath in the subgen. *Geneosperma* differs well from the delicate and easily separable and mostly ornamented outermost perisporial sheath which is present on ascospores of *Scutellinia* sect. *Pseudocheilymeniae* Svr. and sect. *Minutae* Svr. and all species of the genus *Cheilymenia* as proved by SEM [compare J. Moravec (1990)].

The subgenus comprises three up to now known species:

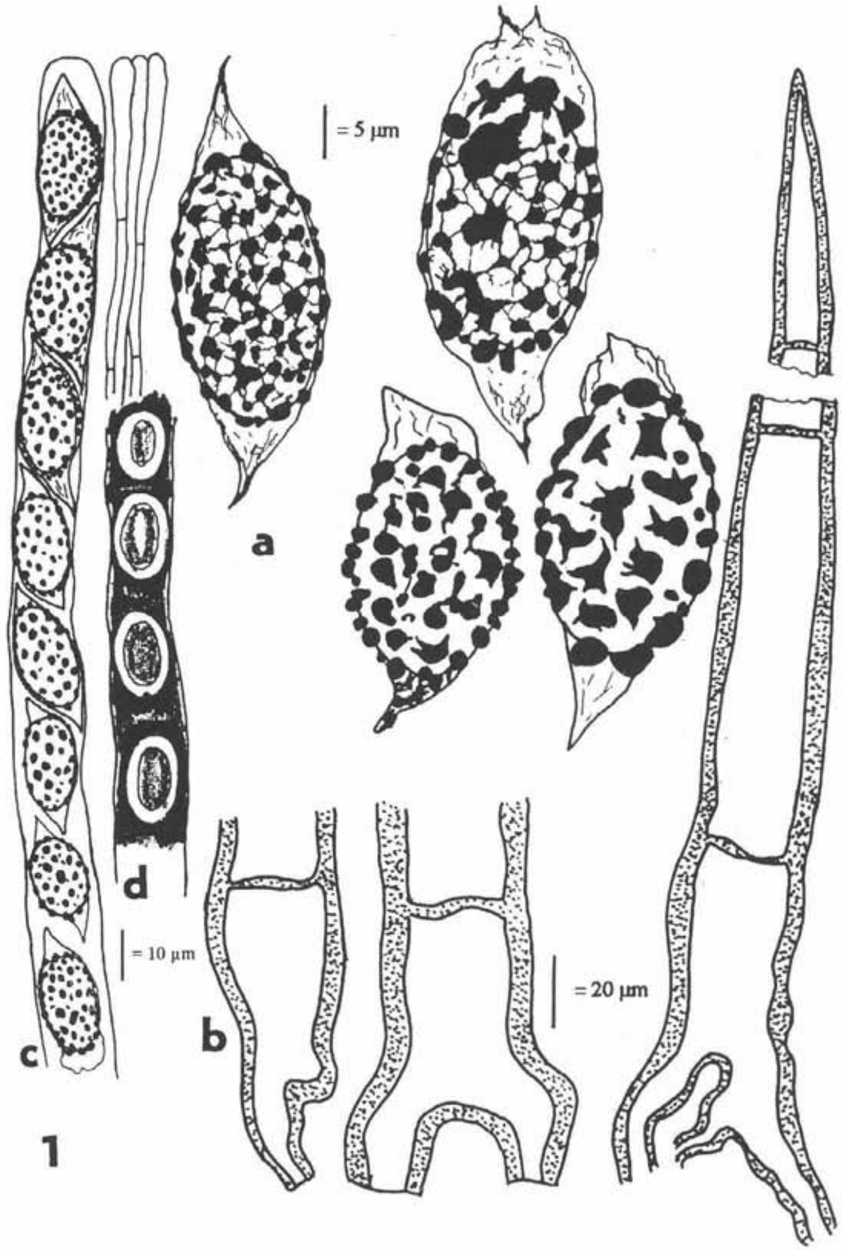


Fig. 1. *Scutellinia (Geneosperma) geneospora*: **a.** Ascospores (oil immersion + CB); **b.** Hairs; **c.** Ascus and upper parts of paraphyses; **d.** Part of ascus with immature ascospores surrounded by epiplasm.

1. **Scutellinia geneospora** (Berk.) O. Kuntze, Rev. Gen. Pl. 2: 869, 1991.

Basionym: *Peziza geneospora* Berkeley, Hook. J. Bot. 3: 203, 1851,

≡ *Lachnea geneospora* (Berk.) Saccardo, Syll. fung. 8: 178, 1889,

≡ *Geneosperma geneosporum* (Berk.) Rifai, Verh. Koninkl. Nederl. Akad. Wetensch. Afd. Nat. 57 (3): 102, 1968. (inaccurately written "geneospora" by Rifai)

= *Lachnea appendiculata* P. Hennings, Warburg, Monsunia 1:35, 1900,

≡ *Humaria appendiculata* (P. Henn.) Boedijn, Sydowia 5: 212, 1951,

= *Lachnea fleischeriana* P. Hennings, Warburg, Monsunia 1:35, 1900,

≡ *Ciliaria fleischeriana* (P. Henn.) Overeem, Icon. Fung. mal. Hft. 9: 1, 1925,

= *Lachnea foliculata* Höhnel, Sber. Akad. Wiss. Wien, Math. - nat. Kl., 1, 117: 396, 1909.

The type species of the subgenus, *S. geneospora*, is distinguished by large discoid apothecia (4-12 mm diam.), on the outside covered by stiff, brownish hairs which are denser, longer and larger on the margin of the apothecia. The marginal hairs of the type specimen (K) are rigid, pointed above, septate, thick-walled (the walls 3,5-7.5 μm thick) and measure 400-955 × 25-45 μm, mostly with bifurcate, rarely simple or trifurcate rooting base. Ascospores ellipsoid, multiguttulate, coarsely ornamented by mostly irregular warts and crests and enveloped by a hyaline membranous sheath which is tightly adpressed to the ornament and therefore hardly or not visible on the outline of mature ascospores but can be seen on the ascospore poles projecting there in a form of transparent apiculi. Ascospores of the type specimen (18-) 21-24.5 (-25.5) × 12-15 (-16) μm (excluding the ornamentation and apiculi), according to my measurement. Paraphyses slightly enlarged above, those of the type material cohered together.

Habitat and distribution: on decayed wood in forested mountains of East Asia: India, Japan, Indonesia (Java) and China. Its distribution is discussed and mapped by Korf and Zhuang (1986).

Material examined: Holotype of *Peziza geneospora* Berkeley, India, Sinchul, Hooker fil., (K ex herbarium Berkeley).

Illustrations: Rifai (1968), Korf and Zhuang (1986), T. Schumacher (1990) - SEM,, J. Moravec (1996) - SEM, and Fig. 1 and SEM Fig. 6 of this paper.

2. **Scutellinia laevispora** (Korf et Zhuang) comb. nov.

Basionym: *Geneosperma laevisporum* Korf et Zhuang, Acta Mycologica Sinica Suppl. 1: 91, 1986;

Appearance and character of the ascospores of *S. laevispora* represent the most peculiar feature within the subgenus, well distinguishing the species. Even if

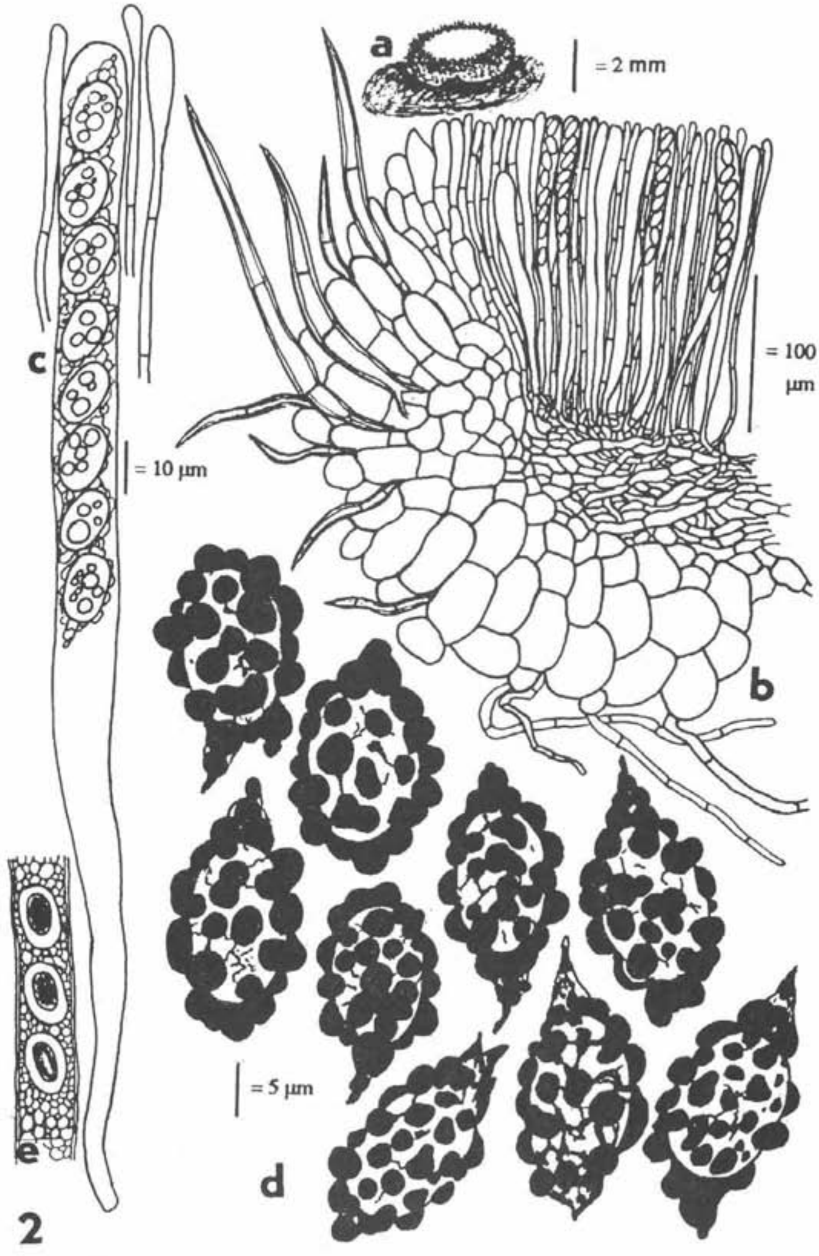


Fig. 2. *Scutellinia (Geneosperma) totaranuiensis*: **a.** Apothecium; **b.** Section of the marginal part of the apothecium; **c.** Ascus and paraphyses; **d.** Ascospores (oil immersion + CB); **e.** Part of ascus with immature ascospores surrounded by pustules of epiplasm.

the authors (Korf and Zhuang 1986) described the ascospores as smooth (the etymology of the Latin epithet " laevisporum"), my examination of the isotype material (CUP) has revealed that the ascospore wall (episporium) is in reality covered by pulvinate cyanophilic tubercles. However, these tubercles may be overlooked when the ascospores are observed under an optical microscope, as they are so large that often only few pustules cover the whole spore wall of the small and conspicuously elongate-ellipsoid biguttulate ascospores, or the tubercles confluent and form one amorphous thick cyanophilic substance. For that reason, this structure was probably considered portions of an "extra-sporal substance" by the authors, and indeed, the tubercles are hardly seen as they often merge with the strongly cyanophilic substance within the follicular sheath. Moreover, it appears that on a certain number of ascospores, the tubercles are distributed only on two facing sides. The sheath develops in the early stage of the asci. The cytoplasm surrounding the immature ascospores is then transparent, whilst the portions of the epiplasm in the form of irregular tubercles of strongly cyanophilic substance are deposited on the ascospores later forming the tuberculate episporium. It is interesting however, that when the sheath is crashed (by pressure of the cover glass) the tubercles of the episporium remain inside the sheath together with a compact cyanophilic matter whilst the released ascospores peeled out of the sheath (and also from the episporium) are almost smooth on their endospore wall. The tubercles are well seen on the SEM microphotographs where the sculptured ascospores appear as situated in the centre of the large sheath which surrounds the ascospores, and the pustules are seen due to the tightly adpressed membrane, but seemingly as if situated on the surface of the sheath. This is obviously caused by the fact that the follicular sheath is strongly flattened on the two facing sides of the ascospores and so adpressed on the tubercles which cover the internal wall. Therefore, also under the light microscope, when it is seen from the upper flat side, we can see the sculpture through the membrane adpressed on the inner wall of the ascospore which is placed in the centre of the extremely large sheath whilst the space between the outlining membrane of the sheath and the inner wall is very wide. However, the same sheath in its lateral perspective appears narrow as it is adpressed on the two sides of the ascospore, and we can then see the tubercles on the ascospore sides and seemingly, since it is adpressed there, simultaneously on the flattened sides of the sheath. Naturally, on the SEM photographs, the sheath appears to be opaque as the samples are coated by an ultra thin layer of gold. The flat shape of the sheath, which somewhat resembles the shape of seeds of *Ailanthus*, probably arose when the ascospores were delimited in the ascus at first arranged laterally and adpressed to one another having the appendages of the follicles bent along the walls of the ascus and thus later shaped into the spine-like and often hook-like simple or doubled (furcate) projections. The bifurcate

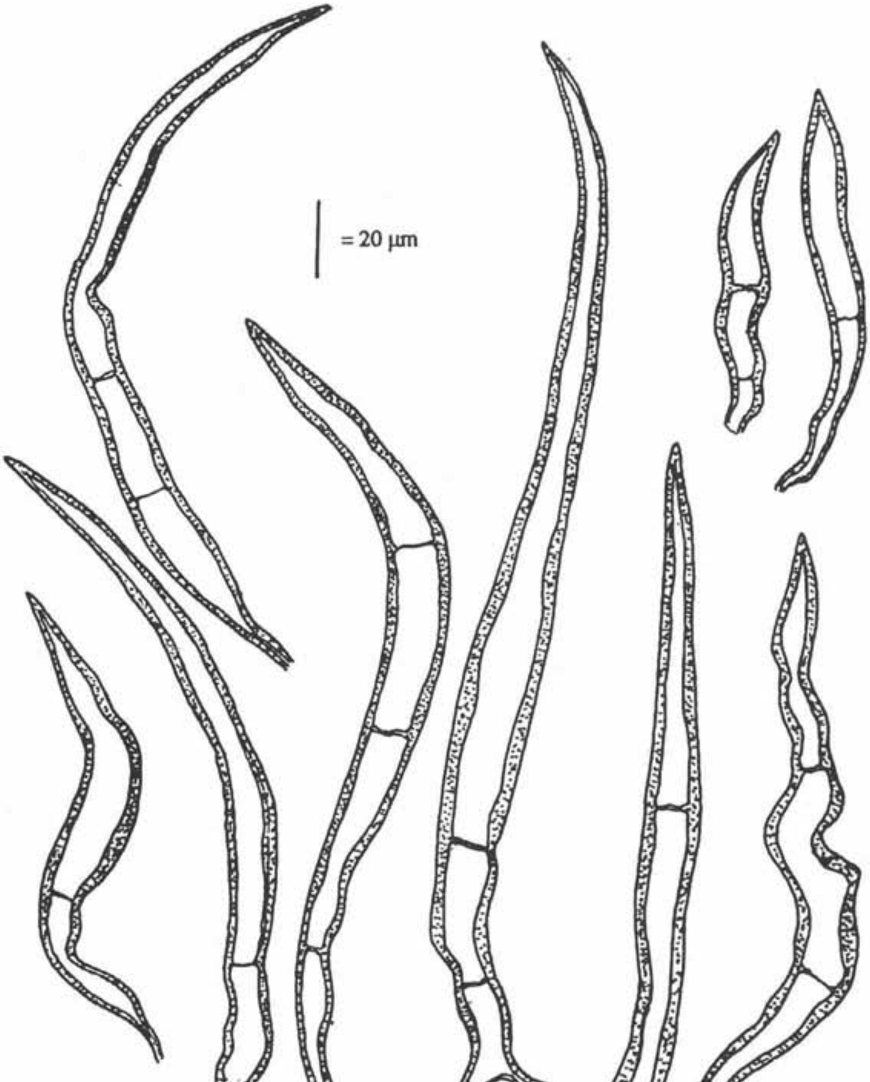


Fig. 3. *Scutellinia (Geneosperma) totaranuiensis*: Hairs.

projections originated when the projection of an adjoining ascospore penetrated into the sheath appendage and split its shape.

I have come to this conclusion on the above discussed features by using the combination of the observation both under the optical microscope and SEM, which is necessary for a better understanding of the ascospore character. However, I am fully aware that the explanation cannot be definitive as there are so many peculiarities which cannot be sufficiently explained.

Korf and Zhuang (1986) discussed the delimitation of ascospores in the ascus and supposed that probably all of the ascal epiplasm is enclosed within the follicular sheaths and concluded that we hardly know how there can be a sufficient build-up of pressure within the ascus for ascospore discharge. I also agree with their opinion that the peculiar ascospore character deserves a further examination by transmission electron microscopy (TEM) which can better explain the ascospore character discussed above.

The apothecia of *S. laevispora* are 3-5 mm in diam. when dried, the colour of fresh apothecia is unknown - the hymenium of the dried apothecia is orange, the apothecial hairs are long but not so wide as in *S. geneospora*, 150-1250 × 17-38 μm, brown, septate, often forked above into two or three arms, or occasionally even stellate, acuminate or blunt above, straight or curved, rigid or flexible, with a mostly simple attenuate base. Asci operculate, eight-spored. The ascospores (their character detailed above) are narrow-ellipsoid, 15-18 × 6.5-9.1 μm (excluding the ornamentation and sheath), and the membranous follicle-like sheath which surrounds them is very large (28-45 × 10-16 μm). Paraphyses not or slightly enlarged above.

Habitat and distribution: on decaying wood, known only from the type collection.

Material examined: New Zealand (South Island), Westland Nat. Park, 8. IV. 1983 leg. G. J. Samuels and all. (Isotype CUP 6177).

Illustrations: Korf and Zhuang (1986) and Figs 4-5 and SEM Figs. 9-11 of this paper.

3. **Scutellinia totaranuiensis** J. Moravec, Mycotaxon 58: 233, 1996.

For detailed description and illustrations see also J. Moravec (1996).

S. totaranuiensis differs from the two other species especially by small (2-5 mm diam. when fresh) apothecia, on the outside and on the margin densely covered by extremely short both excipular and marginal apothecial hairs. The hairs measure 60-270(-285) × 12-21 μm, are rigid, straight or often curved, acuminate above and often narrowing towards the base; the base is bifurcate consisting of short and narrow roots, or simple and truncate. Occasionally the hairs are attenuated below into a subacute "secondary hair" (resembling "bicuspidate"

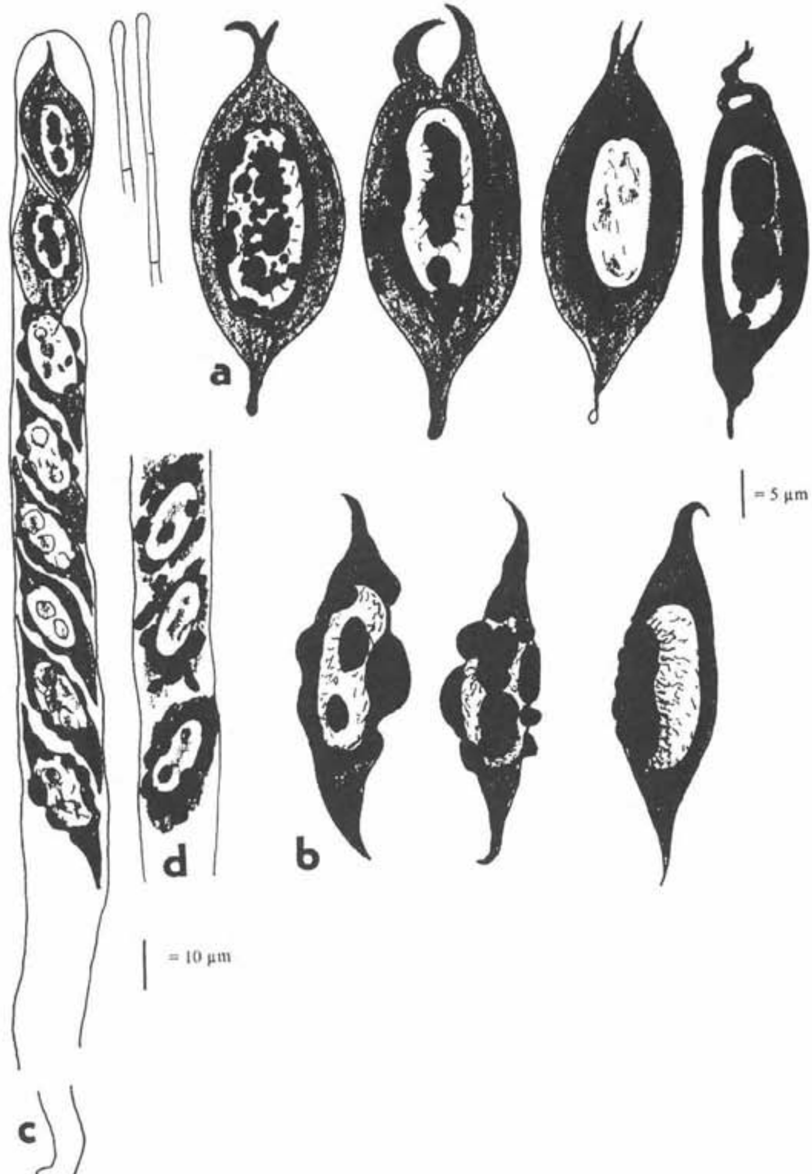


Fig. 4. *Scutellinia (Geneosperma) laevispora*: **a.** Ascospores (oil immersion + CB); **b.** Ascospores in a lateral and sublateral perspective; **c.** Ascus and paraphyses; **d.** Part of ascus with immature ascospores surrounded by epiplasm.

hairs which characterize the genus *Trichophaeopsis*). Also the ascospores clearly differ as they are wide-ellipsoid, 13.5-16.5 (-17.6) × 7.5-10.5 (-11) μm (measured excluding the sculpture and apiculi) - and thus they are much smaller than the ascospores of *S. geneospora* - multiguttulate, ornamented by large, cyanophilic, mostly rounded warts and tubercles, coated by an outermost membranous sheath which is mostly tightly adpressed on the tubercles and copies their shape, and thus visible only as appendages on the ascospore poles, and the tubercles are usually situated and densely arranged also inside the irregular appendages. This ascospore appearance and characteristics well differentiate *S. totaranuiensis* also from *S. laevispora*. A certain difference is also found in the development of the ascospore sheaths in the asci, as the cyanophilic tubercles are largely present in the form of the epiplasm surrounding immature ascospores and are well seen in yet very immature asci before the apiculate sheaths, which later close the ascospores, are developed.

In other features, especially due to the very short apothecial hairs, *S. totaranuiensis* is also close to certain other species of the large genus *Scutellinia*, and therefore, I also compared it to a few other species, in particular *Scutellinia phymatodeus* S. C Kaushal et R. Kaushal and *Scutellinia pseudotrechispora* (Schröt.) Le Gal (see J. Moravec 1996).

Habitat and distribution: On soil. Known only from the type collection.

Material examined: New Zealand (South Island), Totaranui near Takaka, on moist clayey-sandy soil on a path through a sea-side forest, 6. III. 1993 leg. J. Moravec. The holotype BRNM 599298, isotypes CUP, WELTU, J. Mor.).

Illustrations: J. Moravec (1966), and Fig. 2 and Figs 7-8 of this paper.

A KEY OF THE SPECIES OF SCUTELLINIA SUBGEN. GENEOSPERMA

Species of an appearance and other features common for other species of the genus *Scutellinia,* but differing by ascospores embedded within a membranous follicle, being surrounded by it in the form of hyaline, outermost sheath which forms appendages on the ascospore poles .... *Scutellinia* subgen. *Geneosperma*

1 a. - apothecia growing on soil; marginal hairs short (up to 280 μm). Ascospores wide ellipsoid, 13.5-17.6 × 7.5-11μm, (excluding the ornamentation and apiculi), coarsely ornamented by mostly rounded warts and tubercles; the outermost membranous sheath adpressed on the ornamented spore walls proper and so seen mostly as the apiculate appendages on the ascospore poles; the cyanophilic tubercles often present also inside the appendages .... *S. totaranuiensis*

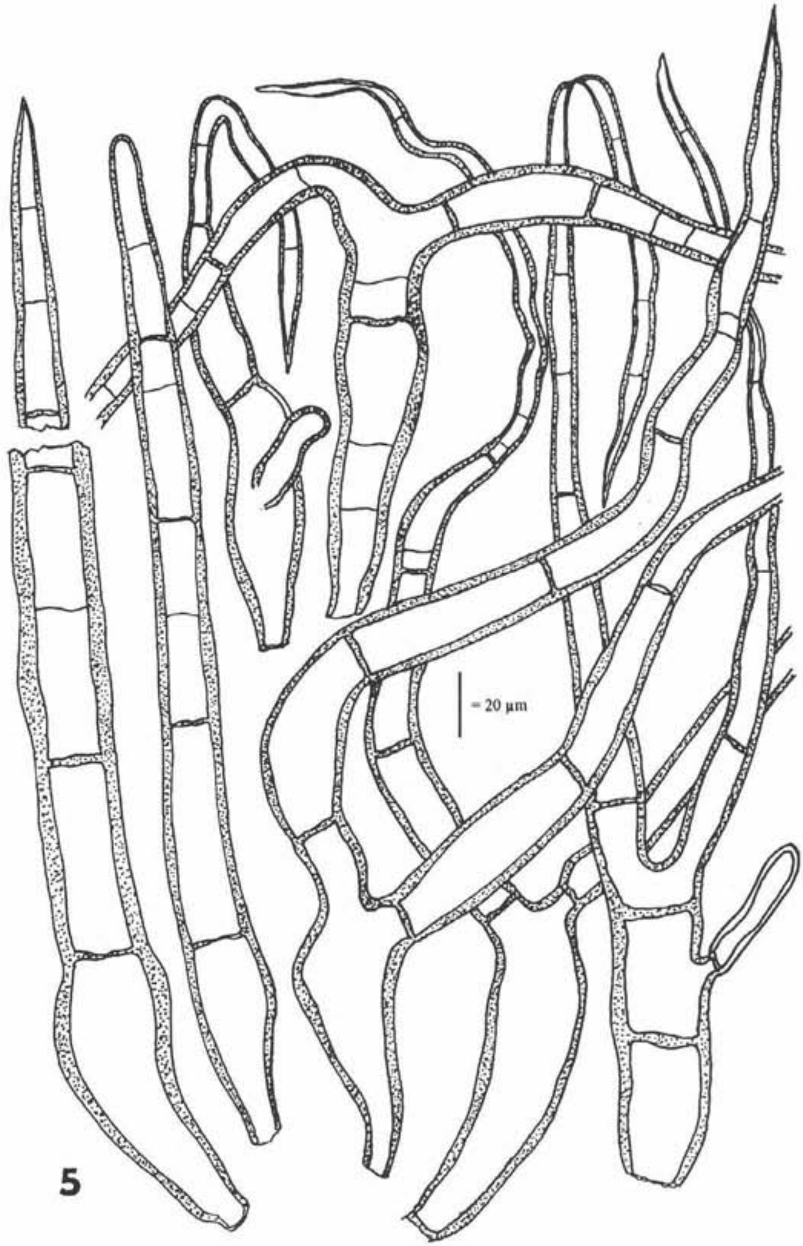
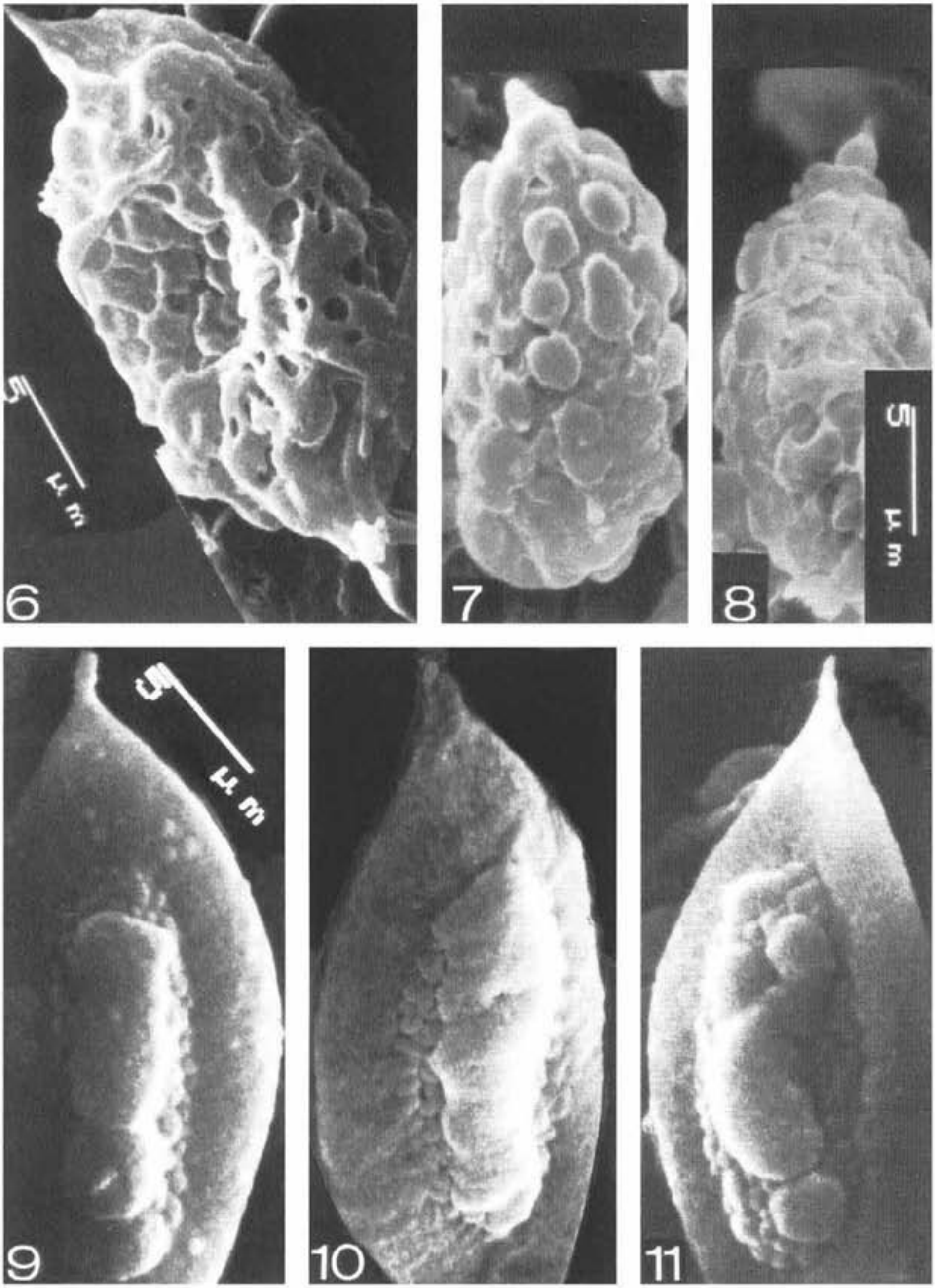


Fig. 5. *Scutellinia (Geneosperma) laevispora*: Hairs.



Figs 6-11. SEM of ascospores: **6.** *Scutellinia (Geneosperma) geneospora*; **7-8.** *Scutellinia (Geneosperma) totaranuiensis*; **9-11.** *Scutellinia (Geneosperma) laevispora.*

1 b. - apothecia growing on decayed wood; marginal hairs long, (up to more than 800 μm) 2

2 a. - ascospores large, 18-25.5 × 12-16 μm (excluding the ornamentation and apiculi), ornamented by mostly irregular warts and crests; the outermost sheath adpressed on the warts and usually seen as empty and transparent appendages on the ascospore poles .... *S. geneospora*

2 b. - ascospores narrow ellipsoid, 15-18 × 6.5-9.1 μm (excluding the outermost sheath), covered by only several large pulvinate cyanophilic tubercles or confluent pigment, surrounded by a very large, (28-45 × 10-16 μm)! fusiform, flattened sheath protruding on the ascospore poles in the form of the thin and sharp apiculi; viewed from the upper flat side, the space between the ascospore and the membrane of the outermost sheath is conspicuously wide, giving the ascospores a smooth appearance; .... *S. laevispora*

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CZECH MYCOL. 50 (2), 1997

Fungi associated with sheep hairs in Saudi Arabia

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Nasser L. A. and Abdel-Sater M. A. (1997): Fungi associated with sheep hairs in Saudi Arabia. – Czech Mycol. 50: 99–106

The frequency of occurrence of fungi in 25 hair samples of nine kinds of sheep, collected from different localities in Saudi Arabia, was estimated using three isolation methods at 28 °C. Forty-five species and one variety representing 23 genera were isolated and the most common genera were *Chrysosporium, Alternaria, Aspergillus* and *Penicillium*. The most prevalent species of the above genera were *C. indicum, C. tropicum, Alternaria alternata, Aspergillus flavus, A. fumigatus. Penicillium chrysogenum* and *P. oxalicum*. Other fungi were also isolated with variable frequencies.

Key words: Keratinophilic, non-keratinophilic fungi, sheep hairs.

Nasser L. A. a Abdel-Sater M. A. (1997): Výskyt hub v srsti ovcí v Saudské Arábii. – Czech Mycol. 50: 99–106

Ve 25 vzorcích srsti sbíraných v různých lokalitách Saudské Arábie a pocházejících z devíti plemen ovcí byla stanovena frekvence výskytu hub pomocí tří metod izolace při 28 °C. Z izolovaných 45 druhů a variet (23 rodů) byly nejčastějšími rody *Chrysosporium, Alternaria, Aspergillus* a *Penicillium*. Převládajícími druhy z jmenovaných rodů byly *Chrysosporium indicum, Ch. tropicum, Alternaria alternata, Aspergillus flavus, A. fumigatus, Penicillium chrysogenum* a *P. oxalicum*. Další houby byly izolovány s různou frakvencí.

Several studies have been made of the mycoflora associated with the hair of different kinds of animals (Kuttin and Beemer 1975, Aho 1983, Bagy and Abdel-Hafez 1985, Bagy 1986, Abdel-Hafez 1987, Ali-Shtayeh et al. 1988a,b, 1989, Chabasse 1988, Kubo et al. 1990, El-Said and Abdel Sater 1994 and others).

In Saudi Arabia, information on the existence of keratinophilic and non-keratinophilic fungi are not available. Thus the present work aims to make an extensive survey of the fungi colonizing the sheep hairs in Saudi Arabia.

MATERIALS AND METHODS

Twenty-five healthy hair samples, from nine kinds of sheep (Saudian 4; Somalian 2; Sudanian 3; Syrian 3; Turkish 3; Italian 3; Iranian 3 and Indian 4) were collected from different localities in Saudi Arabia. The samples were placed in clean plastic bags and transferred to the laboratory. For the isolation of the mycoflora inhabiting the hairs the following three isolation methods were used.

1. Soil-plating technique

The soil-plating technique was used as described by Vanbreuseghem (1952). The soil was double-sterilized by autoclaving at 121 °C for 15 min. The hair bundles (5 from each sample) were scattered on the surface of moistened sterile soil (20–25 % moisture content) in sterile plates (2 plates for each sample). The plates were incubated at room temperature (25 °) for 10–12 weeks and the soil in the plates were remoistened with sterile distilled water whenever necessary. The moulds which appeared on the baits were transferred to the surface of Sabouraud's dextrose agar medium (Moss and McQuown 1969) containing 0.5 g/l cycloheximide and 40 g/ml chloramphenicol. The plates were incubated at 28 °C for 14 days and the developing fungi were isolated, identified and calculated for 10 hair fragments for each sample.

2. Hair-plating directly on the medium

Five bundles from each sample were scattered on the surface of Sabouraud's dextrose agar medium. Three plates were used for each sample. The plates were incubated at 28 °C for 2–3 weeks and the developing fungi were counted, identified and calculated as previously mentioned.

3. The dilution-plate method

For the isolation of fungi inhabiting hairs, the dilution-plate method as described by Johnson and Curl (1972) was used. Five grams of each sheep hair sample are put in a 250 ml Eyrlenmeyer flask. A sufficient quantity of sterile distilled water was added to obtain the desired dilution. The flask was shaken for 15 minutes. One ml of the suspension was transferred aseptically into each of 3 Petri-dishes, and 20 ml of Sabouraud's dextrose agar medium cooled to exactly the solidifying temperature were added to each dish. The dishes were rotated by hand in broad swirling motion. Three plates were used for each sample and the plates were incubated at 28 °C for 2–3 weeks. The developing fungal colonies were counted, identified and calculated per g of hair.

RESULTS AND DISCUSSION

The results in Table 1 indicate that 45 species and one variety belonging to 23 genera were collectively isolated using different techniques, from which 18 species and variety (14 genera) were obtained using soil plating technique, 29 and 1 (14) using hair plating and 31 (15) using dilution-plate method. The most common genera isolated were: *Chrysosporium, Alternaria, Aspergillus* and *Penicillium*. Similar observations were obtained from goats and sheep in many parts of the world (Otčenášek and Dvořák 1962, Aho 1983, Bagy and Abdel-Hafez 1985, Abdel-Hafez 1987, Ali-Shtayeh et al. 1988a,b, El-Said and Abdel-Sater 1994).

Chrysosporium was the most frequent genus and emerged in 68 %, 52 % and 56 % of the samples comprising 48.3 %, 10.0 % and 8.2 % of the total count, using soil-plating, hair-plating and dilution-plate techniques, respectively. This genus was also isolated from goat and sheep hairs in the Gaza Strip as reported by Abdel-Hafez (1987). He observed that *Chrysosporium* was represented in 97.3 % of goat or sheep hair samples matching 36.1 % of total isolates. Also, El-Said and Abdel-Sater (1994) indicated that *Chrysosporium* was the most prevalent fungi on the hair of goats and sheep emerging in 92 % and 96 % of the samples comprising 91.2 % and 87.8 % of total isolates respectively. In our experiments, it was represented by 6 species of which *C. indicum* and *C. tropicum* were the most common species in the three methods used. They occurred in 16 %, 32 % and 40 %, and 36 %, 20 % and 44 % of the samples constituting 10.3 %, 4.7 % and 2.9 %, and 26.4 %, 2.2 % and 4.8 % of all fungal isolates using the three methods, respectively. The remaining 4 species were less common (Table 1). This is in agreement with the results obtained from goat and sheep hair from El-Bahrin (El-Said and Abdel-Sater 1994), who found that *C. indicum* and *C. tropicum* were the most prevalent keratinophilic fungi. The above species and others were also isolated, but with different frequencies, from some animal hairs, cloven hooves of sheep, claws of buffaloes and cows, horse hooves, poultry feathers and soil baited with human or animal hairs in Egypt (Maghazy 1983, Bagy and Abdel-Hafez 1985, Abdel-Gawad 1984, 1990, Moharram and Abdel-Gawad 1989, Abdel-Hafez et al. 1990, Abdel-Hafez 1991) as well as in other parts of the world (Rees 1968, Gugnani et al. 1975, Pugh and Evans 1970, Hubálek et al. 1973, Takatori et al. 1980, Ali-Shtayeh et al. 1988a, b, Chabasse et al. 1989, Filipello Marchisio 1986 and several others).

Further, several saprophytic and cycloheximide resistant fungi were also encountered on sheep and the most predominant species were members of *Alternaria, Aspergillus* and *Penicillium.*

Alternaria (2 species) was found in 28 %, 96 % and 92 % of the samples constituting 12.7 %, 28.5 % and 29.8 % of the total count for the three isolation methods, respectively. It was represented by two species, of which *A. alternata* was prevalent. Similarly, Ali-Shtayeh et al. (1988a) isolated *A. alternata* from the hair of goats in the West Bank of Jordan. Also, this genus was also the most common fungi on hairs of Table 1 goats and sheep (El-Said and Abdel-Sater 1994), skin of dogs and cats (Bone and Jackson 1971), cloven-hooves and horns of goats and sheep (Abdel-Hafez *et al.* 1990), hairs of goats, cows, donkeys and cats (Ali-Shtayeh *et al.* 1988a), and camel and goat hairs (Bagy and Abdel-Hafez 1985).

Aspergillus was the third common genus emerging in 28 %, 80 % and 76 % of the samples contributing to 9.2 %, 19.1 % and 19.0 % of the total number of fungi for the three isolation methods, respectively (Table 1). It was represented by 7 species and one variety of which *A. flavus* and *A. fumigatus* were prevalent. They

Table 1 Fungi isolated from sheep hair (out of 25 samples) using soil-plating (A); hair-plating (B) and dilution-plate method (C) techniques at 28 °C.

Genera & species	A		B		C	
	TC	NCI & OR	TC	NCI & OR	TC	NCI & OR
Chrysosporium	42	17H	32	13H	257	14H
Ch. carmichaelii V. Oorschot	—	—	1	1R	—	—
Ch. georgii (Var. et Ajello) V. Oorschot	4	2R	—	—	—	—
Ch. indicum (Randhawa et Sandhu) Gary	9	4L	15	8M	90	10M
Ch. keratinophilum (D. Frey) Carmichael	6	2R	7	4L	17	2R
Ch. pannicola (Corda) V. Oorschot	—	—	2	1R	—	—
Ch. tropicum Carmichael	23	9M	7	5L	150	11M
Acremonium strictum W. Gams	7	7M	1	1R	109	12M
Acrophialophora fusispora (Saksena) Samson	1	1R	—	—	—	—
Alternaria	11	7M	91	24H	937	23H
A. alternata (Fr.) Keissler	11	7M	90	24H	917	23H
A. tenuissima (Kunze) Wilt.	—	—	1	1R	20	2R
Aspergillus	8	7M	61	20H	596	19H
A. alutaceus Berk. et Curtis	—	—	2	2R	20	1R
A. flavus Link	6	6L	24	11M	87	9M
A. flavus var. *columnaris* Raper et Fennell	2	2R	3	2R	—	—
A. fumigatus Fresenius	—	—	17	11M	443	17H
A. niger v. Tieghem	—	—	7	5L	3	1R
A. oryzae (Ahlb.) Cohn	—	—	—	—	3	1R
A. sydowii (Bain. et Sart.) Thom et Church	—	—	1	1R	40	1R
A. terreus Thom	—	—	7	4L	—	—
Botryotrichum piluliferum Sacc. et Marchal	—	—	1	1R	—	—
Candida albicans (Robin) Berkhout	—	—	—	—	7	1R
Chaetomium globosum Kunze	3	3R	6	5L	17	3R
Emericella nidulans (Eidam) Vuill.	1	1R	6	6L	—	—
Gibberella fujikuroi (Sawada) Ito	—	—	1	1R	—	—
Gymnoascus reesii Baran	—	—	1	1R	—	—
Mucor	2	2R	5	4L	—	—
M. circinelloides v. Tieghem	—	—	3	2R	—	—
M. hiemalis Wehmer	2	2R	—	—	—	—
M. racemosus Fresenius	—	—	2	2R	—	—

Table 1 Fungi isolated from sheep hair (out of 25 samples) using soil-plating (A); hair-plating (B) and dilution-plate method (C) techniques at 28 °C. (Continued)

Genera & species	A		B		C	
	TC	NCI & OR	TC	NCI & OR	TC	NCI & OR
Myrothecium verrucaria (Alb. et Schw.) Dit.	1	1R	—	—	7	1R
Paecilomyces	2	2R	—	—	16	3R
P. lilacinus (Thom) Samson	2	2R	—	—	13	3R
P. variodtii Bainier	—	—	—	—	3	1R
Penicillium	1	1R	90	21H	1009	25H
P. aurantiogriseum Dierckx	—	—	4	3R	3	1R
P. chrysogenum Thom	1	1R	12	9M	245	10M
P. citrinum Thom	—	—	—	—	40	4L
P. corylophilum Dierckx	—	—	1	1R	20	3R
P. duclauxii Delacroix	—	—	—	—	37	8M
P. oxalicum Currie et Thom	—	—	73	20H	661	20H
P. variabile Sopp	—	—	—	—	3	1R
Phoma glomerata (Corda) Wollenw. & Hochapfel	—	—	—	—	3	2R
Rhizoctonia solani Kühn	—	—	—	—	5	1R
Rhizopus stolonifer (Ehrenb.) Lind	—	—	3	2R	22	5L
Scopulariopsis	—	—	10	6L	135	11M
S. brevicaulis (Sacc.) Bainier	—	—	10	6L	125	11M
S. brumptii Salvanet-Duval	—	—	—	—	10	1R
Syncephalastrum racemosum (Cohm.) Schroeter	1	1R	11	4L	5	1R
Thermoascus aurantiacus Miehe	6	4L	—	—	—	—
Trichothecium roseum (Pers.) Link	—	—	—	—	5	1R
Ulocladium botrytis Preuss	1	1R	—	—	—	—
Total isolates		87		319		3140
Number of genera = 23		14		14		15
Number of species = 45 + 1 var.		18+1		29+1		31

TC = total count, NCI = number of cases of isolation; OR = occurrence remarks; H = high occurrence, 13-25 (out of 25) cases; M = moderate occurrence, 7-12 cases; L = low occurrence, 4-6 cases; R = rare occurrence, 1-3 cases.

were found in 24–68 % of the samples matching 2.8–14.5 % of the total number of fungi for the three isolation methods, respectively. The remaining *Aspergillus* species were less common (Table 1). Members of *Aspergillus* were also among the most common fungi on the hair of different animals as reported by several workers.

Penicillium was the most frequent fungus found using the dilution-plate method (100 % of the samples and 23 % of total count), and hair-dilution method (84 % and 28.2 %), but rare in the soil-plating method (4 % and 1 %). It was represented by 7 species, of which *P. oxalicum* was the most frequent, and was encountered each in 80 % of the samples representing 22.9 % and 21.1 % of the total count recovered by the hair-plating and dilution-plate methods, respectively. *P. chrysogenum* emerged in 4 %, 36 % and 40 % of the samples comprising 1.1 %, 3.8 % and 7.8 % of the total number of fungi in the three isolation methods, respectively. The remaining *Penicillium* species isolated had a moderate, low or rare frequency of occurrence (Table 1). In this respect, El-Said and Abdel-Sater (1994) reported that *Penicillium* was the second most predominant fungi occurring in 80 % of the samples contributing to 12.1 % and 10.3 % of the total number of moulds isolated from goat and sheep hairs, respectively. This genus was also isolated from hairs of goats, cows, donkeys and cats (Ali-Shtayeh et al. 1988a,b) and from camel and goat hairs (Bagy and Abdel-Hafez 1985).

Acremonium (1 species) and *Scopulariopsis* (2 species) showed moderate frequencies of occurrence in most isolation methods. These genera were isolated in rare or low occurrence from sheep hair in El-Bahrin (El-Said and Abdel-Sater 1994).

The remaining fungal species were isolated in rare or low frequencies of occurrence (Table 1). Most of these fungi were previously isolated from the hairs of different animals (Aho 1983, Bagy and Abdel-Hafez 1985, Marsella et al. 1985, Bagy 1986, Abdel-Hafez 1987, Abdel-Gawad 1990, Abdel-Hafez et al. 1990, El-Said and Abdel-Sater 1994).

In conclusion, an analysis of the mycoflora of sheep hairs indicated that there are several keratinophilic and saprophytic fungi inhabiting hairs of these animals. A smaller total of isolates and a narrower spectrum of species were collected from soil-plating technique than the other two isolation methods. This method enumerated only fungal species which were able to grow on keratin (moist sheep hair) as their sole source of carbon. Therefore, some species were encountered only using the soil-plating method and not isolated from the others such as: *Chrysosporium georgii, Acrophialophora fusispora, Thermoascus aurantiacus*. On the other hand, the other two methods provided and ideal chance for fast growing fungi inhabiting sheep hair to appear. For example, *Chrysosporium carmichaelii, C. pannicola, Aspergillus terreus, Botryotrichum piluliferum, Gibberella fujikuroi, Gymnoascus reesii, Mucor circinelloides, M. racemosus* by hair-plating; and *Aspergillus oryzae, Candida albicans, Paecilomyces variotii, Penicillium citrinum, P. duclauxii, P. variabile, Phoma glomerata, Rhizoctonia solani, Scopulariopsis brumptii, Trichothecium roseum* by the dilution-plate method.

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Species of Taphrina on Betula in Slovakia

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Bacigálová K. (199): Species of Taphrina on Betula in Slovakia. – Czech Mycol. 50: 107–118

New data on the occurrence of *Taphrina betulae* (Fuckel) Johanson and *Taphrina betulina* Rostr. on *Betula pendula* Roth, *Betula pubescens* Ehrh. and *B. pubescens* Ehrh. subsp. *carpatica* (Kit. ex Willd.) Aschers. et Graebn., till now unsufficiently known from the territory of Slovakia are presented. Brief characteristics on biology, ecology and distribution of the fungi as well as their host plants are given together with the ecological characteristics of their localities.

Key words: *Taphrina* Fr., *Betula* L., Slovakia, biology, ecology, distribution

Bacigálová K. (1997): Druhy rodu Taphrina na brezách na Slovensku. – Czech Mycol. 50: 107–118

Autorka uvádza v mykoflóre doteraz málo známe druhy - *Taphrina betulina* Rostr. na *Betula pubescens* Ehrh. a na *Betula pubescens* subsp. *carpatica*, - *Taphrina betulae* (Fuckel) Johanson na *Betula pendula* Roth na Slovensku. Opisuje symptómy ochorenia na hostiteľských rastlinách, anatomicko - morfologické charakteristiky húb, lokality ich výskytu a ich ekologické charakteristiky.

Phytopathogenic fungi of Taphrinales poorly known and very often overlooked till now, represent a natural component of phytocenoses in Slovakia. They cause morphological deformation of branches, leaves and fruits. The most common "witches' brooms" infections in crowns of trees and shrubs, leaf and other infection symptoms on host plants such as *Carpinus, Alnus, Betula* and *Prunus*, are caused by ascomycetous biotrophic fungi in the genus *Taphrina*. Recent works, however, have been concentrated on the infection symptoms, anatomical and morphological characteristics of *Taphrina* fungi on *Alnus, Carpinus, Populus*, their locations and ecological characteristics in Slovakia (Bacigálová 1992, 1994). The paper summarizes results of a mycofloristic research of *Taphrina* fungi on *Betula* host plants and reports on some aspects of the biology of *T. betulina* and *T. betulae*, their infection symptoms in host plant tissue and chorological observations in ecological conditions of the Slovakian territory.

MATERIAL AND METHODS

The studied material of *Taphrina* fungi on *Betula* species as host plants was obtained from collection samples of mycofloristic research in Slovakia and from existing herbarium items at the following institutes: Mycological Herbarium

Fig. 1. *Betula pubescens* carrying multiple *Taphrina betulina* infections throughout the crown.

of the Slovak National Museum, Bratislava - BRA; Mycological Department, National Museum Prague - PRM; Department of Botany, Faculty of Natural Sciences, Charles University, Prague - PRC; Department of Botany, Natural History Museum Viena - W;

For identification of the *Taphrina* species both visual symptoms of infected trees and anatomical- morphological characteristics of the fungi were used. They were observed by taking cross and longitudinal sections from naturally infected *Betula* leaves or twigs and observed in a drop of 50 % lactic acid. An evaluation was made by means of Zeiss "Amplival" microscope with microphotographic equipment.

The species of the genus *Taphrina* were identified according to Mix (1949), Sałata (1974) and host plants according to Dostál and Červenka (1991). The localities of the fungi and their host plants are reproduced in maps. A list of localities grouped according to their phytogeographical classification (Futák 1966) is compiled.

The collected specimens of *Taphrina* are deposited in the Herbarium of the Institute of Botany, Slovak Academy of Sciences - SAV.

Notes: R.- river, B.- brook, surr. - surroundings

Taphrina betulina Rostr.

Syn.: *Exoascus betulinus* (Rostr.) Sadeb., *Exoascus turgidus* Sadeb., *Taphrina turgida* (Sadeb.) Giesenh., *Taphrina lagerheimii* Palm

Symptoms. The fungus causes "witches' brooms" on species of *Betula* L. (*B. pubescens, B. pubescens* subsp. *carpatica* and *B. pendula*) (Fig. 1). On young brooms, the infected bud gives rise to the main shoot with a thick swollen base compared to those found on normal branching shoots. The axillary buds at the base of the shoots are swollen developing further in the following growing season (Fig. 2a).

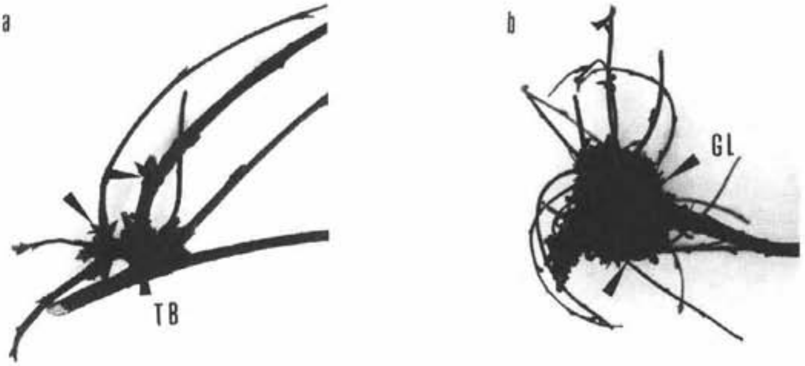

Fig. 2. a) Young "witches' brooms" caused by *Taphrina betulina* on *Betula pubescens*. Note the typically thickened base (TB) and the presence of swollen axillary buds (arrowed) at the base of this shoot.

Fig. 2. b) The shoots on older "witches' brooms" are narrow at the base (arrowed) and arise from a gall-like (GL) structure of the broom on the branch.

Shoots developing on older brooms are narrow at the base, and arise from a gall-like structure at the centre of the broom on the branch of a tree (Fig. 2b). The gall appears to grow through the swelling of tissues surrounding the infected axillary bud. Abundant pubescence was present on both the epidermis and leaves of the shoots developing from these brooms. Many of the shoots show very rapid

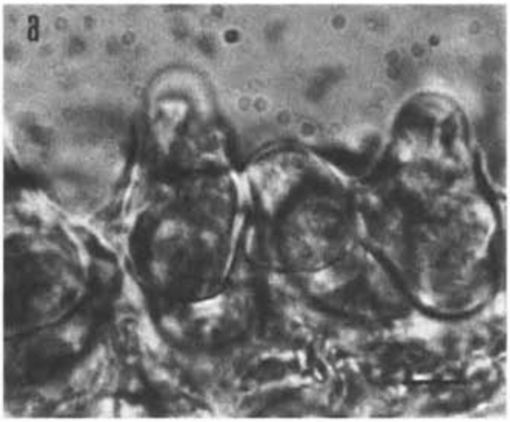

Fig. 3. a). Maturing ascogenous cells of *T. betulina* in the subcuticular layer of the leaves of *B. pubescens*, —— 10 μm.

Fig. 3. b). Mature asci of *T. betulina* with ascospores and blastospores, —— 10 μm.

growth, but the longest shoots often die in their first winter. *Taphrina betulina* infections multiply themselves and the diameter of broom increases with the age of the birch tree and are often over 100-150 mm in diameter and 1 m long. Asci of the pathogen are present on the leaves remaining attached to the shoots. In spring they are pale-green to yellowish, more or less concave but not thickened, later they dry up, blacken from the edge inwards and abscise a little time after their browning. The large central gall-like structures with the surrounding mass of living and dead shoots (older brooms), form suitable habitats for many small insects.

Anatomical and morphological characteristics. The vegetative mycelium is subcuticular and perennial between the epidermal cells of the host tissue. During their further development the size of the mycelium cells increases; the cells become strongly thickened and are disintegrated into thick-walled ascogenous cells. The ascus arises by the splitting of the outer ascogenous cell wall, which allows the inner membrane to form a papilla (Fig. 3a). Asci hypophyllous, cylindric, rounded or truncate at the apex, provided with stalk cells which may be broad and sessile, or wedge shaped and inserted between the epidermal cells (Fig. 3b). On one leaf both cylindric and more elliptical asci were often found. The variability of the size of the asci is demonstrate in Table 1. The asci have eight ascospores. They are ovate to elliptic, 4.5-6 $\times$ 4-5 μm, frequently budding in the ascus filling it with smaller, ovate or elliptic blastospores 3-4 $\times$ 4-5 μm.

Locations of the fungus and their ecological characteristics. *T. betulina* was collected on *B. pubescens* and *B. pubescens* subsp. *carpatica* by Greschik at Levoča in 1917, 1923 (SNM) and 1918 (Jeschková 1957). Later the fungus was collected by Skalický in 1955 in Vysoké Tatry Mts., around Tatranská Lomnica (PRC). Our mycofloristic observations confirmed the occurrence of the fungus mainly in the Carpatian Mts. New localities have been discovered in submontane to montane belts up to the elevation of 1 000 m alt. on birch trees along main roads (Čertovica - Nízke Tatry Mts., Tatranská kotlina - Vysoké Tatry Mts.), along a tourist track and on solitary in trees parks in the Vysoké Tatry Mts. region in the extreme thermal and humidity conditions in the dwarf pine zone up elevations of 1500 m alt.

List of locations (Fig. 4)

On *Betula pubescens* Ehrh.: 22. Nízke Tatry Mts.: Čertovica - Vyšná a Nižná Boca, along the main road; 1983, 1988, 1995; 23a. Západné Tatry Mts.: Žiarska dolina Valley near Žiarska cottage; 1988, 1993; 23b. Vysoké Tatry Mts.: Štrbské Pleso, in the park; 1992; between Štrbské Pleso and Popradské Pleso, on the red marked tourist track; 1988, 1990, 1991, 1992; Vyšné Hágy near the railway station; 1991; Tatranská Polianka, in the park; 1988, 1995; Starý Smokovec, in the park; 1988, along the main road; 1989; omnia leg. Bacigálová (SAV); Tatranské Matliare, in the park; 1955; Nový Smokovec, 1955; omnia leg. Skalický (PRC); Tatranská Lomnica, in the park; 1988, 1990, 1992; Kežmarska Biela voda Valley - Šalviový prameň Spring; 1987, 1990; Matejovce, in garden in the Village; 1987; 23c. Belianske Tatry Mts.: Tatranská Kotlina, along the main road; 1988, 1995; Ždiar, in the Village and along the main road; 1988, 1995; 26b. Spišské kotliny Basin: Štrba (virgin forest near Štrba); 1986; omnia leg. Bacigálová (SAV). 29. Spišské vrchy Mts.: Levoča, leg. Greschik, 1917 (SNM).

On *Betula pubescens* Ehrh. subsp. *carpatica* (Kit. ex Willd.) Aschers. et Graebn.: 23a. Západné Tatry Mts.: Kamenistá dolina Valley, along tourist track; 1988, 1993; Kôprová dolina Valley, near Kôprový B.; 1987; 23b. Vysoké Tatry Mts.: Mengušovská dolina Valley - between Štrbské Pleso and Popradské Pleso, on the red marked tourist trach; 1990; Štrbské Pleso, near the Post office; 1992, 1995; omnia leg. Bacigálová (SAV); Nový Smokovec; 1955, leg. Skalický (PRC); Obrovský vodopád Waterfall; 1988; Malá studená dolina Valley along the tourist track; 1990; Lomnický hrebeň 1 540 m a.s.l. near the tourist track; 1988; Tatranská Lomnica; 1989; omnia leg. Bacigálová (SAV); Matliare, near Tatranská Lomnica; 1955; leg. Skalický (PRC); Kežmarska Biela voda Valley 1200 m a.s.l.; 1987, 1990, 1995; Zelené pleso Valley, near Brnčalova chata Chalet, 1500 m a.s.l.; 1987, 1988, 1990; 26b. Spišské kotliny Basin: Štrba, virgin forest near Štrba, 1986; omnia leg. Bacigálová (SAV). 29. Spišské vrchy Mts.: Levoča; 1923; leg. Greschik (SNM).

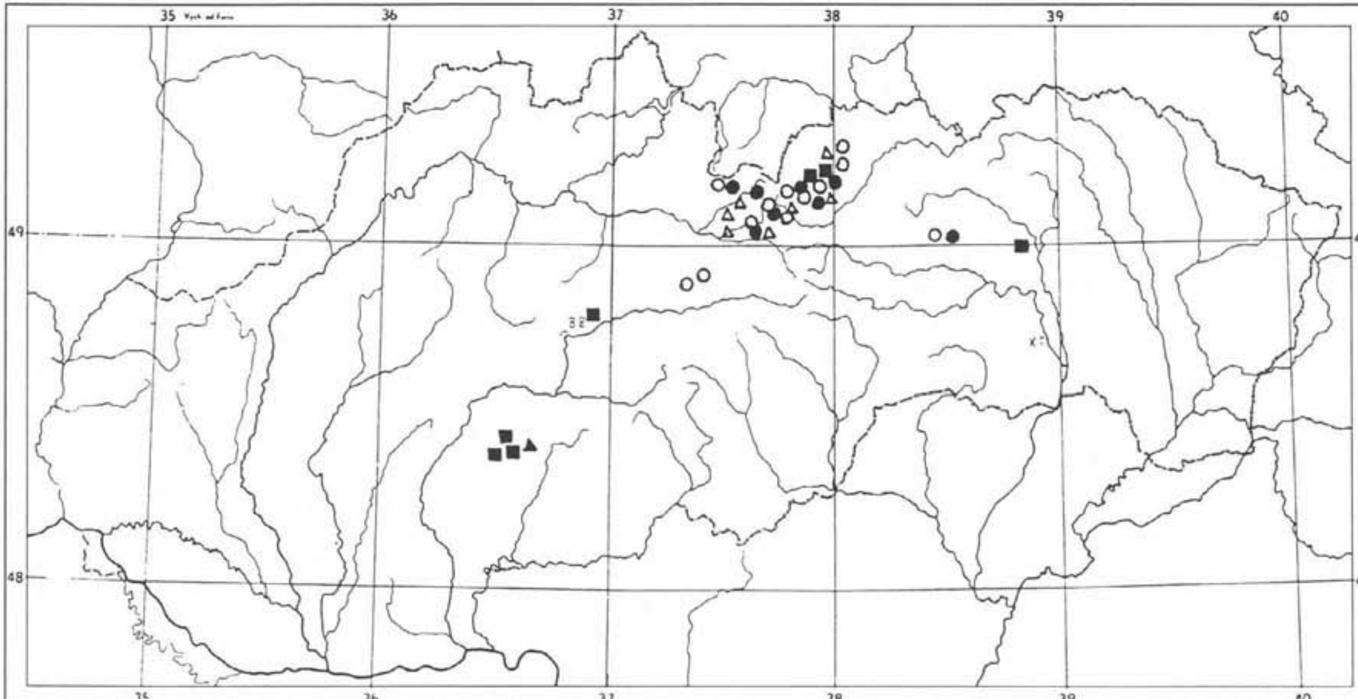

Fig. 4. Distribution map of *T. betulina* on *Betula* sp. - △, on *Betula pubescens* - ○ and on *Betula pubescens* subsp. *carpatica* - ●; of *T. betulae* on *Betula* sp. - ▲, on *B. pendula* - ■.

On *Betula* L.: 23a. Západné Tatry Mts.: Tichá dolina Valley, 1988; Podbanské, near Tri studničky; 1988; 23b. Vysoké Tatry Mts.: Štrbské Pleso, in garden near rack railway; 1987; Horný Smokovec near railway line; 1988; Hrebienok, 1988; Pekná vyhliadka, near the railway station; 1988; Stará lesná, near the railway station; 1988; Tatranská Lomnica; 1988, 1991; 26a. Liptovská kotlina Basin: Východná - Važec, along the main road; 1987; Važec - Štrba along the main road; 1989; 26b. Spišské kotliny Basin: Štrba - Lučivná, along the main road; 1988; 29. Spišské vrchy Mts.: Bachledova dolina Valley, 1988; omnia leg. Bacigálová (SAV).

Taphrina betulina is wide spread on various species of birch, but most of all in the North of Europe. In Norway the fungus occurs on *B. pubescens* Ehrh., *B. pendula* Roth, *B. nana* L., *B. alpestris* Fr. and *B. lenta* L. (Gjaerum 1964), in the United Kingdom (Scotland) *Betula pubescens* Ehrh. is more frequently infected by *Taphrina betulina* than *Betula pendula* (Jump and Woodward 1994), in Poland it occurs on *Betula pubescens, Betula pendula* and *Betula pubescens* subsp. *carpatica* (Sałata 1974). Further *Taphrina betulina* on *B. pubescens* has been found in Germany by Ludwig, 1926,1927 (W); (Poelt and Scheuer 1991) in Bohemia and Moravia (Jeschková 1957). In Southern Europe the fungus occurs on birch trees in the northwestern Vitosa Mts. in Bulgaria (Naidenov 1986).

The fact that fungus cause infections of various species of birch evoked numerous discussions about the fungus species, forms and synonymy of *T. betulina* (Mix 1949, Gjaerum 1964). We also found some differences in morphology of whitches' broom formations in the crowns of birch trees. The size of the asci is also variable, as we can see in Table 1.

Although witches' broom infections have not been considered an important disease, the possibly increased use of birch as a productive timber tree in some countries, will necessitate considering the possible impact of these infections. Spanos and Woodward (1994) recorded birch growth reductions of over 25%, which could seriously affect the economic viability of birch plantations. Mycofloristic observations made for this study show, that infections of birch in Slovakia are not so important as in Scotland or in other Nordic countries.

Taphrina betulae (Fuckel) Johanson

Bas.: *Exoascus betulae* Fuckel
Syn.: *Taphrina auctumnalis* (Sadeb.) Palm

Symptoms. The fungus causes small rounded (up to 10 mm large) pale green to yellow non-thickened spots on the leaves of Betula pendula Roth. In the period

Table 1 Variability of *Taphrina betulina* asci at different locations.

Locations	Ascus — size in μm	Stalk cell — size in μm
Malá studená dolina Valley	16–48 × 11–22	3–16 × 10–38
	(32–35 × 16–19)	(6–16 × 16–22)
Kamenistá dolina Valley	32–51 × 12–16	6–17 × 19–25
	(32–38 × 16)	(6–8 × 22–26)
Zelené Pleso Valley	35–50 × 19	13–15 × 19
Štrbské Pleso, in park	24–73 × 10–25	3–22 × 16–41
	(32–48 × 16–22)	(6–16 × 19–32)
Starý Smokovec, in the Village	32–67 × 12–22	3–28 × 12–28
	(41–48 × 13–16)	(9–22 × 16–19)
Tatranská Lomnica, in park	35–76 × 12–22	6–38 × 12–35
	(48–64 × 16–19)	(6–10 × 16–25)
Žiarska dolina Valley	48–58 × 22–26	10 × 32
	(38–69 × 15–23)	
according the authors:		
Najdenov (1986)	45–55 × 10–15	
Mix (1949)	23–73 × 10–26	7–27 × 10–30
Sałata (1974)	23–80 × 12–27	8–23 × 12–30
Gjaerum (1964)	36–96 × 11–23	

of maturing asci the spots are greyish, turn brown later, become dry and remain on the living leaves (Fig. 5).

Anatomical and morphological characteristics. The vegetative subcuticular mycelium is richly branched and disintegrate into short cells that develop into thick-walled, irregularly shaped ascogenous cells (Fig. 6a). Later, the ascogenous cells increase in length and asci are formed. Asci epiphyllous, hypophyllous or amphigenous, cylindric, rounded or truncate at the apex, sometimes broadened at the base. Stalk cells sessile, broad and flat, sometimes broader than the ascus or isodiametric (Fig. 6b). The dimensions of the asci are 17-39 × 7.7-17 μm, of the stalk cells 3.1-15.4 × 3.1-18.5 μm, but most frequently they are 18.4-27.7 × 9.2-12.3 μm

Fig. 5. Greyisch moderate-sized spots caused by *Taphrina betulae* on living leaves of *Betula pendula*.

with stalk cells 6.2-12.3 × 7.7-15.4 μm. Ascospores eight, ovate or to elliptic, they are 4.6 × 6.2 μm, sometimes budding in the ascus.

According to Mix (1949) they are 17-46 × 8-18 μm, stalk cells 7-17 × 8-30 μm; according to Sałata (1974) most frequently 25-35 × 8-12 μm, stalk cells 6-17 × × 8-30 μm and according to Gjaerum (1964) the asci are 20-44 × 9-18 μm.

Locations of the fungus and their ecological characteristics.

Taphrina betulae was collected by Bäumler at Pozsony (Bratislava), by Kmeť at Prenczfalu near Szitnya (Prenčov, Sitno), by Hazslinszky at Eperjes (Prešov) on *Betula pendula* (Moesz 1939), and by Kmeť at Prenčov, 1898 on Betula sp. (Jeschková 1957).

New locations of this so far very rare fungus not only in Slovakia were found during our mycofloristic observation on *B. pendula* only at two sittes situated in valleys of the Vysoké Tatry Mts. and in one location in Nízke Tatry Mts. near a tourist track at an elevation of 1200 m alt. The fungus was not found at the old locations in east, central and west Slovakia detected by Kmeť, Bäumler and Hazslinszky.

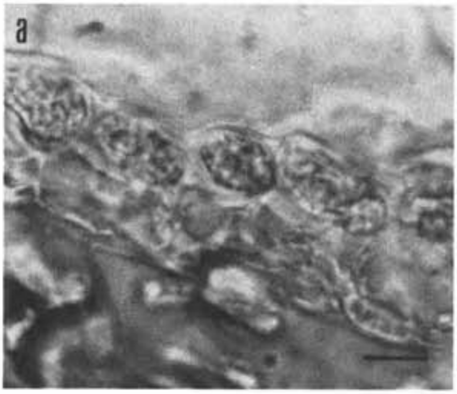

Fig. 6. a). Mycelium cells become enlarged to form ascogenous cells in the subcuticular leaf layer, —— 10 μm.

Fig. 6.b). Mature asci of *T. betulae* with ascospores, —— 10μm.

List of locations (Fig. 4)

On *Betula pendula* Roth (syn. *B. alba* L., syn. *B. verrucosa* Ehrh.): 10. Malé Karpaty Mts.: Pozsony (Bratislava) Bäumler (Moesz 1939); 14e. Štiavnické vrchy Mts.: Čabradský vŕšok; 1877; leg. Kmeť (PRC); Prenčov near Mt. Sitno; 1898; leg. Kmeť (SNM); 22. Nízke Tatry Mts.: Špania dolina Valley; 1985; leg. C. Paulech (SAV); 23b. Vysoké Tatry Mts.: Kežmarská Biela vodaa Valley near Šalviový prameň; 1987, 1988, 1990; Mengušovská dolina Valley, near tourist track; 1990, omnia leg. Bacigálová (SAV); 30a. Šarišská vrchovina Mts.: Eperjes (Prešov), Hazslinszky (Moesz 1939);

On *Betula* L.: 14e. Štiavnické vrchy Mts.: Prenčov; 1882; Prenčov - Sitno; 1898, 1898, 1899; Prenčov - Badaň; 1899; omnia leg. Kmeť (SNM).

The fungus occurs predominantly in North Europa in Scandinavian countries as a biotrophic parasite on *B. pendula* and *B. pubescens*. According to Gjaerum (1964), the fungus is known on *B. pubescens* from localities scattered all over Norway, but on the host *B. pendula* it occurs only in the central regions. In Poland the fungus occurs on *B. pendula* and only at one location on *B. oycowiensis* (Sałata 1974). The new locations of the fungus were found in the north Slovakia in Vysoké Tatry Mts. They are very few and the fungus occurs only on the birch *B. pendula* situated in mountain valleys at elevations up to 1 000 m alt. Ecological conditions of those locations correspond with Northern European climate conditions (Bacigalova 1997). According to Zerova (1969) the fungus occurs on *B. pendula* also on the territory of the East Carpathian Mts. in the Ukraine.

Bacigálová K.: Species of Taphrina on Betula in Slovakia

Summary

The paper deals with biotrophic fungi of *Taphrina* (*T. betulina, T. betulae*) parasitizing on *Betula* species (*B. pubescens, B. pubescens* subsp. *carpatica, B. pendula*), till now unsufficiently known from the Slovak territory. Several years of mycofloristic observations have shown that the species *T. betulina* and *T. betulae* occur only in the higher vegetation range with a colder and a more humid climate in central and north Slovakia. The author presents new data on biology, ecology and distribution of the mentioned fungi as well as their host plants. The ecological characteristics of the new locations are described.

Acknowledgements

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Anthracoidea michelii and Thecaphora affinis in Slovakia

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Paulech, P., Zlinská J. and Szittayová S. (1997): Anthracoidea michelii and Thecaphora affinis in Slovakia. - Czech Mycol. 50: 119–125

Two smut species (*Ustilaginales*) rare or new for Slovakia were detected in the mountains of Považský Inovec: *Anthracoidea michelii* Vánky on *Carex michelii* Host and *Thecaphora affinis* Schneider ex Fischer von Waldheim on *Astragalus glycyphyllos* L. The morphology of the fungi and a short characteristic of the locations of their occurrence are described in the paper.

Key words: *Anthracoidea michelii*, *Thecaphora affinis*, characteristic, Slovakia, Považský Inovec Mts., smut fungi.

Paulech P., Zlinská J. a Szittayová S. (1997): Anthracoidea michelii a Thecaphora affinis na Slovensku. - Czech Mycol. 50: 119–125

V pohorí Považský Inovec boli zistené dva pre Slovensko zriedkavé, prípadne nové druhy snetí (*Ustilaginales*): *Anthracoidea michelii* Vánky na *Carex michelii* Host a *Thecaphora affinis* Schneider ex Fischer von Waldheim na *Astragalus glycyphyllos* L. U oboch druhov je opísaná morfológia huby a stručná charakteristika lokalít ich výskytu.

INTRODUCTION

During the study of phytopathogenous micromycetes of Slovakia oriented predominantly at distribution, host plants range and ecophysiology of the fungus *Tilletia controversa* Kühn (Paulech and Paulech 1995), the occurrence of some smut species (*Ustilaginales*) was established in the mountains of Považský Inovec. Two of these species were found to be rare or unknown to Slovakia: *Anthracoidea michelii* on sedges (*Carex michelii* Host) and *Thecaphora affinis* on wild liquorice (*Astragalus glycyphyllos* L.). A mycofloristic study of the investigated territory was made, including a geobotanical survey.

MATERIAL AND METHODS

The mentioned smut species (*Ustilaginales*) were detected by field investigation of the central and south part of Považský Inovec Mts., which according to the present phytogeographic division of the Slovakian territory (Futák 1966) belongs to the Praecarpaticum and to the West-Carpathian flora = Carpaticum occidentale, by study of literature and herbarium items from the Slovakian territory (herbarium BRA and SAV, Bratislava, TANAP, Tatranská Lomnica – Slovak Republic; BRNM, Brno, PRC and PRM, Prague – Czech Republic; W, Wien – Austria) and Vánky Ust. = exsiccata Vánky K. Ustilaginales (partly deposited in BRA). The identification of individual smut species was carried out according to Vánky (Vánky 1985, 1991). Biometric data of fungus spores were obtained from measuring of 25–100 spore files. Microphotography was realized with a Czechoslovak scanning electron microscope (Tesla BS 301). The nomenclature of higher vascular plants is according to Ehrendorfer (1973). On individual locations of the mentioned smut species a geobotanical investigation was carried out, relevies were made and the soil type was determined.

Fig. 1. Spike of *Carex michelii* infected by *Anthracoidea michelii*, detail.

RESULTS AND DISCUSSION

Anthracoidea michelii Vánky, Bot. Not. 132: 223, 1979

Sori in ovaries of the sedge (*Carex michelii*), forming small, round, hard, black bodies consisting of spores (Fig. 1). Spores variable in form, irregularaly shaped, moderately flattened, in face-view 13–19 × 15–26 μm, in side-view 10–13 μm broad, usually conspicuously angular, rounded and sometimes at the end prolongated and narrowed. Spore wall 1–3 (–5) μm thick, usually thicker at angles and protuberances. Surface verrucose, covered with distinct warts (Fig. 2). Spore colour brown to dark reddish-brown.

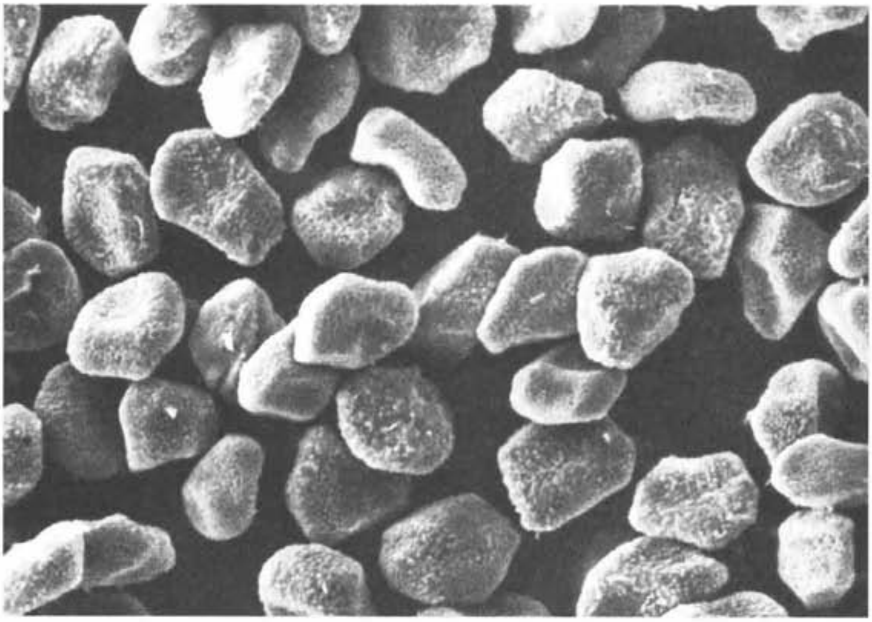

Fig. 2. Spores of *Anthracoidea michelii* on *Carex michelii* in SEM, magnif. 1000 ×.

The occurrence of *Anthracoidea michelii* was detected in the east part of the cadastral territory of Modrová village, district of Trenčín, Považský Inovec Mts. (part Tematínske kopce – Tematín hills), western Slovakia. This location is situated on a sunny south-western slope (25–30 °) in a xerothermic forest (*Quercion pubescentis – petraeae*), above a gamekeeper's cottage at Modrová village in an altitude of 370 m a. s. l., on rendzina soil on dolomite. It is situated only

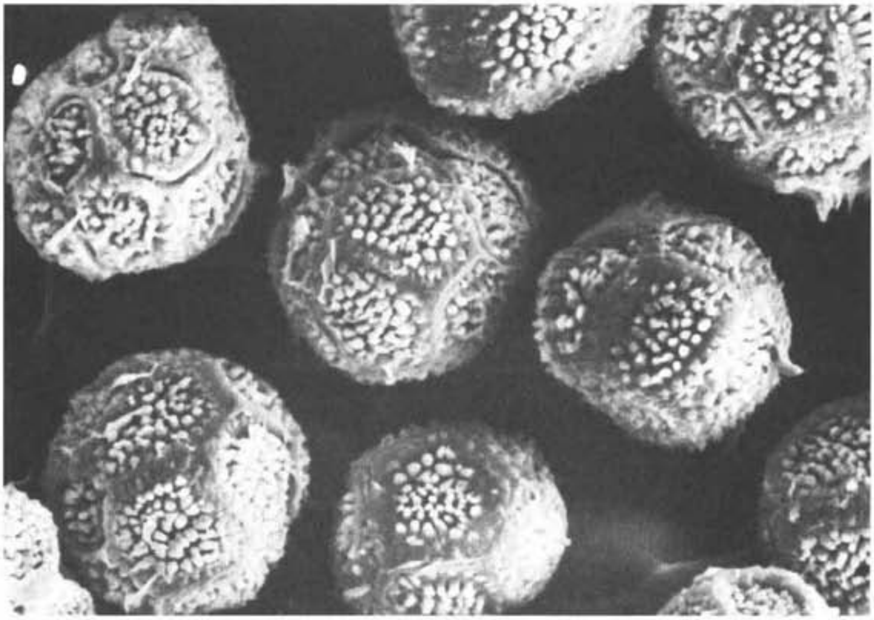

Fig. 3. Spore balls and spores of *Thecaphora affinis* on *Astragalus glycyphyllos* in SEM, magnif. 1000 ×.

a few meters above a forest road, closely after its turn to the east. The fungus *Anthracoidea michelii* was detected there on 11th June, 1993. It was confirmed at this location in the following years, too.

The first herbarium item of *Anthracoidea michelii* from our territory was collected by Vánky (Vánky Ust. No. 554) in the year 1986 (29th May) near the town of Hlohovec. The species spectrum of the genus *Anthracoidea* Bref. on our territory has mainly been studied by Součková (Tomková). In her papers she ranged them under the genus name *Cintractia* Cornu (Součková 1952, 1953, 1954, 1955; Součková-Tomková 1960; Tomková 1962). A report on the occurrence of species of this genus as well as data on the occurrence of numerous other species of phytopathogenous micromycetes in Slovakia was given also by Hruby (1932). In this and last century several other mycologists collected species of the genus *Anthracoidea* on the territory of today's Slovakia as well (E. Hazslinszky, A. Kmeť, J. A. Bäumler, R. Picbauer, I. Györffy, G. Szépligeti, K. Vánky). According to the present knowledge the occurrence of 10 *Anthracoidea* species was established in the area of Slovakia. The real number of species is probably higher. This can be

Fig. 4 Pods of *Astragalus glycyphyllos* infected by *Thecaphora affinis*, detail.

presumed from the rich occurrence of host plants of this genus in the Slovakian flora and from the fact that insufficient attention has been paid to mycological investigation of our territory up to now. Vánky (1985) has described more than 30 species of this genus in his monograph of the Carpathian *Ustilaginales*.

Thecaphora affinis Schneider ex Fischer von Waldheim, Aprecu systématique des Ustilaginées, 37, 1877

T. affinis was detected in seeds of wild liquorice (*Astragalus glycyphyllos* L.). All seeds of the infected plants were destroyed and transformed into a reddish-brown, granular-powdery mass of spore balls composed of usually 4–13 moderately firmly connected spores. The shape of the spore balls was globose, ovoid or sometimes slightly irregular, (22–) 28–46 × (25–) 32–56 (–62) μm large (Fig. 3). The colour ranged from yellowish-brown to reddish-brown. The individual spores were rounded, subcuneiform or irregularly polyhedral, 13–21 μm long, smooth on surfaces with mutual contact, on free surfaces verrucose with distinct warts. The pods of the infected plants were moderately deformed, usually shorter and thicker (as if swollen) than healthy ones. The degree of deformation depended on the ontogenetic stage of the infected plants (Fig. 4).

The occurrence of *T. affinis* was established in the north part of the cadastral territory of Stará Lehota village, district of Trenčín, on 16th October, 1993. This location is situated on the edge of the forest road to Bezovec (hill) at an altitude of 350 m a. s. l. The growth on the location consisted mainly of species of fringe communities of the order *Origanetalia* and *Prunetalia* on brown rendzina soil on dolomite. The occurrence of *T. affinis* on *Astragallus glycyphyllos* at this location was detected also in the following years.

The occurrence of this species had earlier not been established on the area of Slovakia. At total of 35 species parasitizing on different host plants from 15 families were described in the genus *Thecaphora*. Four of them occur on Carpathian territory (Vánky 1985). A previous study by Vánky (1991) dealing with *Thecaphora* species parazitizing on *Leguminosae*, reveated 11 species parazitizing on this group of plants.

ACKNOWLEDGEMENTS

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Identification of a fungal contaminant in a culture of Dunaliella salina

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Toncheva-Panova T. G. (1997): Identification of a fungal contaminant in a culture of Dunaliella salina. – Czech Mycol. 50: 127–131

Acremonium sp. was identified as a contaminant in the culture of the halophilic algal strain *Dunaliella salina* V63. The morphological details of this fungus – algae relationship were determined by growing the association in a slide cavity culture. The interaction between *Dunaliella salina* and the contaminant is described and illustrated.

Key words: *Acremonium*, *Dunaliella salina*, vzájemný vztah.

Toncheva-Panova T. G. (1997): Výskyt houbového kontaminantu v kultuře řasy Dunaliella salina. – Czech Mycol. 50: 127–131

Acremonium sp. byl identifikován jako kontaminant v kultuře halofilního kmenu řasy *Dunaliella salina* V63. Morfologické detaily soužití houby a řasy byly popsány při společném výskytu ve sklíčkové kultuře. Vzájemný vztah mezi *Dunaliella salina* a kontaminantem je popsán a ilustrován.

The development of unicellular algae in nature and laboratory conditions depends on different contaminated organisms – protozoa, bacteria, viruses, fungi and others (Gromov 1976). It is suggested that algae growing in extreme salinity can avoid competition and contamination with other less tolerant organisms (Brock 1975). During the cultivation of the halophilic *Dunaliella salina* in laboratory conditions we had problems with different contaminants. After treatment with antibiotics (Toncheva-Panova and Naneva 1987) bacteria-free *Dunaliella salina* was obtained but increasing occurrence of a fungal contaminant was observed. To our best knowledge there are no other data on fungal contaminants of *Dunaliella salina* besides the data of Bednářová et al. (1976) on the occurrence of *Cladosporium* in laboratory culture of *Dunaliella acidophila* (Kalina) Masjuk.

The aim of the present paper is to present the results from studies of the association of *Dunaliella salina* and the fungus including the identification of the fungus and the interaction between the two organisms.

MATERIAL AND METHODS

The investigation was carried out with *Dunaliella salina* strain V63, kindly donated by M. Tzolova, Institute of Plant Physiology, Bulgarian Academy of

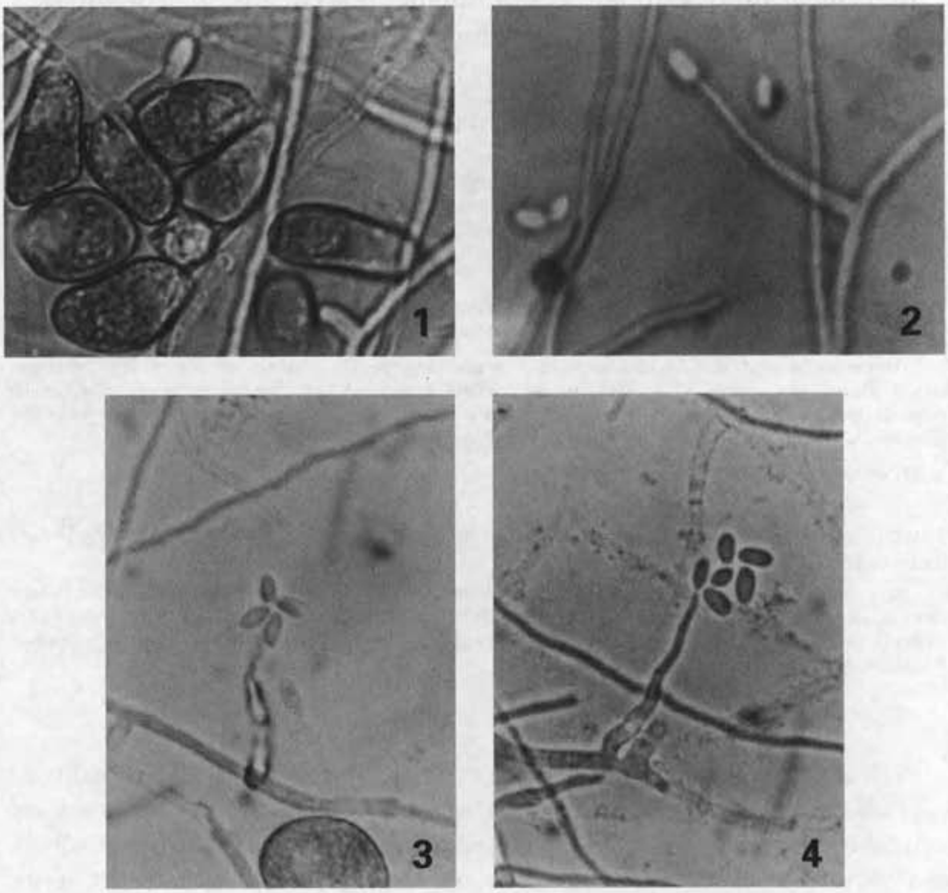

Fig. 1. *Dunaliella salina* V63 enclosed in fungal hyphae. A fungal protuberance contacted an algal cell.
Fig. 2 and 3. Variations of phialides and phialoconidia in the algal-fungus association.
Fig. 4. Aggregate droplet of phialoconidia (phialospores) at the apex of phialides of the well-developed mycelium.

Sciences. The algae was cultivated extensively on Eddy's medium, at 26 °C, light intensity 6000 lux and treated with kanamycin (Toncheva-Panova and Naneva 1973). The morphological details of the alga and fungus community developed thereafter were determined by growing the association in cavity slide culture, placed in a moist chamber for 90 days. Microscopic observations and photographs were made.

RESULTS AND DISCUSSION

The fungus developed together with D. salina and produced slowly a hyaline mycelium consisting of white or pale yellow hyphae, 0.8–1.5 μm wide, with thin cell walls, branched and septate (Fig. 1). Vegetative growth of the fungus was observed together as well as sporulation. Two types of fungal conidia associated with different stages of mycelial maturation were present: 1) abundant, globose, solitary aleurioconidia – 4.0–7.3 μm diam., borne usually on the top of conidiophores or on lateral short conidiophores, and 2) oval phialoconidia formed at the tips of long and slender phialides of the hyphae of the well-developed mycelium (Fig. 2, 3 and 4). The phialides erected from the substratum, have a maximum width of 1.0–2.0 μm at the base and taper to 0.2–0.5 μm at the tip. Phialides produced oval phialoconidia, measuring 1.0–1.5 μm to 0.4 μm (Fig. 3). The phialoconidia are hyaline – separate or in clusters of two to six, parallel to each other or to the phialides producing them. They are deposited in slimy heads at the apex of the phialide (Fig. 3 and 4). According to the features of fine, slow growing mycelium, simple one-celled in slimy heads conidia, the pigmentation and the presence of phialoconidia, the contaminant of *Dunaliella salina* V63 was identified as *Acremonium* sp. (Domsch et al. 1980; Gams 1971).

When the mycelium of *Acremonium* grew together with *D. salina* V63 and the hyphae became intermixed with the algal cells, the first observable reaction was the formation of short protuberances from the fungus towards the algal cells (Fig. 1). First at a distance from the *Dunaliella* cells, the protuberances later elongated and developed into a single hook which appeared to clamp onto algal cells (Fig. 5–7). The algal cell reaction to the fungal invasion was invagination of the cell wall and redrawment of the chloroplast. It was evident from the photographs that in the 40 days old association the algal division was inhibited and the fungus grew over the enormous bigger non-divided *Dunaliella* cells. Only in some cases fungal filaments in the intracellular space of the algae were observed (Fig. 8). We suggest that exhaustion of nutrients in the association caused by the development of algae induces the formation of a hook from the fungus toward the algae. The interaction between the fungus and *Dunaliella* have some similarity to the way some mycoparasites make contact with their hosts (Rakvidhyasastra and Butler 1973). The mycoparasites are deficient in the growth factor mycotropheine and, like the fungal contaminant of *Dunaliella*, produce a special branche of absorptive hyphae for their hosts so as to assure nutrients and the growth factor.

The *Acremonium* sp. occurring in the *Dunaliella salina* culture appeared to be an algal antagonist. Although there is no information about *Acremonium* species – algal parasites, our observations showed that under defined conditions and a proper algal strain some *Acremonium* species act as undesirable contaminants. Our suggestions that *Acremonium* possesses such negative potentials, are supported

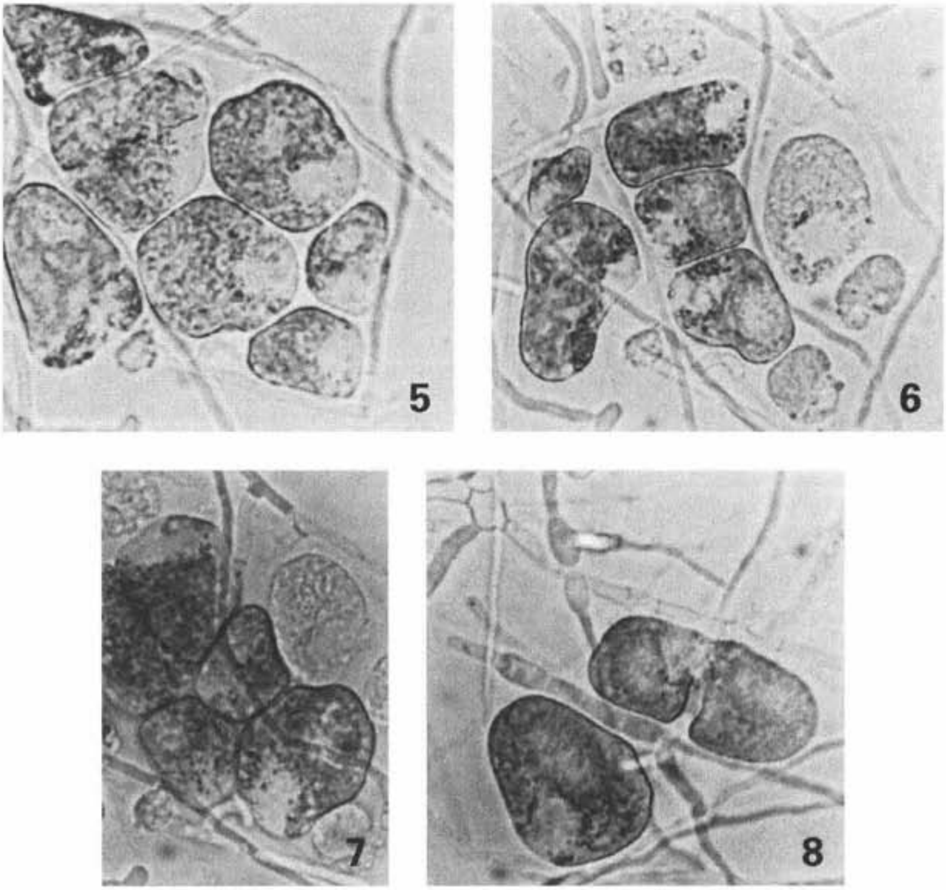

Fig. 5. A single hook formation from the fungal hyphae towards the algae cause invagination of the algal cell.
Fig. 6. The next step of the fungal attack – fungal hook in the closest contact with the Dunaliella cell.
Fig. 7. The hook developed into a clamp directly on the algal cell.
Fig. 8. Some fungal hyphae seemed to enter the algal cells.

All photographs × 200

by the data on proteolytic activity of some *Acremonium* representatives, parasites on sporangia of Myxomycetes, different insects, some higher plants, causal pathogens of gummatous ulcers, and antagonists against *Fusarium oxysporum* f.sp. *lycopersici* (Domsch et al. 1980; Gams 1971).

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The author wishes to thank Prof. Dr. W. Gams, Centraalbureau voor Schimmelcultures, Netherlands, for helping in the identification of the fungus.

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CZECH MYCOL. 50 (2), 1997

Some uncommon or rare polypores (Polyporales s.l.) collected on uncommon hosts

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Kotlaba F. (1997): Some uncommon or rare polypores (Polyporales s.l.) collected on uncommon hosts. – Czech Mycol. 50: 133–142

Seventeen uncommon or rare polypores collected on uncommon, until now unknown hosts in the Czech and Slovak Republics, as well as in some other European countries, are published with full data.

Key words: Fungi, Polyporales, uncommon hosts, localities in Europe

Kotlaba F. (1997): Některé nehojné nebo vzácné choroše (Polyporales s.l.) sbírané na neobvyklých hostitelích. – Czech Mycol. 50: 133–142

Je publikováno sedmnáct nehojných nebo vzácných chorošů se všemi daty, sbíraných na neobvyklých, dosud neznámých hostitelích v České a Slovenské republice nebo v některých jiných evropských zemích.

INTRODUCTION

Recently, a paper was published concerning the common or rather common polypores collected on uncommon or rather uncommon host trees and shrubs (Kotlaba 1997). I will not repeat what is written in the Introduction of the cited paper but the main points are noted here.

This paper chiefly comprises the author's own collections or the collections of some of his friends (first of all Dr. Z. Pouzar), where the identification of the polypore, as well as the host, are quite reliable. If the collections are from the territory of the former Czechoslovakia, then the published hosts are new for the Czech or Slovak Republics (see Kotlaba 1984) and, in the case of some collections from other European countries, the hosts are most probably also new for these countries (in some cases perhaps for the whole of Europe). As regards the known polypore hosts in the mycological literature, I take into account the paper written by Lecot (1984) and the books of Ryvarden with Gilbertson (1993, 1994).

The arrangement of polypore species is alphabetical, the collecting data with for the Czech Republic abbreviated to CR, the Slovak Republic to SR and author's name, as the collector or identifier, to the initials F. K. The abbreviations of herbaria are used according to the international rules (for various other details see Kotlaba 1997 – Introduction).

LIST OF SOME UNCOMMON OR RARE POLYPORES COLLECTED ON UNCOMMON HOSTS

Aporpium caryae (Schw.) Teix. et Rogers

Beech (*Fagus sylvatica*), rarely oaks (*Quercus* sp. div.) and very rarely some other trees or old carpophores of some polypores are hosts of this rather uncommon fungus in Europe. As perhaps new, unpublished hosts it has been collected on *Acer pseudoplatanus, Fomes fomentarius, Ganoderma lipsiense* and *Populus alba*: "Travný" near Morávka close to Frýdek-Místek, c. 1000 m alt., SE Silesia, CR, on wood of *Acer pseudoplatanus*, 17. IX.1991, l. et d. Z. Pouzar (PRM 852247). – "Studený vrch" near Stříbrná Skalice, c. 400 m alt., C Bohemia, CR, on an old carpophore of *Fomes fomentarius*, 21. IX.1987, l. et d. Z. Pouzar (PRM 874121). – "Boky" near Budča close to Zvolen, c. 450 m alt., C Slovakia, SR, on an old carpophore of *Ganoderma lipsiense*, 18. X.1972, l. et d. Z. Pouzar (PRM 874144). – "Boří les" ("Rendezvous") near Valtice close to Břeclav, c. 190 m alt., SE Moravia, CR, on a fallen trunk of *Populus alba*, 14. X.1985, l. et det. Z. Pouzar (PRM 838016).

Inonotus rickii (Pat.) Reid

This extremely rare fungus species has been published in Europe only on trees of foreign origin, viz. *Parkinsonia* sp. and *Schinus molle*, whereas, on European *Celtis australis* and *Sambucus nigra*, it has been until recently unknown: Montenegro, Greece (see Kotlaba and Pouzar 1994).

Irpex lacteus (Fr.: Fr.) Fr.

Hosts of this uncommon fungus in Europe are numerous broad-leaved trees, but beech (*Fagus sylvatica*) is the most frequented species; however, *Ailanthus altissima* seems to be till now an unknown host for it: "Jókaiho ul.", a street in Lučenec, c. 190 m alt., S Slovakia, SR, on a thin dead trunk of *Ailanthus altissima,* 27. VII.1989, l. et d. F. K. (PRM 867380).

Oxyporus corticola (Fr.) Ryv.

This rather uncommon polypore grows in Europe on various species of broad-leaved trees (very rarely on conifers), most often on aspen (*Populus tremula*). As perhaps new hosts, it has been collected on *Aesculus hippocastanum* and *Padus avium*:

"Sady B. Němcové", park in Karviná 3 near Ostrava, c. 230 m alt., NE Silesia, CR, in a cavity within a living branch of *Aesculus hippocastanum*, 22. VIII.1966,

Fig. 1. *Irpex lacteus* on a dead thin trunk of *Ailanthus altissima*. Lučenec, Slovak Republic, 30. VII.1989.
Photo F. Kotlaba

l. et d. F. K. et Z. Pouzar (PRM 870111). – "Lapos" near Nové Hony close to Lučenec, c. 230 m alt., S Slovakia, SR, on a fallen trunk of *Padus avium (= P. racemosa)*, 31. VII.1989, l. et d. Z. Pouzar (PRM 867374).

Oxyporus latemarginatus (Dur. et Mont. in Mont.) Donk

A rather rare polypore occurring in most European countries on a rather great range of host trees, chiefly false acacia (*Robinia pseudoacacia*). On *Celtis occidentalis* and *Gleditsia triacanthos* it is, however, most probably unknown: "Nám. Slobody", a square in Bratislava, c. 210 m alt., SW Slovakia, SR, on a wounded living trunk of *Celtis occidentalis*, 17. X.1993, l. J. Paclt, d. F. K. et Z. Pouzar (PRM 879521). – "Trenčianska ul.", a street in Bratislava, c. 210 m alt., SW Slovakia, SR, on the dead bark of a living trunk of *Gleditsia triacanthos*, 2. X.1994, l. J. Paclt, d. F. K. et Z. Pouzar (PRM 885245).

Perenniporia fraxinea (Bull.: Fr.) Ryv.

Chiefly false acacia (*Robinia pseudoacacia*) and ashes (*Fraxinus* sp. div.), rarely also some other broad-leaved trees are attacked in Europe by this rather rare polypore, but on *Sophora japonica* it has, perhaps, not been published: "Košická ul.", a street in Bratislava, c. 210 m alt., SW Slovakia, SR, on a living trunk of *Sophora japonica*, 1. VIII.1996, l. J. Paclt, d. F. K. et Z. Pouzar (PRM 889596).

Perenniporia tenuis (Schw.) Ryv.

This uncommon and rather thermophilic polypore grows in Europe on a relatively wide range of broad-leaved trees and shrubs, chiefly oaks (*Quercus* sp. div.), false acacia (*Robinia pseudoacacia*) and sweet cherry (*Cerasus avium*); on *Bougainvillea glabra, Phlomis fruticosa* and *Vitis vinifera*, it was perhaps until recent times unknown: Greece (see Kotlaba and Klán 1994).

Phellinus erectus David, Dequatre et Fiasson

A very interesting fungus with an evidently mediterranean pattern of distribution, which was described only 15 years ago, is known until now solely from Portugal, France, Italy and the former Yugoslavia (Ryvarden and Gilbertson 1994); from Greece, it has been up till now not reported although one old collection was deposited under the incorrect name in the herbarium PRM and was recognized only recently by Z. Pouzar as *Phellinus erectus:* Nida, Crete island, 1 000 m alt., Greece, in a bush "makia" /maquis/, VI.1936, l. O. Štěpánek, d. A. Pilát as *P. robustus* (see Pilát 1936–42: 506), rev. 2.12.1996 Z. Pouzar (PRM 756269). The host is unfortunately not mentioned (the collector was a zoologist).

Phellinus pseudopunctatus David, Dequatre et Fiasson

Mostly broad-leaved trees and shrubs such as laurel (*Laurus nobilis*), olive (*Olea europaea*), false acacia (*Robinia pseudoacacia*), oaks (*Quercus* sp. div.) etc. are hosts of this uncommon mediterranean-submediterranean fungus in Europe, but on *Carpinus orientalis* and *Cornus mas* it is perhaps unknown (on *Carpinus betulus* it has been published recently from SE Moravia, CR, by Vampola 1993; PRM 878439, 886770). As this species was described solely 15 years ago, only a limited number of localities have so far been published; for this reason, I give here all localities which I know from Bulgaria and the former Yugoslavia, i.e. including the collections on the known hosts: A park in Split, c. 30 m alt., Croatia, on a dying trunk of *Laurus nobilis*, 29. VII.1966, l. F. K., d. F. K. et Z. Pouzar, 1992 (PRM 876847). – Vicinity of Starigrad near Zadar, c. 5 m alt., Croatia, on a dying trunk of *Olea europaea*, 10. VII.1968, l. F. K., d. F. K. et Z. Pouzar, 1996 (PRM 834905). – Arboretum

Fig. 2. *Phellinus pseudopunctatus* on a dying trunk of *Olea sativa.* Near Starigrad close to Zadar, Croatia, 10. VII.1968.
Photo F. Kotlaba

Trsteno near Dubrovnik, c. 100 m alt., Croatia, on a dying trunk of *Laurus nobilis*, 14. VII.1968, l. F. K., d. F. K. et Z. Pouzar, 1992 (PRM 876840). – Miločer near Budva, in a castle park, c. 20 m alt., Montenegro, on a stump of *Laurus nobilis*, 4. VI.1976, l. F. K., d. F. K. et Z. Pouzar, 1992 (PRM 876852). – In a wood in the vicinity of Vlas near Slnčev Briag close to Nesebr, c. 30 m alt., Bulgaria, on a dead thin trunk of *Carpinus orientalis*, 25. VII.1974, l. F. K., d. Z. Pouzar, 1996 (PRM 741782). – Ropotamo river valley, near "Veselata skala" close to the camp Arkutino between Sozopol and Primorsko, c. 3 m alt., Bulgaria, on a dead branch of *Cornus mas* (PRM 816541) and on a dead thin trunk of *Carpinus orientalis* (PRM 816550), 7. VII.1975, l. F. K., d. Z. Pouzar, 1992. – Brook valley "Kozluka" above the waterfall between "Lovno chanče" and "Taljana" near Vlas close to Slnčev Briag, c. 250 m alt., Bulgaria, on a living trunk of *Carpinus betulus*, 2. VIII.1979, l. F. K., d. Z. Pouzar, 1992 (PRM 821431).

All collections given here from Bulgaria were erroneously published as *Phellinus punctatus* by Kuthan and Kotlaba (1981, 1988) and revised by Z. Pouzar in 1992 and 1996.

Phellinus rhamni (M. Bond.) Jahn

This rare fungus occurs in Europe first of all on *Rhamnus cathartica* and rarely also on several other broad-leaved trees and shrubs; on *Paliurus spina-christi* and especially *Spartium junceum* it was probably previously unknown: *Paliurus spina-christi* – Bulgaria, see Kuthan and Kotlaba (1981). – Petrovac near Budva, 30 m alt., Montenegro, on a dead thin trunk of *Spartium junceum*, 23. VIII.1980, l. et d. F. K. (PRM).

Polyporus badius (S. F. Gray) Schw.

Willows (*Salix* sp. div.) are most the frequented hosts of this uncommon polypore in Europe; it grows rarely also on many other broad-leaved trees, but on *Malus domestica* it has perhaps not been published: Dolní Rokytnice n. Jiz. near Liberec, c. 590 m alt., N Bohemia, CR, in a cavity within a living trunk of *Malus domestica*, 29. VII.1979, l. J. Slavíček, d. Z. Pouzar (PRM 871021).

Postia balsamea (Peck) Jülich

Host trees of this rather uncommon polypore are mostly fir (*Picea abies*) and oaks (*Quercus* sp. div.), rarely also some other trees or shrubs, both conifers and broad-leaved; it has been collected exceptionally, as most probably a new host, on cultivated *Pinus strobus*: "Terezino (Terčino) údolí" near Nové Hrady close to České Velenice, c. 490 m alt., S Bohemia, CR, on a dead trunk of *Pinus strobus*, 23. IX.1991, l. J. Lederer, d. F. K. (PRM 873878).

Postia subcaesia (David) Jülich

This rather uncommon polypore grows in Europe on some broad-leaved trees, most often on poplars (*Populus* sp. div.), but on *Carpinus betulus, Fraxinus*

Fig. 3. *Phellinus rhamni* on a dead branch of *Paliurus spina-christi*. Near Arkutino close to Primorsko, Bulgaria, 9. VIII. 1979. Photo F. Kotlaba

angustifolia ssp. *danubialis* and *Salix alba* it seems to be so far unknown: "Cahnov" near Lanžhot close to Břeclav, c. 155 m alt., SE Moravia, CR, on a fallen trunk of *Carpinus betulus*, 29. X.1987, l. et d. Z. Pouzar (PRM 853319). – "Ranšpurk" near Lanžhot close to Břeclav, c. 155 m alt., SE Moravia, CR; on a dead trunk of *Fraxinus angustifolia* ssp. *danubialis*, 16. X.1985, l. et d. F. K. (PRM 838069). – "Boří les" ("Rendezvous") near Valtice close to Břeclav, c. 190 m alt., S Moravia, CR, on a dead branch of *Salix alba*, 14. X.1985, l. et d. F. K. (PRM 838014).

Schizopora carneolutea (Rodw. et Clel.) Kotl. et Pouzar

A rather uncommon species in some European countries, occurring on a great range of hosts, first of all on oaks (*Quercus* sp. div.) and hornbeam (*Carpinus betulus*), rarely on other hosts including old carpophores of fungi; it is perhaps previously unknown on *Abies alba, Alnus incana, Catalpa erubescens, Cerasus avium* and *Padus avium*: "Komárnická jedlina" near Komárnik close to Svidník, c. 480 m, alt., NE Slovakia, SR, on a fallen trunk of *Abies alba*, 26. X.1987, l. et d. F. K. (PRM 853337). – "Kopáč" near Podunajské Biskupice close to Bratislava, c. 130 m alt., SW Slovakia, SR, on a fallen trunk of *Alnus incana*, 27. VIII.1974, l. Z. Pouzar, d. P. Vampola, 1993 (PRM 879808). – "Nitrianská ul.", a street in Hlohovec close to Bratislava, cemetery, c. 155 m alt., SW Slovakia, SR, on a living trunk of *Catalpa erubescens*, 8. X.1996, l. J. Paclt, d. F. K. et Z. Pouzar (PRM). – "Bikóc" near Hámor close to Lučenec, c. 280 m alt., S Slovakia, SR, on a fallen trunk of *Cerasus avium*, 28. VII.1989, l. et d. F. K. et Z. Pouzar (PRM 867796). – Near the lakes in Lednice Park near Valtice close to Břeclav, c. 170 m alt., SE Moravia, CR, on a fallen trunk of *Padus avium*, 26. V.1989, l. R. Schless, d. F. K. (v.s.).

Spongipellis fractipes (Berk. et Curt.) Kotl. et Pouzar

This extremely rare polypore occurs in Europe nearly exclusively on alder (*Alnus glutinosa*); on *Salix cinerea* it is perhaps unknown: "Šúr" near Sv. Jur close to Bratislava, c. 130 m alt., SW Slovakia, SR, on a fallen branch of *Salix cinerea*, 18. X.1985, l. et d. Z. Pouzar (PRM 838029) – a locality with a rich occurrence of this fungus on alder: this is the only known locality of this species in the Slovak Republic (it is absent from the Czech Republic).

Trametes trogii Berk. in Trog

This rare polypore, in Central Europe (it is distributed mostly in southern countries), frequently attacks poplars (*Populus* sp. div.), rarely also some other broad-leaved trees or shrubs; on *Acacia farnesiana* and *Salix pentandra*, however, it was not earlier published: Kotor near Tivat, c. 10 m alt., Montenegro, on a living trunk of *Acacia farnesiana,* 28. V.1976, l. et d. F. K. (PRM 872018). – "Soběslavská (Borkovická) blata" peat bog (in the westernmost part called "Komárovský chobot") near Soběslav, S Bohemia, CR, on a small dead trunk of *Salix pentandra*, 26. X.1995, l. F. K., d. F. K. and Z. Pouzar (PRM 886026); ib., 28. IV.1996 (PRM 888163), 11. V.1996 (PRM 888166), ib., 9. VI.1996 (PRM 888180), ib., 13. X.1996 (PRM 890055) etc., and on a dying trunk of *Salix pentandra*, 8. XI.1996 (PRM 890090), all leg. et det. F. K.

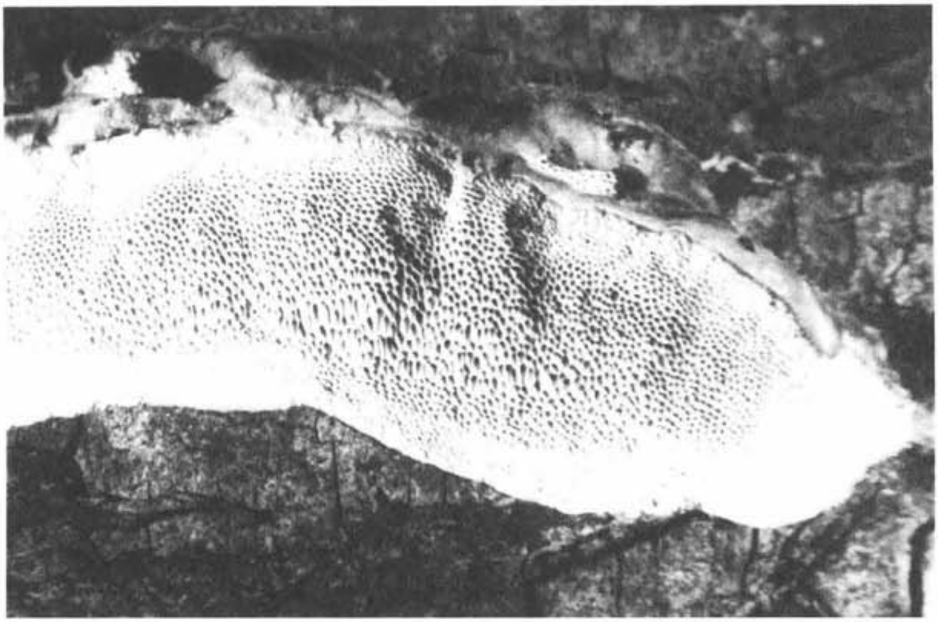

Fig. 4. *Trametes trogii* on a dead thin trunk of *Salix pentandra*. "Soběslavská blata" peat bog (in the part called "Komárovský chobot") near Soběslav, Czech Republic, 26. X.1995.
Photo F. Kotlaba

Trichaptum biforme (Fr. in Klotzsch) Ryv.

Beech (*Fagus sylvatica*), oaks (*Quercus* sp. div.) and birch (*Betula pendula*), very rarely also some few other trees or shrubs are hosts of this rather uncommon polypore in Europe; some time ago it was collected on *Pinus halepensis*, which is most probably new host: Miločer near Budva, the castle park, c. 20 m alt., Montenegro, on a stump of *Pinus halepensis*, 4. VI.1976, l. et d. F. K. (PRM 871993).

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Dr. František Kotlaba septuagenarian

ZDENĚK POUZAR

RNDr. F. Kotlaba, CSc.

Our journal, Czech Mycology, wishes to express its best and cordial regards to Dr. František Kotlaba, who, for long decades has been closely connected with deep ties as author, as well as in the years 1956–1993, a member of the editorial committee. In 1987 we commemorated his sixtieth birthday in an article (in Czech) recording his main activities in mycology and palaeobotany.

F. Kotlaba was born on the 20th May, 1927, in a small peasant family in Vlastiboř, a village in the Tábor district of South Bohemia. He initially studied at a Teachers' training college in Soběslav, but then continued his studies in the Botany Department of the Faculty of Science of Charles University in Prague (1947–1952). Being influenced by the South Bohemian mycologist Rudolf Veselý (Soběslav), from the beginning of his university studies, he turned his attention to fungi. From 1952 to 1955 he remained at the university for a postgraduate studies of mycology and phytopathology, during which he defended two dissertations. The first dealt with the ecology of fungi in sphagnum peat bogs Soběslavská (Borkovická) blata whilst the second analysed the role of wood-inhabiting Hymenomycetes in diseases of fruit trees.

After a short period of working as a palaeobotanist in the National Museum in Prague (1957–1961), he was invited to join the team of the then newly founded Botanical Institute of the former Czechoslovak Academy of Sciences (now Czech Academy of Sciences). In this institution, he worked as a mycologist 27 years up to his retirement in 1988, but has remained in close connection up till now.

In mycology, most his activities were devoted to wood-inhabiting fungi, first of all polypores. These studies (mostly with Z. Pouzar) covered not only taxonomy but also geographical distribution and ecology. His most important work is the book "Geographical distribution and ecology of polypores (Polyporales s.l.) in Czechoslovakia" (1984), written in Czech with an extensive English summary, 16 coloured, 70 black-and-white photographs and 123 distribution maps. But a series of detailed papers in our journal dealing with selected species of Aphyllophorales (mostly stereoid fungi) immediately supplemented the book with further mycogeographically interesting fungi.

The basis for these papers were his own field collections and here it should be emphasized that method was especially important for his programme, which covered field studies not only from districts well known to him, but he systematically collected in almost all parts of the former Czechoslovakia, looking in all kinds of forests from riverside in the lowland to those in the high mountains, as well from dry to wet ones. The result is a representative amount of knowledge on geographic distribution and ecology with data, which could well be included in the general picture of the flora of a given territory.

To compare the mycoflora of the former Czechoslovakia with that of other countries, he visited a number of especially European countries where he particularly collected specimens of Aphyllophorales. Most important are his travells to Roumania (see Kotlaba 1959), the former Yugoslavia (Tortić and Kotlaba 1976), Bulgaria (Kuthan and Kotlaba 1981, 1988), Germany, Poland, Liechtenstein, Switzerland, Great Britain, Estonia, France etc., but also to Turkey (Kotlaba 1976) and Morocco (Kotlaba 1993). Most important is, however, his half year collecting stay in Cuba, where he documented a number of fungi, most with correctly identified host trees and shrubs (Kotlaba, Pouzar and Ryvarden 1984, Vampola, Kotlaba and Pouzar 1994; a further paper is in preparation).

Nevertheless, on this occasion we should, above all, comment on the activities of Dr. Kotlaba during the last ten years. This period is characterized most of all by his co-operation on various projects with the nature conservancy with an object integrating fungi into the general scheme of nature protection. First of all, he organized a team of specialists to compile a book covering various aspects of endangered and rare species of cryptogams of the former Czechoslovakia (Red Data Book of threatened and rare species of the Slovak and Czech Republics, vol. 4, Bratislava 1995), when he, moreover, elaborated 12 species of Aphyllophorales. Simultaneously, he very actively participated (together with S. Šebek and others) in the preparation of a new law for the protection of some species of plants and animals, where, for the first time in the history of our country, fungi are also included (Kotlaba 1992). As a mycologist, he co-operate in the publication "Wetlands of the Czech Republic" (1993, 1995), where he added fungi from many protected wetland areas.

In recent years, Dr. Kotlaba has also been involved in mycological research of nature reserves, especially in the Šumava National Park (South Bohemia). In addition, he has been engaged in editing the local journal for the protection of nature (district of Prague-West), where he has also published a number of his contributions on fungi, as well as green plants. It should be noted that he is a good photographer of fungi, plants and people studying these organisms.

In all of active life, he has also worked intensively in taxonomy, especially of the polypores, which has resulted in the description of several new species (mostly with co-authors): *Phellinus pouzarii* Kotl. 1968, *Pilatoporus maroccanus* Kotl. et Pouzar 1993, *Oligoporus foliculocystidiatus* Kotl. et Vampola 1994, *Antrodia pinicubensis* Vampola, Kotl. et Pouzar 1994, *Phellinus cavicola* Kotl. et Pouzar 1995 and a fossile polypore, *Trametites eocenicus* Knobloch et Kotl. 1994. Together with Z. Pouzar he revised the major part of the polypores described as new by A. Pilát (published 1–4, 1987–1991).

The editorial board of Czech Mycology would like to take this opportunity to wish František good health and very pleasant future years, filled, as usual, with intensive work on fungi, which is always most gratifying for him.

SELECTED MYCOLOGICAL PAPERS OF F. KOTLABA SINCE 1987

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