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Revision and reclassification of some *Chaetosphaeria* species

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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, *Pseudotrachia 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 rehmana* (P. Henn.) Kirschst. are identified with *Melanochaeta hemipsila* (Berk. et Broome) E. Müll., Harr et Sulmont.

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

Rébllová 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 přefazeni do jiných askomycetových rodů. Jsou popsány dva nové druhy, *Calonectria rajasthanensis* sp. nov. a *Eriosphaeria subtomentosa* sp. nov. a je navržena jedna nová kombinace, *Pseudotrachia 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 rehmana* (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 *Pseudotrachia* 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. *Pseudotrachia 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 rehmana* (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.

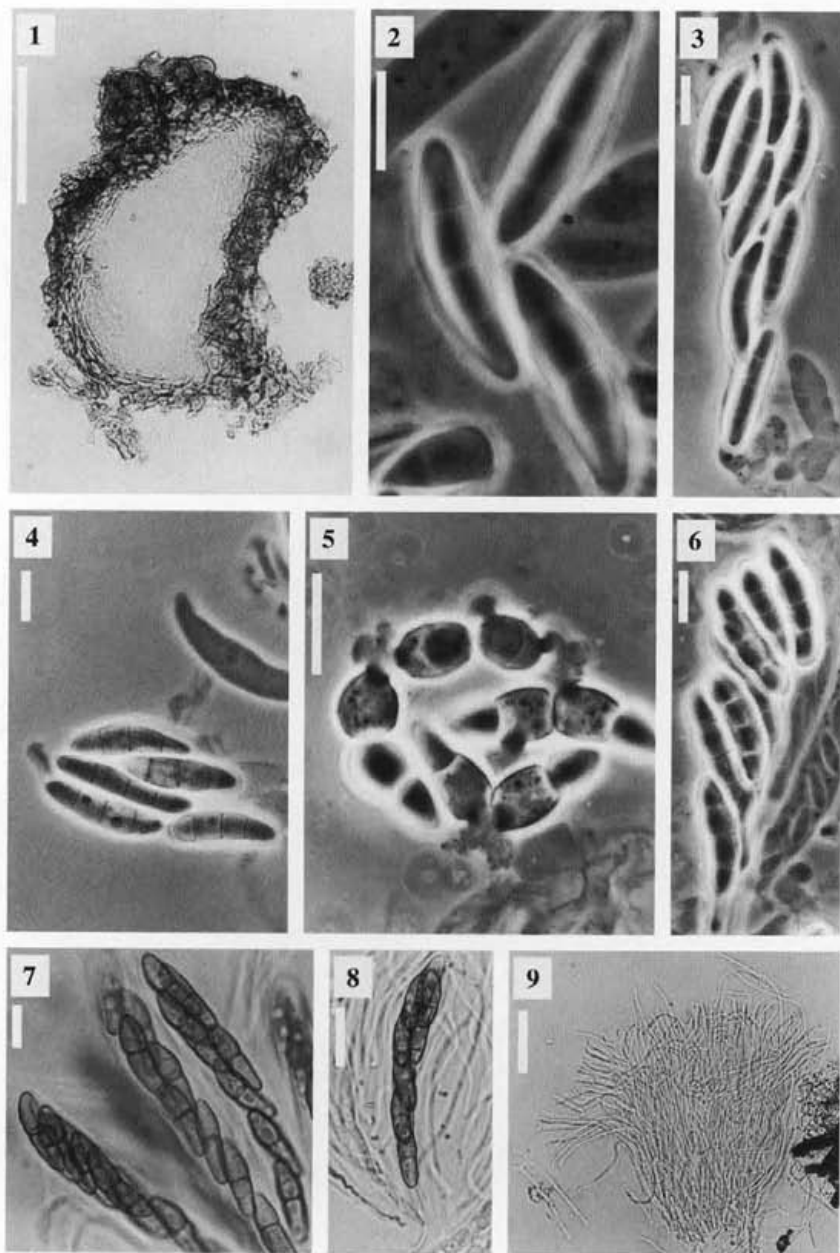
1. *Chaetosphaeria rajasthanensis* Kaur, Indian J. Mycol. Pl. Pathol. 21: 258, 1991. (Not validly published. Arts. 37.1., 37.4.)

* = *Calonectria rajasthanensis* Réblová, sp. nov.

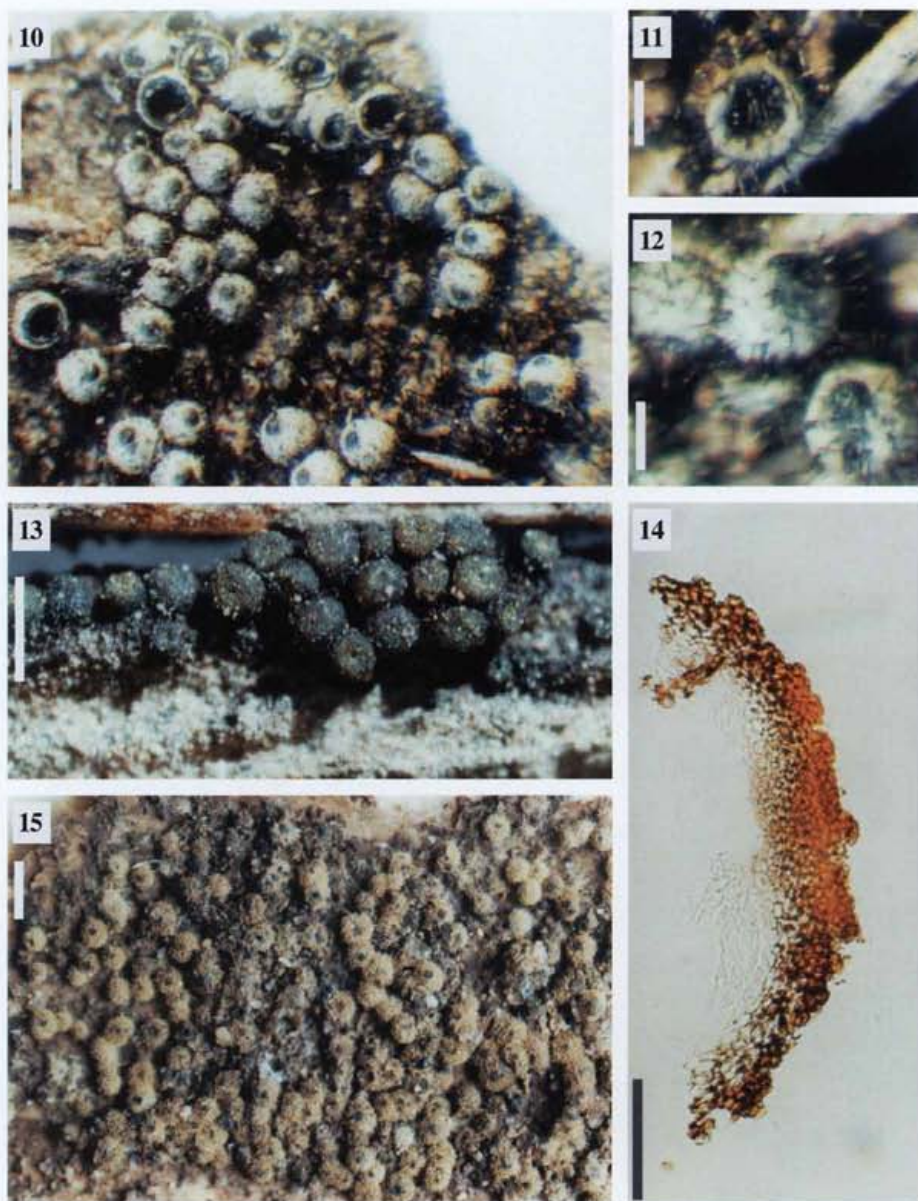
Figs 1-6; 16 a-b.

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 \times 19.9-25.2 μm , unitunicati, clavati usque cylindranei, 8-spori. Ascosporeae 23.7-27.8 \times 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* RĚblová (K 197032): 1. vertical section of the ascoma (scale 100 μ m), 2. ascospores, 3. ascus with ascospores, 4. ascospores, 5. overripe ascospores, 6. ascus with ascospores (scale 10 μ m); 7-9. *Byssosphaeria rhodomphala* (Berk.) Cooke (PACA 12672): 7. asci with ascospores (scale 10 μ m), 8. ascus with ascospores (scale 20 μ m), 9. trabeculate pseudoparaphyses (scale 10 μ m).



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

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 \times 19.9-25.2 μm , clavate to cylindric, apical opening undifferentiated. Intertelial filaments not observed. Ascospores 2-3-seriate, partially overlapping in the ascus, 23.7-27.8 \times 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)

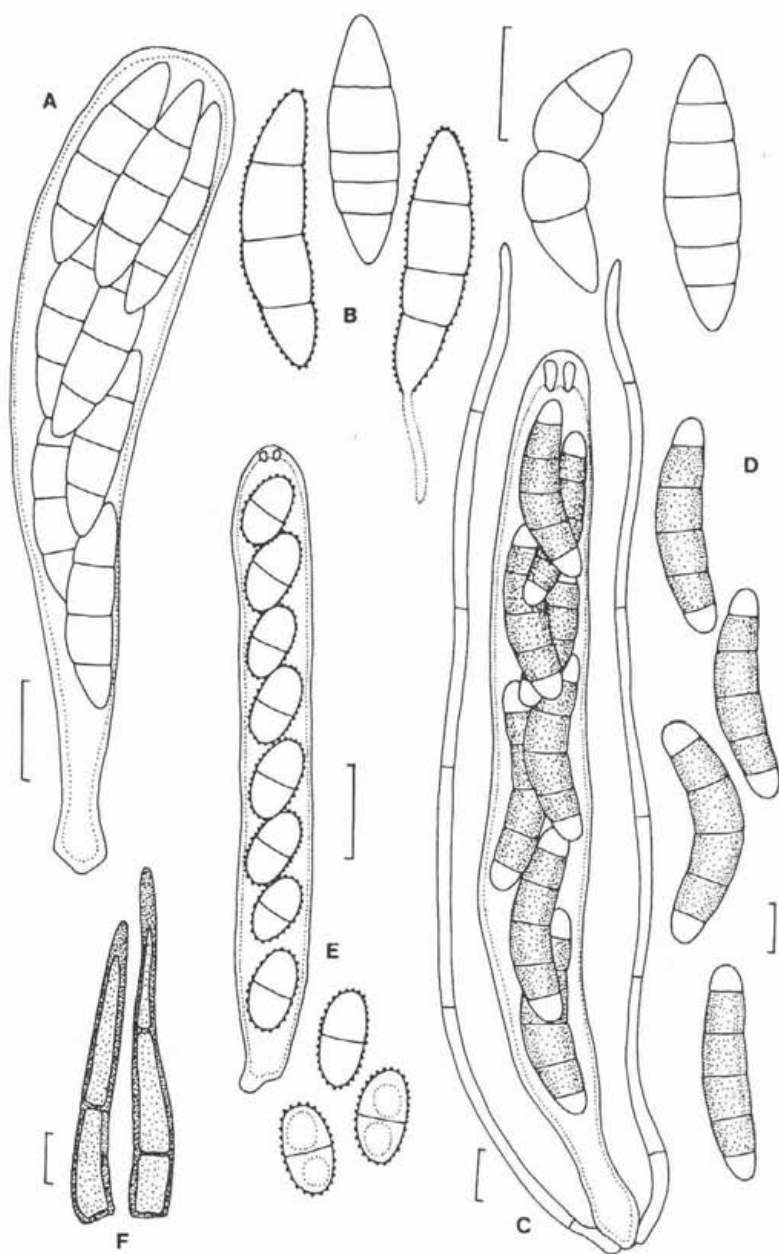
* = *Eriosphaeria subtomentosa* Réblová, sp. nov.

Figs 16 e-f.

Ascomata superficialia, sparsa vel subgregaria, basi parum immersa, globosa vel subglobosa, 150-200 μm lata, subiculo obscuro laxo intricato insidentia. Asci 65.1-80.8 \times (6.3-7.7-8.4) μm , unitunicati, 8-sporei. Ascosporeae 10.5-11.5 (-12.6) \times 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 \times (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) \times 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 \times 7-8 μm) and smaller, smooth-walled ascospores (7-9 \times 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 \times 12-14 μm), slightly thickened at the apex and larger (13-16 \times 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).

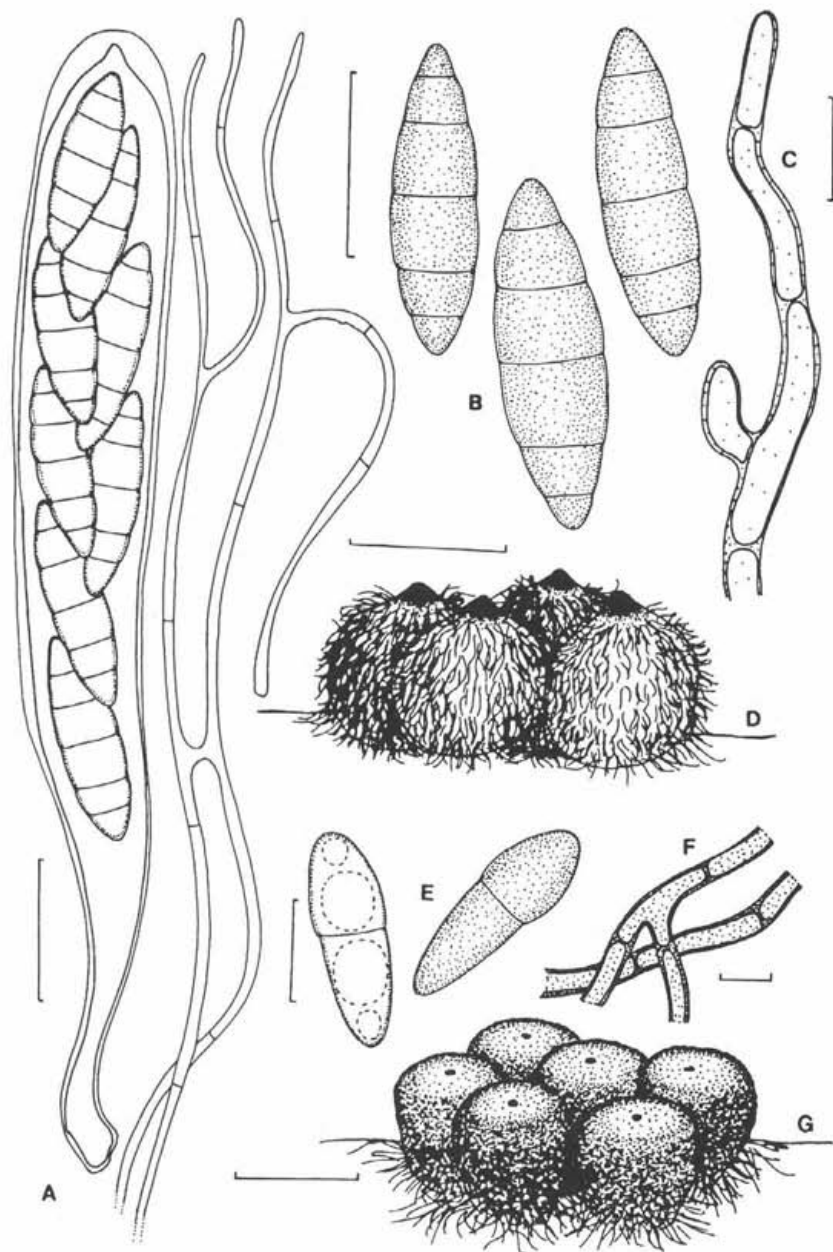
* ≡ *Pseudotruchia xanthotricha* (Berk. et Broome) Réblová, comb. nov.

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 , biseriolate 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 *Lasio-sphaeria* than with *Chaetosphaeria*. The correct position of Berkeley's and Broome's fungus seems to be in *Pseudotruchia*. This species differs from all the species of *Pseudotruchia* 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 μ m), d - habit sketch of ascomata (scale 500 μ m); e-g *Byssosphaeria rhodomphala* (Berk.) Cooke (PACA 12672): e - ascospores, f - hyphae of subiculum (scale = 10 μ m), g - habit sketch of ascomata (scale 500 μ m).

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 rehiana* P. Henn., Verh. Bot. Ver. Prov. Brandbg. 40: 155, 1898.
 ≡ *Chaetosphaeria rehiana* (P. Henn.) Kirschst., Krypt. Fl. Mark. Brandenb. 7: 236, 1911.
 = *Chaetosphaeria coelestina* Höhnelt, 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. Höhnelt (GH - holotype of *Chaetosphaeria coelestina* Höhnelt). - 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* Höhnelt was also included, which position in *Melanochaeta* E. Müll., Harr and Sulmont was suggested based on its description and illustration (Höhnelt 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* (Höhnelt 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. saccardoi* 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 (Höhnelt 1909), New Zealand (Hughes 1966) and Sri Lanka (Berkeley and Broome 1873).

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