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Cladosporium exoasci, C. exobasidii and some allied species

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Abstract: BRAUN, U. 2001: *Cladosporium exoasci, C. exobasidii* and some allied species. Schlechtendalia 7: 53-58.
Cladosporium exoasci, C. exobasidii and *C. diaphanum* are redescribed and discussed. *Cladosporium condylonema, C. prunicola* and *C. fuligineum* are reduced to synonymy with *C. herbarum* s.lat. (incl. var. *macrocarpum*, ≡ *C. macrocarpum*), and the taxonomy of some additional *Cladosporium* spp. is discussed.

Zusammenfassung: BRAUN, U. 2001: *Cladosporium exoasci, C. exobasidii* and some allied species. Schlechtendalia 7: 53-58.
Cladosporium exoasci, C. exobasidii und *C. diaphanum* werden beschrieben und diskutiert. *Cladosporium condylonema, C. prunicola* und *C. fuligineum* werden als Synonyme zu *C. herbarum* s.lat. (incl. var. *macrocarpum*, ≡ *C. macrocarpum*) gestellt und die Taxonomie einiger weiterer Arten wird besprochen.

Attempts to determine a *Cladosporium* collection recently found on old overwintered cherry fruits have been the reason for comprehensive treatments of various *Cladosporium* spp. described on or recorded from species of *Prunus* s.lat. *Cladosporium epiphyllum* (Pers.) Mart., recorded from dead leaves of *Prunus* spp. (LINDAU 1907), is a synonym of *C. herbarum* (Pers.: Fr.) Link (de VRIES 1952). Type material of *C. nodulosum* Corda, also recorded from dead *Prunus* leaves, has not been re-examined, but seems to be an additional synonym of *C. herbarum* s.lat. (incl. var. *macrocarpum* (Preuss) M.H.-M. Ho & Dugan). Type material of *C. penicillioides* Preuss, deposited at B, has been examined, but was too scarce for a final conclusion on its taxonomic status and affinity. *Cladosporium condylonema* Pass. (syntype: on *Prunus domestica*, Italy, Parma, 1889, Passerini, Briosi & Cav., Funghi paras. 79, HAL) belongs to *C. herbarum* s.lat. and is morphologically intermediate between var. *herbarum* and var. *macrocarpum* (≡ *C. macrocarpum* Preuss). The conidiophores are characteristically nodulose and the conidia are 8-25 x 5-10 µm, (0-)1(-3)-septate, verrucose. Type material of *Cladosporium prunicola* McAlp., described from leaves of *Armeniaca vulgaris* in Australia, is not preserved in McAlpine's herbarium at VPRI, but notes written by I. Pascoe and J. Walker indicate that the description is close to *Cladosporium herbarum* var. *macrocarpum* (J. Cunnington, in litt.). Original material of *C. phyllophilum* McAlp., described from leaves of *Armeniaca vulgaris* and *Persica vulgaris* in Australia is, however, preserved at VPRI and has been re-examined by J. Cunnington who found that this species is very close to and probably identical with *C. cladosporioides* (Fres.) de Vries (J. Cunnington, in litt.). *Cladosporium americanum* H.C. Greene has been described from leaves of *Prunus americana.* Type material has not been examined, but, according to the original description, this species seems to be very close to and possibly identical with *C. cladosporioides*, too.

The *Cladosporium* collection on cherry fruits (*Cerasus vulgaris*) from the Botanical Garden of the Martin-Luther-University Halle belongs, however, to *Cladosporium exoasci*

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Lindau and will be distributed in TRIEBEL, "Microfungi exsiccati". Type material of *C. exoasci* and some allied species has been re-examined and compared with this new collection. These studies represent the basis for the present redescription of *C. exoasci*.

Cladosporium exoasci Lindau, in Rabenh., Krypt.-Fl., Ed. 2, Bd. 1, Abt. 8: 808, Leipzig 1907 Fig. 1
= *Cladosporium exoasci* Ellis & Barthol., in Barthol., Fungi Columbiani, Cent. XV, No. 1493 (1901), nom. nud.

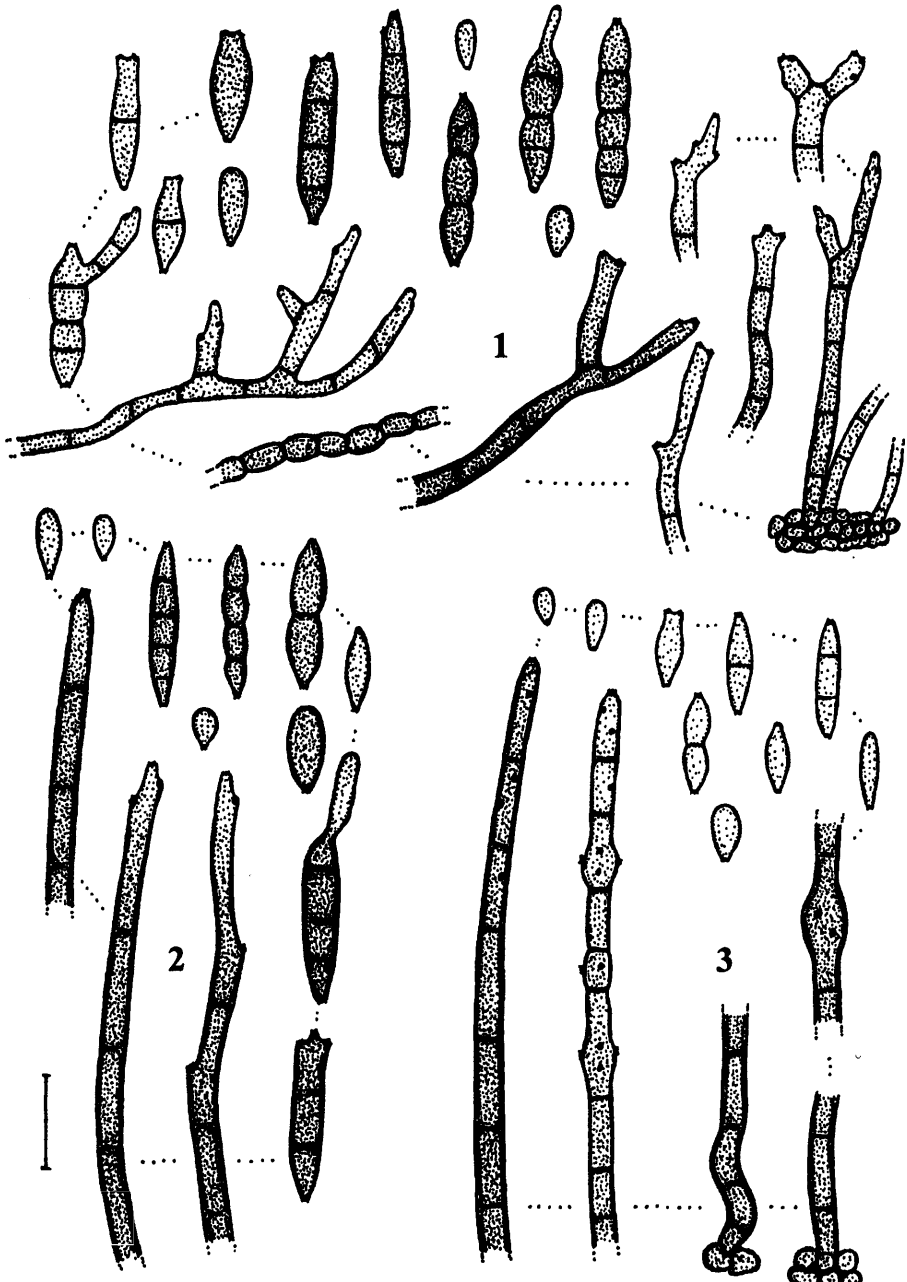
Lectotype: on *Taphrina pruni* (Fuckel) Tul. (= *Exoascus rostrupianus* Sadeb.), on *Prunus spinosa*, Germany, Hessen-Nassau, Rhön, near Gersfeld, ca. 500 m, 31 Jul. 1906, O. Jaap, Fungi sel. exs. 248 (B). Isolectotypes: Jaap, Fungi sel. exs. 248.
Additional material examined: On *Taphrina pruni*, on *Prunus avium*, Switzerland, Kandersteg, 19 Jul. 1905, O. Jaap (B). On *Taphrina pruni*, on *Prunus domestica*, Germany, Brandenburg, Prignitz, Triglitz, 1 Oct. 1904, O. Jaap (B). On fruits of *Prunus* sp., Flora Danica, Sjalland, 1907, J. Lind (HBG). On fruits of *Prunus cerasus*, Germany, Sachsen-Anhalt, Halle/Saale, Botanical Garden, 27 Apr. 2000, U. Braun (HAL, M).

On disfigured fruits of *Prunus* s.lat., often on galls caused by *Taphrina* spp. Colonies effuse, loose to dense, dingy olivaceous to blackish brown. Mycelium immersed and external; external hyphae creeping, intricate, septate, branched, 2-10 µm wide, often with constrictions and swollen cells (monilioid); stromata small to well-developed, loose to dense, confluent, olivaceous to medium dark brown, immersed to somewhat erumpent, composed of swollen hyphal cells, subcircular in outline, 3-12 µm diam. Conidiophores solitary to loosely aggregated, caespitose, arising from stromata, erect to decumbent, creeping, straight, subcylindrical to flexuous, geniculate-sinuous, simple or branched, frequently branched, often multibranched, 20-250 x 3-7 µm or even longer, sometimes swollen at the very base, up to 10 µm diam., pluriseptate, often densely septate, sometimes with constrictions, but without swellings which are connected with the conidiogenesis, pale olivaceous, yellowish brown to medium dark brown throughout or tips paler, sometimes subhyaline, wall somewhat thickened, smooth, occasionally rough-walled; conidiogenous cells integrated, terminal, intercalary or pleurogenous, 10-40 µm long, conidial scars protuberant, thickened, darkened, with a central convex dome surrounded by a raised rim (*Cladosporium* type), 1-2(-2.5) µm diam. Conidia catenate, frequently in branched chains, dimorphic, small conidia subglobose, ellipsoid-ovoid, 4-13 x 3-6 µm, mostly rather pale, thin-walled, large conidia (ramo-conidia) ellipsoid-ovoid, fusiform-subcylindrical, 10-30(-35) x 4-10 µm, 1-5(-6)-septate, subhyaline, pale olivaceous to olivaceous brown, wall thin to somewhat thickened, smooth or almost so (light microscopy), ends rounded, subtruncate, short obconically truncate, hila mostly somewhat protuberant, thickened and darkened (*Cladosporium*-like), (0.5-)1-2(-2.5) µm diam.

This fungus infects cherry fruits in the current season directly or occurs hyperparasitically on galls caused by *Taphrina*. The infected fruits are disfigured, shrink and remain at twigs, overwinter, and may still be found in the next spring between new flowers.

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Figs 1-3: Hyphae, conidiophores, conidia, 1 – *Cladosporium exoasci*, 2 – *C. diaphanum*, 3 – *C. exobasidii*; scale = 20 µm; U. Braun del.

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LINDAU (1907) compared *C. exoasci* with *Cladosporium fuligineum* Bonord. (Bonorden 1864), which was described from decaying mushroom gills ("in Agaricis emortuis, in Guestphalia"). He considered *C. fuligineum* to be very closely allied to his new species. Type material of *C. fuligineum* is not preserved. Therefore, nine collections of "*C. fuligineum*" deposited at B, including several specimens examined by Lindau (1907) and used as basis for his redescription of this species, have been studied (on *Cantharellus cibarius, Peziza macropus, Boletus subtomentosus, Epichloë typhina, Lycogala epidendron, Lepiota procera, Hypholoma fasciculata, Gomphidius viscidus*). The fruit bodies in all collections are covered by abundant fructification of *Cladosporium herbarum* s.lat. (incl. var. *macrocarpum*). Two specimens (on *Lepiota procera* and *Gomphidius viscidus*, Germany, Brandenburg, Triglitz, 4/5 Oct. 1905, O. Jaap, B) are mixed collections of *C. herbarum* var. *macrocarpum* (conidiophores nodulose, conidia verrucose) and a second species of *Cladosporium* (conidiophores non-nodulose, conidia smooth). The identity of *C. fuligineum* can only be clarified by a neotypification. Bonorden (1864) described this species with nodulose-geniculate conidiophores and 1-septate conidia which agrees well with *C. herbarum*, common on decaying gills of mushrooms. *C.* sp., the second species with smooth conidia, is characterised by having non-nodulose conidiophores and (0-)1-5(-6)-septate conidia, Therefore, I propose to neotypify *C. fuligineum* with a collection of *C. herbarum*.

Cladosporium herbarum var. *herbarum*
= ***Cladosporium fuligineum*** Bonord., Abh. Geb. Mykol. I: 92 (1864), **syn. nov.**

Neotype: on decaying gills of *Boletus subtomentosus*, Germany, Westfalen, Siegen, Hainichen, 16 Jul. 1922, A. Ludwig (B).

The second *Cladosporium* sp. with smooth conidia is also a saprobic hyphomycete which is morphologically indistinguishable from *Cladosporium diaphanum* Thüm. This species has been briefly redescribed by Ellis (1976). There is no monograph of *Cladosporium*, many old names have not yet been reassessed, so that it could be possible to find an older name for this saprophyte, but at present the fungus concerned is referred to *C. diaphanum*.

Cladosporium diaphanum Thüm., Mycoth. univ. 1868 (1881) Fig. 2

Lecotype: on dead leaves of *Photina serrulata*, France, Lyon, June 1880, J. Therry, Thüm., Mycoth. univ. 1868 (HAL). Isolectotypes: Thüm., Mycoth. univ. 1868.

Saprobic on dead leaves, decaying gills of mushrooms and other organic matter. Colonies thin to thick, velvety, dark olivaceous-brown to almost blackish brown. Mycelium internal, forming loose to dense aggregations. Conidiophores arising from swollen hyphal cells, solitary to aggregated, caespitose, loose to dense, erect to decumbent, filiform-setiform, usually unbranched, non- to slightly geniculate-sinuous in the upper portion (connected with the proliferation of conidiogenous cells), hardly nodulose, swellings (if present) not connected with conidiogenesis, 40-250 x (3-)4-7 µm, pluriseptate throughout, wall

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somewhat thickened, smooth, occasionally faintly rough-walled, pale to medium brown, apex paler; conidiogenous cells integrated, terminal to intercalary, 10-40 µm long, sympodial, conidial scars thickened, darkened, protuberant, 1-2 µm diam. Conidia catenate, occasionally in branched chains, dimorphic, small conidia aseptate, subglobose, broadly ellipsoid-ovoid, ellipsoid-fusoid, pale, thin-walled, (2-)3-12 x 2-6 µm, smooth to faintly rough-walled, large conidia obovoid, ellipsoid-fusoid, cylindrical, 10-30 x 4-8 µm, (0-)1-5(-6)-septate, rarely with 1-2 additional distosepta, pale olivaceous to medium brown, smooth or almost so, wall slightly thickened, ends rounded to attenuated, with 1-3 *Cladosporium*-like hila, thickened, darkened, protuberant, 1-2.5 µm diam.

LINDAU (1907) referred collections on *Exobasidium* galls to *C. fuligineum.* Jaap (1907) introduced the name *Cladosporium exobasidii* for this fungus, which clearly differs from *C. fuligineum* (= *C. herbarum*) in having smooth conidia and from *C. diaphanum* in having nodulose conidiophores and 0-1(-2)-septate conidia. The Canadian *Cladosporium gallicola* B. Sutton (see ELLIS 1976: 329) seems to be close to *C. exobasidii*, but differs in having frequently branched, non-nodulose conidiophores and smooth to verruculose conidia. HO et al. (1999) cited *C. exobasidii* as a synonym of *Cladosporium cladosporioides* (Fres.) de Vries, but the former species is well-distinguished by having frequently nodulose, hardly geniculate-sinuous conidiogenous cells with numerous aggregated scars.

Cladosporium exobasidii Jaap, Verh. Bot. Ver. Prov. Brandenb. 49: 29 (1907) Fig. 3

Holotype: on *Exobasidium* galls on *Vaccinium uliginosum*, Germany, Rhön, Gersfeld, Rotes Moor, 30 Jul. 1906, O. Jaap (B).
Paratypes: on *Exobasidium* galls on *Vaccinium uliginosum*, Germany, Brandenburg, Putlitzer Heide, 1 Sep. 1900, O. Jaap (B) and Denmark, Jütland, Wiborg, 14 June 1906, J. Lind (B).

Hyperparasitic on galls caused by *Exobasidium* spp., colonies effuse, loose to dense, brown, sooty. Mycelium immersed, forming loose to dense groups or layers of swollen hyphal cells, olivaceous-brown, 3-12 µm diam. Conidiophores solitary or in loose to dense aggregations, caespitose, erect to decumbent, filiform, subcylindrical, usually simple, occasionally branched, mostly in the lower half, 25-250 x 2.5-8 µm, rarely longer, pale to medium dark brown, paler towards the apex, tips sometimes subhyaline, pluriseptate throughout, smooth, faintly rough-walled, wall somewhat thickened; conidiogenous cells integrated, terminal or intercalary, 10-40 µm long, terminal cells subcylindrical-conic, hardly geniculate-sinuous, intercalary cells usually swollen, nodulose; scars (*Cladosporium* type) often numerous, aggregated, protuberant, thickened and darkened, 1-2 µm diam. Conidia catenate, frequently in branched chains, broadly ellipsoid-ovoid, obovoid, fusoid (-subcylindrical), (2-)4-18(-23) x 2-5(-6) µm, mostly aseptate, some conidia 1-septate, very rarely 2-septate, smooth or almost so, subhyaline to olivaceous, ends rounded to attenuated, hila protuberant, thickened and darkened, 1-2 µm diam.

The species concerned, belonging to a group of *Cladosporium* taxa with smooth conidia, may be keyed out as follows:

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1 Conidiophores nodulose, swellings connected with conidiogenesis (with scars); conidia more or less uniform, (2-)4-18(-32) x 2-5(-6) µm, most conidia aseptate, only some conidia 1(-2)-septate; hyperparasitic on galls caused by *Exobasidium* spp. ..... *Cladosporium exobasidii*

1* Conidiophores non-nodulose or swellings not connected with conidiogenesis (without scars); conidia dimorphic, larger conidia up to 30 µm long, 0-5(-6)-septate 2

2 Conidiophores frequently branched; conidiogenous cells terminal, intercalary, and pleurogenous; confined to fruits of *Prunus* s.lat. or on galls caused by *Taphrina* spp. ..... *Cladosporium exoasci*

2* Conidiophores usually unbranched; conidiogenous cells terminal and intercalary; saprobic, on leaf litter, decaying gills of mushrooms, etc. ..... *Cladosporium diaphanum*

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