
The genus Fusicladium s.lat. is monographed. Pollaccia and Spilocaea are reduced to synonymy with Fusicladium. The latter genus has been proposed to be conserved. The history, phylogeny, taxonomy, circumscription and delimitation of this genus are discussed in detail, a key to Fusicladium and morphologically similar genera and a key-like list of Fusicladium species by host genera are included. Individual species are then described, illustrated and discussed. Doubtful, ill-defined and excluded taxa are listed and discussed at the end of the paper. The new species Fusicladium asperatum, F. caulicola, F. junci and F. nashicola are described and the new combinations F. ahmadii, F. byrsonimatis, F. catenosporum, F. elegans, F. mandshuricum, F. nebulosum, F. oleagineum, F. phillyreae, F. radiosum var. lethiferum, F. radiosum var. populi-albae and Pseudocladosporium caruanianum are introduced.


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1. Introduction

The genera Fusicladium Bonord., Pollaccia E. Bald. & Cif. and Spilocaea Fr. (Hyphomycetes) are, as far as known, anamorphs of Venturia Sacc. (Ascomycota, Venturiaceae E. Müll. & Arx ex M.E. Barr). These fungi are plant pathogens causing characteristic leaf spots, necroses and scab diseases as well as leaf and fruit deformations. They overwinter as mycelia in fallen fruits, leaves and twigs, where they form pseudothecia with asci and ascospores in the following spring. Mature two-celled ascospores are forcibly ejected after dehiscence of the apical ascus wall and are dispersed by the wind. They germinate on suitable host organs, form germ tubes which enter the host through stomata or directly through the cuticle. Intramatrical mycelia then develop and new infections become established. First symptoms are often visible as small leaf discolorations or spots, which are later covered by dark punctiform to effuse fungal colonies, composed of conidiophores, conidiomata and conidia. Conidia are spread throughout the whole growing season by rain and wind, and are transferred to healthy fruit, leaves and twigs, where they cause new infections.

The anamorphs are the phytopathologically relevant and diagnostically important phases in the life cycles of these fungi. Since monographs of these fungi do not exist, comprehensive examinations of Fusicladium, Pollaccia and Spilocaea species by means of molecular, morphological and scanning electron microscopic methods have recently been carried out, with the aim to elucidate the phylogenetic and taxonomic significance of these anamorphs for Venturia. All taxa assigned to these genera have been considered and reassessed, i.e., either excluded from or recognised in Fusicladium s.lat. The latter species are keyed out, redescribed, illustrated and supplemented with host range and distribution data, so that this work can be considered a monograph of this fungal genus.

2. Materials and methods

Collections from numerous herbaria (BRA, DAVFP, G, HAL, HBG, IMI, JE, K, LE, M, NTU-PPE (TAI), NY, PAD, PC, PDD, TLF, WIS, VPI) and some fresh specimens were examined by standard light microscopy (oil immersion). Drawings and photomicrographs were also made where necessary from prepared material, including type collections. Electronmicrographs were prepared at the "Interdisziplinäres Wissenschaftliches Zentrum für Materialwissenschaften" at the Martin-Luther-University, Halle, using an Environmental Scanning Electron Microscope (ESEM). Molecular investigations were carried out at the "Botanische Staatsammlung" (Munich). Detailed results of these studies will be published separately.

3. History of Fusicladium, Pollaccia and Spilocaea

3.1. Spilocaea

The name Spilocaea was introduced by Fries (1819) in connection with Spilocaea pomi, the type species of this genus, but the first detailed description dates back to Fries (1825). Link (1825) added Spilocaea scirpi, described from stems of Scirpus sp. Corda (1829) redescribed the latter species, but its generic affinity and the status of Spilocaea was not discussed. In 1832, Fries described Spilocaea epiphylla from leaves of Malus and Pyrus species and mentioned S. scirpi in a footnote. S. epiphylla and S. scirpi have not been recorded or otherwise considered since. Saccardo (1886) assigned Spilocaea (with S. concentria Schw., S. epiphylla Fr., S. pomi Fr., S. opuntiae Rabenh. and S. scirpi Link) to a list of doubtful and excluded genera (“Genera dubia vel exclusenda”). Saccardo (1897), Aderhold (1896, 1897), Lindau (1907) and Ferraris (1912) treated Spilocaea pomi as a synonym of Fusicladium dendriticum (Wallr.) Fuckel. Lind (1913) proposed the combination Fusicladium pomi (Fr.) Lind, although S. pomi was the type species of the older genus Spilocaea. For a long time, Spilocaea had been a forgotten name. Most species morphologically belonging to the Spilocaea type were treated under Fusicladium or other names like Cladosporium Link and Cycloconium Castagne (VasiliEysky & Karakulin 1937). In 1953, Hughes re-introduced Spilocaea for Venturia anamorphs with annellate conidiogenous cells, reduced Cycloconium Castagne (Castagne 1845) and Basiascum Cavara (Cavara 1888) to synonymy with this genus, and confined Fusicladium to taxa with sympodially proliferating conidiogenous cells. Most subsequent authors followed his new taxonomic concept (e.g., Barr 1968; Ellis 1976; Sivanese 1977, 1984a).

3.2. Fusicladium

Fusicladium was introduced by Bonorden (1851) as a monotypic hypomycetous genus with F. virescens Bonord. on apple leaves as type species. Based on Malus as type host, Höhnel (1923) considered F. virescens to be identical with F. dendriticum (= Spilocaea pomi), although Bonorden (1851) described and depicted denticulate (sympodial) conidiogenous cells. Saccardo (1897) and Lindau (1907) reduced F. virescens to a synonym of F. pyrorum (Lib.) Fuckel. Hughes (1953) later suggested that the type host of the former species could have been misidentified. Type material of Bonorden’s species is not preserved, so it is not possible now to check the identification of the host. Since Fusicladium pyrorum and Spilocaea pomi are pathogens of Malus spp. as well as Pyrus spp., it is irrelevant if F. virescens had been described from apple or pear leaves. The identity of this species can only be proven on the basis of the morphological features of the conidiophores given in the original description. Saccardo (1897), Lindau (1907), Ferraris (1912) and other previous authors used Fusicladium s.lat. for taxa with sympodial (denticulate) as well as percurrent (annellate) conidiogenous cells, including Pollaccia-like species, e.g., F. radiosum (Lib.) Lind, and Spilocaea-like taxa, e.g., F. dendriticum. Baldacci & Ciferri (1937) excluded Fusicladium radiosum and placed it in the new genus Pollaccia. Viennot-Bourgin (1949) introduced the new genus.
Megacladosporium for Fusicladium-like species with denticulate (sympodial) conidiogenous cells and confined Fusicladium s.str. to taxa with annellate conidiogenous cells, being undoubtly influenced by Höhnel’s (1923) treatment of F. virescens, the type species of Fusicladium, as a synonym of F. dendriticum. Megacladosporium was introduced without indicating a type species and has to be considered a superfluous name since the type species of Fusicladium was included in the protologue of its original description. Based on Bonorden’s (1851) original description and illustration, Hughes (1953) confined Fusicladium s.str. to species with sympodially proliferating conidiogenous cells and more or less denticulate conidiogenous loci, and placed all taxa with distinctly annellate conidiogenous cells in Spilocaeae. Several authors assigned Fusicladium species with catenate conidia to Cladosporium, e.g., F. carpophilum (Thüm.) Oudem., F. cerasi (Rabenh.) Eikks. and F. effusum G. Winter [as Cladosporium caryigenum (Ellis & Langl.) Gottwald] (Bensande & Keitt 1928; Ellis 1976; Gottwald 1982). Previous authors, e.g., Saccardo (1897) and Lindau (1907), treated these species under Fusicladium s.lat. Höhnel (1923) and Vassilevsky & Karkulin (1937) excluded some species with catenate conidia from Fusicladium as well as Cladosporium and introduced the new genera Hormocladium and Fusiciadiopsis, respectively. The latter name, which is a younger homonym of Fusiciadiopsis R. Maire, 1906, was replaced by Karkulinia nom. nov. (Golovina 1964). Ondrej (1971) retained species with catenoid conidia in Fusicladium, but placed these taxa in the new subgenus Pseudofusicladium. Battista (1957) described the new genus Ramalia with R. veronicae Bat. as type species. Sutton & Pascoe (1988) re-examined type material of this species and reduced Ramalia to synonymy with Fusicladium. Ramalia veronicae is also characterised by having catenoid conidia. Partridge & Morgan-Jones (2003) described the new genus Fusicladosporium [type species: F. carpophilum (Thüm.) Partridge & Morgan-Jones, = Cladosporium carpophilum Thüm., = Fusicladium carpophilum] for Venturia anamorphs with catenate conidia. They discussed Karkulinia N.P. Golovina and Megacladosporium Vienn.-Bourg., but failed to take into consideration that the older genera Hormocladium and Ramalia had also been introduced for Fusicladium-like anamorphs with catenate conidia.

3.3. Pollaccia
Baldacci & Cifferri (1937) described the monotypic genus Pollaccia for P. radiosa (Lib.) E. Bald. & Cif. (= Oidium radiosum Lib., = Fusicladium radiosum) distinguished from Fusicladium species by having short, monoblastic, determinate to percurrent, annellate conidiogenous cells. Servazzi (1939) distinguished two Pollaccia species on Populus leaves, viz., P. radiosa, which he considered the anamorph of Venturia tremulae Aderh., and P. elegans Servazzi, the anamorph of V. populina (Vuil.) Fabric. Hughes (1953) recognised Pollaccia as a separate genus well-distinguished from Fusicladium and Spiilocaeae, and most subsequent authors followed his taxonomy (e.g., Barr 1968; Ellis 1971, 1976; Sivanesan 1984; Brandenburg 1985). Morelet (1972, 1985) and Morelet & Sigaud (1996) published important contributions to biology and taxonomy of Pollaccia species.

4. Molecular examinations and phylogeny
Schnabel et al. (1999) were the first to publish molecular analyses (rDNA, ITS) of Venturia species. Their analyses, which were restricted to species that occur on rosaceous hosts, were later supplemented by Kasanen et al. (2001) who examined Venturia dictyicha (Fr.) P. Karst., V. populina and V. tremulae. Sequence data deposited at the NCBI (National Center for Biotechnology Information) have been used for a new, more comprehensive molecular analysis of Venturia species and their anamorphs together with additional sequences of Fusicladium, Pollaccia and Spiilocaeae obtained during the course of molecular examinations carried out in Munich. The research group there used Cladosporium [C. cladosporioides (Fresen.) G.A. de Vries], often confused with Fusicladium, as the outgroup, and included data of “human pathogenic Cladosporium species” (= Cladophialophora Borelli) and Botryosphaeria dothidea (Moug.) Ces. & de Not. The data coming out of these studies are still limited, so only preliminary conclusions are possible. The detailed results of these examinations will be published in a separate paper. A cladogram based on all the data mentioned above provides the first comprehensive molecular results for Venturia and its anamorphs and a first insight into phylogenetic connections. In any case, Venturia species and its anamorphs (Venturiaceae) have been proven to form a monophyletic clade. This was confirmed by Braun et al. (2003) who put rDNA ITS data of cladosporioid Venturia anamorphs in a more comprehensive context of Cladosporium-like fungi, i.e., dematiaceous hyphomycetes with amero- to phragmosporous conidia formed in acropetal chains.

The cladogram published by Schnabel et al. (1999) is less useful for phylogenetic analyses and taxonomic interpretations since “Cladosporium caryigenum” was taken to serve as the outgroup. The latter species is, however, a true anamorph of the Venturiaceae and this has been confirmed by molecular analysis and a study of the morphology of the fungus.

The Venturia clade is composed of several small subclades, which, at least partly, seem to indicate tendencies of co-evolutions between hosts and Venturia species. V. asperata Samuels & Sivan., V. carpophila E.E. Fisher and V. cerasi Aderh. form a subclade of closely allied species on various hosts of the Rosaceae that are characterised by having anamorphs with catenate conidia. The Rosaceae also appear to have been colonised by Venturia on several different occasions. Venturia inaequalis (Cook) G. Winter s.lat. as well as Venturia pyrina Aderh. and V. nashicola S. Tanaka & S. Yamam. form separate subclades. Another group is formed by species with Pollaccia anamorphs on hosts of the Salicaceae. Various morphological features of Venturia anamorphs, e.g., conidia formed singly or in chains and proliferation of conidiogenous cells percurrently or sympodially, have probably been acquired several times in the past in separate lineages in co-evolution with several groups of hosts. However, a clear separation of the Venturia clade into uniform subclades based on morphological features of the anamorphs is not evident. Species with sympodial conidiogenous cells occur in several subclades, and taxa with percurrent proliferations form two different groups separated by a subcluster with Fusicladium anamorphs (sympodial conidiogenous cells). Species with catenate conidia are also not confined to a single subcluster.
These results also show that *Fusicladium convolvarum* Ondřej and *E. effusum*, two species with unknown telemorphs, are true members of the Venturiaeae. The treatment of *Venturia pyrina* and *V. nashicola* as two distinct species is also supported by the present molecular data.

5. The taxonomic value of morphological features

*Fusicladium*, *Pollaccia* and *Spilocaea* are characterised by having immersed, subcortical to intraepidermal mycelia, often forming radiating strands or loose to dense stromatic aggregations, which give rise to conidiogenous cells or conidiophores penetrating the cuticle. A superficial (secondary) mycelium is rarely formed, but is present, for example, in *Fusicladium veronicae* (Bat.) B. Sutton & Pascoe, *F. scitae* (Deighton) U. Braun & K. Schub. and *Spilocaea oleaginea* (Castagne) S. Hughes. In *Spilocaea pomi*, a superficial mycelium is usually absent, but in a single collection some external hyphae have been observed. The conidiophores are usually erumpent through the cuticle, but in *Fusicladium levieri* Magnus, *F. juncti* Sawada ex K. Schub. & U. Braun and *F. convolvarum* they are, at least partly, fasciculate and emerge through stomata. In *Pollaccia* species, superficial hyphae are unknown. The arrangement of the conidiophores within the three anamorphic genera of the Venturiaeae is fairly variable, ranging from conidiophores formed singly or in loose to dense fascicles, to distinct sporodochia. In *Spilocaea nebulosa* (Ellis & Everh.) S. Hughes & Piroz., all conidiophores are formed singly and are erumpent through the cuticle, in *S. oleaginea* they are solitary to fasciculate, and *S. pomi* is characterised by having loosely to densely fasciculate conidiophores. In *Fusicladium* species, the conidiophores are usually formed singly (e.g., *F. caricinum* Bres., *F. veronicae*) or in fascicles (e.g., *F. pyrorum*), but some taxa with sporodochial conidiomata are also known (e.g., *F. fraxini* Aderh., *F. romellianum* Ondřej). In *F. martianoffianum* (Thüm.) K. Schub. & U. Braun, all kinds of conidiophore arrangements, ranging from solitary conidiophores to sporodochia, can be observed. *Pollaccia* species are usually characterised by having conidiophores in fascicles or sporodochia. Hence, the arrangement of conidiophores and the location of the mycelium are not suitable for the differentiation of *Fusicladium*, *Pollaccia* and *Spilocaea*. These genera have been traditionally distinguished by the mode of proliferation of the conidiogenous cells, viz., *Fusicladium* with sympodial proliferation, *Pollaccia* with monoblastic, determinate to percurrent conidiogenous cells (with few rather inconspicuous annellations) and *Spilocaea* with percurrent proliferation and numerous conspicuous annellations. However, there are numerous transitional cases, e.g., in *Fusicladium obsiduncens* Pat. and *F. veronicae*, two species with sympodial proliferations which are occasionally mixed with some annellations caused by percurrent proliferations. The conidiogenous cells of *Fusicladium caulicola* U. Braun & K. Schub. and *F. romellianum* are usually monoblastic, determinate. In *F. fraxini*, the conidiogenous cells range from being unilocular, percurrent to multilocular, sympodial and sometimes even mixed in the same collection. *Pollaccia* and *Spilocaea* species possess unilocular, determinate to percurrent (annellate) conidiogenous cells, except for *Spilocaea oleaginea* and *S. nebulosa* in which conidiogenous cells with several loci had been observed (Hughes 1953). The differences between *Pollaccia* and *Spilocaea* are weak and only gradual, so that a separation of these genera cannot be maintained. Both genera have monoblastic (unilocular) conidiogenous cells, frequently determinate or only with few annellations in *Pollaccia* and usually with numerous annellations in *Spilocaea*. The discrimination of *Fusicladium* on the one hand and *Pollaccia/Spilocaea* on the other hand, based on the presence of percurrent and sympodial conidiogenous cells, is also not tenable. This can be demonstrated by the existence of numerous taxa with mixed types of conidiogenous cells. This phenomenon has also been observed in various other hyphomycetous genera, e.g., in cercosporoid *Mycosphaerella* anamorphs. Crous et al. (2000, 2001) showed that combinations of sympodially and percurrently proliferating conidiogenous cells are not uncommon in *Pseudocercospora*, and that the separation of the latter genus and *Cercosporidium* U. Braun is not tenable. This view is also supported by data from molecular studies of these genera. Percurrent and sympodial conidiogenous cells are also known to occur together in *Septoria* Sacc. species (Verkeley 1997). Different structures of the conidiogenous loci, reflecting differences in the mode of conidiogenesis, proved to be meaningful for genera of cercosporoid anamorphs (Crous et al. 2000, 2001; Crous & Braun 2003). The conidiogenous loci and conidial hila of *Fusicladium*, *Pollaccia* and *Spilocaea* species have been examined by means of light and scanning electron microscopy (Ritschel 2001; Schubert 2001). The basic structure of the loci and hila is, however, rather uniform by being more or less truncate, unthickened, or almost so and non-pigmented to slightly darkened-refractive. These scars agree well with those of *Pseudocercospora* species. There are no any fundamental differences in the structures of the conidiogenous loci and conidial hila of *Fusicladium, Pollaccia* and *Spilocaea* species. The conidiogenous loci of *Fusicladium* species are often more or less denticulate-like, and there are gradual differences in the width of loci and hila, which are mostly somewhat narrower in *Fusicladium* and wider in *Pollaccia* and *Spilocaea*, although there are numerous exceptions and transitions, e.g., in *Fusicladium caricinum* with relatively broad loci. The conidiogenesis in all *Venturia* anamorphs is consistently holoblastic, and the structures of the conidiogenous loci and conidial hila are uniform, and, consequently, these features cannot be used to separate these genera. The conidia of *Fusicladium, Pollaccia* and *Spilocaea* species are also fairly uniform by being amero-, didymo- to phragmosporous and pigmented. They are usually ellipsoidal–ovoid to fusiform and more or less smooth, although there are some taxa with verruculose conidia [e.g., *Fusicladium psoraleae* (Ellis & Barthol.) S. Hughes & Piroz. and *F. pisiola* Linford].

It has been suggested that the formation of the conidia in chains or singly is a feature that could be used to separate *Fusicladium* into smaller units ( Höhnél 1923, Golovina 1964, Ondřej 1971, see chapter 3.2.). Taxa with catenate conidia occur in *Fusicladium* as well as *Pollaccia*, viz., *P. catenosporea* Butin, and there are even some species in which the conidia are formed singly as well as in chains, e.g., *F. cerasi*.

Conidial formed in chains or singly is a good, useful feature for differentiating between species, but is not one that can be used at the generic level. This is also true with other groups of hyphomycetes, e.g., *Ramularia* Unger (Braun 1998) and cercosporoid genera (Crous et al. 2000, 2001). A separation of species with catenate conidia from *Fusicladium* is not tenable and this is also supported by molecular data.
6. Taxonomy based on morphology and molecular data

The results of the examinations recently carried out by RITSCHEL (2001) and SCHUBERT (2001) have shown that, within the Venturia anamorphs (Fusicladium, Pollaccia and Spilocaea), features such as the type and growth of the mycelium, arrangement of the conidiophores (solitary, fasciculate and sporodochial), proliferation of conidiogenous cells (percurrent and sympodial), structure of the conidiogenous loci and shape and size and formation of conidia (solitary, catenate) cannot be used to define the various genera. These features are only useful for distinguishing between species. RITSCHEL (2001) and SCHUBERT (2001) using molecular analyses has also demonstrated that Venturia species form a monophyletic clade. These two sets of results mean that the separation of Venturia anamorphs into several genera cannot be maintained and that Fusicladium, Pollaccia and Spilocaea must be merged into a single anamorph genus. The conidiogenesis and structure of the conidiogenous loci and conidial hila are uniform in these genera and resemble those found in Pseudocercospora and allied genera (Mycosphaerella anamorphs). The situation in the Venturiaceae reminds one of the Erysiphales (powdery mildew fungi), which is characterised by the anamorph genus Oidium Link. There is, however, a nomenclatural problem since the less known, smaller genus Spilocaea (five recognised species) is older than the much larger genus Fusicladium with 40 recognised species. Fusicladium is well-known to mycologists and phytopathologists and readily associated with Venturia. Merging the three anamorph genera of Venturia under the oldest name Spilocaea would result in more than 40 new combinations. Therefore, it has been proposed to maintain the well-known genus Fusicladium (BRAUN et al. 2002). In doing so, the old wide concept of Fusicladium, including all kinds of Venturia anamorphs (see chapter 2.2.), is reintroduced. The new circumscription of Fusicladium can be given as follows:

Fusicladium

Bonord., Handb. Mykol.: 80 (1851), emend.
Type species: F. virescens Bonord. (= F. pyrorum).
= Spilocaea Fr., Novit. fl. svec. 5: 79 (1819), nom. rej. prop., type species: S. pomi Fr.
= Cycloconium Castagne, Cat. pl. Marseille: 220 (1845), nom. rej. prop., type species: C. oleaginum Castagne.
= Napicladium Thüm., Hedwigia 14: 3 (1875), type species: N. soraueri Thüm.

7. The species concept

Venturia species and their anamorphs are, as far as known, host specific, mostly confined to a single host genus or at least allied host genera in a single host family. Plurivorous taxa are unknown and this has been confirmed by preliminary molecular examinations. Hence, the morphological differentiation between and keys to the species concerned can be based on host plant families. The following features are useful and applicable at species rank:

- Symptoms, lesions.
- Mycelium (internal, external).
- Arrangement of conidiophores (solitary, fasciculate, in sporodochia).
- Shape, length and septation of conidiophores.
- Conidiogenous cells (terminal, intercalary, conidiophores reduced to conidiogenous cells; determinate or proliferation percurrent, sympodial; number of loci, width).
- Conidiogenous cells (percurrent and sympodial), structure of the conidiogenous loci and shape and size and formation of conidia (solitary, catenate) cannot be used to define the various genera. These features are only useful for distinguishing between species. RITSCHEL (2001) and SCHUBERT (2001) using molecular analyses has also demonstrated that Venturia species form a monophyletic clade. These two sets of results mean that the separation of Venturia anamorphs into several genera cannot be maintained and that Fusicladium, Pollaccia and Spilocaea must be merged into a single anamorph genus. The conidiogenesis and structure of the conidiogenous loci and conidial hila are uniform in these genera and resemble those found in Pseudocercospora and allied genera (Mycosphaerella anamorphs). The situation in the Venturiaceae reminds one of the Erysiphales (powdery mildew fungi), which is characterised by the anamorph genus Oidium Link. There is, however, a nomenclatural problem since the less known, smaller genus Spilocaea (five recognised species) is older than the much larger genus Fusicladium with 40 recognised species. Fusicladium is well-known to mycologists and phytopathologists and readily associated with Venturia. Merging the three anamorph genera of Venturia under the oldest name Spilocaea would result in more than 40 new combinations. Therefore, it has been proposed to maintain the well-known genus Fusicladium (BRAUN et al. 2002). In doing so, the old wide concept of Fusicladium, including all kinds of Venturia anamorphs (see chapter 2.2.), is reintroduced. The new circumscription of Fusicladium can be given as follows:

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= Napicladium Thüm., Hedwigia 14: 3 (1875), type species: N. soraueri Thüm.
- Conidia (formation, solitary or catenate; shape, size, septation, wall smooth or verruculose).

The following characteristics are either more or less uniform within *Venturia* anamorphs or vary variable and thus less appropriate for the discrimination of species:
- Structure of the mycelium.
- Width of the conidiophores.
- Structure of the conidiogenous loci (uniform).
- Degree of pigmentation of conidiophores and conidia.

8. **Key to *Fusicladium* emend. and similar genera**

1 Conidiophores and conidia colourless; conidiogenous loci conspicuous, somewhat thickened and darkened; conidia solitary or catenate, hila also slightly thickened and darkened ......................................................... Ramularia

1* Conidiophores and conidia pigmented .............................................................................................................. 2

2 Conidiogenous loci inconspicuous or denticle-like, but wall of the loci always unthickened ........................................... 3

2* Conidiogenous loci conspicuous, thickened and darkened ............................................................................ 6

3 Mycelium and stroma usually subcuticular to intraepidermal, hyphae often radiating, forming hyphal or stromatic strands or plates, membranous (*Fusicladium*-like growth), rarely substomial; conidiophores solitary, fasciculate or in sporodochial conidiomata, usually erumpent through the cuticle, rarely emerging through stomata or arising from superficial hyphae; conidia amero-, didymo- to phragmosporous ............................................................... 4

3* Mycelium not *Fusicladium*-like, immersed or superficial, neither radiating nor forming hyphal plates; stroma usually substomatal; conidiophores usually emerging through stomata ........................................... 5

4 Mycelium and stroma membranous; older conidiophores usually curved by having unequally thickened walls; conidiogenous cells unilocular (monoblastic), usually determinate, rarely percurrent, conidiogenous loci distinctly thickened and darkened; conidia solitary, 1-septate, broad (6–14 µm) .................................... *Fusicladiella*

4* Mycelium and stroma usually radiating; conidiogenous cells uni- to multilocular (mono- to polyblastic), but wall of the conidiophores equally thickened, not distinctly curved, percurrent or symposium; loci always unthickened, at most somewhat darkened-refractive; conidia solitary or catenate, amero- to phragmosporous, 0–2 (–4)-septate, < 10 µm ...................................................... *Fusicladium* emend.

5 Conidia scolecosporous, usually pluriseptate ...................... Pseudocercospora

5* Conidia amero- to phragmosporous, 0–1 (–3)-septate .................. *Denticularia*

6 Conidiogenous loci more or less protuberant, coronate (with a central convex ‘dome’ surrounded by a raised rim, i.e., *Cladosporium* type) ........ *Cladosporium*

6* Conidiogenous loci uniformly thickened and darkened, more or less truncate (planate), without raised rim ................................................................. 7

7 Conidia formed singly, coarsely verrucose–echinulate ............ *Asperisporium*

7* Conidia formed singly or in chains, smooth to faintly rough-walled ...... *Passalora*
Fusicladium pomi

1 Conidia solitary, 1–3 µm wide ........................................... Fusicladium pyrorum
1* Conidiogenous cells percurrent; loci 4–5 µm wide ................................ Fusicladium pomi

On Aronia, Fusicladium pyrorum

On Chenomeles, Fusicladium pyrorum

On Cotoneaster, Fusicladium pomi

On Dracaena, Fusicladium pomi

On Eriobotrya, Fusicladium pomi

On Heteromeles, Fusicladium pomi

On Kagenekia, Fusicladium pomi

On Malus, Fusicladium pyrorum

On Prunus, Fusicladium pomi

On Pyracantha, Fusicladium pomi

On Diospyros, Fusicladium pomi

On Populus, Fusicladium pomi

On Pseudopanax, Fusicladium pomi

On Phytolacca, Fusicladium pomi

On Sambucus, Fusicladium pomi

On Symphoricarpos, Fusicladium pomi

On Tilia, Fusicladium pomi

On Triticum, Fusicladium pomi

On Urtica, Fusicladium pomi

On Violaceae, Fusicladium pomi

On Vitis, Fusicladium pomi

On Xanthium, Fusicladium pomi

On Zizyphus, Fusicladium pomi
On *Pyrus*,  
1 Conidiogenous cells percurrent ........................................ 2  
1* Conidiogenous cells sympodial ....................................... 3  
2 Conidia obclavate, 25–45 × 6–8 µm, 1(–2)-septate; on *P. pashia*; Pakistan  
........................... *Fusicladium martianoffianum*  
2* Conidia obpyriform to clavate, shorter and wider, 12–30 × 6–10 µm, 0–1-septate; cosmostipatan ........................................ *Fusicladium pumi*  
3 Conidia 9–20(–28) × 5.5–10 µm; on Chinese and Japanese species of *Pyrus*  
........................... *Fusicladium nashicola*  
3* Conidia significantly longer, 10–34 × 5–11 µm; only on European species of *Pyrus*  
........................... *Fusicladium pyrourum*

On *Rubus*, *Fusicladium grayianum*  
On *Sorbus*, *Fusicladium pomi*  
On *Spirea*, *Fusicladium spiraeae*

**Salicaceae:**  
On *Populus*,  
1 Conidiogenous cells polyblastic, with a single to several conidiogenous loci, subdenticulate, 5.35 × 3–10 µm  
........................... *Fusicladium martianoffianum*  
1* Conidiogenous cells mostly monoblastic (unilocal), or not only slightly denticulate, shorter and narrower, 5–25 × 2–5 µm  
...........................  
2 Conidiophores monoblastic, rarely with two or several conidiogenous loci, loci 1–3 µm wide; conidia solitary or in unbranched or branched chains  
...........................  
2* Conidiophores always monoblastic, loci ca. 5 µm wide; conidia always solitary  
...........................  
3 Conidiomata mostly sporodochial; conidiogenous cells sympodial, not percurrent, loci 1–2 µm wide; conidia aseptate, very rarely with a single septum  
........................... *Fusicladium romellianum*  
3* Conidiophores in small to large fascicles, rarely sporodochial; conidiogenous cells sympodial as well as often percurrent with a single to several annellations, loci 1.5–3 µm wide; conidia (0–)1(–3)-septate  
........................... *Fusicladium subsexissile*  
4 Conidia relatively large, 20–39 µm long ........................................ 5  
4* Conidia smaller, up to 28 µm long (*Fusicladium radiosum* s.lat.) ........................................ 6  
5 Conidia often curved, fusiform to obclavate, 7–10 µm wide; (0–)2–3(–4)-septate; on *P. simonii* × *P nigra*; China  
........................... *Fusicladium mandschuricum*  
5* Conidia straight, rarely curved, ellipsoid to broadly fusiform, 9–14 µm, (0–)2(–3)-septate; on *P. balsamifera* and *P. nigra*; Europe, North America  
........................... *Fusicladium elegans*  
6 Conidia (0–)1(–2)-septate, 8–10 µm wide; on *P. alba*; Europe, North Africa  
........................... *Fusicladium radiosum* var. *populi-albae*  
6* Conidia mostly 1–2-septate, narrower, 5–8 µm wide  
...........................  
7 Conidia straight, rarely curved, on various species of *Populus*, but not on *P. grandidentata* and *P. tremuloides*  
........................... *Fusicladium radiosum* var. *radiosum*  

7* Conidia often curved; occurring on various species of *Populus*, incl. *P. alba*, *P. grandidentata* and *P. tremuloides*; North America  
........................... *Fusicladium radiosum* var. *lethiferum*

On *Salix*,  
1 Conidiogenous cells polyblastic, sympodial ........................................ 2  
1* Conidiogenous cells monoblastic or percurrent ........................................ 3  
2 Conidiophores 40–95(–130) × 3–5 µm, arising from stromata; conidia (10–)12–20 × 3–4(–5) µm  
........................... *Fusicladium sp. (1)*  
2* Conidia arising as short lateral branchlets from hyphae; conidia 20–25 × 5–8 µm  
........................... *Fusicladium sp. (2)*  
3 Conidia in unbranched, rarely branched chains, mostly 0(–2)-septate  
........................... *Fusicladium catenosporum*

**Scrophulariaceae:**  
On *Parahebe*, *Fusicladium veronicae*  

**Verbenaceae:**  
On *Vitex*, *Fusicladium viticis*

### 10. The species of *Fusicladium* emend.

The species of *Fusicladium* emend. (incl. *Policiaea* and *Spilocaea*) are alphabetically arranged. References to the original descriptions, type material, synonyms, teleomorphs (as far as known), references to important descriptions and illustrations in literature, exsiccatae, comprehensive descriptions, host range and distribution, material examined and notes are given for each species. The drawings, mostly based on type or other original material, have been prepared at a ration of 1 : 100 (bar = 10 µm). The exsiccatae cited have generally been examined. If only few collections have been examined (up to five), all of them are listed, whereas numerous specimens (more than five) are not cited in order to save space. In the latter case, the acronym of the herbaria, in which the numerous collections examined are housed, are mentioned. Herbarium acronyms are based on HOLMGREN et al. (1990), abbreviations of author names follow BRUMMITT & POWELL (1992), and those of journals agree with the system introduced by LAWRENCE et al. (1968), supplemented by BRIDSON & SMITH (1991). The names of European countries are symbolised by the international standard abbreviations for the particular countries that are used for vehicles. Abbreviations of the particular states of the USA follow FARR et al. (1989), and those of Canadian provinces and territories are based on GINNS (1986). Names of all other countries are given in full.

### 10.1. Abbreviations

**General:** auct. = auctorum, ca. = circa, comb. nov. = new combination, comb. superfl. = superfluous combination, fig. = figure, herb. = herbarium, incl. = inclusive, i.e. = locus citatus, nom. cons. = nomen conservandum, nom. illeg. = nomen illegitimum, nom. inval. = nomen invalidum, nom. nov.
olivaceous-brown, somewhat thick-walled cells, 5–8 µm diam. Conidiophores loosely to densely fasciculate, arising from the upper cells of the stromata, erumpent through the cuticle, subcuticular, composed of subcircular to slightly angular, pale to medium whitish, surrounded by a brown, shining margin. Colonies amphigenous, punctiform, aggregated in the centre, olivaceous to dark brown. Mycelium immersed. Stroma subcuticular, composed of subcircular to slightly angular, pale to medium whitish, surrounded by a brown, shining margin. Colonies amphigenous, punctiform, aggregated in the centre, olivaceous to dark brown. Mycelium immersed.

On living leaves, leaf spots amphigenous, subcircular to irregular, 5–10 mm diam., whitish, surrounded by a brown, shining margin. Colonies amphigenous, punctiform, aggregated in the centre, olivaceous to dark brown. Mycelium immersed.
the cuticle, erect, straight to slightly flexuous, cylindrical to ampulliform, unbranched, 15–60 × 5–6 µm, 0–1-septate, pale to medium olivaceous-brown, smooth, thick-walled. Conidiogenous cells integrated, terminal, with a single conidiogenous locus, proliferation percurrent, with up to eight conspicuous annellations at the distal end, loci 4–5 µm wide, unthickened, not darkened. Conidia solitary, obclavate, straight to slightly curved, (23–)25–38 × 6–8 µm, 1(–2)-septate, septum median or somewhat in the lower half, more or less constricted at the septum, pale to medium olivaceous-brown, smooth, walls of the lower cells somewhat thicker than those of the upper one, apex narrowly pointed, base truncate, hila 4–5 µm wide, unthickened, not darkened.

Hosts and Distribution: on Pyrus spp. (Rosaceae), Asia – Pyrus pashia (Pakistan).

Notes: This species seems to be closely allied to F. pomi, but differs in having significantly longer and narrower conidia. Conidiogenous cells illustrated by ELLIS (1976) seem to show up to two loci, which could not be confirmed by a re-examination of type material.

10.2.2. _Fusicladium asperatum_ K. Schub. & U. Braun _sp. nov._


Ill.: Fungi Canadenses (No. 291), Fig. 5, SAMUELS & SIVANESAN (1975: Figs 11, 12; Pl. 8, E), SIVANESAN (1977: 39, Fig. 12 C, D; 1984a: 608, Fig. 365).

Fig. 1: _Fusicladium ahmadii_. A – conidia, B – loose fascicle of conidiogenous cells with one to several conspicuous annellations, scale = 10 µm. A. Ritschel del.

Fig. 2: _Fusicladium asperatum_. A – conidia, B – conidiogenous cells. C – small fascicle of conidiophores, scale = 10 µm. K. Schubert del.
erecta vel flexuosa, non-ramosa, 30–150 × 4–5 µm, pluriseptata, olivacea vel brunnea, apicem versus pallidiora, levia, leniter crassitunicata, basi leniter inflata. Cellulae conidiogenae integratae, terminales, sympodiales. Cicatrices conidiales terminales, aggregatae, denticulatae, 1–2 µm latae, non-incrassatae, non-fuscatae–refractivae. Conidia solitaria vel catenata, fusiformes vel cylindrica, recta, 9.5–17 × 3–5 µm, 0(–1)-septata, flavissima vel pallide olivacea, levia vel verruculosa, leniter crassitunicata, apice rotundato vel truncato, basi truncata, 1–2 µm lata, non-incrassata, non-vel leviter fuscata–refractiva.

On living leaves causing distinct leaf spots, sometimes almost symptomless, spots epiphyllous, greyish brown, margin irregular. Colonies caespitose, dark brown to black. Hyphae subcuticular. Stromata 35–60 µm diam., composed of olivaceous to brown, thick-walled, pseudoparenchymatous cells. Conidiophores solitary or in small groups, straight, erect to flexuous, unbranched, 30–150 × 4–5 µm, pluriseptate, olivaceous to brown, paler towards the apex, smooth, with somewhat thickened walls, sometimes base somewhat swollen. Conidiogenous cells integrated, terminal, with several denticle-like conidiogenous loci, mostly crowded at the apex, proliferation sympodial, loci 1–2 µm wide, unthickened, slightly darkened–refractive. Conidia solitary or catenate, in short, simple or sometimes branched chains, fusiform to cylindrical, straight, 9.5–17 × 3–5 µm, 0(–1)-septate, yellowish to pale olivaceous, sometimes subhyaline, smooth to verruculose, walls somewhat thickened, apex rounded or truncate, base truncate, hila 1–2 µm wide, unthickened, not or very slightly darkened–refractive.

**Hosts and Distribution:** on *Malus* spp. (Rosaceae), New Zealand, North America – *Malus pumila* (New Zealand); *M. sylvestris* (New Zealand; North America, Canada, Ont.).

**Notes:** In culture this fungus grows *Cladosporium*-like. The conidiophores are often determinate and form conidia in short, branched chains (Fungi Canadenses No. 291). The type material of *F. asperatum* is also paratype material of *Venturia asperata*. Since the anamorph may occur independently of the teleomorph, we prefer to propose a separate name for this stage.

10.2.3. **Fusicladium betulae** Aderh., Centralbl. Bakteriol., 2. Abth., 2: 57 (1896) and Hedwigia 36: 80 (1897)  
Fig. 3

Neotype: on *Betula pendula* (= *Betula alba*), Germany, Berlin, Grunewaldmoor, 13 Jul. 1923, Laubert (B), selected here.  
**Teleomorph:** *Venturia ditricha* (Fr.) P. Karst., Mycol. fenn. 2: 188 (1873).  
**Ill.:** KARSTEN (1873: 188, Figs 29, 30; Pl. 1, A), ADERHOLD (1897: Tab. 4, Fig. 1), SVANESAN (1977: 62, Fig. 30; 1984a: 614, Fig. 370 B).  
**Exs.:** Krieger, F. sax. 232 b; Rehm, Ascomyc. 597; Siem., F. bialow. exs. 197; Syd., Mycoth. march. 982; Thüm., Mycoth. univ. 350.

On living leaves, occasionally also on petioles, spots amphigenous, subcircular to somewhat irregular, punctiform, 1–4 mm wide, scattered, brown, later darker to black, sometimes with a paler margin or a paler centre. Colonies amphigenous, punctiform, scattered, black. Mycelium subcuticular, radiating, hyphae 3–4 µm wide, septate, hyaline to pale yellowish, stroma composed of thick-walled, brown cells, forming up to three layers. Conidiophores solitary or in loose fascicles, arising from stromata, erumpent through the cuticle, erect, straight to flexuous, unbranched, 25–100 × (3–) 4–6 µm, 0(–1)-septate, yellowish brown to dark brown, paler towards the apex, apex sometimes subhyaline, smooth, later occasionally rough-walled, wall somewhat thickened, base mostly swollen, up to 10 µm. Conidiogenous cells integrated, terminal, with a single or several conidiogenous loci, subdenticulate, proliferation sympodial,
looci unthickened, not darkened–refractive, 2–3 µm wide. Conidia solitary, fusiform to obclavate or clavate, straight to slightly curved, 12–30(–34) × 5–9 µm, yellowish to pale olivaceous, (0–)1(–2)-septate, often constricted at the septum, septum mostly somewhat in the upper half, smooth to verruculose, apex obtuse, rounded to pointed, base often elongated, hila truncate or slightly convex, unthickened, not darkened, 2–3 µm wide.

**Hosts and Distribution:** on Betula spp. (Betulaceae), Asia, Caucasus, Europe, North America – Betula glandulosa (North America, Canada, Que.), B. litwinowii (Caucasus, Georgia), B. nana (Europe, DK, N, RO), B. papyrifera (North America, Canada, Ont.), B. pendula (Asia, Kazakhstan, Uzbekistan; Europe, A, D, DK, GB, PL, RO, RUS, Ukr.), B. populifolia (North America, USA, ME, NY), B. pubescens (Europe, D, DK, S), Betula spp. (Asia, Kirghizia, Uzbekistan; Caucasus, Armenia; Europe, D, EW, GB, H, RUS, Byelorussia; North America, Canada, Ont., Que.).

**Material examined:** collections from B, LE.

**Notes:** Parts of Aderhold’s herbarium, previously housed at the “Biologische Bundesanstalt Berlin” (BBA), were transferred to the herbarium of the “Botanical Garden Berlin-Dahlem” (B), but the type material of Fusicladium betulae unfortunately was not preserved. Consequently, it is necessary to propose a neotype for this species.

Sivanesan (1977) reduced Asteroma betulae Roberge ex Desm., Ann. Sci. Nat. Bot. 19: 349 (1843), to synonymy with Fusicladium betulae. The examination of lectotype material (Desm., Pl. Crypt. N. France, 1346; PC) showed that only immature ascomata of the teleomorph, Venturia ditricha, with setae, stromata and some remnant of conidiophores were present, but conidia could not be traced. Hence, Asteroma betulae should rather be considered a synonym of Venturia ditricha.

In one collection, conidiophores germinating with hyphae have been seen. Lind (1937) described Venturia ditricha from Alnus incana and cited Strasser (1907: 314), who also recorded it from Berberis vulgaris. These records are very doubtful.

10.2.4. *Fusicladium brevipes* Ellis & Everh., J. Mycol. 5: 69 (1889) Fig. 4

**Teleomorph:** Unknown.

**Lit.:** Saccardo (1892: 598).

On living leaves, lesions inconspicuous or causing diffuse discolarations. Colonies hypohyphal, variable in shape and size, effuse, dense, sometimes confluent, dark greyish brown to blackish. Mycelium internal, forming well-developed, loose to dense stromata with hyphal aggregations in thin layers, subcircular to intraepidermal, cells oblong to subglobose, 2–15 µm diam., at first subhyaline, pale yellowish-greenish, later brown. Conidiophores arising from stroma cells, solitary, in loose to dense fascicles or in effuse layers, erumpent, erect, straight, subcylindrical, conical to flexuous, somewhat geniculate–sinuous, unbranched, 5–25(–30) × 3–9 µm, 0–1-septate, pale to medium brown, smooth, thin-walled, conidiophores usually reduced to conidigenous cells, unilocular, determinate, occasionally with 2–3 loci, proliferation sympodial, loci subtruncate to convex, 2–4 µm wide, unthickened, not darkened. Conidia solitary, ellipsoid to ovoid, oblong, 15–35 × 7–13 µm, aseptate (according to the original description later with 1–2 septa), pale olivaceous to olivaceous-brown, almost smooth to finely asperulate, apex broadly rounded, base subtruncate to rounded, hila unthickened, not darkened.

**Hosts and Distribution:** on Astragalus spp. (Fabaceae), North America, in the western parts of the USA – Astragalus bisulcatus (USA, MT), A. canadenis (USA, WA), A. hypoglottis (USA, CO).

10.2.5. *Fusicladium byrsonimatis* (U. Braun & Mouch.) U. Braun comb. nov. Fig. 5

**Teleomorph:** Unknown.

**Ill.:** Braun & Mouchacca (2000: 1010, Figs 4–5).

Leaf spots amphigenous, subcircular to slightly angular–irregular, small, 0.5–2 mm wide, grey, greyish brown, margin narrow, blackish brown, somewhat raised. Colonies mainly hypohyphal, punctiform, dense, medium to dark brown. Mycelium internal, forming well-developed, loose to dense stromata well-developed, composing of swollen hyphal cells, 2–8 µm wide, yellowish to medium brown. Conidiophores solitary or in small loose groups, arising from stroma, erect to decumbent, straight, subcylindrical to somewhat geniculate–sinuous, subnodulose, apically subdenticulate to conspicuously denticulate, unbranched, 20–100 × 3–7 µm, pluriseptate, pale to medium brown, smooth, wall somewhat thickened, paler and thin-walled towards the apex. Conidiogenous cells integrated, terminal, proliferation sympodial, 10–30 µm long, subdenticulate to denticulate, denticles minute, conically truncate, wall of the loci neither thickened nor darkened. Conidia solitary or catenate, occasionally in branched chains, solitary conidia obovoid, catenate conidia ellipsoid–fusiform, straight, 8–18 × 4–7 µm, 0–1-septate, light brown, smooth, wall thin or somewhat thickened.
apex broadly rounded or obconically truncate, base obconically truncate, 1–2.5 µm wide, hila unthickened, not darkened.

**Hosts and Distribution:** only known from the type.

10.2.6. **Fusicladium caricinum** Bres., in P. Syd., Mycoth. march., Cent. XLI, No. 4065 (1894)

Lectotype: on *Carex acutiformis*, Germany, Berlin, near Zehlendorf, Sept. 1893, P. Sydow, Mycoth. march. 4065 (HBG), selected here; isolectotypes: on "*Carex ampullacea*", Germany, Berlin, between Zehlendorf and Klein-Machnow, 1893, P. Sydow (B) and Syd., Mycoth. march. 4065.

**Teleomorph:** Unknown.

**Lit.:** SACCARDO (1895: 618), LINDAU (1907: 775), IMI Descr. (No. 1511).

**Ill.:** IMI Descr. (No. 1511, Figs A–B).

**Exs.:** Fl. bav. 2831; Rabenh., F. eur. 4294; Syd., Mycoth. march. 4065.

Leaf spots amphigenous, elliptical–oblong to irregular, 2–5 × 1–5 mm, pale yellowish-olivaceous, brownish, surrounded by a narrow, medium to dark brown or blackish margin. Colonies amphigenous, effuse, punctiform, dark, fructification mostly sparse. Conidiophores solitary or up to three in small fascicles, erumpent, erect, straight to slightly curved, subglobose, broadly ampulliform to short cylindrical, unbranched, 8–23 × (6–)10–19 µm, aseptate, medium to dark brown, smooth, walls thin to somewhat thickened, broadly truncate at the apex, conidiophores reduced to conidiogenous cells, unilocular, determinate, conidiogenous loci truncate to slightly convex, occasionally rounded, 3–5 µm wide, unthickened, not or only very slightly darkened–refractive. Conidia solitary, fusiform to broadly obclavate, straight to flexuous, (20–)30–50(–57) × 10–15(–17) µm, (0–)1(–2)-septate, sometimes slightly constricted at the septa, septa more or less median or often in the lower half, pale olivaceous to pale brown, smooth, wall thin to somewhat thickened, pointed at the apex, base mostly slightly oblique, hila 3–6(–7) µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Carex* spp. (Cyperaceae), Europe – *Carex acutiformis* (D, LV), *C. riparia* (D), *C. vesicaria* (LV), *Carex* spp. (H).

**Material examined:** collections from B, HBG, JE, LE, M.

**Notes:** In the original diagnosis, the conidiophores were described as hyaline but the examination of type material showed that they are medium to dark brown.
10.2.7. \textit{Fusicladium carpineum} (Ellis & Everh.) U. Braun & K. Schub., IMI Descriptions of Fungi and Bacteria 152, No. 1512 (2002) Fig. 7

\begin{itemize}
  \item \textit{Cladosporium caryigenum} [(Ellis & Langl.) Gottwald] var. \textit{carpineum} (Ellis & Everh.), Mycologia 74(3): 389 (1982), comb. inval.
\end{itemize}

\textbf{Teleomorph:} Unknown.

\textbf{Lit.:} SACCARDO (1892: 598).

\textbf{Ill.:} IMI Desct. (No. 1512, Figs A–B).

\textbf{Exs.:} Ellis & Everh., N. Am. F. 2793.

Leaf spots mainly epiphyllous, subcircular to angular–irregular, 1–5 mm wide, dingy yellowish to greyish brown, scattered. Colonies punctiform to subeffuse, dark brown. Mycelium internal, mainly subcuticular, hyphae about 2 µm wide, septate, hyaline to pale yellowish. Stromata variable, small to large, up to 150 µm diam., composed of swollen hyphal cells, 5–12 µm diam., brown, thick-walled. Conidiothecids in loose fascicles, arising from stromata, erect, straight to curved or somewhat geniculate–sinuous, unbranched, 90–300(–340) × 5–7(–8) µm, pluriseptate, brown, paler towards the apex, smooth, thick-walled, occasionally with a percurrent proliferation which is not connected with conidiogenesis. Conidiogenous cells integrated, terminal, 10–40 µm long, with a single or several inconspicuous to subdenticulate conidiogenous loci, 1.5–3 µm wide, wall of the loci unthickened, not darkened. Conidia catenate, in simple or branched chains, pyriform, ellipsoid, fusiform, straight to slightly curved, 10–21 × (5–)6–8(–10) µm, aseptate, pale olivaceous to pale brown, smooth, thin-walled, attenuated towards apex and base, apex rounded, pointed or truncate, base truncate, hila 1.5–3 µm wide, unthickened, not darkened.

\textbf{Hosts and Distribution:} on \textit{Carpinus} spp. (Corylaceae), North America – \textit{Carpinus americana} (Canada), \textit{C. caroliniana} (USA, GA, WI).

\textbf{Material examined:} collections from B, M, NY.

\textbf{Notes:} This fungus is morphologically closely allied to \textit{Fusicladium effusum} G. Winter on \textit{Carya} species (Juglandaceae), but differs in its occurrence on unrelated hosts (on \textit{Carpinus} species, Corylaceae), distinct lesions, much longer and wider conidiothecids with pale tips and less conspicuous conidiogenous loci. Based on these differences, and since \textit{Venturia} species with phytopathogenic anamorphs are generally confined to related hosts of a single host plant family, \textit{F. effusum} var. \textit{carpineum} is considered a separate species. \textit{Fusicladium carpini} Osipyan (OSIPYAN 1971), described from Armenia on \textit{Carpinus caucasica}, is a quite distinct species with very short conidiophores (10–17 × 3.5–7.5 µm) and narrower, 0–1-septate conidia (18.1–26.4 × 4.9–6 µm).

10.2.8. \textit{Fusicladium carpophilum} (Thüm.) Oudem., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk. 1900: 388 (1900) Fig. 8

\begin{itemize}
  \item \textit{Cladosporium carpophilum} Thüm., Oesterr. Bot. Z. 27: 12 (1877); syntype: on \textit{Prunus persica} (= \textit{Persica vulgaris}), Austria, Wien, 1877, Thüm., Herb. myc. oec. 599 (LE).
  \item \textit{Megacladosporium carpophilum} (Thüm.) Vienn.-Bourg., Les champignons parasites des plantes cultivées 1: 489 (1949).
  \item \textit{Fusicladosporium carpophilum} (Thüm.) Partridge & Morgan-Jones, Mycotaxon 85: 362 (2003).
\end{itemize}
Fig. 8: *Fusicladium carpophilum*. A – conidia, B – conidiophores, scale = 10 µm, K. Schubert del.
USA, FL, IA), P. padus (North America, USA, AK), P. persica [Asia, Afghanistan, Jordan, Lebanon, Uzbekistan, China, India, Japan, Korea, Taiwan; Caucasus, Georgia; Europe, A, F, GB; Africa, Ethiopia, Kenya, Morocco, Mozambique, Zambia, Rhodesia (Zimbabwe), South Africa; North America, Canada, Ont., USA, AL, CA, CT, DE, IL, NC, NY, PA, TX; Central America, Guatemala; South America, Chile, Colombia, Uruguay; Australia, Queensland, Tasmania, Victoria; New Zealand], P. salicifolia (African, South Africa; South Australia; New Zealand), P. serotina (North America, USA, FL), P. serrulata (North America, USA, MS), P. spinosa (Europe, GB; South America), Prunus spp. (Asia, Japan; Europe, H; North America, Canada, Que., USA, OK, South America).

Material examined: collections from JE, HBG, LE.

Notes: Previous authors, e.g., ELLIS (1976) and SIVANESAN (1977), often referred Fusicladium carpophilum to Cladosporium. However, this species is an anamorph of Venturia with fusicladioid conidiogenous loci and conidial hila, which has also been confirmed by molecular data. Records of F. carpophilum from various other hosts are very doubtful, e.g., on species of Potentilla, Filipendula and Rosa from Kazakhstan (SHARTSMAN et al. 1975), Salix sp. from Romania (BONTÈA 1985), Bromus inermis and Hordeum vulgare from Estonia (JÄRA et al. 1998) and species of Acacia, Cheirodendron and Metrosideros from the USA (FARR et al. 1989). Records from South America are also uncertain because Fusicladium carpophilum and Coryneum carpophilum (Clasterosporium carpophilum) have often been confused in this area (VIÉGAS 1961).

10.2.9. Fusicladium catenosporum (Butin) Ritschel & U. Braun comb. nov.  Fig. 9
≡ Fusicladium salicis Moesz & Smarods, in herb.

Teleomorph: Unknown.
Ill.: BUTIN (1992: 659, Figs 1–6).
Exs.: Krieger, F. sax. 2090.

Leaf spots amphigenous, scattered, at first subcircular, later irregular, 2–10 mm wide, reddish brown, margin dark brown to blackish, often causing distortions at the leaf margin, incurved or entire leaves bent, on young twigs forming punctiform, pale brown swellings. Colonies amphigenous, dense, oblong or circular, medium olivaceous-brown, sometimes confluent. Mycelium immersed, subcuticular, forming colourless, circular hyphal plates. Stroma 100–300 µm diam., composed of pale brown, thick-walled cells, 4–8 µm diam., 15–25 µm deep. Conidiophores in dense fascicles, arising from the upper cells of the stroma, forming sporodochial conidiomata, erumpent through the cuticle, erect, ovoid to doliform, unbranched, 10–16 × 6–8 µm, aseptate, medium olivaceous-brown, smooth, walls somewhat thickened, conidiophores reduced to conidiogenous cells, unilocular, determinate or rarely percurrent, with up to two inconspicuous annellations, loci truncate or slightly convex, (2–)3–4(–5) wide, not to slightly thickened, not darkened. Conidia catenate, in unbranched or rarely branched chains, ellipsoid, limoniform or fusiform, straight to sometimes slightly curved, 10–21(–27) × 5–9 µm, mostly aseptate, rarely 1–2-septate, pale olivaceous-brown, smooth, walls not or only slightly thickened, truncate at the apex and base, hila (2–)3–4(–5) µm wide, unthickened to occasionally very slightly thickened, not darkened.

Hosts and Distribution: on Salix spp. (Salicaceae), Europe – Salix amygdalina (D), S. purpurea (LV), S. triandra (D).

Material examined: on Salix purpurea, Latvia, Kandara, May 1936, Smarods (M), as Fusicladium catenosporum (Butin) Ritschel & U. Braun comb. nov. Hosts and Distribution: on Salix spp. (Salicaceae), Europe – Salix amygdalina (D), S. purpurea (LV), S. triandra (D).

Material examined: on Salix purpurea, Latvia, Kandara, May 1936, Smarods (M), as Fusicladium catenosporum (Butin) Ritschel & U. Braun comb. nov.

Notes: BUTIN (1992) described conidiogenous cells with only a few, inconspicuous annellations. In Fig. 1 (drawing) and Fig. 3 (micrograph), conidiogenous cells possibly with two conidiogenous loci are shown, indicating an affinity to species of Fusicladium s.str. with catenate conidia. During the course of monographic studies, carried out by RITSCHEL (2001), conidiogenous cells with up to two annellations were found, but two loci were not observed.

ONDŘEJ (1973) described Fusicladium sp. from Salix purpurea, characterised by having catenate conidia, but this fungus was distinguished by having longer, plurisepaete conidia and longer, narrower conidia formed in unbranched chains.

10.2.10. Fusicladium cauticola U. Braun & K. Schub. sp. nov.  Fig. 10
Holotype: on dry stems of Sedum maximum, Germany, Bavaria, Gerolzhofen, May 1906, herb. P. Magnus (HBG).

Teleomorph: Unknown.
On dry stems without conspicuous lesions or discolorations. Colonies punctiform, effuse, scattered to confluent, black. Stromata 30–120 µm diam. or confluent and larger, sometimes forming expanded layers, medium to dark brown, cells subcircular to angular–irregular in outline, 3–15 µm diam., thick-walled. Conidiophores in small to large, loose to dense fascicles, sporodochial or spread, caespitose, forming layers; conidiophores straight, subcylindrical to flexuous, geniculate–sinuous, usually attenuated, 10–50 × 4–8 µm, septate, septa mostly in the lower half, pale to medium brown throughout or usually paler towards the apex, tips sometimes very pale, subhyaline, smooth, walls somewhat thickened. Conidiogenous cells integrated, terminal, mostly unilocular (monoblastic), determinate, sometimes with two or three loci (polyleptastic, sympodial), loci flat, truncate to slightly convex, 2–3 µm wide, unthickened or almost so, not darkened, occasionally somewhat refractive or slightly darkened. Conidia solitary, ellipsoid, ovoid, verruculose, thin-walled to slightly thickened, apex blunt to somewhat pointed, base truncate to slightly convex, hila 2–3 µm wide, unthickened, not darkened.

**Hosts and Distribution:** only known from the type collection.

≡ *Fusicladium cerasi* (Rabenh.) Sacc., Syll. Fung. 4: 346 (1886), comb. superfl.  

**Teleomorph:** *Venturia cerasi* Aderh., Landw. Jahrb. 29: 541 (1900).


**Ill.:** ADERHOLD (1900: Pl. 9, Fig. 22), VASSILJEVSKY & KARAKUL (1937: 210, Fig. 18), HUGHES (1953: 568, Fig. 7), SCHWEIZER (1958: Figs 5–13, 16, 20), ONDŘEJ (1971: 167, Fig. 2), CMI Descr. (No. 706, Figs), SIVANESAN (1977: 51, Fig. 22; 1984a: 610, Fig. 367).

Colonies on fruits as greyish-brownish or black tufts, caespitose, sooty, on leaves mostly epiphyllous, causing small, greyish black spots. Mycelium intra- or intercellular, hyphae 2–3 µm wide, hyaline or yellowish. Stromata subcuticular, composed of unthickened or only slightly thickened polygonal cells, 3–6 µm diam. Conidiophores solitary or in loose fascicles, arising from stromata, erect, straight or somewhat flexuous, unbranched or rarely branched at the base, (10–)20–40(–60) × (3–)4–6(–7) µm, 0–1(–2)-septate, septa in the lower half, pale to medium brown or olivaceous, paler towards the apex, smooth, walls slightly thickened, mostly somewhat swollen at the base. Conidiogenous cells integrated, terminal, with several conidiogenous loci, crowded at the apex, proliferation sympodial, loci denticulate, 1–2(–2.5) µm wide, unthickened, not or only slightly darkened–refractive. Conidia solitary, rarely in short, unbranched or occasionally branched chains, fusiform, subcylindrical, ellipsoid or obclavate, 11–25(–28) × 4–7 µm, 0–1(–3)-septate, constricted at the septa, yellowish to medium brown, smooth or somewhat roughened to wrinkled, pointed or rounded at the apex, truncate at the base, hilum truncate to slightly convex, 1–2(–2.5) µm wide, unthickened, not or only slightly darkened–refractive.

**Hosts and Distribution:** on species of *Prunus* s.lat. (Rosaceae), Asia, Caucasus, Europe, North America, South America, Australia, New Zealand – *Prunus armeniaca* (Europe, D, RO), *P. avium* (Asia, Kirghizia, Kazakhstan, Uzbekistan; Caucasus, Azerbaijan, Georgia; Europe A, CS, D, DK, I, LV, Moldavia, NL, RO, RUS, SLO, UKr.; America; Australia, Victoria; New Zealand), *P. capolin* (South America, Columbia), *P. cerasifera* (Europe, RO), *P. cerasus* (Asia, Iran, Kazakhstan, Kirghizia, Uzbekistan; Caucasus, Armenia, Azerbaijan, Georgia; Europe, A, CZ, D, DK, EW, GB, LV, Moldavia, NL, RO, RUS, S, UKr.; North America, USA, NC, NE, WA; South America, Brazil; Australia, Victoria; New Zealand), *P. domestica* (Asia, Iran), *P. persica* (Europe, D, RO), *Prunus* spp. (Europe, BG, HR, NL, SK, Cyprus; Asia, Japan).

**Material examined:** collections from B, HBG, JE, LE.

**Notes:** MENON (1956), ONDREJ (1971) and SIVANESAN (1977) described very short conidiophores, up to 20 µm in length. *Fusicladium cerasi* and *F. carpophilum* are two allied species on various hosts of the genus *Prunus* s.lat., but they are morphologically (conidia usually formed singly in *F. cerasi*, always catenate in *F. carpophilum*), physiologically (differences in the temperature tolerance), bio-

**Fig. 11:** *Fusicladium cerasi*. Iconotype (from BRAUN 1853). 1 – conidiophores with conidia, 2 – conidia.

**Fig. 12:** *Fusicladium cerasi*. A – conidia, B – conidiophores, scale = 10 µm, K. Schubert del.
Holotype: on stems of *Succisa pratensis* (= *Scabiosa succisa*), France, Bais de Meudon, May 1900, M. Ludwig, comm. P. Hariot (PC), [together with *Didymosphaeria peregrina*].

**Teleomorph:** Unknown.

**Lit.:** SACCARDO (1910: 732; 1913: 1375).

Lesions lacking. Mycelium internal. Hyphae sparingly branched, 2–4 µm wide, septate, pale or pigmented, smooth, often with swollen cells and constrictions at the septa. Conidiophores solitary or in small, loose fascicles, arising from internal hyphae or swollen hyphal cells, crumplent, erect, straight, subcylindrical, rarely or only slightly geniculate–sinuous, 10–40 × 3–5 µm, 0(–1)-septate, brownish, wall thin to slightly thickened, smooth or almost so; conidiophores usually reduced to conidiogenous cells, conidiogenous loci subdenticulate, 1.5–2 µm wide, unthickened, not darkened. Conidia formed singly or in short, simple chains, ellipsoid–obovoid, pyriform, 12.5–18 × 3.5–5 µm, (0–)1-septate, pale olivaceous-brown, smooth or almost so, wall thin or slightly thickened, apex obtuse, truncate, rarely subacute, base obconically truncate, 1.5–2 µm wide, hila unthickened, but mostly somewhat darkened–refractive.

**Hosts and Distribution:** only known from the type collection.

**Notes:** This species is tentatively maintained in *Fusicladium* since it is morphologically indistinguishable from other species of this genus. The biology of *F. consors* is unclear. Lesions are not observed, so that a saprobic habit may be supposed.

![Diagram](image.png)

Fig. 13: *Fusicladium consors*. A – conidia, B – conidiophores, C – mycelium, scale = 10 µm, U. Braun del.

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**Teleomorph:** Unknown.

**Lit.:** IMI Descr. (No. 1513).

**III:** Onďej (1971: 170, Fig. 5), IMI Descr. (No. 1513, Figs A–D).

Leaf spots amphigenous, 1–5 mm wide, subcircular, brown, later with greysish brown to greyish white centre and brown margin. Mycelium usually subcortical. Hyphae brown, forming flat stromatic layers of angular–irregular, subhyaline to brown cells, often radiating. Conidiophores solitary or in small loose groups, arising from stromatic cells or hyphae, mostly erumpent through the cuticle, rarely emerging through stomata, erect, straight or curved at the apex, subcylindrical to geniculate–sinuous, unbranched, 10–60 × 4–7 µm, 0–1(–2)-septate, pale to medium brown, smooth, wall somewhat thickened, but often irregularly thickened, often with a single or occasionally several percurrent proliferations which are not connected with conidiogenesis. Conidiogenous cells integrated, terminal, 10–25 µm long, with a single or several, often denticle-like conidiogenous loci, proliferation sympodial, loci 1.5–3 µm wide, unthickened, not or often somewhat darkened–refractive. Conidia solitary or occasionally in unbranched or branched chains, ellipsoid–ovoid, fusiform, subcylindrical, 10–27 × 3–6 µm, 0–3–septate, mostly constricted at the septa, subhyaline to pale olivaceous, smooth to rough-walled, usually somewhat attenuated towards apex and base, apex rounded, pointed or truncate, base truncate, hila 1.5–3 µm wide, flat, unthickened or almost so, not or somewhat darkened–refractive.

**Hosts and Distribution:** on *Calystegia* and *Convolvulus* spp. (*Convolvulaceae*), Europe, New Zealand – *Calystegia sepium* (Europe, CZ), *C. soldanella* (Europe, GB), *Convolvulus arvensis* (Europe, CZ, New Zealand).


**Notes:** In the collections examined some conidium-like structures with a length of up to 60 µm have been observed, but it is not quite clear if they belong to the present species. In molecular studies, it has been demonstrated that *F. convolvularum* is a genuine member of *Fusicladium*, since this species clustered near to *F. effusum* within a large monophyletic *Venturia* clade.

Holotype: on *Crataegus laevigata* (= *C. oxyacantha* auct.), Germany, Erfurt, 15 Mar. 1902, Aderhold, Syd., Mycoth. germ. 45 (HBG), selected here; isotypes: Syd., Mycoth. germ. 45 (e.g., JE, LE).


Fig. 14: *Fusicladium convolvularum*. A – conidia, B – conidiogenous cells, C – conidiophore arising from hyphae or swollen hyphal cells, D – conidiophore emerging through a stoma, scale = 10 µm, K. Schubert del.

Fig. 15: *Fusicladium crataegi*. A – conidia, B – conidiophores solitary or in small groups, scale = 10 µm, K. Schubert del.
On living leaves and fruits, dark, crustaceous, small, subcircular spots, 1–2 mm wide or confluent and larger, sometimes covering the entire surface of the leaves or fruits. Colonies brown to blackish. Mycelium immersed, subcuticular, hypophase branched, 2.5–3 µm wide, septate, pale olivaceous. Stromata pseudoparenchymatous, forming few layers, composed of pale olivaceous to brown, thick-walled, polygonal cells, 5–13 µm diam. Conidiophores solitary or in loose to dense fascicles, arising from stromata, erumpent through the cuticle, erect, straight, at the distal end somewhat somewhat curved, unbranched, 20–54(–80) × (3.5–)4–5(–6) µm, 0–2-septate, mainly in the lower half, pale olivaceous to chestnut-brown, paler towards the apex, smooth, walls somewhat thickened. Conidiogenous cells integrated, terminal, proliferation sympodial, with a single or several conidiogenous loci, mostly at the apex, denticulate, (1–)1.5–2–(2.5) µm wide, unthickened, not darkened. Conidia solitary, fusiform, obclavate, 10–25 × 4–6(–8.5) µm, pale olivaceous, 0–1-septate, septum more or less median, rarely 2-septate, more or less constricted at the septa, smooth to verruculose, apex usually acute or rounded, truncate at the base, walls only slightly thickened, hila 1.5–2 µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Crataegus* spp. (Rosaceae), Asia, Caucasus, Europe, North America, Australia – *Crataegus crenulata* (= *Pyranthella crenulata*) (South Australia), *C. laevigata* (= *C. oxyacantha* auct.) (Europe, D, DK, F, RO), *C. monogyna* (Europe, RO), *C. pentagyna* (Asia, Iran), *C. subvillosa* (Europe, RO), *Crataegus* spp. (Caucasus, Armenia, Georgia; Europe, H, LT, RO, RUS, SK; North America, USA, FL).

**Material examined:** collections from B, HBG, JE, LE, M.

**Notes:** VIENNOT-BOURGIN (1949) described conidia formed singly as well as in short chains, with one or two septa.


**Holotype:** on *Syringa vulgaris* (= *Syringa alba*), North America, USA, Illinois, Cobden Zels., 1 Oct. 1882, F.S. Earle (B).

**Teleomorph:** *Cladosporium* auct. (Europe, D; North America, USA, FL).

**Material examined:** collections from B, HBG, JE, LE, M.

**Notes:** VIENNOT-BOURGIN (1949) described conidia formed singly as well as in short chains, with one or two septa.
Fig. 17: Fusicladium effusum. A – conidia, B – microcyclic conidiogenesis, C – conidiophore arising from a hypha, D – conidiophores in a loose fascicle, scale = 10 µm, K. Schubert del.

or several denticle-like conidiogenous loci, proliferation sympodial, loci unthickened, not or only somewhat darkened–refractive, 1.5–3 µm wide. Conidia in simple or branched chains, pyriform, subcylindrical, ellipsoid, fusiform, (8.5–)10–24 × 5–10 µm, pale brown, 0(–1)-septate, smooth, attenuated towards apex and base, apex mostly truncate, occasionally rounded or pointed, base truncate, hilum unthickened, but often somewhat darkened–refractive, 1.5–3 µm wide.

**Hosts and Distribution:** on Carya spp. and ?Juglans spp. (Juglandaceae), Africa, North, Central and South America, New Zealand – Carya aquatica (North America, USA, FL), C. cordiformis (= C. amara) (North America, USA, KS, WI), C. glabra (North America, USA, FL), C. illinoiensis (= C. pecan, = C. olivaeformis) (Africa, South Africa; North America, USA, AL, LA, MO, TX; South America, Brazil; New Zealand), C. ovata (North America, USA, WI), C. tomentosa (= C. alba) (North America, USA, IL, LA, KS), Carya spp. (North America, USA, AL, FL, NC, OK; Central America, Mexico; South America, Paraguay), ?Juglans regia (South America, Brazil).

**Material examined:** collections from B, M, NY.

**Notes:** On account of the catenate conidia, GÖTTWALD (1982), assigned Fusicladium effusum to Cladosporium, but the conidiogenous loci of this species agree well with those of Fusicladium in that they are denticle-like and have unthickened walls. The conidiogenous loci in species of Cladosporium, described and illustrated in detail by DAVID (1997), are quite distinct. Therefore, F. effusum belongs in Fusicladium, as has recently been confirmed by molecular studies of rDNA ITS sequences (SCHNABEL et al., 1999; SCHUBERT 2001) in which this species clustered close to various Venturia species with Fusicladium and Pollaccia anamorphs within a monophyletic Venturia clade (see chapter 3) In addition to its occurrence on an unrelated host, Fusicladium effusum var. carpineum Ellis & Everh. on Carpinus species (Corylaceae) in North America is distinguished from F. effusum on Carya species (Juglandaceae) in causing distinct lesions and having much longer and wider conidiophores with paler conidiogenous cells and less conspicuous conidiogenous loci. This variety is now considered to be a separate species of Fusicladium. Records on Juglans regia from Brazil (MENDEZ et al. 1998) are uncertain (no material seen).

**10.2.17. Fusicladium elegans** (Servazzi) Ritschel & U. Braun comb. nov. Fig. 18

≡ Pollaccia elegans Servazzi, Boll. Lab. Sperim. Osserv. Fitopatol. 15(3–4): 64 (1939); neotype: on Populus nigra, Germany, Geesthacht, 10 Jul. 1904, Jaap (B), as Napicladium asteroma (Fuckel) Allesch., selected here; isoneotype: H.


**Teleomorph:** Venturia populina (Vuill.) Fabric., Jahresber. Neuerung Pflanzenkrankh. 5: 282 (1902).

lochi 4–7 µm wide, not to very slightly thickened, somewhat refractive. Conidia solitary, ellipsoid to broadly fusiform, straight, rarely slightly curved, (21–)25–40(–45) × 9–13(–16) µm, 1–2(–3)-septate, with a large central cell and two smaller cells at the ends with somewhat thinner walls, more or less constricted at the septa, dark olivaceous-brown, smooth, thick-walled, rounded at the apex, base truncate to slightly convex, sometimes oblique, hila 4–7 µm wide, not to very slightly thickened, somewhat refractive.

**Hosts and Distribution:** on *Populus* spp. (Salicaceae), Asia, Europe, North America – *Populus balsamifera* [Asia; China; Europe; GB; North America, Canada, Alta., BC., Man., NB., Nfld., NS., NWT (Mack.), Ont., PEI, Que., Sask., Yukon, USA, WI], *P. × canadensis* (Europe, I; North America, Canada, Ont.), *P. ciliata* (Asia, India), *P. deltoides* (North America, Canada, Que.) *P. nigra* (incl. *P. pyramidalis*) (Asia; India; Europe, CS, D, F, I, SLO; North America, Canada, NB., USA, northern central states, north-eastern states, OR, WA), *P. trichocarpa* (North America, Canada, BC., USA, AK, OR), *Populus* spp. (Europe, CH, GB; North America, Canada, Alta., BC., Man., Nfld., Ont., Sask., USA, northern central states, north-eastern states, WA).

**Notes:** **PHILLIEUX** (1892) examined *Fusicladium* on *Populus nigra* from France, compared it with *F. tremulae* (= *Pollacia radiosa*), and found differences in the conidial shape and size but maintained this fungus under the latter species (as *Napicladium tremulae*). LIND (1905) followed the treatment of PHILLIEUX (1892), but called this species *Fusicladium radiosum*. SERVAZZI (1939) introduced *Pollacia elegans* and discussed the differences to *P. radiosa* in detail. Unfortunately, type material of *P. elegans* could not be traced and is probably not preserved, so a neotype is proposed in this paper. DANCE (1961) showed that *Venturia populnea* only attacked *Populus* species of sect. *Tacamahaca* and sect. *Algeiros* and this was confirmed during the course of the monographic examinations by RITSCHEL (2001). Records from *Populus* species of sect. *Leuce* (GINNS 1986, ONDERJ 1972) have probably been based on misidentifications of the fungi or hosts.

**III:** SERVAZZI (1939: PI. III, Figs 10–15; PI. IV, Figs 16–22; PI. V, Figs 23–25; PI. VI, Figs 26–31; PI. VII, Figs 32–36), DANCE (1961: PI. I, Figs 1–9; PI. II, 10–18, Figs 1–9), BARR (1968: 805, Fig. 20), ONDERJ (1972: 145, Figs 6, 7), CMI Descr. (1976: No. 483, Fig. B), ELLIS (1976: 110, Fig. 77 B), SIVANESAN (1977: 91, Fig. 49; 1984a: 620, Fig. 374 B), LIU, CHEN & SHAO (1981: PI. II, Fig. 6; 23, Figs 1–2), WU & SUTTON (1995: 985, Fig. 6), ELLIS & ELLIS (1997: Pl. 82, Fig. 850).

Leaf spots amphigenous, subcircular to irregular, 5–20 mm wide, pale brown, surrounded by a narrow, reddish brown, somewhat raised margin, limited by the leaf margin or by veins, later confluent and larger, sometimes covering large leaf segments, occasionally causing distortions of the leaves. Colonies amphigenous, punctiform to confluent, fructification often spread along veins, on the upper leaf surface dark brown to almost black, below pale brown to dark brown, also on twigs. Mycelium immersed. Stroma intraepidermal to subcuticular, composed of subcircular to slightly angular, thick-walled cells, 5–10 µm diam., forming up to three layers. Conidiophores usually in dense fascicles, arising from the upper cells of stromata, forming sporodochial conidiomata, sometimes solitary, erumpent through the cuticle, subglobose to cylindrical, 10–16 × 4–10 µm, 0–2-septate, olivaceous-brown, smooth, relatively thick-walled, conidiophores usually reduced to conidiogenous cells, unilocal, determinate or occasionally percurrent, with a single or two inconspicuous annellations,
Fig. 19: *Fusicladium euphorbiae*. A – conidia, B – dense fascicle of conidiophores (LE 40957, type), C – dense fascicle of conidiophores (collection from M), scale = 10 µm, K. Schubert del.

**Hosts and Distribution**: on *Euphorbia* spp. (Euphorbiaceae), Asia, Caucasus, Europe – *Euphorbia amygdaloides* (Europe, RO), *E. cyparissias* (Europe, RO), *E. esula* (Europe, CZ), *E. exigua* (Europe, RO), *E. lamprocarpa* (Asia, Kazakhstan; Europe, CZ, RUS), *E. villosa* (Europe, RO), *E. virgata* (Europe, RUS), *Euphorbia* spp. (Asia, Central Asia, Turkmenistan; Caucasus, Armenia; Europe, CZ, RUS).


10.2.19.1. *Fusicladium fasciculatum* Cooke & Ellis, Grevillea 6: 88 (1878) var. *fasciculatum*

**Holotype**: on stems of *Euphorbia nutans*, USA, New Jersey, Newfield, J.B. Ellis no. 2774 (90098 b) (K); **isotype**: NY (mixed infection with *Cladosporium chaetomium*).

≡ *Passalora fasciculata* (Cooke & Ellis) Earle, Torreya 2: 60 (1902).

**Teleomorph**: Unknown.

**Lit.**: DEIGHTON (1967: 16–21).
**Ill.**: DEIGHTON (1967: 20, Fig. 9).
**Exs.**: Ellis, N. Am. F. 545.

On stems, without conspicuous lesions. Colonies caespitose, effuse, up to 2 cm long, black, velvety, rarely on leaves, amphigenous. Mycelium internal, intercellular, subcuticular, hyphae branched, 1.5–4 µm wide, septate, almost colourless to very pale olivaceous. Conidiophores in small, loose fascicles, up to 6, arising from hyphae, consisting of two or three swollen cells, erumpent through the cuticle, erect or slightly divergent, more or less straight, usually somewhat flexuous, unbranched, very rarely branched, 37–175 × (3–)4–5 µm, septate, septa very thin, not always conspicuous, dark olivaceous, paler towards the apex, smooth, thick-walled, base often slightly swollen, sometimes with percurrent proliferations which are not connected with conidiogenesis. Conidiogenous cells integrated, terminal or intercalary, numerous and often crowded, proliferation sympodial, loci conspicuous and prominent, sometimes situated at the end of short lateral projections, denticulate, 1.5–2 µm wide, wall not or only very slightly thickened, somewhat darkened–refractive. Conidia solitary, fusiform, ellipsoid or subcylindrical, straight, 8.5–16 × (3–)4–6.5 µm, 0(–1)-septate, pale olivaceous, smooth to...
Fig. 20: Fusicladium fasciculatum var. fasciculatum. A – conidia, B – microcyclic conidiogenesis, C – unbranched and branched conidiophores, D – conidiophores in a small fascicle, scale = 10 µm, K. Schubert del.

verruculose, wall relatively thin-walled, apex rounded or pointed, attenuated at the base, truncate, hila 1.5–2 µm wide, not or only very slightly thickened, but somewhat darkened–refractive.

**Hosts and Distribution:** on Euphorbia spp. (Euphorbiaceae), North America, South America – Euphorbia corollata (North America, USA, WI), E. glyptosperma (North America, USA, WI), E. nutans (North America, USA, NJ), E. serpillifolia (North America, USA, WI), Euphoria spp. (North America, USA, KS, MD, NJ; South America, Brazil).

**Material examined:** collections from B, M.

**Notes:** Farr et al. (1989) listed species of Ammophila and Alopecurus as hosts of this species, which is very doubtful.

10.2.19.2. Fusicladium fasciculatum [Cooke & Ellis] var. didymum Deighton, Mycol. Pap. 112: 23 (1967) Fig. 21

Holotype: on Euphorbia corollata, USA, Iowa, Decorah, 5 Aug. 1884, E.W.D. Holway, as Fusicladium fasciculatum (NY).

Teleomorph: Unknown.

II: Deighton (1967: 22, Fig. 10).

Leaf spots indefinite or sometimes small, subcircular, up to 3 mm wide, somewhat orange to yellowish brown, or sometimes consisting of dark punctate areas of irregular shape, which may cover a large area of the leaf. Colonies amphigenous, dark, velvety. Mycelium immersed, intercellular; hyphae sparingly branched, 1.5–3 µm wide, septate, almost colourless. Conidiophores solitary or in small groups of 2–3, arising from hyphae, erumpent through the cuticle, erect, more or less flexuous or curved, unbranched or rarely branched near the apex, 65–260 × 2.5–5 µm, septate, dark olivaceous, paler towards the apex, smooth, walls somewhat thickened. Conidiogenous cells integrated, terminal or intercalary, proliferation sympodial, loci numerous, prominent, often on short nodulose projections, denticulate, 1.5–2.5 µm wide, conspicuous, but not or only very slightly thickened, somewhat darkened–refractive. Conidia solitary, broadly fusiform to short clavate, (9–)13–19 × (4.5–)5–7 µm, (0–)1(–2)-septate, usually slightly or distinctly constricted at the septum, sometimes not constricted, pale olivaceous, verruculose, apex rounded or shortly papillate, base attenuate, truncate, hila 1.5–2.5 µm wide, unthickened or only very slightly thickened, not or only slightly darkened–refractive.

**Hosts and Distribution:** on Euphorbia spp. (Euphorbiaceae), North America – Euphorbia corollata (USA, IA).

**Notes:** Var. didymum differs from var. fasciculatum in having usually 1-septate conidia (more than 90 %).
On dry stems, numerous discrete, oblong, greyish brown dots, densely scattered over the whole surface. Colonies forming small blackish tufts on the greyish brown spots. Mycelium subcuticular. Stromata 60–110 µm diam., composed of dark olivaceous-brown, thick-walled cells. Conidiophores densely fasciculate, arising from stromata, erumpent through the cuticle, erect, more or less straight, unbranched, 30–90 × 4–6 µm, septate, dark olivaceous-brown, somewhat paler towards the apex, smooth. Conidiogenous cells integrated, terminal, with a single to several conidiogenous loci, proliferation sympodial, loci conspicuous, slightly prominent, not or only very slightly thickened, not darkened. Conidia solitary, obclavate to fusiform, straight, 11–20.5 × 4–5.5 µm, 0–1-septate, lower cell mostly larger than the upper one, very rarely with three septa, not or only very slightly constricted at the septa, pale olivaceous, slightly verruculose, apex pointed, truncate at the base, hilum truncate to slightly convex, 1.5–2.5 µm wide, unthickened, not darkened.

Hosts and Distribution: only known from the type collection.

Notes: This species resembles Fusicladium euphoriae, but differs in having more robust, thick-walled, darker conidiophores, thick-walled, dark brown stromatic cells and somewhat shorter and wider conidia, consistently formed singly. Additional collections and molecular data are necessary to prove the true status of F. fautreyi and its affinity to F. euphoriae.
**Fusicladium fraxini** Aderh., Hedwigia 36: 74, 83* (1897) [*erroneously as Fusicladium tremulae]  
**Fig. 23**

Neotype: on leaves of *Fraxinus ornus*, Italy, prov. Verona, Tregnago, May 1913, C. Massalongo, Kab. 
& Bub., F. imp. exs. 794 (B), selected here; iso-neotypes: Kab. & Bub., F. imp. exs. 794 (e.g., BPI, W).

* = *Actinomera fraxini* Allesch., Bot. Centralbl. 2: 44 (1890); syntype: on leaves of *Fraxinus excelsior*, Germany, Munich, Isardamm, Sept. 1897, Allescher (M).  
* = *Fusicladium granulosum* Pass., in herb. (B).

**Teleomorph:** *Venturia fraxini* Aderh., Hedwigia 36: 83 (1897).


**Ill.:** Aderhold (1897: Tab. 4, Fig. 6), Sivanesan (1977: 67, Fig. 33; 1984a: 615, Fig. 371).


Leaf spots amphigenous, circular, oval to angular–irregular, up to 10 mm wide, ochraceous, yellowish to olivaceous-brown on the upper leaf surface, paler below, surrounded by a medium to dark brown, narrow margin, often marginal and fragile. Colonies amphigenous, punctiform, mainly spread along leaf veins, dark olivaceous to blackish. Stromata subcuticular to intraepidermal, 10–100 µm diam., composed of relatively large, olivaceous to medium brown swollen cells, 2–7 µm diam., forming expanded layers. Conidiophores aggregated in loose to dense fascicles, sometimes sporodochial or solitary, arising from the stromata, mostly erect, straight to geniculate, flexuous, subcylindrical to conical, unbranched, (5–)12–35 (–100) × 3–5 µm, (0–)1–3-septate, pale olivaceous to medium brown, smooth, often swollen at the base, up to 7 µm wide. Conidigenous cells integrated, terminal or conidiophores usually reduced to conidigenous cells, proliferation sympodial with one to several loci, or percurrent with several distinct, transverse annellations or both types of proliferation mixed, loci subdenticulate, 1–2 µm wide, unthickened, not or at most slightly darkened–refractive. Conidia solitary, fusiform to obclavate, straight to slightly curved, 12–28 × 4–6 (–7) µm, (0–)1–3-septate, not or only slightly constricted at the septa, septa more or less conical or somewhat in the lower half, subhyaline, pale olivaceous to olivaceous-brown, walls somewhat thickened, attenuated towards apex and base, apex often oblong-pointed, truncate at the base, hila 1–2 µm wide, unthickened, slightly darkened–refractive.

**Hosts and Distribution:** on *Fraxinus* spp. (Oleaceae), Asia, Caucasus, Europe, North America – *Fraxinus angustifolia* (Europe, RO), *F. excelsior* (Asia, Central Asia, Uzbekistan; Caucasus, Armenia, Georgia; Europe, CZ, D, EW, GB, LV, RO, RUS, Ukr.), *F. ornus* (Europe, I, RO), *F. raibocarpa* (Asia, Russia, Tadzhikistan), *F. sogdiana* (Central Asia, Uzbekistan), *Fraxinus* spp. (Central Asia, Uzbekistan; Caucasus, Armenia; Europe, EW, H, LV, RO, Ukr.; North America, USA, FL).

**Material examined:** collections from B, HBG, IMI, LE, M.

≡ *Isariopsis grayiana* Ellis, Bull. Torrey Bot. Club 9: 98 (1882); holotype: on dead stems of *Rubus villosus*, USA, Pa., West Chester, Oct. 1881, J.B. Gray (NY); isotypes: Ell., N. Am. F. 818 (e.g., IMI 92619).  

≡ *Phaeoasteriopsis grayiana* (Ellis) Ferraris, Ann. Mycol. 7: 280 (1909), as ‘grayiana’.  

**Teleomorph:** Unknown.  

**Ill.:** DEIGHTON (1990: 1097, Fig. 1).  

**Exs.:** Ellis, N. Am. F. 818.  

Colonies on stems, effuse, tufted, dark blackish brown. Mycelium immersed, hyphae branched, 1.5–3 μm wide, septate, pale brown, wall smooth. Stromata mostly immersed, pseudoparenchymatous, 16–60 μm wide, 20–40 μm high, brown or dark brown. Conidiophores usually aggregated in dense fascicles, arising from the upper cells of the stromata, erect, flexuous, unbranched, 80–280×2.5–4 μm, pluriseptate, brown, dark near the base, paler towards the apex, mostly smooth, the upper part occasionally wrinkled or verruculose. Conidiogenous cells integrated, terminal, with a single or several scattered, subdenticulate conidiogenous loci, proliferation sympodial, loci unthickened, not or only very slightly darkened. Conidia solitary, cylindrical to short obclavate, 6–14×2.5–4 μm, 0–1-septate, pale olivaceous, smooth to verruculose, rounded at the apex, base 0.5–1 μm wide, hila unthickened, not or only very slightly darkened–refractive.  

**Hosts and Distribution:** on *Rubus* spp. (Rosaceae), North America – *Rubus villosus* (USA, PA), *Rubus* spp. (USA, PA).  

**Material examined:** on *Rubus* sp., USA, Pa., Catoctin, Jun. 1940, J.A. Stevenson (M).  

Fig. 24: *Fusicladium grayianum*. A – conidia, B – dense fascicle of conidiophores, scale = 10 μm, K. Schubert del.


**Ill.:** Plakidas (1942: 30, Fig. 2), Ellis (1976: 340, Fig. 258), Sivanesan (1977: 26, Fig. 2; 1984a: 607, Fig. 364), IMI Descr. (No. 1520, Figs A–C), Partridge & Morgan-Jones (2003: 365, Fig. 3).  

Leaf spots (only associated with the anamorph) amphigenous, variable in shape and size, subcircular to angular, 0.5–20 mm wide, dark reddish brown on upper leaf surface, greyish below, sometimes zonate, margin irregular, pale grey. Mycelium internal, hyphae subhyaline to pale brown, rough-walled, septate, forming mainly subcortical net-like aggregations, effuse. Colonies amphigenous, punctiform to subefuse, dark. Stromata 35–80 µm diam., composed of thick-walled, brown cells, 4–10 µm wide. Conidiophores solitary, arising from internal or external, superficial hyphae or swollen hyphal cells, or formed in loose fascicles arising from stromata, erect to flexuous, straight to geniculate, unbranched or occasionally branched, 15–70 × 3.5–6 µm, septate, olivaceous to pale brown, smooth, wall somewhat thickened. Conidiogenous cells integrated, terminal or intercalary, with a single or several denticle-like conidiogenous loci, proliferation sympodial, loci unthickened, not or only slightly darkened-refractive. Conidia catenate, in simple or branched chains, cylindrical or fusiform, straight or slightly curved, 10–29 × 4–7 µm, 0–2(–3)-septate, not or somewhat constricted at the septum, pale olivaceous to medium brown, smooth, attenuated towards apex and base, apex pointed or truncate, base truncate, hila 1–3(–3.5) µm wide, unthickened, not darkened.  

**Hosts and Distribution:** on Acer spp. (Aceraceae), North America – *Acer negundo* (USA), *A. nigrum* (USA), *A. rubrum* (Canada, NB., Nfld., Ont.; USA, AL, MI, NY, WI), *A. saccharinum* (USA, NC, WI), *A. saccharum* (Canada, Ont.), *A. spicatum* (Barr 1968: USA).  

**Material examined:** collections from WIS.  

**Notes:** The teleomorph was described and illustrated in detail by Barr (1968) and Sivanesan (1977, 1984a). Due to the structure of the conidiogenous loci and conidial hila, *Cladosporium humile* has to be excluded from *Cladosporium* and assigned to *Fusicladium*, which is consistent with its connection with a *Venturia* teleomorph. The report of *Cladosporium humile* from India (Kashmir) on *Populus* (Beig & Khan 1999) probably refers to either *Fusicladium martianoffianum* or *F. romellianum*.  

10.2.25. *Fusicladium junci* Sawada ex K. Schub. & U. Braun sp. nov.  


**Holotype:** on *Juncus prismatocarpus*, Taiwan, K. Sawada (NTU-PPE) (= National Taiwan University, Dept. of Plant Pathology and Entomology).  

**Teleomorph:** Unknown.  

**Ill.:** Sawada (l.c.: Figs 34–35).

On necrotic brown leaves, sheaths and stems, leaf spots indefinite, diffuse, brown. Colonies amphigenous, punctiform, brown. Mycelium internal. Stromata absent to well-developed, substomatal, oblong, 20–40 × 10–20 µm, brown, stromatic cells 3–6 µm diam., brown, with slightly thickened walls. Conidiophores in small, more or less dense fascicles, emerging through stomata, cylindrical–conic, straight, erect, unbranched, 5–15(–38) × 4–7(–9) µm, aseptate, pale brown, smooth, conidiophores usually reduced to conidiogenous cells. Conidiogenous cells unilocular (monoblastic), determinate or with two conidiogenous loci, sympodial, loci flat, 1.5–2.5 µm wide, unthickened, not darkened, but sometimes somewhat refractive. Conidia solitary, obclavate to cylindrical, straight, (26–)30–50(–57) × 4–6 µm, 1-septate, slightly constricted at the septa, subhyaline to very pale yellowish-greenish or olivaceous, smooth, apex obtuse, rounded, base obconically truncate, hila flat, 1.5–2.5 µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Juncus* spp. (Juncaceae), Taiwan – *Juncus prismatocarpus* (Taiwan).
10.2.26. *Fusicladium lathyrinum* (Ellis & Galloway) S. Hughes & Piroz., Canad. J. Bot. 50(12): 2528 (1972) Fig. 28

≡ *Dicoccum lathyrinum* Ellis & Galloway, J. Mycol. 5: 65 (1889), as ‘lathyrmum’; holotype: on *Lathyrus ochroleucus*, USA, Montana, Highwood Mts., Highwood Canyon, 18 Jun. 1888, R.S. Williams, Parasitic Fungi of Montana 301 (NY); isotype: DAOM 130903 (permanent slide).

**Teleomorph:** Unknown.

**Ill.:** HUGHES & PIROZYNSKI (1972: 2528, Fig. 3).

Leaf spots amphigenous, on the upper leaf surface forming yellowish discolorations, on the lower side almost white, sunken. Colonies hypophyllous, dense, caespitose, dark yellowish brown, velvety. Mycelium immersed, subcuticular to intraepidermal, composed of irregular, colourless, thin-walled hyphae, branched in the mesophyll, aggregated in the epidermis, and giving rise to widely extended, compact layers of conidiogenous cells. Conidiophores reduced to conidiogenous cells, erumpent through the outer wall of the epidermis and the cuticle, cylindrical, narrowly clavate or ovoid, erect, unbranched, 4–18 × 4–7 µm, aseptate, subhyaline to very pale brown, smooth, thin-walled, except for the apex, which has a thicker brown wall, mostly with two or three loci, proliferation sympodial, loci denticulate, flat, about 3 µm wide, not or only slightly thickened and darkened. Conidia solitary, ellipsoid, subcylindrical to obclavate, straight, 15–28 × 6–10 µm, 0–1-septate, constricted at the septa, septa thin, inconspicuous, at first hyaline, later pale olivaceous, coarsely verrucose, rounded at the base, with a flat, broad, not or only slightly thickened, not or only very slightly darkened hilum, 3 µm wide.

**Hosts and Distribution:** only known from the type collection.

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10.2.27. *Fusicladium levieri* Magnus, in Sommier & Lévier, Trudy Imp. S.-Peterburgsk. Bot. Sada 16: 543 (1900) Fig. 29


≡ *Cladosporium levieri* (Magnus) Hara, Agric. & Hort. 12: 2706 (1937).


≡ *Fusicladium diospyri* Chona, Munjal & J.N. Kapoor, Indian Phytopathol. 9: 129 (1956); type: on *Diospyros kaki*, India, U. P., Saharanpur (HCIO?).

≡ *Fusicladium diospyri* Hori & Yoshino in herb. (B).

**Teleomorph:** Unknown.


**Ill.:** VASSILJEVSKY & KARAKULIN (1937: 373, Fig. 32), BRAUN & MELNIK (1997: Fig. 38), SCHOLLER et al. (2003: Figs 1–2).


Leaf spots amphigenous, subcircular to angular–irregular, 1–5 mm wide, centre greenish brown or ochraceous to greyish white, surrounded by a small to fairly broad,
dark, often almost blackish margin, sometimes with a wide, somewhat discoloured halo, scattered on the leaf surface. Colonies amphigenous, mainly hypophyllous, inconspicuous to punctiform, dark, fructification mostly sparse. Mycelium internal, immersed, hyphae branched, septate, pigmented. Stromata absent or as small, brown hyphal aggregations, substomatal or intraepidermal. Conidiophores solitary or usually in small, loose to dense fascicles, arising from internal hyphae or stromatic hyphal aggregations, erumpent through the cuticle or emerging through stomata on the lower leaf surface, erect to flexuous, straight to geniculate–sinuous, unbranched or rarely branched, 10–70 × 3–8 µm, 0–3-septate, pale olivaceous to pale brown, smooth, walls somewhat thickened. Conidiogenous cells integrated, terminal, with a single to only a few conidiogenous loci, proliferation sympodial, loci 1.5–3 µm wide, inconspicuous, unthickened or almost so, occasionally somewhat darkened. Conidia catenate, in simple, occasionally in branched chains, subcylindrical, ellipsoid to fusiform, straight, 13–40 × 3–7 µm, 0–2-septate, sometimes slightly constricted at the septa, pale olivaceous, smooth, ends obtuse or obconically truncate, hila 1.5–3 µm wide, unthickened or almost so, occasionally somewhat darkened.

**Hosts and Distribution:** on Diospyros spp. (Ebenaceae), Asia, Caucasus, Europe, North America – Diospyros kaki (Asia, China, India, Japan; Caucasus, Georgia; Europe, RO), D. lotus (Caucasus, Georgia), D. virginiana (North America, USA, CT, FL, IN, MS).

**Material examined:** on Diospyros kaki, Japan, Miyazaki, Houzouy-machi, 30 May 1935, M. Ebihara (B); on Diospyros lotus, Anhrensky, 2 Aug. 1915, V. Semaschek (LE 161233); on Diospyros virginiana, USA, Indiana, Vigo County, Terre Haute, Persimmon Street, J. Lehman, 26 Jun. 2002 (PUR 1680).

**Notes:** Höhnel (1919: 156) introduced the new genus Hormoconia based on Fusicladium kaki. Braun, in Braun & Melnik (1997), transferred Fusicladium levieri to Phaeoramularia, but detailed examinations of additional collections clearly showed that the fungus from Diospyros spp. must be maintained in Fusicladium. The conidiogenous loci and conidial hila are occasionally somewhat darkened–refractive, but consistently truncate and unthickened as in other species of Fusicladium.

### 10.2.28. *Fusicladium mandshuricum* (M. Morelet) Ritschel & U. Braun comb. nov.


≡*Pollaccia sinensis* W.P. Wu & B. Sutton, in herb. (IMI).


**Ill.:** Wu & Sutton (1995: 984, Figs 1–4), Morelet & Sigaud (1996: 16, Fig. 4; 17, Fig. 6).

On living leaves, petioles and twigs, spots circular to irregular, 5–10 mm wide, at first punctiform, later confluent and larger, often vein-limited, at first brown, later silvery white to grey, margin conspicuous, yellowish brown, on the lower leaf surface 3–8 mm wide, grey, margin yellowish brown, infected necrotic tips of shoots often curved, hook-like. Colonies amphigenous, punctiform, scattered to aggregated in groups, dark olivaceous-green to blackish. Mycelium immersed, hyphae branched, 2–3.5 µm wide, septate, brownish. Stroma at first intraepidermal, later subcuticular, 40–80 µm diam., composed of subglobose to slightly angular, brown, relatively thick-walled cells, 4–8 µm diam., aggregated, forming up to three layers. Conidiophores densely fasciculate, arising from the upper cells of the stromata, forming sporodochial conidiomata, erumpent through the cuticle, straight, cylindrical to ampulliform, unbranched, 5–7 × 6–7.5 µm, aseptate, pale to medium olivaceous-brown, smooth, walls somewhat thickened, occasionally swollen at the base, up to 10 µm wide, conidiophores reduced to conidiogenous cells, unilocal, determinate or percurrent, with a single annellation (in culture up to three annellations), annellations with a somewhat irregular, more or less darkened, pale to medium olivaceous-brown, smooth, walls somewhat thickened, occasionally swollen at the base, up to 10 µm wide, conidiophores reduced to conidiogenous cells, unilocal, determinate or percurrent, with a single annellation (in culture up to three annellations), annellations with a somewhat irregular, more or less dark rim, loci truncate to slightly convex, 4(–5) µm wide, not to very slightly thickened, not darkened, occasionally with a small, lateral, subhyaline foot-like projection.


Notes: This species, described as “grey spot disease” of Populus spp. in northeast China, was erroneously considered in the older Chinese literature to be Coryneum populorum Bres. and the anamorph of Mycosphaerella mandshurica Miura. However, MORELET (1993) and MORELET & SIGAUD (1996) examined this fungus in vivo and in vitro and demonstrated that it was an undescribed anamorph of a new species of Venturia. WU & SUTTON (1995) depicted the conidiogenous loci with irregular, darkened rims. In the material examined during the course of the present monographic studies, the rims of the loci were less conspicuous. It is to be supposed that this species is more widespread in China and possibly also in the Far East of Russia.

10.2.29. Fusicladium martianoffianum (Thüm.) K. Schub. & U. Braun, IMI Descriptions of Fungi and Bacteria 152, No. 1515 (2002) Fig. 31


Teleomorph: Unknown.

Ill.: ONDJEI (1973: 238, Fig. 6), IMI Descri. (No. 1515, Figs A–C).

Exs.: PILZL. Sib. 474, 653; Thüm., Mycoth. univ. 2067.

Leaf spots amphigenous, subcircular to somewhat angular–irregular, 1–10 mm wide, dirty greenish to dark brown by abundant fructification, margin indefinite. Colonies epiphyllous, punctiform, scattered to dense, sometimes confluent, dark brown. Mycelium subcortical to intraepidermal, forming swollen, yellowish-brownish, thick-walled cells, 3–10 µm diam., which form conidiophores. Conidiophores solitary or in loose to dense sporodochial aggregations, often confluent, forming dense fascicles or layers, cylindrical to conical or irregularly shaped, erect, straight, 5–35 × 2–30 µm, 0(–1)-septate, olivaceous or medium brown, smooth, wall thin to somewhat thickened, conidiophores mainly reduced to conidiogenous cells. Conidiogenous cells with a single or several conidiogenous loci, subdenticulate, proliferation sympodial, loci 1.5–2.5(–4) µm wide, apex truncate to slightly convex, unthickened, not or only very slightly darkened–refractive. Conidia solitary (primary conidia) or mostly in short, 0–1(–3)-septate, pale olivaceous to olivaceous, smooth, rarely somewhat rough-walled, thin-walled, attenuated towards apex and base, apex rounded, truncate or pointed, base obconically truncate, with a single hilum, apex with one or two hila, 1–3 µm wide, unthickened, not or only very slightly darkened–refractive.

10.2.30. Fusicladium nashicola K. Schub. & U. Braun sp. nov. Fig. 32

Holotype: on leaves of Pyrus pyrifolia, Japan, Tsukuba, Ibaraki, Orchard of the National Institute of Agro-Environmental Sciences, 18 Aug. 2000, H. Ishii (HAL 1749).


Ill.: ISHII & YANASE (2000: 757, Figs 1–2).

Differt a F. pyrorum conidiis brevioribus.
Leaf spots amphigenous, pale brown to dark brown, even blackish by abundant fructification. Colonies mostly smaller than 1 mm, but confluent and finally sometimes covering the entire surface of the leaves, often occurring along leaf veins. Mycelium subcuticular. Stromata composed of brown, thick-walled cells, 4–8 µm diam., forming few layers, hyphae branched, 2–3 µm wide, septate, subhyaline to pale olivaceous. Conidiophores loosely to densely fasciculate, arising from stromata, erect to flexuous, geniculate–subnodulose, sinuous, unbranched or rarely branched, 20–70 × 4–6.5 µm, continuous or septate, brown, paler towards the apex, smooth, thick-walled. Conidiogenous cells integrated, terminal or intercalary, with numerous conidiogenous loci, proliferation sympodial, loci denticulate, 1.5–3 µm wide, truncate to slightly convex, unthickened, sometimes with a single percurrent proliferation which is not connected with conidiogenesis. Conidia solitary, subcircular to fusiform, sometimes cylindrical, straight or slightly curved, 9–20(–28) × 5.5–10 µm, aseptate, pale brown, smooth, apex rounded or obtuse to pointed, base truncate or slightly convex, hilum 1.5–3 µm wide, unthickened, somewhat darkened–refractive.

Hosts and Distribution: on leaves of Pyrus spp. (Rosaceae), Asia – Pyrus bretschneideri (Asia, China), P. betulaefolia (Asia, China), P. lindleyi (China, Taiwan), P. pyrifolia (China, Japan, Korea, Taiwan), P. ussuriensis (China).

Material examined: on leaves of Pyrus lindleyi (= P. sinensis), Japan, Tokyo, Shira, as F. dentriticum (B).

Notes: Sivasesan (1977, 1984a) reduced Venturia nashicola to a synonym of V. pyrina, but Ishii et al. (1992, 1997) and Ishii & Yanase (2000) found clear morphological, pathological and physiological differences between the fungi on Asian and European pears. Venturia nashicola differs from V. pyrina in having significantly shorter conidia and shorter, narrower lower cells of the ascospores. The two taxa are also biologically differentiated. V. nashicola is confined to Asian pears, and V. pyrina occurs on European pears. Molecular data obtained by Schnabel et al. (1999) showed that these two taxa are closely allied. However, the data available are not sufficient to determine whether the fungi are two distinct species or two races of a single species. The morphological differences between the two taxa on pears were confirmed during the course of the present monographic studies and, therefore, we prefer to follow the taxonomy of Ishii & Yanase (2000) in keeping two separate species. The anamorph of Venturia nashicola has not yet been denominated formally. Since it occurs independently from the teleomorph, we prefer to introduce a separate name for this anamorph.
the cuticle, subglobose, broadly ampulliform to campanulate, 5–12 × 5–7 µm, 0–1-septate, medium olivaceous-brown, smooth, somewhat thick-walled. Conidiophores reduced to conidiogenous cells or conidiogenous cells integrated, terminal, with a single, rarely with two conidiogenous loci, proliferation percurrent, producing a succession of up to 10 single conidia, but annellations not very conspicuous because the conidia may arise and secede at about the same level or even at progressive lower levels. Conidia solitary, fusiform to navicular, straight to somewhat curved, (10–)12–15 (–16) × (4–)5–6 µm, 0–1(–2)-septate, septum near the base, pale olivaceous-brown, verruculose to minutely echinulate, pointed at the apex, truncate to somewhat convex at the base, hila (3–)4 µm wide, unthickened, not or only slightly darkened.

Hosts and Distribution: on Fraxinus spp. (Oleaceae), North America – Fraxinus americana (USA, WI).

Material examined: on Fraxinus americana, USA, Wisconsin, Domers, 10 Sept. 1893, J.J. Davis (NY).

Notes: HUGHES & PIROZYNSKI (1972) described conidiogenous cells with up to two conidiogenous loci with percurrent proliferation and this was confirmed during the re-examination of the type material. In this respect, F. nebulosum is intermediate between Fusicladium s.str. (multilocal, sympodial) and Spilocaea (unilocal, percurrent).


Fig. 34  

Type: on leaves of Prunus serotina (= P. salicifolia), South America, Ecuador, Cotocollao, Lagerheim (not seen).  

Teleomorph: Unknown.  

Lit.: SACCARDO (1895: 618), IMI Descr. (No. 1516).  

Ill.: IMI Descr. (No. 1516, Figs A–C).  

Exs.: Syd., F. exot. exs. 1234.
Leaf spots lacking or almost so. Colonies epiphyllous, effuse, dendritic, olivaceous-brown to blackish. Mycelium immersed, subcortical, hyphe branched, 2–3 µm wide, septate, hyaline. Stromata composed of relatively small brown, thick-walled, rough-walled cells, 5–7 µm diam. Conidiophores in loose fascicles arising from stromatic cells or from hyphae, erect, mostly somewhat flexuous or geniculate, unbranched or branched, 40–120 × 6–8 µm, septate, olivaceous to brown, paler towards the apex, smooth, wall somewhat thickened, often with percurrent proliferations which are not connected with conidiogenesis. Conidiogenous cells integrated, terminal or intercalary, proliferation sympodial, with a single or several conidiogenous loci, subdenticulate, 2–4.5 µm wide, wall unthickened, slightly convex, non-pigmented, often with percurrent proliferations which are not connected with conidiogenesis. Conidia solitary, fusiform, oblong, ellipsoid, straight, (9.5–)12–26 × 6–10 µm, pale to medium brown, 0–1(–2)-septate, not or only slightly constricted at the septa, smooth, apex obtuse, rounded or pointed, obconically truncate at the base, hila 2–4.5 µm wide, unthickened, non-pigmented.

**Hosts and Distribution:** on *Prunus* spp. (Rosaceae), South America – *Prunus capollin* (Ecuador), *P. serotina* (South America).

**Material examined:** some duplicates of ‘Syd., F. exot. exs. 1234’ from herb. B, HBG, M.

**Notes:** Type material of this species could not be traced at either FH or PC. The present description and illustration are based on duplicates of ‘Sydow, Fungi exotici exsiccati 1234’ from B, HBG and M.

### 10.2.33. *Fusicladium oleagineum* (Castagne) Ritschel & U. Braun comb. nov. Fig. 35

≡ *Cycloconium oleagineum* Castagne, Cat. pl. Marseille: 220 (1845), as ‘oleagineum’; lectotype: on leaves of *Olea europaea* France, Marseille, Castagne (STR), selected here; isolecotypes: on leaves of *Olea europaea*, France, Marseille, Castagne (M; IMI 69757, slide).

≡ *Spilocaea oleaginea* (Castagne) S. Hughes, Canad. J. Bot. 31: 564 (1953).

**Teleomorph:** Unknown.


**Ill.:** Briosi & Cavara (F. paras. 223, Fig.), Lindau (1907: 771, Figs 1–4), González Fragoso (1927: 177, Fig. 36; 178, Fig. 37), Hughes (1953: 564, Fig. 4), Ellis (1971: 142, Fig. B).

**Exs.:** Briosi & Cav., F. paras. 223, Kab. & Bab., F. imp. exs. 144.

On living leaves, fruit stalks and fruits, leaf spots amphigenous, subcircular, 5–10 mm wide, pale to greyish brown. Colonies mainly epiphyllous, punctiform or radiating, 3–10 mm wide, below punctiform, 0.1–0.5 mm wide, grey to blackish. Mycelium intraepidermal to mostly subcortical or superficial, hyphae occasionally branched, 2.5–8 µm wide, septate, hyaline to medium brown, thin-walled, sometimes slightly thick-walled. Conidiophores solitary, arising from hyphal cells, erumpent through the cuticle, subglobose, 8–10 µm diam, or ampulliform, 10–25(–30) × 5–7 µm, or up to 15 µm wide at the base, erect, straight, unbranched, mostly aseptate, medium to dark brown, paler towards the apex, smooth, sometimes smooth, usually rough-walled, thick-walled, conidiophores reduced to conidiogenous cells, with a single or rarely with two or three conidiogenous loci, proliferation percurrent, with up to seven conspicuous annellations, loci 5 µm wide, unthickened, not darkened. Conidia solitary, obclavate, straight or occasionally slightly curved, (15–)18–25(–28) × (9–)10–11(–12) µm, 1-septate, septum median or somewhat in the lower half, sometimes 2-septate, often slightly constricted at the septum, medium to dark olivaceous-brown, verrucose, thick-walled, apex pointed to rounded, truncate at the base, hila 5 µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Olea* spp. (Oleaceae), Asia, Europe (Mediterranean), Africa, North America, South America, New Zealand – *Olea europaea* [Asia, India, Iran (Palestine), Jordan, Lebanon, Turkey; Europe, E, F, I, Malta, Cyprus; Africa, Egypt, Algeria, Libya, Morocco, Somalia, South Africa, Tunisia; North America, USA, CA; South America, Chile; New Zealand].

**Material examined:** on *Olea europaea*. Italy, Siena (1889), Comin (1892), Briosi & Cav., F. paras. 223 (HAL, M); Italy, Verona, Tregano, May 1903, Massalongo, Kab. & Bab., F. imp. exs. 144 (M); USA, California, Berkeley, Feb. 1895, Berletti (M).

**Notes:** *Fusicladium oleagineum* differs from almost all other *Spilocaea*-like *Fusicladium* species in having more than one conidiogenous locus. “Striate” conidia described by Hughes (1953) have not been observed in the collections examined. The occurrence of this fungus on fruits and stalks was described by Lindau (1907).
10.2.34. Fusicladium peucedani Ellis & Holw., Bull. Lab. Nat. Hist. Iowa State Univ. la, 3(3): 42 (1895)  
Fig. 36
Holotype: on leaves of Peucedanum simplex (= Lomatium simplex), USA, California, Modoc Co., 13 Jun. 1894, Nutting (NY).
≡ Asperisporium peucedani (Ellis & Holw.) Maubl., Lavoura 16: 207, 211 (1913) and Bull. Soc. Mycol. France 29: 357 (1913).
Teleomorph: Unknown.
Ill.: Deighton & Pirozynsky (1965: 42, Figs 17 A–D), Ellis (1976: 110, Fig. 77 A).

Leaf spots amphigenous, more or less angular, 2–7 mm wide, grey to pale brownish, vein-limited. Colonies amphigenous, punctiform, dark olivaceous-brown, in most collections (but not the type collection) associated with black, densely arranged pycnidia. Mycelium immersed, hyphae branched, septate, colourless, densely intricated. Stromata intraepidermal to subcuticular, up to 100 µm diam., forming two to four layers. Conidiophores in dense fascicles, arising from the upper cells of the stromata, forming sporodochial conidiomata, at first subcuticular, later erumpent through the cuticle, protruding, 5.5–6.5 µm wide, attenuated towards the apex, about 4 µm wide above, erect, straight to slightly flexuous, cylindrical, unbranched, 10–30 × 5–8 µm, aseptate, at first more or less colourless, with a slightly greenish tinge, and smooth, later pale to medium olivaceous-brown, loosely verrucose, walls barely thickened, conidiophores reduced to conidiogenous cells, unilocular, determinate or proliferation percurrent, with up to six conspicuous annellations, loci slightly convex, 3–5 µm wide, unthickened, not darkened. Conidia solitary, oblong–ellipsoidal, straight, 20–29 × (7–)9–11 µm, 0–1-septate, with a median septum, usually somewhat constricted in the middle, pale olivaceous, loosely verrucose, walls somewhat thickened, apex rounded, hilum slightly convex, 3–5 µm wide, unthickened, not darkened.

Hosts and Distribution: on Angelica, Cicuta, Glehnia, Lomatium and Sphaenosциadium spp. (Apiaceae), North America – Angelica arguta (Canada, Alta., BC.), A. breweri (USA, CA), Angelica spp. (USA, WA, WY), Cicuta douglasi (USA, ID), C. occidentialis (USA, ID), Glehnia leiocarpa (USA, WA), G. littoralis (Canada, BC., USA, CA), Lomatium brandegei (Canada, BC., USA, CA), L. macrocarpum (Canada, Alta.), L. martindalei (Canada, BC.), L. nudicaule (USA, ID, OR, WA), L. simplex (= Peucedanum simplex) (USA, CA), L. trirnatum (USA, OR), Sphaenosциadium capitellatum (USA, NV).

Notes: Based on percurrent conidiogenous cells, Deighton, in Deighton & Pirozynsky (1965) placed Fusicladium peucedani Ellis & Holw. in Pollaccia. He supposed that pycnidia, often found in association with sporodochia of F. peucedani, may belong into the life cycle of this species. Records on Peucedanum decursivum from Japan [e.g., Shirai & Hara (1927)] have to be excluded since they belong to Fusicladium peucedani Syd. [= Passalora depressa (Berk. & Broome) Sacc.].

10.2.35. Fusicladium phillyreae (Nicolas & Aggéry) Ritschel & U. Braun comb. nov.
Teleomorph: Unknown.
Ill.: Ellis (1976: 111, Fig. 78).

On living leaves and petioles, spots amphigenous, subcircular, 1–4 mm wide, on the upper leaf surface medium brown and somewhat shining, below pale brown. Colonies punctiform, diffuse, olivaceous to blackish brown. Mycelium subcuticular. Stromata composed of loosely aggregated, subcircular, pale to dark olivaceous-brown cells, 6–9 µm diam. Conidiophores solitary or in small groups, arising from the upper cells of the stromata, erumpent through the cuticle, ampulliform or doliiform, erect, straight to slightly flexuous, unbranched, 10–30 × 5–7 µm, aseptate, medium to dark olivaceous-brown, smooth, thick-walled, swollen at the base, up to 11 µm wide, conidiophores usually reduced to conidiogenous cells, unilocular, proliferation percurrent, with up to six conspicuous annellations, loci truncate, 5–6 µm wide, unthickened, not darkened. Conidia solitary, navicular to broadly ovate or obclavate,

Fig. 36: Fusicladium peucedani. A – conidia, B – conidiogenous cells, one with several conspicuous annellations, arranged in a sporodochium, C – solitary conidiophore, scale = 10 µm, A. Ritschel del.
straight to slightly curved, 17–40 × 7–11 µm, (0–)1(–3)-septate, septum median or somewhat in the lower half, often slightly constricted at the septa, medium to dark olivace-brown, verruculose, thick-walled, apex pointed or somewhat rounded, truncate at the base, hilum 5–6 µm wide, not or only very slightly thickened and darkened.

**Hosts and Distribution:** on *Phillyrea* spp. (Oleaceae), Europe – *Phillyrea angustifolia* (F), *P. media* var. *ligustrifolia* (CH).

**Material examined:** on *Phillyrea media* var. *ligustrifolia*, Europe, Switzerland, Brissago, Lago Maggiore, Ticino, 15 May 1966, Deighton (IMI 119435).

**Notes:** Type material of this species could not be traced, but a collection from Switzerland has been examined. According to the original diagnosis, *Fusicladium fraxini var. phillyreae* Trotter, described from galls of *Braueriella phillyreae* on *Phillyrea media*, differs from *F. phillyreae* in having much smaller conidia (11–12 × 4–5.5 µm) and seems to be quite distinct. However, type material of this variety could not be traced and examined.

10.2.36. *Fusicladium pisicola* Linford, Phytopathology 16(8): 549 (1926)

**Lectotype:** on *Pisum sativum*, USA, Utah, Exp. Station Logan, 21 Aug. 1923, M.R. Linford (M), as *F. brevipes* Ellis & Everh., selected here; islectotypes: BPI 424334 A, B.

**Teleomorph:** Unknown.

**Hil.:** LINFORD (1926: PI. 27, C).

On leaflets, stipules and tendrils, leaf spots hypophyllous, varying in shape and size, irregular to oblong, up to 10 mm wide, pale to dark brown, dark grey, sometimes sooty black, paler on the upper leaf surface, yellowish grey to pale brown, sometimes confluent, vein-limited, without conspicuous margin. Colonies hypophyllous, rarely amphigenous, dark, velvety. Mycelium intercellular, subcuticular to intraepidermal, hyphae branched, 3–5 µm wide, septate, subhyaline to pale olivaceous. Stromata composed of slightly thick-walled, rough-walled cells, 5–8 µm diam., forming stromatic layers. Conidiophores scattered to aggregated, but not fasciculate, erumpent through the cuticle, very short, conical, erect, unbranched, 5–24 × (4–)6–8 µm, aseptate, olivaceous to brown, smooth, walls somewhat thickened, slightly swollen at the base, truncate at the apex, conidiophores usually reduced to conidigenous cells, unilocular, determinate, with a single, subdenticulate locus, flat to slightly convex, 2–4 µm wide, unthickened or almost so, somewhat darkened–refractive. Conidia solitary, ellipsoid–ovoid, obvoid to short cylindrical, 12–28(–32) × 6–10(–14) µm, 0–1-septate, more or less constricted at the septum, septa more or less median or somewhat in the upper half, asperulate, coarsely verrucose to echinulate, walls somewhat thickened, apex broadly rounded, base rounded to truncate, hila 2–4 µm wide, unthickened or almost so, somewhat darkened–refractive.
Hosts and Distribution: on *Pisum* spp. (Fabaceae), North America – *Pisum sativum* (USA, ID, UT).

Notes: The lectotype is a part of the material cited in the original publication.

10.2.37.  *Fusicladium pomi* (Fr.) Lind, Dan. fung.: 521 (1913)  [Fig. 39]

- *Spilocaea pomi* Fr., Novit. fl. scev.  5: 79 (1819); syntypes: on *Malus sylvestris*, Sweden (Fr.), Scler. exs. 260 (e.g., B, UPS).
- *Spilocaea pomi* Fr.: Fr., Syst. mycol. 3: 504 (1832).
- *Cladosporium dendriticum* Wallr., Fl. crypt. Germ. 2: 169 (1833); syntypes: B, STR.
- *Passalora dendritic* (Wallr.) Sacc., Mycoth. ven., Cent. XII, 1246, Padua 1876 [Michelia 1: 265 (1878)].
- *Fusicladium orbiculatum* (Desm.) Thüm., Fungi austral., Cent. VIII, 774, Teplitz 1873.
- *Passalora dendritic* var. *orbiculata* (Desm.) Berk., in Sacc., Mycoth. ven., Cent. XII, 1246, Padua 1876 [Michelia 1: 265 (1878)].
- *Fusicladium dendriticum var. orbiculatum* (Desm.) Sacc., Syll. fung. 4: 345 (1886).
- *Scolecostachium venosum* Bonord., in Rabenh., Fungi eur., Cent. VI, 582, Dresden 1863; lectotype: on leaves of *Malus sp.*, Germany, Westphalia, Rabenh., F. eurol. 582 (HAL, M).
- *Cladosporium var. orbiculatum* Thüm., Fungi austral., Cent. XI, 1091, Bayreuth 1874, nom. nud.
- *Fusicladium dendriticum var. soraueri* (Thüm.) Sacc., Syll. fung. 4: 346 (1886).
- *Actinomema crataegi var. sorbi-torminalis* Thüm., Herb. mycol. occ., Fasc. XII, 527, Klosterneburg 1877, nom. nud.
- *Cladosporium dendriticum var. heteromeses* Harkn. (1881), in herb.
- *Fusicladium pityrin var. amelanchieris* Sacc., Syll. fung. 4: 346 (1886).
On living leaves, petioles, twigs and fruits, spots amphigenous, subcircular to irregular, 1–10 mm wide, at first pale olivaceous-brown, later greyish black, on leaves sometimes with a brown, slightly raised margin, confluent, occasionally covering large leaf segments, on fruits forming small, circular to larger and than irregular spots, margin indefinite to whitish. Colonies amphigenous, in the center of the spots densely caespitose, at the margin dendritic, radiating, olivaceous-brown to blackish, on young twigs blister-like. Mycelium immersed, very rarely superficial, then conidiophores solitary, arising from superficial hyphae. Stromata more or less well-developed, subcuticular, composed of subglobose cells, 5–10 µm diam., olivaceous-brown, relatively thick-walled. Conidiophores mostly in loose to dense fascicles, arising from the upper cells of the stromata, erumpent through the cuticle, erect, straight to slightly flexuous, cylindrical to ampulliform, unbranched, 10–50(–90) × 5–6 µm, variable in length, depending on the age of the conidiophores, 0–1-septate, rarely pluriseptate, pale to dark olivaceous-brown, paler towards the apex, smooth, walls thickened, often swollen at the base, up to 10 µm wide. Conidiogenous cells integrated, terminal, with a single locus, proliferation percurrent, with a few to many conspicuous annellations, loci truncate, 4–5(–6) µm wide, unthickened, not darkened. Conidia solitary, shape variable, ovoid to obpyriform or obclavate, straight, (11–)14–23(–32) × (4–)7–10(–13) µm, 0–1(–2)-septate, more or less constricted at the septa, pale to medium olivaceous-brown, smooth, walls somewhat thickened, narrowly pointed or broadly rounded at the apex, truncate at the base, hilum truncate, 4–5(–6) µm wide, unthickened to occasionally very slightly thickened, not darkened.

**Hosts and Distribution:** on species of *Amelanchier*, *Aronia*, *Cotoneaster*, *Docynia*, *Eriobotrya*, *Heteromeles*, *Kageneckia*, *Malus*, *Praunus*, *Pyracantha*, *Pyrus*, *Sorbus* (Rosaceae), cosmopolitan – *Amelanchier* sp. (Europe, F; New Zealand), *Aronia prunifolia* (= *Pyrus floribunda*) (Europe, D), *Cotoneaster aitchisoni* (Asia, India), *C. integerrimus* (Europe, CH), *C. suavis* (Caucasus, Georgia), *Docynia indica* (Asia, India), *Eriobotrya japonica* (Asia, China, Israel (Palestine), Iran, Japan, Jordan, Lebanon, Russia, Turkey, Uzbekistan; Caucasus, Armenia, Georgia; Europe, CH, D, E, GB, GR, F, I, P, RUS, SLO, Cyprus; Africa, Libya, Morocco, South Africa; North America, USA, CA, FL, OH, WA; South America, Chile; Australia, New South Wales, Tasmania; New Zealand), *Heteromeles arbutifolia* (= *Photinia arbutifolia*) (North America, USA, CA), *Heteromeles sp.* (= *Photinia sp.*) (Europe, GB; Australia, Tasmania), *Kageneckia oblonga* (North America, USA, CA), *Malus domestica* (incl. all of the cultivars) (Asia, Afghanistan, China, India, Iran, Kazakhstan, Russia, Turkey, Turkmenistan, Uzbekistan; Caucasus, Armenia; Europe, CS, D, I, E, EW, GB, H, RO, RUS, S, SF, Cyprus; North America, Libya; North America, Canada, Alta., BC., Man., NB., Nfld., NS., Ont., PEI, Que., Sask., USA, AK, CA, GA, FL, IL, MA, WI, VA; South America, Chile), *M. sylvestris* (= *Pyrus malus*) (Asia, China, India, Israel (Palestine), Jordan, Nepal, Pakistan, Russia, Turkey, Turkmenistan, Uzbekistan; Europe, A, BG, CS, D, DK, E, EW, GB, GR, I, IRL, LV, RO, RUS, S, SF, SLO, Cyprus; Africa, Ethiopia, Libya, Madagascar, Morocco, Mozambique, South Africa; North America, USA, AK, AL, CA, CT, DE, FL, ID, KS, MI, MS, MT, NC, ND, NE, OK, OR, SD, TN, WA, WI; South America, Argentina, Chile, Columbia, Peru; Australia,
New South Wales, Queensland, Tasmania, Victoria; New Zealand], Malus sp. (Asia, Afghanistan, China, India, Iran, Iraq, Japan, Jordan, Kazakhstan, Korea, Pakistan, Russia, Saudi-Arabia, Taiwan, Syria, Turkey; Caucasus, Armenia, Azerbaijan, Georgia; Europe, B, BG, CH, D, DK, EW, F, FR, GB, H, I, LT, LV, RO, UKr, YU; Africa, Egypt, Ethiopia, Libya, Zimbabwe; North America, Canada, Alta., BC., NB., NS., Ont., Que., Sask., USA, CT, MA, NC, NH, OH, PA, RI, SD, WI, Central America, Panama; South America; New Zealand], Prunus spp. (Europe, GB), Pyracantha angustifolia (New Zealand], P. coccinea (incl. cv. lalandei) (Caucasus, Georgia; Europe, B, D, DK, F, GB, NL, RO, SLO, TR, UKr; South America, North America, Canada, BC., USA, AL, CA, DE, FL, GA, NC, OK, OR, WA). P. crenato-serrata (North America, USA, IL), Pyracantha spp. (Europe, F; North America, Canada, BC., USA, FL, MO, NC; Australia, New South Wales), Pyrus communis (Europe, D, EW, GB, TR), P. serotina (Asia, Korea), P. sinensis (Asia, Korea), Pyrus spp. (Asia, Pakistan; North America, USA, WI), Sorbus americana (North America, USA, IL, MN, NY, WA), S. aria (Asia, Russia, Turkmenistan; Europe, A, CH, D, GB, SLO), S. aucuparia (Asia, Russia; Europe, CS, D, DK, EW, I, SLO; North America, USA, CT, IL), S. boissieri (Caucasus, Armenia), S. chamaemespilus (Europe, CH), S. domestica (Europe, D, E, F, I, LV, SLO, TR), S. intermedia (=Pyrus suavica, =S. scandica) (Europe, D, EW, FR), S. lanata (Asia, India), S. persica (Asia, Kazakhstan, Uzbekistan), S. tianschanica (Asia, Kazakhstan, Uzbekistan), S. torminalis (Asia, Russia; Caucasus, Armenia, Georgia; Europe, A, CS, D, GB, RO), Sorbus spp. (Asia, Russia; Caucasus, Armenia, Georgia; Europe, CS, GB, H, RO, RUS, TR; North America, USA, WA).

Material examined: collections from herb. B, HAL, HBG, IMI, JE, LE, M, NY, PC.

Notes: Spilocaea pomi was originally used for the anamorph of Venturia inaequalis on Pyrus spp. SIVANESAN (1977, 1984a) recorded the latter species from Cotonoeaster integerrimus, Malus, Pyracantha, Pyrus and Sorbus species. Morphologically very similar fungi occur on some other hosts of the Rosaceae (Amelanchier, Heteromeles, Erioibotrya, Kageneckia). Some of them have been considered to be distinct species. Detailed morphological investigations of Spilocaea pomi-like fungi have been carried out by RITSCHEL (2001). Collections from Malus, Sorbus and Amelanchier species are indistinguishable from each other. There are no differences in the conidal shape and size (RITSCHEL). 2001. Conidia from Erioibotrya and Pyracantha species are slightly shorter on an average, and collections from Heteromeles are somewhat larger in general, but these differences are not significant. Therefore, Spilocaea amelanchieris, S. erioibotryae, S. photinica and S. pyracanthae are reduced to synonymy with Fusicladium pomi. Spilocaea ahmadii on Pyrus pashia is the only species in this complex which is morphologically clearly distinct from F. pomi by having much longer and narrower conida. RAABE & GARDENER (1972) carried out inoculation experiments with collections from Erioibotrya, Kageneckia, Heteromeles and Pyracantha, and proposed to refer all of them to Spilocaea pyracanthae. Based on inoculation experiments, MENON (1956) proposed some "formae specialis" of Venturia inaequalis for races on Pyrus malus, Sorbus aucuparia, Cotonoeaster integerrimus and Crataegus oxyacantha (the latter one was misapplied and referred to Venturia crataegi Ander.). Molecular examinations carried out during the course of monographic studies (RITSCHEL 2001) showed that V. inaequalis and Spilocaea pyracanthae are very closely allied or even indistinguishable. Collections from Sorbus species are also indistinguishable from F. pomi. The fungus on Erioibotrya was originally described as Basiascum erioibotryae Cavara. HUGHES (1953) proposed the combination Spilocaea erioibotryae, and RAABE & GARDENER (1972) reduced it to synonymy with Spilocaea pyracanthae.

HUGHES (1958) examined type material of Spilocaea pomi from UPS. Type material of Fusicladium lalandi E.J. Marchal & Verpl. could not be traced but, according to the original description, this species seems to be the same as Fusicladium pomi. The name of the type host "Crataegus lalandii" does not exist and seems to refer to Pyracantha cocinea "Lalandiae" (= cv. lalandei). Records of this species from Dociynia indica are from BILGRAMI, JAMALUDDIN & RIZWI (1991). RAABE & GARDENER (1972) recorded Kageneckia oblonga as host of this species. The record of Arum korolkovi (Araceae) as host in SAGDULLAEVA et al. (1990) is undoubtedly wrong, and records from Fusicladium dendriticum var. opuli Thüm., F. austr. 1091 have been checked and proved to be based on misidentifications of the hosts.

10.2.38. Fusicladium psoraleae (Ellis & Barthol.) S. Hughes & Piroz., Canad. J. Bot. 50(12): 2532 (1972) Fig. 40

≡ Diococcus psoraleae Ellis & Barthol., in Ellis & Everh., Fungi Columb. 1820 (1903); lectotype: on Psoralea tenuiflora, USA, Kansas, Stockton, 27 Jun. 1903, E. Bartholomew 3044, ex herb. Ellis (NY), selected here; isolecotype: DAOM and F. Columb. 1820 (BPI 423604, NY).

Teleomorph: Unknown. III.: HUGHES & Pirozynski (1972: 2532, Fig. 6).

Exs.: Ellis & Everh., F. Columb. 1820.

Colonies on discoloured areas of leaves, petioles and stems, dense, effuse, olivaceous, velvety. Mycelium immersed, composed of branched, colourless, thin-walled hyphae. Stromata subcortical, sometimes extraepidermal, punctiform to effuse, pseudoparenchymatous, composed of rounded to polygonal, pale brown, thin-walled cells, 5 µm diam., few layers thick. Conidiophores solitary or in loose, dense groups, 10-15 µm diam., with bulbous bases, cell walls thin-walled, smooth, septate, 11-13.5 µm long, 5 µm diam., few layers thick. Conidiophores solitary or in loose to dense groups, 10-15 µm diam., with bulbous bases, cell walls thin-walled, smooth, septate, 11-13.5 µm long, 5 µm diam., few layers thick. Conidiophores solitary or in loose to dense groups, 10-15 µm diam., with bulbous bases, cell walls thin-walled, smooth, septate, 11-13.5 µm long, 5 µm diam., few layers thick. Conidiophores solitary or in loose to dense groups, 10-15 µm diam., with bulbous bases, cell walls thin-walled, smooth, septate, 11-13.5 µm long, 5 µm diam., few layers thick. Conidiophores solitary or in loose to dense groups, 10-15 µm diam., with bulbous bases, cell walls thin-walled, smooth, septate, 11-13.5 µm long, 5 µm diam., few layers thick. Conidiophores solitary or in loose to dense groups, 10-15 µm diam., with bulbous bases, cell walls thin-walled, smooth, septate, 11-13.5 µm long, 5 µm diam., few layers thick. Conidiophores solitary or in loose to dense groups, 10-15 µm diam., with bulbous bases, cell walls thin-walled, smooth, septate, 11-13.5 µm long, 5 µm diam., few layers thick. Conidiophores solitary or in loose to dense groups.
sometimes sporodochial, forming large expanded layers, arising from stromata, cylindrical to narrowly ovoid or obpyriform, 6–40 × 3–5 µm, aseptate, thin-walled, pale brown, smooth to verruculose, mainly in the upper half of the conidiophores, conidiophores usually reduced to conidiogenous cells. Conidiogenous cells unilocal, determinate or with two or only few conidiogenous loci, proliferation sympodial, loci flat, truncate, 2–3 µm wide, unthickened, not darkened. Conidia solitary, broadly ellipsoid, ovoid to clavate, straight, sometimes slightly curved, 10–27(–34) × 6–10(–11) µm, 0–1(–3)-septate, not or only slightly constricted at the septa, at first hyaline, becoming pale brown, smooth to coarsely verrucose, rugose, rounded at the apex, hila flat, truncate, 2–3 µm wide, unthickened, not darkened.

Hosts and Distribution: on Psoralea spp. (Fabaceae), North America – *Psoralea argophylla* (Canada, Man.), *P. tenuiflora* (USA, KS).


10.2.39. *Fusicladium pyrorum* (Lib.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 357 ‘1869’ (1870), as ‘*Fusicladium pyrinum*’ Fig. 41
≡ *Helminthosporium pyrorum* Lib. (p.p.), Pl. crypt. ard., Fasc. 2, 188 (1832); lectotype: on leaves of *Pyrus communis*, Pl. crypt. ard. 188 (DAOM).
≡ *Passalora ‘pyrina’* (Lib.) Sacc., Michelia 1: 537 (1879).
≡ *Megacladosporium pyrorum* (Lib.) Vienn.-Bourg., Les Champignons parasites des plantes cultivées 1: 489 (1949), as ‘*Megacladosporium pyrinum’*.
≡ *Arthrinium pyrinum* Wallr., Fl. crypt. Germ. 2: 163 (1833); holotype: herb. Wallroth (STR); isotype: IMI 68306.
≡ *Fusidium pyrinum* Corda, Icon. fung. 1: 3 (1837); type: PR.
≡ *Fusicladium virescens* Bonord., Handb. Mykol. 80 (1851); iconotype: Bonorden, l.c.: Fig. 94.
≡ *Cladosporium polymorphum* Peyl, Lotos 15: 18 (1865).
≡ *Fusicladium pyrorum* ([Lib.] Fuckel) f. *carpophila* Sacc., Mycoth. ital. 992 (1901); syntype: on fruits of *Pyrus communis*, Italy, Selva, Treviso, Aug. 1901, D. Saccardo, Mycoth. ital. 992 (B).
≡ *Fusicladium pyrorum* ([Lib.] Fuckel) var. *dearnessianum* (Sacc.) M.B. Ellis, in herb.

On leaves and fruits, rarely on young twigs and buds, leaf spots scab-like, amphiogenous, diffuse, subcircinar, olivaceous to dark brown or almost black, surrounded by a paler brown halo. Colonies amphiogenous, caespitose, velvety, dark brown to olivaceous-brown. Mycelium subcuticular, hyphae branched, 3 µm wide, septate, pale brown. Stromata almost lacking to well developed, stromatic cells 4–11 µm diam., dark brown, thick-walled. Conidiophores solitary or in loose fascicles, arising from stromata, erect, straight to flexuous, generulcate–subnbulodonthe, 11–70(–4) × 4–11 µm, 0–1–septate, olivaceous to dark brown, paler towards the apex, smooth, slightly rough-walled with age, thick-walled. Conidiogenous cells integrated, terminal or intercalary, with numerous conidiogenous loci, proliferation symподial, loci denticulate, short cylindrical, truncate or somewhat convex, 1–3 µm wide, walls unthickened or almost so, slightly darkened–refractive. Conidia solitary, very rarely in unbranched chains, fusiform to pyriform, ellipsoid to obovoid, straight to slightly curved, 10–34 × 5–11 µm, 0–1(–2)–septate, olivaceous to brown, smooth, later somewhat rough-walled, pointed at the apex, truncate at the base, hila 1–3(–4) µm wide, unthickened or slightly thickened, somewhat darkened–refractive.

**Hosts and Distribution:** On *Aronia*, *Chaenomeles*, *Eriobotrya*, *Malus* and *Pyrus* spp. (Rosaceae), cosmopolitan – *Aronia melanocarpa* (North America, Canada, Ont.), *Chaenomeles speciosa* (North America, USA, OK), *Eriobotrya japonica* (Europe, GB), *Malus domestica* (Europe, D; South America, Argentina), *Pyrus amygdaliformis* (Europe, F, TR), *P. bucharica* (Central Asia, Tadzhikistan, Uzbekistan), *P. caucasica* (Caucasus, Georgia), *P. communis (= *P. sativa*) (Asia, Israel, Lebanon, Iran, Iraq, Afghanistan, Russia, Kazakhstan, Kirghizia, Uzbekistan, Turkmenistan, Tadzhikistan, China, India, Korea, Japan, Taiwan; Caucasus, Armenia, Azerbaijan, Georgia; Europe, A, AL, BG, CH, CZ, D, DK, EW, F, GB, H, I, LT, LV, P, RO, RUS, SLO, TR, Ukr., YU, Byelorussia, Moldova, Malta, Cyprus; Canary Islands; Africa, Libyan, Morocco, Mozambique, South Africa, Madagascar; North America, Canada, BC, NB, NS, Ont., Que., PEI, USA, FL, MA, WI; South America, Columbia, Argentina, Chile; Australia, New South Wales, Queensland, Tasmania, Victoria; New Zealand), *P. coronarius* (Europe, CH), *P. korshinskyi* (Central Asia, Uzbekistan), *P. mamorensis* (Africa, Morocco), *P. pyraster* (Europe, RO), *Pyrus* spp. (Asia, China; Europa, EW).

**Material examined:** on *Eriobotrya japonica*, Europe, Great Britain, Surrey, Wisley, 23 Dec. 1966, A.V. Brook (IMI 123946), on *Pyrus* spp. collections from B, G, HBQ, IMI, J, LE, M.

**Notes:** In a few cases, conidia forming secondary conidiophores and conidia by microcyclic conidiogenesis have been found. This phenomenon usually occurs under high humidity. *Bontea* (1985) recorded *Sorbus domestica* as host of this species. *Malus* spp. are also known to be hosts of *Fusicladium pyrum*, e.g., in the types of *F. fuscescens* and *Cercospora pyriformis*, but the correct determinations of these hosts could not be proven.
subglobose, pale to dark olivaceous-brown, relatively thick-walled cells, 4–9 µm diam. Conidiophores in dense fascicles, forming sporodochial conidiomata, erumpent through the cuticle, erect, short cylindrical to doliiform or somewhat ampulliform, unbranched, short, 10–17 × 4–6 (–8) µm, usually aseptate, medium olivaceous-brown, smooth, walls somewhat thickened, conidiophores reduced to conidigenous cells, unilocular, determinate or occasionally percurrent, with up to two inconspicuous annellations, loci (2–3)–4 (–5) µm wide, neither thickened nor darkened. Conidia solitary, ellipsoid to ovoid, straight, sometimes slightly curved, (13–)18–26 (–37) × 5–8 µm, mostly 1-septate, septum in the upper third, to 2-septate, second septum in the lower third, rarely aseptate, more or less constricted at the septum, pale to dark olivaceous-brown, smooth, wall somewhat thickened, rounded to pointed at the apex, obconically truncate at the base, hilum truncate, (2–)3–4 (–5) µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Populus* spp. (Salicaceae), Asia, Caucasus, Europe – *Populus alba* (Europe, F), *P. × canescens* (Europe, F), *P. tremula* (Asia, Russia, Turkmenistan, Uzbekistan; Caucasus, Armenia, Europe, BG, CS, D, DK, E, F, GB, I, LT, LV, N, PL, RO, RUS, S, SF, UKr., YU), *P. tremula × P. alba* (Europe, F), *P. tremula × P. tremuloides* (Europe, F).

sometimes leaf margin incurved, twigs often becoming necrotic, causing twig dieback. Colonies amphigenous, pale to dark olivaceous-brown, fructification at first formed in the center of the leaf spots, denticrily expanding. Mycelium immersed, hyphae branched, septate, smooth. Stromata intraepidermal to subcuticular, composed of rounded to somewhat angular, pale to medium olivaceous-brown, relatively thick-walled cells, 5–8 µm diam. Conidiophores densely fasciculate, arising from the upper cells of the stromata, forming sporodochial conidiomata, erumpent through the cuticle, erect, cylindrical to doliiform or somewhat ampulliform, unbranched, short, 10–17 × 4–6 (–8) µm, usually aseptate, medium olivaceous-brown, smooth, walls somewhat thickened, conidiophores reduced to conidigenous cells, unilocular, determinate or occasionally percurrent, with up to two inconspicuous annellations, loci (2–3)–4 (–5) µm wide, neither thickened nor darkened. Conidia solitary, ellipsoid to ovoid, straight, sometimes slightly curved, (13–)18–26 (–37) × 5–8 µm, mostly 1-septate, septum in the upper third, to 2-septate, second septum in the lower third, rarely aseptate, more or less constricted at the septum, pale to dark olivaceous-brown, smooth, wall somewhat thickened, rounded to pointed at the apex, obconically truncate at the base, hilum truncate, (2–)3–4 (–5) µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Populus* spp. (Salicaceae), Asia, Caucasus, Europe – *Populus alba* (Europe, F), *P. × canescens* (Europe, F), *P. tremula* (Asia, Russia, Turkmenistan, Uzbekistan; Caucasus, Armenia, Europe, BG, CS, D, DK, E, F, GB, I, LT, LV, N, PL, RO, RUS, S, SF, UKr., YU), *P. tremula × P. alba* (Europe, F), *P. tremula × P. tremuloides* (Europe, F).

On living leaves, petioles and twigs, spots circular to irregular, 5–20 mm wide, yellowish brown, surrounded by a pale to later dark brown margin. Colonies amphigenous. Stromata intraepidermal to subcuticular, composed of subglobose, pale to dark olivaceous-brown, relatively thick-walled cells, 4–9 µm diam. Conidiophores in dense fascicles, arising from the upper cells of stromata, forming sporodochial conidiomata, erumpent through the cuticle, erect, short cylindrical to doliiform, unbranched, short, 10–17 × 4–6 (–8) µm, usually aseptate, medium olivaceous-brown, smooth, walls somewhat thickened, conidiophores reduced to conidigenous cells, multi-lobed, determinate or occasionally percurrent, with up to two inconspicuous annellations, loci (2–3)–4 (–5) µm wide, neither thickened nor darkened. Conidia solitary, ellipsoid to ovoid, straight, sometimes slightly curved, (13–)18–26 (–37) × 5–8 µm, mostly 1-septate, septum in the upper third, to 2-septate, second septum in the lower third, rarely aseptate, more or less constricted at the septum, pale to dark olivaceous-brown, smooth, wall somewhat thickened, rounded to pointed at the apex, obconically truncate at the base, hilum truncate, (2–)3–4 (–5) µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Populus* spp. (Salicaceae), Asia, Caucasus, Europe – *Populus alba* (Europe, F), *P. × canescens* (Europe, F), *P. tremula* (Asia, Russia, Turkmenistan, Uzbekistan; Caucasus, Armenia, Europe, BG, CS, D, DK, E, F, GB, I, LT, LV, N, PL, RO, RUS, S, SF, UKr., YU), *P. tremula × P. alba* (Europe, F), *P. tremula × P. tremuloides* (Europe, F).

On living leaves, petioles and twigs, spots circular to irregular, 5–20 mm wide, yellowish brown, surrounded by a pale to later dark brown margin. Colonies amphigenous. Stromata intraepidermal to subcuticular, composed of subglobose, pale to dark olivaceous-brown, relatively thick-walled cells, 4–9 µm diam. Conidiophores in dense fascicles, arising from the upper cells of stromata, forming sporodochial conidiomata, erumpent through the cuticle, erect, short cylindrical to doliiform, unbranched, short, 10–17 × 4–6 (–8) µm, usually aseptate, medium olivaceous-brown, smooth, walls somewhat thickened, conidiophores reduced to conidigenous cells, multi-lobed, determinate or occasionally percurrent, with up to two inconspicuous annellations, loci (2–3)–4 (–5) µm wide, neither thickened nor darkened. Conidia solitary, ellipsoid to ovoid, straight, sometimes slightly curved, (13–)18–26 (–37) × 5–8 µm, mostly 1-septate, septum in the upper third, to 2-septate, second septum in the lower third, rarely aseptate, more or less constricted at the septum, pale to dark olivaceous-brown, smooth, wall somewhat thickened, rounded to pointed at the apex, obconically truncate at the base, hilum truncate, (2–)3–4 (–5) µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Populus* spp. (Salicaceae), Asia, Caucasus, Europe – *Populus alba* (Europe, F), *P. × canescens* (Europe, F), *P. tremula* (Asia, Russia, Turkmenistan, Uzbekistan; Caucasus, Armenia, Europe, BG, CS, D, DK, E, F, GB, I, LT, LV, N, PL, RO, RUS, S, SF, UKr., YU), *P. tremula × P. alba* (Europe, F), *P. tremula × P. tremuloides* (Europe, F).

On living leaves, petioles and twigs, spots circular to irregular, 5–20 mm wide, yellowish brown, surrounded by a pale to later dark brown margin. Colonies amphigenous. Stromata intraepidermal to subcuticular, composed of subglobose, pale to dark olivaceous-brown, relatively thick-walled cells, 4–9 µm diam. Conidiophores in dense fascicles, arising from the upper cells of stromata, forming sporodochial conidiomata, erumpent through the cuticle, erect, short cylindrical to doliiform, unbranched, short, 10–17 × 4–6 (–8) µm, usually aseptate, medium olivaceous-brown, smooth, walls somewhat thickened, conidiophores reduced to conidigenous cells, multi-lobed, determinate or occasionally percurrent, with up to two inconspicuous annellations, loci (2–3)–4 (–5) µm wide, neither thickened nor darkened. Conidia solitary, ellipsoid to ovoid, straight, sometimes slightly curved, (13–)18–26 (–37) × 5–8 µm, mostly 1-septate, septum in the upper third, to 2-septate, second septum in the lower third, rarely aseptate, more or less constricted at the septum, pale to dark olivaceous-brown, smooth, wall somewhat thickened, rounded to pointed at the apex, obconically truncate at the base, hilum truncate, (2–)3–4 (–5) µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Populus* spp. (Salicaceae), Asia, Caucasus, Europe – *Populus alba* (Europe, F), *P. × canescens* (Europe, F), *P. tremula* (Asia, Russia, Turkmenistan, Uzbekistan; Caucasus, Armenia, Europe, BG, CS, D, DK, E, F, GB, I, LT, LV, N, PL, RO, RUS, S, SF, UKr., YU), *P. tremula × P. alba* (Europe, F), *P. tremula × P. tremuloides* (Europe, F).
doliiform or ampulliform, unbranched, 8–12 × 4–6 µm, aseptate, pale to medium olivaceous-brown, smooth, walls thickened, conidiophores reduced to conidiogenous cells, uni/oloc, determinate or occasionally percurrently proliferating, with a single or two inconspicuous annellations, loci truncate, (2–)3–4(–5) µm wide, neither thickened, nor darkened. Conidia solitary, oblong–ellipsoid to fusiform, often slightly curved, sometimes straight, 6–7(–7.5) µm, aseptate, medium olivaceous-brown, smooth, walls somewhat thickened, apex truncate to slightly convex, (2–3–4–(–5) µm wide, not or only slightly thickened, not darkened.

Hosts and Distribution: on Populus spp. (Salicaceae), Europe, North America – Populus alba (North America, Canada,Ont.), P. alba × P. grandidentata (North America, Canada, Ont.), P. alba × P. jackii (North America, Canada, Que.), P. grandidentata (North America, Canada, NB., NS., Ont., PEI, USA, MD, NY, WI), P. tremuloides (Europe, BG, GB: North America, Canada, Alta., BC., Labr., Man., NB., Nfld., NS., Ont., PEI, Que., Sask., USA, AK, ID, ME, MT, NH, NY, PA, SD, WI).

Notes: Based on the original diagnosis, SERVAZZI (1937) considered Cladosporium lethiferum to be a species probably belonging in Pollaccia, but he did not introduce a formal combination. ONDREJ (1972) described this fungus as Pollaccia americana, and MORELET (1978) published the combination P. lethiferum. In 1985, MORELET found the teleomorph of this North American species which he considered a variety of Venturia tremulae (var. grandidentatae), and he introduced the combination Pollaccia radiosus var. lethiferum for its anamorph. RULAMORT (1986) reintroduced Pollaccia lethiferum and proposed the new name Venturia moreletii for the teleomorph. However, this re-assessment was not based on any new examinations or any other new data. Morphological analyses of the whole Fusicladium radiosum complex (RITSCHEL 2001) showed that the conidial sizes of var. radiosum and var. lethiferum are not significantly distinct. The conidia in var. lethiferum are only distinguished from those of var. radiosum by being frequently curved. These minor differences are not sufficient to treat this taxon as a separate species. We prefer to follow MORELET (1978) and maintain its status as a variety. A molecular approach would be the only way to re-assess the whole P. radiosum complex with all taxa included.

10.2.40.3. Fusicladium radiosum var. populi-albae (M. Morelet) Ritschel & U. Braun comb. nov. Fig. 44

≡ Pollaccia radiosus [Lib.] E. Bald. & Cif. var. populi-albae M. Morelet, Cryptog. Mycol. 6: 112 (1985); holotype: on living leaves of Populus alba var. bollesana, Poland, Dabrowsyn (the former “Tamšel”, ca. 5 km north-east of Kostrzyn), 21 Sept. 1904, Sydow (B, P), as Cladosporium asteroma [Fuckel] var. microsperum Sacc.
≡ Naplicadium asteroma var. microasperma Sacc., in herb.


Hosts: on Populus alba (Canada, Nova Scotia, New Glasgow, 26 Aug. 1908 (NYS), as Cladosporium lethiferum Peck; on Populus grandidentata, USA, Maryland, Prince George’s, 26 Jun. 1951, Waterman (B), as Fusicladium tremulae A.B. Frank.

Material examined: on Populus grandidentata, Canada, Nova Scotia, New Glasgow, 26 Aug. 1908 (NYS), as Cladosporium lethiferum Peck; on Populus grandidentata, USA, Maryland, Prince George’s, 26 Jun. 1951, Waterman (B), as Fusicladium tremulae A.B. Frank.


Notes: Based on the original diagnosis, SERVAZZI (1937) considered Cladosporium lethiferum to be a species probably belonging in Pollaccia, but he did not introduce a formal combination. ONDREJ (1972) described this fungus as Pollaccia americana, and MORELET (1978) published the combination P. lethiferum. In 1985, MORELET found the teleomorph of this North American species which he considered a variety of Venturia tremulae (var. grandidentatae), and he introduced the combination Pollaccia radiosus var. lethiferum for its anamorph. RULAMORT (1986) reintroduced Pollaccia lethiferum and proposed the new name Venturia moreletii for the teleomorph. However, this re-assessment was not based on any new examinations or any other new data. Morphological analyses of the whole Fusicladium radiosum complex (RITSCHEL 2001) showed that the conidial sizes of var. radiosum and var. lethiferum are not significantly distinct. The conidia in var. lethiferum are only distinguished from those of var. radiosum by being frequently curved. These minor differences are not sufficient to treat this taxon as a separate species. We prefer to follow MORELET (1978) and maintain its status as a variety. A molecular approach would be the only way to re-assess the whole P. radiosum complex with all taxa included.

On living leaves, petioles and twigs, leaf spots circular to irregular, 10–30 mm wide, or confluent and larger, pale to reddish brown, with a dark brown, narrow to broad margin, sometimes causing twig dieback. Colonies amphiogenous, pale to later dark olivaceous-brown, on the upper leaf surface often dendritic. Mycelium immersed. Stromata intraepidermal to subcuticular, composed of subglobose, thick-walled cells, 4–6 µm, aseptate, pale to medium olivaceous-brown, on the upper leaf surface often dendritic. Mycelium immersed. Conidiophores in loose sporodochium, scale = 10 µm, A. Ritschel del.

Material examined: collections from herb. B, H, JE, M, PAD.

Notes: ONDREJ (1972) used the name *Cladosporium ramulosum* for this fungus from *Populus alba*, but this name is a synonym of *Pollaccia radiosa* var. *radiosa*. MORELET (1985) introduced the name *P. radiosa* var. *populi-albae* for this taxon, which was later raised to species rank by RULAMORT (1986). Morphological and morphometric examinations, carried out by RITSCHEL (2001), confirmed the observations of MORELET (1985) that the conidial size in collections from *Populus alba* is only slightly different from those of other varieties of *P. radiosa*. Therefore, we prefer to follow MORELET’s (1985) taxonomy, in which this fungus was treated as variety of the latter species. Furthermore, it is noteworthy that *Populus alba* is infected by all varieties of this species, i.e., a strict host separation is not evident.

10.2.41. *Fusicladium romellianum* ONDREJ, Česká Mykol. 27(4): 237 (1973)


Ill.: ONDREJ (1973: 238, Fig. 4), ELLIS (1976: 323, Fig. 243 A), FUNK (1989a: Figs 1–8).
Exs.: Fl. Suec. 17688; Mycoth. Ross. 247; Reliqu. Petrak. 328; Syd., Mycoth. germ. 2248.

Leaf spots more or less circular, 1.5–3 mm wide, brown, later with a whitish to pale grey centre, often surrounded by a dark reddish brown, sometimes somewhat raised margin. Colonies mainly hypophyllous, pale brownish, fructification spread over the whitish centre. Mycelium immersed, hyphae branched, septate, brown. Stromata intraepidermal, olivaceous to yellowish brown, 20–100 µm diam., composed of loosely aggregated cells. Conidiophores in dense fascicles, arising from stromata, forming sporodochial conidiomata, erumpent through the cuticle, erect, straight or flexuous, cylindrical to conical, unbranched, 5–25 × 2–4 µm, aseptate, pale brown, olivaceous, smooth, conidiophores usually reduced to conidiogenous cells, unilocular, determinate or with two or only few conidiogenous loci, subdentate, unthickened, not or only
very slightly darkened–refractive. Conidia solitary or catenate, in simple or branched chains, oblong, cylindrical or ellipsoid, straight or slightly curved, (7–)11–21(–28) × 3–7 µm, (0–)1–septate, pale brown, sometimes subhyaline, smooth, walls thin to somewhat thickened, attenuated towards apex and base, apex pointed or truncate, base truncate, hila 1–2 µm wide, unthickened, not or only very slightly darkened–refractive.


**Material examined:** collections from B, DAVF, HBG, M.

**Notes:** *Fusicladium rostellum* has often been confused with *Pollaccia radiosa*, the anamorph of *Venturia tremulae*. Both species can easily be distinguished by their symptoms and the morphology of the conidia. *Pollaccia radiosa* causes irregular, large, blackish leaf spots on species of *Populus*. The conidia are formed singly, they are larger than those of *F. rostellum* (15–42 × 6–11 µm) and often septate (1–2 septa). *Pollaccia borealis* is morphologically indistinguishable from *F. rostellum*. The teleomorph, *Venturia borealis*, has only been found and proven in connection with *Pollaccia borealis* (Funk 1989b).

10.2.42. *Fusicladium saliciperdum* (Allesch. & Tubeuf) Tubeuf, Arbeiten Biol. Reichsanst. Land–Forstw. 2: 568 (1902) Fig. 46

≡ *Septogloeum saliciperdum* Allesch. & Tubeuf; in Allesch. & Schn., Fungi bavar. 485 (1895); lectotype: on *Salix bicornis* (= *S. laurina*), Germany, Bavaria, Tutzing, Jun. 1895, Tubeuf (M), selected here; isolectotypes: Allesch. & Schn., F. bavar. 485.


On living leaves, petioles and twigs, spots mostly hypophyllous, but also epiphyllous along leaf veins, irregularly shaped, 1–3 mm wide, brown, surrounded by a dark brown, somewhat raised, shining margin, often causing lateral distortions and necroses as well as twig dieback. Colonies amphiogenous, punctiform, scattered to dendritic, mainly along leaf veins, dark brown to blackish. Mycelium immersed, pale to medium olivaceous-brown. Stromata intraepidermal to subcuticular, 10–60 µm wide and 10–30 µm deep, composed of subcircular to slightly angular, somewhat thick-walled cells, 5–10 µm diam. Conidiophores in dense fascicles, arising from the upper cells of stromata, forming sporodochial conidiomata, erumpent through the cuticle, erect, cylindrical to slightly ampulliform, unbranched, short, 8–15 × 5–8 µm, aseptate, pale to medium olivaceous-brown, smooth, walls somewhat thickened, conidiophores usually reduced to conidiogenous cells, unilocular, determinate or occasionally percurrently proliferating, with a single or two, more or less conspicuous annellations, loci truncate, 3–6 µm wide, unthickened. Conidia solitary, cylindrical to ellipsoid, often septate (with 1–2 septa). *Pollaccia borealis* is morphologically indistinguishable from *F. rostellum*. The teleomorph, *Venturia borealis*, has only been found and proven in connection with *Pollaccia borealis* (Funk 1989b).

**Hosts and Distribution:** on *Salix* spp. (Salicaceae), Asia, Caucasus, Europe, North America – *Salix alba* (Europe, CZ, DK, GB, RUS, RO; north-eastern North America), *S. americana* (Europe, PL), *S. alba* (incl. var. pendula) (North America, Canada, USA, Que., USA, CT, MA, ME, NH, NY), *S. alba × S. babylonica* (Europe, D), *S. amygdalina* (Europe, D, RUS), *S. aurita* (Europe, GB, DK), *S. babylonica* (Europe, D, GB, RUS; North America, Canada, BC., NB., NS., Que., USA, CT, MA, NY, PA), *S. babylonica* (Europe, GB), *S. babylonica* (Europe, D, GB, RUS; North America, Canada, BC.), *S. bicolor* (Europe, GB, DK), *S. alba* (Europe, CZ, DK, GB, RUS, RO; north-eastern North America), *S. amygdalina* (Europe, D, RUS), *S. aurita* (Europe, GB, DK), *S. babylonica* (Europe, D, GB, RUS; North America, Canada, BC.), *S. bicolor* (Europe, GB, DK), *S. alba* (Europe, CZ, DK, GB, RUS, RO; north-eastern North America), *S. amygadalina* (Europe, D, RUS), *S. aurita* (Europe, GB, DK), *S. babylonica* (Europe, D, GB, RUS; North America, Canada, BC.), *S. bicolor* (Europe, GB, DK). *S. alba* (Europe, CZ, DK, GB, RUS, RO; north-eastern North America), *S. amygadalina* (Europe, D, RUS), *S. aurita* (Europe, GB, DK), *S. babylonica* (Europe, D, GB, RUS; North America, Canada, BC.), *S. bicolor* (Europe, GB, DK), *S. alba* (Europe, CZ, DK, GB, RUS, RO; north-eastern North America), *S. amygadalina* (Europe, D, RUS), *S. aurita* (Europe, GB, DK), *S. babylonica* (Europe, D, GB, RUS; North America, Canada, BC.), *S. bicolor* (Europe, GB, DK), *S. alba* (Europe, CZ, DK, GB, RUS, RO; north-eastern North America), *S. amygadalina* (Europe, D, RUS), *S. aurita* (Europe, GB, DK), *S. babylonica* (Europe, D, GB, RUS; North America, Canada, BC.), *S. bicolor* (Europe, GB, DK).
S. bicolor (= S. laurina) (Europe, D), S. blandula (Europe, RUS; North America, Canada, NS.), S. caprea (Europe, D, DK), S. cinerea (Asia, Kazakhstan; Europe, DK, RUS), S. cordata (North America, Canada, Que.), S. cuspidata (Europe, DK), S. discolor (North America, Canada, Que.), S. fragilis (Europe, D, DK, RO; North America, Canada, NS., USA, MA, NY), S. fragilis × S. pentandra (Europe, DK), S. gracilis (Europe, D), S. japonica (Europe, D), S. lucida (North America, USA, CT, ME), S. mollissima (Europe, DK), S. nigra (North America, Canada, NS., USA, CT, MA, NY), S. pentandra (Europe, D; North America, Canada, Que.), S. purpurea (incl. var. nana) (Europe, RO, RUS; North America, Canada, Que.), S. sericea (North America, USA, CT, NY), S. silesiaca (Europe, RO), S. × smithiana (North America, Canada, BC.), S. viminalis (Europe, RUS), S. vitellina (Europe, D; North America, Canada BC., NS.), Salix spp. (Asia, Japan, Russia, Uzbekistan; Caucasus, Armenia, Azerbaijan, Georgia, Europe, CZ, D, DK, GB, LT, LV, NL, RUS; North America, Canada, BC., Man., NB, Nfld., NS., Ont., PEI, Que., USA, north-eastern states, NC, PA, WA).

Material examined: collections from B, HBG, JE, M.

Notes: Rostrup (1883) used the name Fusicladium ramulosum for collections on species of Salix as well as Populus, suggesting that they were the same as Cladosporium ramulosum, described by Desmazières from Populus alba. Aderhold (1897) disagreed, assigned the fungus from Populus spp. to Fusicladium tremulae and confined the name Fusicladium ramulosum to the species on Salix, which he erroneously considered to be the anamorph of Venturia chlorospora. The first valid description of the Fusicladium on Salix spp. dates back to Allescher & Tubeuf, in Allescher & Schnabl, Fungi bavarici 485, 1895, who introduced Septogloeum saliciperdum, which was later transferred to Fusicladium by Tubeuf (1902). Nuesch (1960) examined this fungus in vitro, found the teleomorph and described it as Venturia saliciperda.

10.2.43. Fusicladium scillae (Deighton) U. Braun & K. Schub., IMI Descriptions of Fungi and Bacteria 152, no. 1518 (2002) Fig. 47

Teleomorph: Unknown.

Leaf spots amphigenous, elliptical, small or occasionally up to 10 × 5 mm, dark brown, finally greyish brown, margin indefinite. Colonies epiphyllous, effuse, brown, loose to dense. Primary mycelium internal, inter- and intracellular in the mesophyll and epidermal cells, composed of pale olivaceous, septate, sparingly branched hyphae, 1.5–2 µm wide, and subcuticular swollen hyphal cells, 8–12 × 4–8 µm, aggregated, forming expanded subcuticular radiating strands, stromatic hyphal aggregations variable, almost lacking to well-developed. Secondary mycelium superficial, almost lacking to well-developed, hyphae creeping, septate, sparingly branched, 1.5–2.5 µm wide, pale olivaceous, smooth. Conidiophores in small to large fascicles (up to 100 or even more), loose to moderately dense, often caespitose, arising from internal hyphae or stromatic hyphal aggregations, erumpent through the cuticle, sometimes emerging through stomata, occasionally solitary, arising from creeping superficial hyphae, erect, straight, subcylindrical to flexuous, geniculate–sinuous, usually unbranched, rarely branched, 19–70(–120) × (1.5–)2–4 µm, septate, pale olivaceous, smooth, wall thin

Fig. 47: Fusicladium scillae. A – conidia, B – solitary conidiophores arising from creeping hyphae, C – conidiophores and conidiogenous cells, D – fasciculate conidiophores, scale = 10 µm, K. Schubert del.
Conidiogenous cells integrated, terminal, 10–25 µm long, with a single or several conidiogenous loci, subdenticulate, proliferation sympodial, loci 1–1.5 µm wide, wall unthickened, non-pigmented, at most somewhat refractive. Conidia catenate, in simple or branched chains, subcylindrical, ellipsoid–ovoid (–fusiform), 7–22 × 2.5–4 µm, 0–3-septate, often somewhat constricted at the septa, pale olivaceous, occasionally subhyaline, smooth to faintly rough-walled, apex obtuse in primary conidia, truncate in secondary conidia, base obconically truncate, hila 1–1.5 µm wide, unthickened, not darkened.

**Hosts and Distribution:** on *Scilla* spp. (Liliaceae), New Zealand – *Scilla peruviana* (New Zealand).

**Material examined:** on *Scilla peruviana*, New Zealand, Levin, 27 May 1965, E.A. Way (IMI 115480).

**Notes:** The conidiogenous loci in this species are quite distinct from those of *Cladosporium* species, described in detail by David (1997), and agree with *Fusicladium* by being subdenticulate, unthickened and not darkened. Based on the structure of the conidiogenous loci and the features of the conidia, *Cladosporium scillae* was transferred to *Fusicladium*.

### 10.2.44. *Fusicladium scribnerianum* (Cavara) M.B. Ellis, More Dematiaceous Hyphomycetes: 238 (1976) [Fig. 48]

≡ *Cladosporium scribnerianum* Cavara, Hedwigia 31: 143 (1892) and in Briosi & Cavara, F. paras. 187 (1892); syntype: on *Betula populifolia*, Italy, Pavia, 1890, F.L. Scribner, Briosi & Cavara, F. paras. 187 (HAL).

**Teleomorph:** Unknown.

**Lit.:** Ferraris (1912: 340).

**Ill.:** Briosi & Cavara (F. paras. 187, Figs 1–4), Ellis (1976: 238, Fig. 178).

**Exs.:** Briosi & Cavara, F. paras. 187.

Leaf spots amphigenous, numerous, subcircular, 3–8 mm wide, on the upper leaf surface olivaceous-greyish to dark brown, pale greenish below, centre of the spots darker as the surrounding halo, sometimes confluent, spreading over the leaf veins. Colonies only epiphyllous, effuse, velvety, olivaceous. Mycelium subcuticular, hyphae 2–3 µm wide, septate, pale olivaceous. Stromata composed of brown, thick-walled cells, 4–5.5 µm, 0–1-septate, septa not very conspicuous, olivaceous to pale brown, paler towards the apex, smooth to faintly rough-walled, apex obtuse in primary conidia, truncate in secondary conidia, base obconically truncate, hila 1–1.5 µm wide, unthickened, not darkened. Based on the structure of the conidiogenous loci and the features of the conidia, *Cladosporium scillae* was transferred to *Fusicladium*.

### 10.2.45. *Fusicladium spiraeae* Karak., Mater. Mikol. Obsl. Rossii 2: 82 (1915) [Fig. 49]


**Teleomorph:** Unknown.


**Ill.:** Ondřej (1984a: 47, Fig.).

Leaf spots amphigenous, irregular, 3–5 mm diam., reddish brown, with a somewhat darker, slightly raised, shining margin, sometimes confluent. Colonies epiphyllous, punctiform, scattered, dark brown to blackish. Mycelium immersed. Stromata subcylindrical, 50–80 µm diam., composed of subcylindrical, olivaceous-brown cells, 5–10 µm diam. Conidiophores in dense fascicles, arising from the upper cells of stromata, form-
ing sporodochial conidiomata, erumpent through the cuticle, erect, straight to some-
times slightly flexuous, cylindrical, unbranched, 5–15(–30) × 3–4 µm, 0–1-septate,
subhyaline, pale yellowish to pale olivaceous-brown, smooth, walls slightly thick-
ened, often swollen at the base, up to 7 µm wide. Conidiogenous cells integrated,
unilocal, determinate or occasionally percurrently proliferating, with a single, incon-
spicuous annellation, locus truncate, (2–)3–4 µm wide, unthickened, not darkened.Conidia solitary, narrowly cylindrical to obclavate, (15–)18–29(–35) × (3.5–)5–
6(–7) µm, 0–1-septate, sometimes slightly constricted at the septum, subhyaline, pale
yellowish to pale olivaceous-brown, smooth, walls somewhat thickened, apex pointed
or rounded, base (hilum) truncate, (2–)3–4 µm wide, not or only slightly thickened,not darkened.

Hosts and Distribution: on Spiraea spp. (Rosaceae), Europe – Spiraea crenifolia
(RUS), Spiraea spp. (RUS). Material examined: on leaves of Spiraea hypericifolia,
Russia, Bashkortostan, Micher., 24 May 1916, Poreunij (LE); on leaves of Spiraea
hypericifolia, Russia, Bashkortostan, Saratova, 9 Aug. 1919, Karakulin (LE).

Notes: Karakulin, in VASSILJEVSKY & KARAKULIN (1937) described amphigenous colonies with
fasciculate conidiophores emerging through stomata, which could not be confirmed during the course
of the present monographic studies. The conidiophores observed were epiphyllous, erumpent through
the cuticle, which was also confirmed by examinations of ONDREJ (1984).
µm, 0(–1)-septate, pale olivaceous, smooth to faintly rough-walled, wall thin to slightly thickened. Conidiogenous cells integrated, terminal or conidiophores usually reduced to conidiogenous cells, with 1–3, rarely more conidiogenous loci, subdenticulate, proliferation sympodial as well as percurrent with 1–3 fine annellations, conidiogenous loci often denticulate-like, 1.5–2.5 µm wide, but wall of the loci unthickened, not darkened or at most slightly darkened–refractive. Conidia solitary or catenate, in simple or occasionally branched chains, fusiform–subcylindrical, straight to somewhat curved, 9–24(–36) × 3.5–5(–6) µm, (0–)1(–3)-septate, pale olivaceous, smooth or faintly rough-walled, wall thin to slightly thickened, attenuated towards apex and base, apex rounded or truncate, base truncate or somewhat convex, hila 1.5–3 µm diam., unthickened, not darkened.

Hosts and Distribution: on Populus spp. (Salicaceae), North America – Populus deltoides ssp. monilifera (= Populus monilifera) (USA, KS).

Notes: This species was reduced to synonymy with Phaeoramularia maculicola (Romell. & Sacc.) B. Sutton (= Fusicladium romellianum Ond.) by SUTTON (1970) and ELLIS (1976). However, F. romellianum differs from F. subsessile in having conidiophores, which are usually formed in sporodochial conidiomata, smaller conidiogenous loci and conidial hila (1–2 µm wide) and conidia, which are usually aseptate, rarely 1-septate. F. romellianum occurs on a wide range of Populus species, whereas F. subsessile is, as far as known, confined to Populus deltoides var. monilifera. It may be supposed that the latter species has often been confused with other species of Fusicladium and Pollaccia on Populus species. It is probably much more common than indicated under ‘hosts and distribution’.

10.2.47. Fusicladium veronicae (Bat.) B. Sutton & Pascoe, Austral. Syst. Bot. 1: 81 (1988) Fig. 51
≡ Ramalia veronicae Bat., Revista Biol. (Lisbon) 1(2): 111 (1957); holotype: on Parahebe derwentiana, Australia, Clyde Mtn., N.S.W., Jan. 1937, L. Fraser (DAR 3568).

On leaves, petioles and stems, leaf spots amphigenous, mainly hypophyllous, subcicular, variable in size, up to 5 mm wide, dark olivaceous-brown, margin darker, scattered over the leaf surface, frequently confluent, sometimes covering the entire surface. Primary mycelium immersed, epidermal and subcuticular, in the upper epidermal cells intracellular, hyphae branched, 1–3 µm wide, septate, hyaline, between the cuticle and upper epidermal wall plates of fan-like, hyaline, septate hyphae, forming one cell-layer, composed of irregularly lobed cells, 2.5–6.5 µm wide. Secondary (superficial) mycelium not extensively developed, when present composed of irregularly branched, 3–5 µm wide, pale to medium brown, thin- or thick-walled, smooth hyphae. Stromata absent. Conidiophores solitary, arising from the subcuticular mycelium, erumpent through the cuticle, erect, straight or slightly curved, flexuous, cylindrical, unbranched, 25–60(–70) × 5–8 µm, 1–5-septate, pale to medium brown, paler towards the apex, verruculose, thick-walled, slightly attenuated towards the apex. Conidiogenous cells integrated, terminal, with 1–2, rarely more loci, proliferation sympodial, loci 2–4 µm wide, unthickened or almost so, not darkened, often with 1–3 percurrent proliferations which are not connected with conidiogenesis. Conidia

![Fig. 51: Fusicladium veronicae. A – conidia, B – germinating conidia and secondary conidia (microcyclic conidiogenesis), C – conidiophores arising from hyphae, scale = 10 µm, K. Schubert del.]
solitary or catenate, in unbranched, short chains, fusiform, straight, 11.5–20 × 4.5–8 µm, 0–3-septate, mostly with one septum, slightly constricted at the septum, pale brown, verruculose, attenuated to a conical apex and to a truncate base, hila 2–4 µm wide, unthickened or almost so, not darkened.

**Hosts and Distribution:** on *Parahebe* spp. (Scrophulariaceae), Australia – *Parahebe derwentiana*, *P. formosa*, *P. perfoliata*.

**Material examined:** on *Parahebe perfoliata*, Australia, Victoria, Burnley, P. R. I. Gardens, 4 Jun. 1986, H.Y. Yip (VPRI 13987); on *P. perfoliata*, Australia, Victoria, Burnley, P. R. I., 5 Dec. 1985, S. Isaacs (VPRI 13120, DAR 55930).

10.2.48. *Fusicladium virgaureae* Ondřej, Česká Mykol. 25(3): 170 (1971) Fig. 52


**Teleomorph:** Unknown.

**Ill.:** Ondřej (1971: 168, Fig. 4).

Leaf spots amphigenous, shape and size variable, irregular, varying from small spots, 2–3 mm wide, to large blotches, 10–30 mm wide or oblong, up to 50 mm, yellowish, olivaceous to brown, sometimes purple-brown. Stromata absent, only with small subcuticular aggregations of swollen hyphae. Conidiophores solitary or in small, loose fascicles, erect, straight to somewhat flexuous, subcylindrical to slightly sinuous, unbranched or rarely branched, 20–100 × 3–6 µm, septate, yellowish or olivaceous-brown to medium brown, paler towards the apex, smooth, occasionally minutely rough-walled, walls somewhat thickened. Conidiogenous cells integrated, terminal, with a single or up to four loci, proliferation sympodial, loci truncate to slightly convex, 1–1.5 µm wide, neither thickened nor darkened, rarely with percurrent proliferations, which are not connected with conidiogenesis. Conidia in unbranched chains, cylindrical to fusiform or obclavate, straight, 8–16 × 3–6 µm, 0–1-septate, not or only slightly constricted at the septum, yellowish or olivaceous-brown, smooth, hila truncate to slightly convex, 1–1.5 µm wide, neither thickened nor darkened.

**Hosts and Distribution:** on *Solidago* spp. (Asteraceae), Europe – *Solidago gigantea* (A), *S. virgaurea* (CZ, SK).

**Material examined:** on *Solidago virgaurea*, Moravia, Hrubý Jesenik, 16 Aug. 1981, M. Ondřej (BRA); on *S. virgaurea*, Slovakia, Slovensko Vysoke Tatry, 7 Sept. 1974, M. Ondřej (BRA); on *Solidago gigantea*, Austria, Steiermark, Grazer Feld, S of Graz, Kaiserwald, near Wundschuh, 16 Aug. 1995, P. Zwetko (GZU), see Scheuer (2003).

10.2.49. *Fusicladium viticis* M.B. Ellis, More Dematiaceous Hyphomycetes: 238 (1976) Fig. 53


**Teleomorph:** Unknown.

**Ill.:** Ellis (1976: 237, Fig. 177).

Definite leaf spots lacking or only with irregular discolorations, dark brown to greyish brown. Colonies hypophyllous, effuse, dark brown, often spread along leaf veins. Mycelium internal, subcuticular, hyphae branched, 2–3 µm wide, septate,
pale olivaceous. Stroma with flat, only one-layered aggregations of swollen, pale brown, thick-walled cells, 3–6 µm diam., forming layers or radially spreading. Conidiophores solitary or fasciculate, arising from stromata, erect, straight or slightly flexuous, unbranched, 40–100 × 3–5 µm, 0–1-septate, brown, paler towards the apex, smooth, thick-walled. Conidiogenous cells integrated, terminal or intercalary, with numerous, small conidiogenous loci, crowded at the apex, proliferation sympodial, loci denticulate, 1 µm wide, unthickened, somewhat darkened–refractive. Conidia solitary, fusiiform or limoniform, 8–14 × 5–7 µm, aseptate, yellowish to pale olivaceous, smooth to minutely verruculose, attenuated towards apex and base, apex pointed, base truncate, hila 1 µm wide, unthickened, somewhat darkened–refractive.

**Hosts and Distribution:** on *Vitex* spp. (Verbenaceae), Africa – *V. cienkowskii* (Uganda).

### 10.2.50. *Fusicladium*-state of *Acantharia echinata* (Ellis & Everh.) Theiss. & Syd. Fig. 54

**Teleomorph:** *Acantharia echinata* (Ellis & Everh.) Theiss. & Syd., Ann. Mycol. 16: 15 (1918).


On leaves, mycelium superficial, setose, composed of olivaceous-brown, densely branched, septate hyphae up to 8.5 µm thick, sometimes forming a multicellular compact mass of hyphopodium-like structures functioning as anchoring organs on the leaf. Stromata subcuticular, composed of thick-walled, dark brown cells, eventually bursting through the cuticle. Conidiophores and setae arise from the stromata as well as from the base and outer wall of the ascostromata. Setae simple, 70–210 × 6.5–9 µm, septate, dark brown, smooth to rough-walled, thick-walled. Conidiophores simple, occasionally branched, 16–46 × 5.5–5.8 µm, septate, brown, paler towards the apex, smooth to rough-walled. Conidiogenous cells integrated, terminal, holoblastic, proliferation sympodial, cicatrised. Conidia solitary, dry, blastic, broadly fusiform to broadly ellipsoid, 15–23 × 8–10 µm, 0–2-septate, commonly with one septum, brown, smooth to rugulose, tapering towards the apex, truncate at the base.

**Hosts and Distribution:** on *Quercus* spp. (Fagaceae), North America – *Quercus chrysolepis* (USA, CA), *Q. vaccinifolia* (USA, CA).

**Notes:** SIVANESAN (1984b) described the anamorph of *Acantharia echinata* as *Fusicladium* sp. Material of this fungus has not been examined, and the descriptions and illustration are based on SIVANESAN (1984b). It is not quite clear if the position of this anamorph in *Fusicladium* is correct. The setae formed on the host are very unusual in the latter genus. Additional material should be examined, and molecular data would also help any re-assessment of this fungus.

### 10.2.51. *Fusicladium*-state of *Apiosporina collinsii* (Schwein.) Höhn. Fig. 55


**Ill.:** BARR (1968: 854, Fig. 94), SIVANESAN (1984a: 599, Fig. 360).

**Exs.:** Barthol., F. Columb. 2927, 2320, 5013; Brenckle, F. Dakot. 505; Ellis, N. Am. F. 488a (as *Sphaeria collinsii*), Ellis & Everh., F. Columb. 1431; Griffiths, West Am. F. 177; Kellerman, Ohio Fungi 182; Rabenh., F. eur. 3541; Seym. & Earle, Econ. F. 125a, 125b; Thüm., Mycoth. univ. 849 (as *Dimerosporium collinsii*).

On leaves the teleomorph causes crustaceous layers, mainly on the lower surface, anamorph only formed on the subiculum, caespitose, brown. Conidiophores arising from superficial hyphae of the subiculum, hyphae branched, 3–5 µm wide, pale olivaceous. Conidiophores erect, straight to flexuous, cylindrical, unbranched or sometimes branched, 30–225 × 4 µm, septate, somewhat constricted at the septa, medium to dark brown, verruculose, walls only slightly thickened. Conidiogenous cells integrated, terminal or intercalary, with several conidiogenous loci, proliferation sympodial, loci denticulate, apex truncate, 1–2 µm wide, unthickened, slightly darkened, refractive. Conidia in short, unbranched or branched chains, ellipsoid, ovoid to subcircular, straight, 8–18 × 5–9 µm, aseptate, olivaceous to pale brown, verruculose, walls somewhat thickened, often with 2–3 denticles at the distal end, truncate at the base, hila 1–2 µm wide, unthickened, slightly darkened–refractive.

**Hosts and Distribution:** on *Amelanchier* spp. (Rosaceae), North America – *Amelanchier alnifolia* (Canada, Alta., BC., Man., NWT, Ont., Sask.; USA, ID, ND, NV, WY), *A. canadensis* (Canada, NB., NS., Ont.; USA, CT, MA, WI), *A. pumila* (USA, OR), *A. pubescens* (USA, NM), *A. utahensis* (North America), *Amelanchier* sp. (Canada, Alta., Man., NB., NS., Nfld., Ont., Sask.; USA, ID, MA, VA).

**Material examined:** collections from M.

**Notes:** This anamorph was usually referred to *Cladosporium* sp., but on account of the structure of the conidiogenous loci and conidial hila and its connection to *Apiosporina collinsii* (Venturiaceae), it has to be placed in *Fusicladium*. Since this anamorph is strictly confined to and connected with the teleomorph, it is not necessary to propose a separate, formal name for it.
10.2.52. *Fusicladium*-state of *Apiosporina morbosa* (Schwein.) Arx


**Ill.:** ARX (1954: 86, Figs 17, 95), ELLIS (1976: 239, Fig. 179), Fungi Canadenses (No. 84, Fig. 4), SIVANESAN (1984a: 600, Fig. 361).

**Exs.:** Barthol., F. Columb. 4336; Brenckle, F. Dakot. 97, 410; Syd., F. exot. exs. 515.

Stromata on twigs, erumpent, variable in shape and size, at first olive-green, then blackish and firm, consisting of fungal hyphae on the surface and a mixture of hyphae and host cells inside, sometimes anamorph abundant, forming brown covers on the blackish surface of the teleomorph, colonies effuse to caespitose, brown, stromatic cells 4–12 µm diam., pale to medium brown, thick-walled. Conidiophores arising from the upper cells of stroma, in loose to dense fascicles, erect, flexuous, geniculate or apex curved, unbranched or branched at the base, 20–95 × 3–6(–7) µm, septate, pale olivaceous to pale brown, paler towards the apex, smooth, thick-walled, somewhat swollen at the base. Conidiogenous cells integrated, terminal or intercalary, with several conidiogenous loci, proliferation sympodial, loci denticulate, 1–1.5 µm wide, unthickened, somewhat darkened-refractive. Conidia solitary or rarely in short chains, often laterally fused in pairs, ovoid, obvoid, ellipsoid or irregular, 4–19 × 3–6 µm, 0–1-septate, pale olivaceous, smooth, thick-walled, hilum 1–1.5 µm wide, unthickened, slightly darkened-refractive.

**Hosts and Distribution:** on *Prunus* spp. (Rosaceae), North America – *Prunus americana* (USA, AL, FL, MS, NC, ND, OK), *P. angustifolia* (USA, FL, GA), *P. armeniaca* (Canada, BC.; USA, CO, FL, IA, NY), *P. avium* (Canada, BC., Nfld.; USA, NC, NE, TX), *P. besseyi* (USA, ND), *P. cerasus* (Canada, BC., NB., PEI, Que.; USA, GA, NC and the eastern states), *P. domestica* (Canada, BC., NB., NS., Nfld., Ont., PEI, Que.; USA, FL, KY, MI, MS, NC, OH), *P. dulcis* (Canada, BC.), *P.
emarginata (USA, ID, MT, OR, WA), P. maritima (USA, AL, MA, NY, OR), P. munsoniana (USA, AL, FL, GA, MS), P. nigra (Canada, NS., Ont.), P. padus (Canada, Alta., Man., NWT), P. pensylvanica (Canada, Alta., Man., NB., NS., Nfld., NWT, Ont., PEI, Que., Sask.; USA, NC), P. persica (Canada, NS.), P. pumila (USA, MI, ND, WI), P. serotina (Canada, NB., NS., Ont., PEI, Que.; USA, GA, MS, NC, VA, WI), P. spinosa (Canada, BC.), P. subcordata (Canada, BC.; USA, OR), P. umbellata (USA, GA), P. virginiana (Canada, Alta., BC., Man., NB., NS., Nfld., NWT, Ont., PEI, Que., Sask.; USA, CA, CO, ID, MS, MT, NC, SC, SD, WA, WI), Prunus spp. (Canada, Alta., BC., Man., NB., NS., Nfld., NWT, Ont., PEI, Que., Sask.; USA, GA, MA, MD, NC, ND, OK, SD, VT, WI).

Material examined: all collections from IMI.

Notes: This anamorph is always associated with the teleomorph and does not occur separately. Therefore, we decline to propose a formal, separate name for it.

10.2.53. Fusicladium sp. (1) Fig. 57

Teleomorph: Unknown.
Lit.: ONDŘEJ (1973: 239).
Ill.: ONDŘEJ (1973: 238, Fig. 7).

Leaf spots on fading or mainly necrotic leaves, irregular, brown, often confluent. Mycelium internal, subepidermal. Conidiophores solitary or in small groups of up to 6, arising from stromata, erumpent through the cuticle, straight, simple or rarely branched, 40–95(–130) × 3–5 µm, septate, dark coloured. Conidiogenous cells integrated, terminal, with a single or up to three conidiogenous loci, proliferation sympodial. Conidia catenate, in unbranched or branched chains, cylindrical or fusiform, (10–)12–20 × 3–4(–5) µm, 0–1(–2)-septate, dark, pigmented.

Hosts and Distribution: on Salix spp. (Salicaceae), North America – Salix purpurea (USA, NY).

Notes: ONDŘEJ (1973) described this fungus based on material from North America (on Salix purpurea, USA, NY, 22 Jun. 1949), which was originally identified as Fusicladium saliciperdum. Since this material could not be traced, it was impossible to re-assess this fungus. The anamorph of Venturia chlorospora [Fusicladium sp., NÜESCH (1960) and SIVANESAN (1977)] is probably allied, but distinguished by having broader conidia.

11. Doubtful and unclear species of Fusicladium s.lat.

Type material of the following species could not be traced or was not available and other collections have not yet been found, so that the generic affinity and taxonomic status of these taxa could not be proven.


Type: on leaves of Aplectrum hyemale (Orchidaceae), USA, Delaware, Commons. Original description (EILLS & EVERHART l.c.): Spores irregular, whitish, with a shaded, purple border, 1cm diam. Hyphae fasciculate, olivaceous, simple, 2–3-septate, 65–75 × 5–6 µm, mostly twisted or abruptly bent at the tip, olive-brown. Conidia terminal, elliptical, greenish, granular, continuous at first, becoming 1-septate, 12–15 × 6–7 µm.


Type: on leaves of Butyrospermum parkii (Sapotaceae), Africa, Koulikoro, Vuillet. Original description (SACCARDO 1931: 803): Maculis rotundatissimis vel angulosis, 2–3 mm diam. amphigenis, superne brunneis inferne fulvis, margine atropurpureo cinctis; caespitulis obscure brunneis, amphigenis, minusitis, in centro macularum dense gregariis; hyphis fertilibus, caespitosis, simplicibus, cylindraceis apice rotundatis vel paulum attenuatis, continuis vel uniseptatis, fulgineis, 15–20 × 4–5 µm; conidios argyrophilae, ovoides, medio septatis et subinde constrictulis, fulgineis, 10 × 6 µm; mycelio in epidermide evoluto, cellulis globosis vel ellipticis formato.


Type: on leaves of Carpinus caucasica (Corylaceae), Caucasus, Armenia, Goris-Kafan, 30 Jul. 1954, A. Grossh. (ERCB).
Type: on twigs, leaves and buds of Cephalanthus sandvini, Uruguay, Montevideo; Argentina, pr. Quilmes et La Plata.
Original description (SACCARDO 1902: 1056): Rami-folio-colum, late dense effusum, olivaceum; caespitis superficialibus, densissime gregariss, ex hyphis paucis, 5–12 µm, efformatis, hyphis et basi seleriato parenychymatico-olivaceae matrici innatae orientibus, chlorinis, subteretibus, 40–50 × 3–4 μm, apice vix attenuatis, 1–5-septatis, non constrictis; conidii acrogeni, cyanitis, non. v. clavulatis, magnitudine ludentibus, 10–30 × 3–5 μm, chlorinis, 1-septatis, non constrictis.

Fusicladium chanousii Ferraris, Malpighia 16: 474 (1902).
Type: on anthers of Gentiana lutea, Italy, Picollo S. Bernardo.
Original description (FERRARIUS I.c.): Caespitulis, minutis, velutinis, effusis, olivaceis, hyphis fusci, erectis, simplicibus, non. vel 1-septatis, apice subdenticulatis, 35–50 × 4.5–6 μm; conidii olivaceis, elliptici, continuis, dein. 1-septatis non constrictis, 14–19 × 6–7 μm.

Type: on Ephedra sp., Switzerland, Montagnay provenant de Sion (Valais), D. Curchet.
Teleomorph: Venturia ephedrae Curchet, l.c.
III.: CRUCHET (1925: 158, Fig. 2/1). Spores fusiiformes, peu arrondies, arondies atténuées de deux extrémités, unisepitéées, légèrement resserrées à la choïos, très nombreuses, brunes, se détachant facilement de basides fusiiformes, cylindriques, ténues, peu apparentes, presque hyalines, entourant les périthèces.

Type: on leaves of Ficus sp., Eritrea, Valle Calabalen, Mensa 1900, Pappi.
Original description (BACCARINI I.c.): Maculis amphigenae, supra pallides et rubro-cinctis, subitus rufo-ferruginis; caespitulis amphigenae punctiformibus; hyphis fertilibus simplicibus, continuis, brevibus, fusiidalis, ad apicem pallidifloribonis; conidii pneumiformis, fusiidalis, septatis, 20 × 10 μm.

Original material is missing. This variety is very probably not conspecific with Spilocaea phillyreae.

Type: on leaves of Gardenia jasminoides, China, Prov. Guangdong, Quijiang, Oct. 1988, leg. F.X. Chao No. 024.
III.: CHI (l.c.: Fig. 178).
Original description (CHI I.c.): Maculae orbiculares, flavo-brunneahe, margine distinctae, 0.4–0.8 mm diam., annulatae, leviter depressae. Caespituli epiphylli, nigri; stromata subcuticulares, 30–220 μm diam.; conidii conhostriphillyreae, simplicia, sursum 0–1 geniculata, 1–4 septata, 13–24 × 3–4 μm, cellulae conidiogeneae sympodiales, ad apicem conico-truncateae, pallido-brunneahe, cicatricosa, conida singularia, raro catellatula, longiovoidea, pallido-brunnea, 1-septata, utrinque attenuata, ad basin obconico-truncatea, 7–8 × 3–4 μm.

Type: on leaves and twigs of Hippophae rhamnoides, Russia, Kazakhstan, region Alma-Ata, in promotioris Alata Tuvi Transiliensis, prope pagum Saty, 23 Jul. 1956, B.K. Kalymbetov (AA).
Original description (SHVARTSMAN et al. l.c.): Conidiophora 0–3-septata, interdum subconstricta, cilindrica, recta, rarius, incurvata, apice late rotundata vel obtusa, edentulata, indivisa, 16.8–73.5 × 5.2–11.5 μm, brunneo-fusa, pallida, solitaria, raro catellulata. Conidia acrogena, transverse 1–3-septata, constricta, cilindrica, subulata, fusiformia, obpyriformia, recta, interdum incurvata, 22.5–90.3 × 3.4–14.7 μm, brunneo-fusca, pellucida, solitaria vel catellulata. Caespituli orbiculares, irregularis, angulis, haud dense velutini vel velutacae, epiphylli pro more secus nervos dispositi, in ramulis convexi, compacti, atro-brunnee vel nigrescenti-olivaceae, sace confluentes. Maculae epiphylli, plerumque subinconspicue.

Fusicladium linii Sorauer, Z. Pflanzenkrankh. 5: 104 (1895).
Type: on leaves and stems of Linum usitatissimum, Belgium, Ardoye, Nijbels, 1894.
Lit.: LINDAU (1907: 784), VASSILIEVSKY & KARAKULIN (1937: 207)
Original description (translation based on SORAUER’S, I.c., et LINDAU’S (1907) descriptions in German): Leaf spots oval to oblong, brown. Caespituli on the leaf spots, 0.75–1 mm long, almost black. Conidiophores fasiculate, dense, genulate-sinuosus, more or less greenish brown at the base, hyaline towards the apex, ca. 30 µm long, 3 µm wide. Conidial terminal, solitary, ovoid to oblong, almost hyaline, 8 mm long, 4 µm wide, also with some longer conidia, 14–18 µm long.

Holotype: on Lonicera tatarica, Kazakhstan, Karaganda, botanical garden, 4 Aug. 1951, M.P. Vasyagina (AA).
Original description (VASYAGINA I.c.): Maculis rotundatis, albo-fuscis, saepe confluentes. Conidiophori fasiculati, hypophylli, recti vel curvatis, fusi, apice hyalini, numerosissimi denticulati, 30–44 × 3 μm. Conidia ovales vel piroideae, uniseptatae vel unicellularae, rarius 2 septatis, albo-fuscis, 12.8–19 × 5.6 μm.

Fusicladium stuckerti (Speg.) M.B. Ellis, in herb. (IMI).

Type: on living cladoles of Baccudia trimera, Argentina, Córdoba.

Type: on stems of Phaeus vulgaris, Germany, Westphalia.
Original description (SACCARDO 1886: 347): Caespitulis sparsi aut densi, ex cinereo-viridibus; hyphis erectis, simplicibus, parte septatis, apice obtusis, viridibus et fusciculato–conjunctis; conidia oblongo–fusiformibus, dilute viridibus.
Fusicladium theae  
Hara, Tea J. 14: 16 (1919); Mycologia 12: 330 (1920).
Type: on leaves of Camellia thea (= Thea sinensis), Japan.
Original description (Saccardo 1931: 803): Acervulis amphigenis, vellutinis, nigris; conidiophoris filiformibus rectis v. curvis basi incrassatis continuis v. 3-septatis infra brunneascendibus supra pallide coloratis et incurvatis, 40–70 × 4–5 μm; conidiis terminalibus, cylindraceis v. ovato-oblongis sub medio uniseptatis non v. parum constrictis, apice obtusi, basi subacute, rectis v. curvis, hyalinis v. flavescantibus, 15–28 × 5–6 μm.

Fusicladium vanillae  
Type: on leaves of Vanilla sp., Java, Buitenzorg.
Original description (Saccardo 1906: 580): Hyphis sterilibus foliorum superficie adpressis, rarius liberas, brunneolis; conidiophoris erectis, rectiusculis, apice acutis, continuis, brunneolis, 25–30 μm longis; conidiis ovoideoblongis, basi acutiusculis, apice rotundatis, bicaliculata, 8 × 4 μm.

Spilocaea concentrica  
Type: In cortice Peptonum putridorum, Bthl. Optime aut evoluta mense Octobri prope Philadelphia in talibus.
Notes: Listed by Saccardo (1886: 761) under doubtful and excluded species.

Spilocaea ephiphylla  
Fr., Syst. Mycol. 3: 504 (1832).
Type: Plures tales formationes in foliis Pyri, Mali etc. misit Levieux, omnes e Gallia occid.
Original description (Fries): Maculis epidermide bullata circumscissa secedente minutis sparsis nigris. Epidermidis valde radiatae, haud rumputur, sed in ambitu integrae in squamam aequae latam integram solvantur. Tum sub hac conspicietur macula interrupta s. plures maculae sparsae nigrae, folio arctae adnatae, nec pulverulentae, quae non sine difficiate a matrice separatea characteres datos monstrant.

Spilocaea opuntiae  
Raben., Flora 33: 625 (1850).
Type: “Auf unrefil abgefallenen Früchten der indischen Feige, auf Capri.”
Original description (Rahnenhorst l.c.): Maculis aureo-flavescentibus saepius obliteratis rugosocommissatis, subglobosis; conidiophoris erectis, rectiusculis, apice acutis, continuis, brunneolis, 5–6 μm; conidiis ovato-oblongis, basi acutiusculis, apice rotundatis, bicaliculata, 8 × 4 μm.

Spilocaea scirpi  
(Sawada) Deighton, in herb.
Type: Plures tales formationes in foliis Pyri, Mali etc. misit Levieux, omnes e Gallia occid.
Original description (Fries): Maculis epidermide bullata circumscissa secedente minutis sparsis nigris. Epidermidis valde radiatae, haud rumputur, sed in ambitu integrae in squamam aequae latam integram solvantur. Tum sub hac conspicietur macula interrupta s. plures maculae sparsae nigrae, folio arctae adnatae, nec pulverulentae, quae non sine difficiate a matrice separatea characteres datos monstrant.

Spilocaea proxima  
Ellis & Everh., J. Mycol. 4: 53 (1888).
Type: on leaves of Ascyrum hypericoides, USA, Louisiana, Natchitoches, 26 Sept. 1886, A.B. Langlois (NY). This is a hyphomycete of unclear affinity.

Spilocaea aronici  
Numerous collections (HBG, JE, M) have been examined.

Fusicladium anethi  
Nevod., Griby rossii (Russian fungi) IV, No. 191 (1917).
Type: on leaves of Peucedanum graveolens (= Anethum graveolens), Georgia, Prov. Tiflis, Dist. Gori, near Skra, in horto Pridonov, 23 Jul. 1912, G.S. Nevodovskij, Griby rosii 191 (e.g., B. IMI 1423, K, LE).

Fusicladium angulare  
Type: on leaves of Archangelica atropurpurea (= Angelica atropurpurea), USA, Wisconsin, Racine, Sept. 1890, J.J. Davis (NY; Ellis & Everh., N. Am. F. 2790, e.g. M, NY).

Fusicladium arboricola  
(Ellis & Everh.) U. Braun, Schlechtendalia 5: 260 (1916).
Type: on leaves of Jasminum arborescens, India, U.P., Orai, Bandlekhand, 27 Feb. 1907, E.J. Butler, No. 1710 (S).

Fusicladium careae  
Type: on leaves of Cucurba papaya, Paraguay, Guarapi, Feb. 1881, B. Balansa 2739 (LPS). Other authentic material (Balansa 3855) at B.
≡ Asperosporium careae (Speg.) Maubl., Lavoura 16: 212 (1913).

Fusicladium chlorinum Ellis & Kellerm., in herb.

Holotype: on leaves of Cynanchum acutum, Egypt, near Damiettam, 20 Mar. 1921, C. Ehrenberg (B).

Fusicladium depressum (Berk. & Broome) Roum., Fungi gallow. exs. 86 (1879).


Fusicladium caruanianum Sacc., Ann. Mycol. 11: 20 (1913), basionym
- Pseudocladosporium caruanianum (Sacc.) U. Braun comb. nov.
Holotype: on dead leaves of Magnolia grandiflora, Malta, Balzan, leg. Caruano Gatto (PAD).
Lil.: Saccardo (1931: 801).
On dead leaves, saprobic, lesions lacking. Colonies hypophyllous, effuse, loose to dense, forming small to large patches, confluent, velutinous, brown, sooty. Mycelium internal and external, superficial, hyphae creeping, often aggregated, forming ropes or aggregations of swollen hyphal cells, sparingly branched, 2–6 µm wide, septate, often with constrictions and swellings, pale olivaceous to medium dark brow or olivaceous-brown. Conidiophores solitary, arising from swollen hyphal cells or from creeping hyphae, lateral, occasionally terminal, erect, straight and subcylindrical to geniculate–sinuous, unbranched, 10–30 × 2–4 µm, (0–)1–3–4–5–septate, pale to medium dark brown, smooth, wall thin or slightly thickened. Conidiogenous cells integrated, terminal, 10–20 µm long, conidiogenous loci denticle-like, mostly with several denticles, tips truncate, wall unthickened, not darkened or occasionally slightly darkened–refractive. Conidia catenate, often in branched chains, ellipsoid–ovoid, fusiform, subcylindrical, 5–18 × 2–4 µm, 0–1-septate, pale olivaceous or olivaceous-brown, yellowish brown, smooth to faintly rough-walled, apex of primary conidia obtuse, rounded, hila (1–3, rarely up to 5) short obconically truncate, unthickened, not darkened.
Notes: This species fits well into the concept of Pseudocladosporium U. Braun (1998). It is distinguished from Pseudocladosporium hachijoense (Matsush.) U. Braun by having well-developed, longer, septate conidiophores and usually aseptate conidia. Pseudocladosporium brevicaudatum (U. Braun & Feiler) U. Braun differs from P. caruanianum in having (0–)1–2–3–4–5–septate conidia. The long, septate conidiophores of the latter species resemble those of Pseudocladosporium sp. (BRAUN, 1998), described from Japan, but the conidia in the latter fungus are septate.
Together with Arungitea B. Sutton, Fusicladium, Polyscytalum Riess and similar genera, Pseudocladosporium belongs to a group of acroblastosporic hypomyces (Acroblastosporaceae, Kiffer & Morelet 1999). The taxonomy within this assemblage of genera is unsettled and uncertain. Monographic studies and molecular data are necessary to get a system of well-defined natural genera.

Fusicladium depressum var. platysporum (Ellis & Holw.) Davis, Paras. fungi Wisconsin: 113 (1942).
- Fusicladium depressum var. sii (Ellis & Everh.) Davis, Paras. fungi Wisconsin: 113 (1942).
- Pseudocladosporium caruanianum (Sacc.) U. Braun & Feiler differs from P. caruanianum by having well-developed, longer, septate conidiophores and usually aseptate conidia. Pseudocladosporium hachijoense (Matsush.) U. Braun by having well-developed, longer, septate conidiophores and usually aseptate conidia. Pseudocladosporium caruanianum (Sacc.) U. Braun differs from P. caruanianum in having (0–)1–2–3–4–5–septate conidia. The long, septate conidiophores of the latter species resemble those of Pseudocladosporium sp. (BRAUN, 1998), described from Japan, but the conidia in the latter fungus are septate.
Together with Arungitea B. Sutton, Fusicladium, Polyscytalum Riess and similar genera, Pseudocladosporium belongs to a group of acroblastosporic hypomyces (Acroblastosporaceae, Kiffer & Morelet 1999). The taxonomy within this assemblage of genera is unsettled and uncertain. Monographic studies and molecular data are necessary to get a system of well-defined natural genera.
**Fusicladium dubiosum** Speg., Anales Soc. Ci. Argent. 22: 211 (1886).  
Syntypes: on leaves of *Digitaria* sp., Pl. du Paraguay 3517, Guarapu, Dez. 1882, Balansa (B, PC).  

The type at B consists of a drawing and some notes, but without any material. Based on the drawing, this species can be excluded from *Fusicladium*, but its status and generic affinity are unclear.

**Fusicladium euonymi-japonici** Hori (Tai 1979), nom. nud.

Type: on leaves of *Fagopyrum esculentum*, Netherlands, Amsterdam, Jun. 1897, Oudemans (L 66363).  
The type consists of various saprobic hyphomycetes, incl. *Alternaria* and *Cladosporium*. Some conidia agreeing with the original description of this species belong to *Cladosporium herbarum* s.lat.


**Fusicladium fuliginosum** Kalchbr. & Cooke, Grevillea 1884: 24 (1884).  
Host plant unknown. This is a hyphomycete of unknown affinity.

**Fusicladium gnaphaliatiun** Bonar, Mycologia 57: 392 (1965).  
Holotype: on leaves of *Gnaphalium stramineum* (= *G. chilense*), USA, California, Lake Merced, San Francisco Co., 9 Sept. 1934, L. Bonar (UC 532308); paratypes: on *G. stramineum*, USA, California, San Francisco, Golden Gate Park, 16 Oct. 1925, L. Bonar (UC 257214); USA, California, Humbold Co., Hors-Linto Creek, 4 Sept. 1938, L. Bonar (UC 640690).  

≡ *Cladosporium* sp.  
Notes: Long, brown, septate conidiophores with somewhat thickened walls and large solitary conidia, 16–30 × 8–11 µm, 0–3-sepate, olivaceous-brown, with somewhat thickened, echinulate walls. This is a species of *Cladosporium* morphologically close to *C. phlei* (C.T. Greg.) G.A. de Vries.

Types: on leaves of *Epilobium parviflorum*, Austria, Wiener Wald, near Witten, 7 Jun. 1905, v. Höhnel (B) and Kab. & Bub., F. imp. exs. 293 (e.g., BPI 424286, H, K).  

Holotype: on dead petioles of *Livistona chinensis*, Russia, Karelia, Vyborg, Liimatta, Sept. 1891, A. Thesleff (H 4252).  
Notes: This species does not belong in *Fusicladium*, status unclear (BRAUN 2000).

**Fusicladium macrosporum** Bonord., Hedwigia 3(5): 74 (1864).  
≡ *Monotospora ovata* Sacc., Syll. fung. 4: 299 (1866).

**Fusicladium maculicola** (Ellis & Kellerm.) Ondřej, Česká Mykol. 27(4): 237 (1973).  
≡ *Scolecostachium maculicola* Ellis & Kellerm., J. Mycol. 3: 103 (1887), as ‘maculicola’.  

Isotype: on leaves of *Vitis californica*, USA, Santa, Chryon., Sept. 1916, J.R. Weir (M).  

**Fusicladium peucedani** Syd. & P. Syd., Ann. Mycol. 5: 340 (1907), nom. illeg., homonym of *F. peucedani* Ellis & Holw., 1895.  
Types: on leaves of *Peucedanum decursivum*, Japan, Tokio, N. Nambu (B, S).  

**Fusicladium pongamiae** Syd., Ann. Mycol. 11: 328 (1913).  

**Fusicladium poricola** Bonar, Mycologia 57: 393 (1965).  
Holotype: on *Phellinus ferea*, on trunks of *Alnus* sp., USA, California, Humboldt Co., Van Duzen River, 31 Mar. 1931, H.E. Parks 2726 (UC 1272719); isotype: California Fungi 1251 (PC, UC 568840).  

Syntypes: on leaves of *Tragopogon orientalis*, Czech Republic, pr. Bisten ad Brunnam Moraviae, May, G. de Niessl, Rabenh., F. eur. 1166 (e.g., B, HBG, HAL, LE, M).  

**Fusicladium punctiforme** G. Winter, in Rabenh., Fungi eur., Fasc. 16 (32), No. 3582 (1886), non *Passalora punctiformis* G.H. Otth, 1868.  
Syntypes: on leaves of *Pimpinella integerrima* (= *Zizia integerrima*), USA, Missouri, near Perryville, Aestate 1885, C.H. Demetrio, Rabenh., F. eur. 3582 (e.g., HAL, M).  
**Fusicladium rhamni** Fuckel, in herb.


Syntype: on leaves of Robinia pseudacacia, USA, Maryland, Glen Sligo, 3 May 1899, C.L. Shear, Barthol., F. Columb. 1619 (HBG).

= **Passalora robiniae** (Shear) S. Hughes, Canad. J. Bot. 31: 572 (1953).


Syntypes: Petr., F. polon. 638 (e.g., K, W).


**Fusicladium schnablianum** Allesch., Fungi bavar. exs. 397 (1894).

Lectotype: on leaves of Carduus pannonica, Germany, Bavaria, Oberammergau, 1894, Allescher (M), selected here; isoelectotype: on *Carduus pannonica*, Germany, Bavaria, Oberammergau, Aug. 1894, Allescher, Allesch. & Schn., F. bavar. 397 (B).

= **Fusidcieliella melaeuca** (Fuckel) S. Hughes, Mycol. Pap. 49: 21 (1952).

**Fusicladium sorgii** Pass., Hedwigia 16: 122 (1877).

Isotype: on leaves of Sorghum halepense, Italy, Pavia, Estate 1893, Briosi & Cavara, F. paras. 240 (HAL).


Holotype: on leaves of Limonium vulgare (= *Statice limonium*), USA, New Jersey, Cape May, 13 Sept. 1894, A. Commons (NY).

= **Cladosporium c. herbarum** (Pers.: Fr.) Link.


= **Cladosporium sp**.


13. References

Beside references cited in this work, additional papers, checklists and monographs are included that have been used as sources of data on host range and distribution.


CASTAGNE, J.L.M. 1845: Catalogue des plantes qui croissent naturellement aux environs de Marseille. Aix.


SCHUBERT, RITSCHEL & BRAUN: A monograph of Fusicladium s.lat.


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