

Chaenothecopsis Vainio
(CALICIALES: MYCOCALICIACEAE)

After Tibell, and others

Rev. 5/94

Thallus usually indistinct, \pm loosely associated with algal colonies, lichenicolous or saprobic. Photobiont, when present, chlorococcoid or Trentepohlia. Apothecia short- to long-stalked, black or stalk pale below; head obovoid to lens-shaped. True exciple of a few rows of periclinally arranged or interwoven hyphae; stalk \pm colorless in central part, usually brown, reddish or greenish in outer part; hyphae periclinally to irregularly arranged. Paraphyses absent. Asci \pm cylindrical, with thickened apex penetrated by a narrow canal; persisting until ascospores mature. Spores 8, simple or 1-septate, ellipsoid to oblong- or fusiform-ellipsoid, brown, 5-10 x 2-4 μ m; septum colorless to dark brown; surface smooth to minutely warted; not aggregated into a dry spore mass. Anamorphs pycnidia, walls of outwardly pointed cells (Asterophoma species), amongst the spore-masses of host Caliciales, or sometimes borne on long, branched stalks; conidiogenous cells narrowly ampuliform to subcylindrical, arising singly, enterblastic, acrogenous; conidia rod-shaped to oblong-ellipsoid, simple, colorless. Ascomata with various pigments. Mostly on dry bark or wood of old, hollowed or dead trees; also on Cladonia squamules, rotting wood polypores and in rock underhangs.

Distinguished from Calicium, Chaenotheca and Microcalicium by the ascospores not forming a dry spore-mass. Mycocalicium, Phaeocalicium and Stenocybe differ in having a uniformly thickened ascus apex, and the last two genera have larger ascospores.

1. Spores non-septate. Also see C. sp. of Harris 1995. 2

1. Spores 1-septate. 5

2. Apothecia sessile or with a very short stalk, hairy due to projecting excipular hyphae; growing on thallus of sterile Tylophoron protrudens. Florida. C. pilosa Tibell & Kalb

2. Apothecia distinctly stalked, not hairy. 2a

2a. Apothecia large, 0.5-2 mm high. 3

2a. Apothecia small to intermediate, up to 1 mm high. 4

3. Apothecia black, all parts K- (to dull brownish). Stalk externally black or slightly greenish, epruinose, 0.2-0.3 mm high (0.5-1.4 mm high according to Titov & Tibell, 1993), slender, 0.03-0.07 mm diam.; capitulum spherical to lenticular, 0.1-0.4 mm wide, black; internally dull or red-brown, K-, N-, or partly greenish (K+ dull brownish, N \pm intensifying); epithecium thin, aeruginose to brownish; hypothecium aeruginose to brownish. Excipulum poorly developed and formed as a continuation of the outermost part of the stalk. Stalk consisting of periclinally arranged, greenish to brown hyphae; central part with a small layer of pale hyphae. Asci small, 22-32 x 2.5-3.5 μ m, cylindrical and with apex penetrated by a narrow canal. Spores ellipsoid with rounded ends, pale greenish brown, 4.5-6.5 x 2-2.7(-3) μ m, smooth under light microscope. Associated with Stichococcus on dry bark, of conifers or birches, or parasitic or parasymbiotic

on lichen thalli. Florida. Harris (1995) has a question mark after this name. C. savonica (Räsänen) Tibell

3. Stalk with a white pruina; capitulum K+ green. Stalk slender, 0.8-2.1 mm high. Apparently not associated with algae. Hypothecium and stalk reddish brown. Capitulum lenticular when young, soon hemispherical and often irregular, black, 0.20-0.28 mm diam. Epithecium thin, brownish. Hypothecium consisting of branched and intertwined hyphae, pale, but with varying amounts of yellowish red pigment in the lower part, 80-119 µm high. Excipulum poorly developed, forming a short collar at the base of the capitulum, 8-14 µm thick, consisting of 4-6 layers of periclinally arranged and \pm interwoven hyphae, reddish brown from abundant occurrence of a yellowish red pigment. Stalk 0.05-0.09 mm diam., pale in central part, consisting of periclinally arranged hyphae; outer part with irregular surface, aeruginose. Outermost layers of hyphae die and turn whitish and thus form an irregular layer of senescent tissue, giving the stalk an uneven, pruina-like surface and a pale color. All parts of apothecium containing red pigment turn aeruginose with K; some apothecia have little or no pigment. Asci 43-52 x 2.5-3.5 µm, cylindrical. Spores uniseriately arranged, periclinally or slightly obliquely oriented. Spores ellipsoid, medium to dark brown, 7-10 x 3-3.5 µm, with a distinctive minute ornamentation visible at high magnification under the light microscope. On bark and wood of conifers. C. viridialba (Krempelh.) A. Schmidt

4. Thallus with algae. Capitulum K+ intensely red. Stalk 0.4-0.7(-0.9) mm high, epruinose. Capitulum lenticular, black, 0.14-0.28 mm diam. Epithecium thin, medium brown. Hypothecium 70-95 µm, hyaline to yellowish brown, particularly towards the base. Excipulum 6-10 µm, consisting of 3-4 layers of periclinally arranged, \pm interwoven hyphae, dark yellowish brown. Stalk 0.04-0.07 mm diam., shiny, in the upper part consisting of periclinally arranged hyphae; inner part with pale hyphae, which in the central part contain varying amounts of yellowish to reddish pigment; outermost part dark yellowish brown; towards the base the stalk consists of irregularly arranged hyphae. All brown or yellowish/reddish pigmented parts of the apothecium K+ persistently red. Asci 31-37 x 3.0-3.5 µm with a thickened apex penetrated by a narrow canal. Spores allantoid to ellipsoid, medium brown, 6.5-9 x 3-3.5 µm, when mature with distinctive, minute irregular surface ornamentation under light microscope. Alga Trentepohlia. On bark of deciduous and rarely coniferous trees, cool-temperate and temperate forests. C. rubescens Vainio

4. Thallus without algae. 4a

4a. Spores oblong-ellipsoid, arranged end to end. Apothecia 0.5-0.6 mm high; stalk black to brown-black, 0.07-0.1 mm wide, somewhat pale inside; capitulum obconical to sublentiform, 0.15-0.3 mm wide; excipulum black, epruinose, brown inside, pseudoparenchymatous, c. 15 µm thick; cells angular-roundish, or angular-ellipsoid, c. 10 µm wide; hypothecium brown, triangular, composed of erect hyphae; hymenium c. 60 µm; spores uniseriate, oblong-ellipsoid, brown, 6.5-10 x 3-4 µm. On Sabal palmetto, Florida. C. rappii (Nadv.) R. C. Harris

4a. Spores fusiform, obliquely arranged. Capitulum K-. Apothecia small, 0.37-0.63 mm high, black, epruinose. Capitulum broadly obovate, 0.15-0.23 mm diam. Excipulum poorly developed, brown, formed as a continuation of the outer part of the stalk. Hypothecium pale aeruginose to brown. Stalk 0.03-0.06 mm diam., consisting of periclinally arranged hyphae. Central part of stalk pale, the outer part brown to greenish brown. All parts of the apothecium N-,

K-. Asci small, 26-33 x 3.1-3.8 µm, cylindrical, with a distinct apical thickening penetrated by a fine canal. Spores very densely stacked and obliquely oriented in semi-mature asci, fusiform, medium to dark brown, 5.4-6.8 x 2.8-3.4 µm, under the light microscope with a distinctive, minute areolate ornamentation. Saprophytic on the bark or more rarely wood of conifers, in rather open and dry localities in cool-temperate and temperate forests. British Columbia, California, Oregon; Florida. C. nana Tibell

5. Parasymbiont/parasite on Chaenotheca spp. 6

5. Not parasymbiont/parasite on Chaenotheca spp. (but may be parasitic on other lichens). 10

6. Growing on Chaenotheca chrysocephala, which is bright yellow and contains Trebouxia. Epihymenium, hypothecium and surface of stalk reddish brown to brown, "H"- (presumably this means HNO₃- or HCl-), K+ greenish. Apothecia 0.7-0.9 mm high, black. Capitulum lenticular, 0.2-0.4 mm diam. Epithecium thin. Hypothecium 44-60 µm. Excipulum 7-16 µm, consisting of intertwined and sclerotized hyphae. Asci 35-45 x 3-3.5 µm, cylindrical. Spores ellipsoid, dark brown, 6.5-9.0 x 2.5-3.0 µm; mature spores smooth under light microscope. On trunks of old trees in old and humid conifer forests, boreal to boreal-nemoral. The production of apothecia by Chaenotheca chrysocephala is often inhibited. C. consocians (Nádv.) Schmidt

6. Growing on other species. 7

7. Growing on Chaenotheca furfuracea, which is bright greenish yellow and contains Stichococcus; apothecia of the host inhibited. West slope of Cascades, Washington state, rare. C. sp.

7. Growing on other species. 8

8. Capitulum and other parts of apothecium with reddish pigment, K+ green or blue-green. (often on Chaenotheca stemonea or C. trichialis (both with Stichococcus), on wood or rarely bark in shaded and moist localities in cold-temperate forests. Maine; elsewhere. C. viridireagens (Nádv.) A. Schmidt

8. Capitulum K+ red-purple, or K- to brownish. 9

9. All parts of apothecium N-, K-, or hypothecium greenish, K+ brownish. Apothecia 0.6-1 mm high, black. Spores 5.5-6.5 µm, 1-septate; septum darker than outer walls. Growing on Chaenotheca trichialis which contains Stichococcus, on wood.

Canada. C. epithallina

9. All parts of apothecia internally with diffuse, greenish yellow pigment, K+ red or purple (dissolving). Apothecia 0.4-0.8 mm tall, black or stalk rarely brown below; capitulum 0.15-0.38 mm wide; stalk 0.04-0.1 mm wide. Spores 5.4-7.8(-9.5) x 2.2-2.7 µm, 1-septate, the septum colorless or pale brown and much thinner than outer wall, the surface smooth. On wood of pines (rarely birch), usually on thallus of Chaenotheca brunneola, which contains Dictochloropsis or Trebouxia, but sometimes associated with Stichococcus ("C. lignicola").

..... C. pusiola (Ach.) Vainio

10. Parasitic on thallus and ascocarps of Arthonia (A. cf. platygraphella, or others).

Ascocarps subsessile, 0.13-0.19 mm tall, black, epruinose, with spherical to lenticular capitula; occurring singly or in groups of as many as four fused together; lower portion of excipulum and upper portion of stalks frequently red-brown in wet mount; spores 8 per ascus, 1-septate, uniseriate, brown when mature, (6.9-)6.6-[8.5]-10.5(-10.8) x (2.4-)2.6-[3.2]-3.8(-3.9) μ m; surface finely papillate, mostly with little to no indentation at septa; asci cylindrical, with a thickened apex penetrated by a fine canal. On bark of Thuja and Acer, Maine; I have collected a very tiny amount of what appears to this species on the west slope of the Cascades in Washington state. C. brevipes Tibell

10. Not parasitic on Arthonia. 11

11. Apothecia containing norstictic acid. Ascospores 2-celled, \pm cylindrical with rounded ends, 7-11 x 3-3.5 μ m. Thallus not evident; no algae; not parasitic. Apothecia dark brown, slightly shiny, c. 0.9 mm tall. Stalk dark brown; hyphae seem \pm parallel but hard to tell. Capitulum obconical, ca. 0.3-0.4 mm diam. Exciple and upper stalk bleeding yellow in K with subsequent formation of typical crystals of norstictic acid. Asci with tip pierced by narrow canal. Ascospores pale brown, septum dark. On old wood, Florida. C. norstictica R. C. Harris

11. Apothecia without norstictic acid (but may be K+ red due to other substances).

.....11a

11a. Not associated with any algae. Stalk K- or K+ purplish red, N+ intensely red.

Apothecia 0.7-1.4 mm high, black, shiny. Capitulum lenticular, 0.14-0.40 mm diam., sometimes with white, cottony hyphae on lower side. Epithecium 5-7 μ m, brown to reddish brown. Hypothecium 85-100 μ m, slightly aeruginose. Excipulum 10-35 μ m, formed by up to eight layers of periclinally arranged hyphae, reddish brown, sometimes poorly developed and consisting of amorphous or sclerotized material. Epihymenium reddish brown. Excipulum and epithecium K-, N-. Hypothecium N+ reddish intensifying, K-. Stalk 0.04-0.10 mm diam., the surface often with a distinct reddish tinge in section and N+ intensified reddish to violet red, K+ grayish red or sometimes K-. Stalk composed of hyphae parallel with surface. Asci 40-54 x 2.7-3.3 μ m, cylindrical. Spores ellipsoid, medium brown, 6.5-9.8 x 2.2-3.3 μ m, 5.5-7.5 x 2-2.3 μ m, smooth under light microscope, or minutely cracked; septum distinct. On dry and weathered wood of conifers and birch, in open situations, usually not associated with algae or lichens. C. debilis (Turn. & Borr. ex Sm.) Tibell

11a. Associated with algae. Stalk N-. On wood, especially of conifers. 12

12. Associated with a member of the Chlorococcales. Apothecia K-, 0.6-1.0 mm high, epruinose. Stalk often pale greenish, brownish or gray in the lower part becoming darker in upper part. Capitulum lenticular, 0.15-0.28 mm diam. Epithecium thin, greenish brown to brown. Hypothecium 85-110 μ m high, pale or greenish to brownish. Excipulum 8-14 μ m, consisting of irregularly interwoven hyphae, greenish to brown. Stalk 0.04-0.08 mm diam., consisting of irregularly interwoven hyphae; in section pale in inner part and greenish to brown at the surface; in K the stalk swell strongly. All parts of apothecium K-, N-. Asci 29-36 x 2.7-3.8 μ m, cylindrical, with apex penetrated by a fine canal. Spores ellipsoid, medium brown, 5-7(-8.5) x 2-2.5(-3) μ m; septum only tardily colored, much paler than outer wall; surface \pm smooth. On wood of a variety of trees and more rarely on bark. In cold-temperate wet forests and in slightly drier and warmer areas.

..... *C. pusilla* (Ach.) A. Schmidt
12. Associated with *Stichococcus*. 13

13. Capitulum K+ red. Apothecia with dark olive-brown stalks, 0.5-0.8 mm high.

Apothecia 0.4-0.9 mm high, epruinose. Capitulum lenticular to hemispherical, black, 0.15-0.35 mm diam. Epithecium thin, medium brown. Hypothecium 55-65 µm high, hyaline to yellowish brown. Excipulum well developed, consisting of 4-5 layers of periclinally arranged hyphae. Stalk 0.04-0.10 mm diam., consisting of irregularly interwoven hyphae throughout; outer part yellowish brown; inner part pale, with varying amounts of yellowish to reddish pigment in the central part. All brown or yellowish parts of the apothecium K+ red, but the reaction fades fast and the tissue turns greenish brown. Asci cylindrical, 31-36 x 2.7-3.8 µm with a apex penetrated by a fine canal. Spores ellipsoid, pale brown, 5.4-6.5 x 2.2-2.7 µm, smooth; septum thin and with less contrast than the wall. Parasitic or parasymbiotic on lichen thalli or on free-living algal colonies on wood of conifers or, rarely, deciduous trees, boreal. *C. pusiola* (Ach.) Vainio

13. Capitulum K+ green, black. Apothecia 0.6-1 mm high; stalks usually reddish, particularly just below capitulum. Apothecia 0.6-1.2 mm high, black, epruinose; upper part of stalk and lower part of excipulum sometimes reddish tinged. Capitulum hemispherical to subspherical, 0.16-0.22 mm diam. Epithecium thin, brownish. Hypothecium reddish to yellowish brown, 40-80 µm thick, with dark red pigment granules and numerous colorless oil droplets. Excipulum 10-14 µm thick, consisting of periclinally arranged or interwoven hyphae, with varying amounts of a red pigment. Stalk 0.04-0.07 mm diam., often containing red pigment droplets; outer part consisting of dark brown, irregularly interwoven hyphae; inner part pale, consisting of strongly and irregularly intertwined swollen hyphae. Asci 33-39 x 2.2-3.3 µm, cylindrical, the apex penetrated by a fine canal. Spores ellipsoid, pale brown, (5-)6-7 x 2-2.7 µm, smooth, with a pale septum. Saprophytic or parasymbiotic on free-living colonies of algae or lichens (often on *Chaenotheca stemonea* or *C. trichialis* (both with *Stichococcus*), on wood or rarely bark in shaded and moist localities in cold-temperate forests. Maine; elsewhere. *C. viridireagens* (Nádv.) A. Schmidt

Add:

C. sp. of Harris 1995

Apothecia and thallus lacking lichen substances. Apothecia distinctly stalked, not hairy. Stalk almost colorless to pale olive or pale brown, hyphae irregularly arranged. Ascospores simple, elliptical to fusiform, arranged end to end, 6-7 x 2.5-4 µm. On pine bark, Florida. Rare.

C. kalbii K. Ryaman & Tibell

Parasitic or parasymbiotic on the thallus and ascomata of *Lecanora*.

Ascomata solitary, 0.14-0.26 mm high, short-stalked, with a black capitulum and pale stalk. Capitulum shining, pyriform, 0.07-0.26 mm diam. Epithecium thin, pale. Hypothecium hyaline, of irregularly branched and intertwined hyphae, 1.5-2.5 µm diam. Excipulum in outer part grayish to white, in inner part brownish, 10-12 µm thick, of 4-6 layers of periclinally arranged, 1-2 µm wide hyphae. Stalk medium to pale brown, short, 0.04-0.06 mm wide, 0.08-0.28 mm high, of thin-walled, cylindrical intertwined cells 2.5-3 µm long. All parts of ascomata K-, N+ brownish red, I-. Asci when mature with strongly and uniformly thickened apices without

canal, 52-69 x 3.5-5 μ m. Spores 1-septate, septum distinct and of similar contrast as the outer wall, brown, ellipsoid with pointed ends, with a minute ornamentation of smoothly rounded, lower, irregular verrucae, 9-11 x 4-5.5 μ m. Semi-mature and mature spores with a thin hyaline or pale brown coat.

Baja California. Sur.

C. rubina Tibell

Parasitic on the thallus of Pyrgidium montelicum.

Mexico: Chiapas (see Tibell, 1996 for description)

Descriptions

Literature

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