

Chaenotheca Th. Fr.
(CALICIALES: CALICIACEAE)

After Tibell, and others

Rev. 5/94

Thallus crustose, superficial or immersed, farinose, granular, verrucose or squamulose, gray, greenish gray, golden yellow, or brownish (bright yellow-green in C. furfuracea). Photobiont Dictyochloropsis, Stichococcus, Trentepohlia or Trebouxia.

Apothecia with short to long stalk; head globose to obconical; mazaedium pale brown to medium brown; thalline exciple absent; proper exciple \pm well developed, formed as a continuation of stalk tissue; stalk consisting of periclinally arranged brown hyphae. Paraphyses sparingly branched, continuing to grow into the ascospore mass. Asci cylindrical, ellipsoid or irregular, dissolving at an early stage, formed from ascogenous hyphae with or without croziers, either singly or in chains. Spores simple or rarely 1-5-septate, forming a dry brown spore mass, globose or ellipsoid-cylindrical, brown to pale brown; wall \pm thick, smooth or with an ornamentation of irregular cracks.

Pycnidia absent. Pulvinic acid derivatives occur as a pruina and more rarely within the thallus; sometimes also contain unidentified P+ yellow-red depsides or depsidones. Mainly on bark and wood, rarely on soil and rocks, mostly in very sheltered situations with high humidity and low light levels.

The inclusion of C. furfuracea in this genus rather than in Coniocybe, where it has been placed traditionally, is somewhat controversial. Purvis and James synonymize Cybebe under Chaenotheca.

Calicium differs in the black ascospore mass and exclusively ellipsoid ascospores; it also always has Trebouxia as photobiont. In Microcalicium the spore mass is greenish black or dark brown, and all the species are saprobes or grow on lichens.

1. Apothecia with a yellow pruina, at least below. Pruina (and thallus when bright yellow) with vulpinic acid. 2

1. Apothecia without a yellow pruina below, but sometimes with a reddish brown or whitish pruina. 9

2. Spores mainly ellipsoidal to subcylindrical. 3

2. Spores mainly spherical. 5

3. Thallus intensely yellow. Photobiont Trebouxia. Spores 5-6 x 2-3 μ m (6-9 x 4-5 μ m according to Purvis & James), non-septate. Thallus of

rounded, coarse granules, usually well developed, forming a continuous crust, more rarely immersed; granules ecorticate, \pm globose, K-, P-, C-, KC-

Apothecia 0.6-1.3 mm tall; stalk 0.04-0.08 mm diam., black to pale brown; capitulum obovoid or broadly obconical. Asci produced singly, cylindrical.

On bark and wood of conifers, birch and oaks. Maine;

elsewhere.C. chrysocephala (Turner ex Ach.) Th. Fr. [see Tibell 1996 for fuller description]

3. Thallus gray-green to olive yellow or immersed. Photobiont Stichococcus or unidentified chlorococcoid. Spores (Purvis & James) 5-8 x 3-3.5 μ m. 4

4. Photobiont Stichococcus, the cells ellipsoid or rectangular, < 10 μ m wide, in short chains; thallus \pm well-developed, greenish gray. Thallus usually distinct, covering surface, granular-verrucose, ecorticate, grayish green to green. Apothecia 0.4-1.6 mm tall; stalk black, with dense yellowish green pruina in upper part; capitulum broadly obovoid to lens-shaped; true exciple mostly well developed, with a dense, yellowish green pruina on lower side. Spores 5-7.5 x 2.5-3.5 μ m, ellipsoid, with coarse and irregular ornamentation when mature. On dry undersides and inside hollow trunks of deciduous trees. Maine; elsewhere. C. chlorella (Ach.) Müll. Arg. (synonym: C. carthusiae) [see Tibell 1996 for fuller description]

4. Photobiont cells rounded, 10-15 μ m diam., separate or in clusters (unidentified chlorococcoid). Thallus immersed, or \pm well-developed, granular-verrucose, olive-yellow; granules with distinct cortex, 8-15 μ m thick. Apothecia 0.9-1.9 mm tall; stalk 0.05-0.08 mm diam; capitulum obovoid-broadly obconical; true exciple well developed. Mature spores subcylindrical to cylindrical, often curved and with 1-3 septa, 6-15 x 2-3 μ m (5-8 x 3-3.5 μ m according to Purvis & James), with a roughly cracked surface. Asci produced singly, cylindrical. On bark in crevices of Fraxinus or Ulmus. Maine; elsewhere.C. laevigata Nád. v.

5. Thallus leprose, well developed, bright yellow green (vulpinic acid, pulvinic acid and pulvinic acid dilactone); photobiont Stichococcus, the cells elongate or rectangular, in short chains, transversely septate, the cells < 10 μ m wide. On soil or on roots, on surfaces protected from precipitation, in shaded humid crevices among tree roots and in rock underhangs, on soil banks sheltered by overhanging roots, or on upturned bases of large old coniferous trees in moist forests. Apothecia 1.6-2.7 mm tall, slender; head and stalk covered by a yellowish green pruina, black beneath. Spores 2-3 μ m, globose. Maine; Pacific NW; California; elsewhere. Some authors other than Tibell continue to treat this species under Coniocybe. C. furfuracea (L.) Tibell

5. Thallus grayish, greenish, or immersed. On bark or wood, not among tree roots or in crevices or overhangs. 6

6. Phycobiont Trentepohlia, with red-green contents, the walls thick. Thallus immersed (endophloedal or epixylic). Apothecia 0.5-1 mm tall; stalks slender and flexuose, black; capitulum obconical-obovoid; true exciple well developed. Spores (according to Purvis & James) 5-7.5 μ m diam. On dry, \pm acid bark and wood, especially tree bases. Maine; elsewhere.C. hispidula (Ach.) Zahlbr.
6. Photobiont Stichococcus or chlorococcoid; cells with bright green contents, the walls thinner. Thallus immersed or superficial. 7

7. Thallus immersed. Photobiont Stichococcus. Apothecia 0.4-1.4 mm tall; head and stalk covered in a dense yellow-green pruina; stalk black beneath; true exciple poorly developed; ascospore mass dark brown. Spores 3-3.5 μ m diam., globose, with a slightly cracked surface. Pruina with vulpinic and pulvinic acids. On dry bark in crevices of deciduous trees and wood of hollow trunks. C. brachypoda (Ach.) Tibell (syn. Coniocybe sulphurea auct.)

7. Thallus superficial (epiphloedal or epixylic), farinose. Photobiont belonging to the Chlorococcales, rounded, clustered or solitary, not transversely septate, the cells 10-15 μ m diam., 8

8. Thallus usually thick and well-developed, verrucose-squamulose, olivaceous green to grayish green; apothecia usually coarse, stout (0.5-1.2 mm), and with a rather short stalk; capitulum deep purple-brown to \pm brown orange when abraded; true exciple well developed. Phycobiont Trebouxia. Spores (according to Purvis & James) 5.5-7 μ m diam. On old worked timber, often forming extensive patches.C. phaeocephala (Turner) Th. Fr.

8. Thallus thin, light gray, consisting of small granules giving the thallus a sorediate appearance growing in small, diffuse patches. Apothecia rather small, with long and slender (mostly 0.05-0.07 mm diam.) stalks, (0.6-)0.8-1.3(-1.8) mm tall. Photobiont chlorococcoid. Thallus K-, C-, KC-, P-. Capitulum lenticular; excipulum well developed. Spores spherical, (5.4-)6.0-7.3(-8.7) μ m, uniseriate; surface becoming irregularly reticulately fissured, forming polygonal areas. Usually on bark of Picea or Thuja. West of the Rockies, 0-1600 m.C. subroscida (Eitner) Zahlbr.

9. Photobiont Stichococcus. Apothecia red-brown pruinose or faint to densely white pruinose. 10

9. Photobiont chlorococcoid. Apothecia without pruina or sometimes (C. brunneola) with white pruina. 15

10. Apothecia with a faint to dense red-brown pruina visible

particularly in young apothecia on underside of excipulum and upper part of stalk (quinonoid? pigment, dissolving in K and precipitating feather-like or plate-like, violet-red crystals. Stalk black, 1.5-3 mm long, slender (0.05-0.07 mm), often somewhat flexuous; capitulum lenticular to subglobose or spherical, 0.19-0.34 mm diam.; excipulum covering lower third, less distinct when old. Asci formed singly, cylindrical. Spores spherical (2.6-3.8 μ m diam.) to subglobose or broadly ellipsoid, Thallus immersed or superficial, greenish gray, K-, C-, KC-, P-. *C. gracillima* (Vainio) Tibell [see Tibell, 1996 for fuller description]

10. Apothecia without red-brown pruina, often with white pruina. 11

11. Thallus superficial, usually distinct and \pm granular. 12

11. Thallus immersed, or thin and leprose. 13

12. Apothecia slender, 13-24 x as high as the diameter of the stalks, of which the lower parts are not pale colored. Thallus usually distinct, granular-squamulose, often rather glossy, more rarely finely granular, greenish gray, forming a crust or restricted to small patches, but sometimes immersed; P-. Apothecia sometimes with faint white pruina, 1-1.9 mm tall; stalk black or sometimes brown, 0.05-1 mm diam.; capitulum obconical to lens-shaped; true exciple well developed. Asci formed in chains, shortly cylindrical or irregular. Spores 4-5 μ m diam., globose, smooth, with irregular, narrow cracks. Photobiont *Stichococcus*. In dry, acid bark crevices and on wood. Maine; elsewhere. *C. trichialis* (Ach.) Th. Fr. [see Tibell, 1996 for fuller description]

12. Apothecia rather robust, 6-10 x as long as diameter of the stalks, of which the lower half is \pm pale colored. Thallus superficial, warty-granular, grayish white. Photobiont *Stichococcus*. Apothecia 0.6-1 mm high; capitula obovate to obconic, with well developed exciple; underside with or without whitish pruinosity. Asci produced in chains. Spores 4.6-5.6 μ m, diam., smooth or with a few irregular cracks. Michigan, Ontario. On *Populus trichocarpa* in humid, old-growth forest in the Interior Cedar-Hemlock Zone, British Columbia. (In Europe the species grows predominantly on trunks of oak, but also on other deciduous trees in old parks and gardens, or on *Dryas* and moss cushions). *C. cinerea* (Pers.) Tibell (syn. *C. schaereri*)

13. Thallus immersed, sometimes visible as a greenish gray tinge.

True exciple well developed, cushion-like. Without substances.

Apothecia usually with a thick, white pruina on underside of excipulum and upper part of stalk, 0.9-1.5 mm tall; stalk 0.04-0.08 mm diam., black; capitulum obconical; Spores 3-4 μ m diam., globose, smooth, with regular, narrow cracks. Photobiont *Stichococcus*. On wood of old trees (alder, birch,

oak, pine). C. xyloxena Nádv.

13. Thallus thin, farinose. True exciple poorly developed. Asci produced in chains. 14

14. Spores 2.5-3 mm diam., very pale brown to colorless. Asci ellipsoid; croziers absent. Apothecia 2.5-3.5 mm tall. Thallus thin, farinose, grayish green. Photobiont Stichococcus. Apothecia 2.5-3.5 mm tall, with flexuous and slender stalks; stalks black, with grayish, granular pruina; lower surface of head and upper stalk with a faint, grayish white pruina; true exciple poorly developed. Asci formed in chains. Spores globose, with a slightly cracked surface. Unidentified substances. On dry bases of old maples and elms. Differs from the rest of Chaenotheca (and treated by Tibell under Cybebe) in lacking croziers and having pale spores. C. gracilentia (Ach.) Mattsson & Middleborg (syn. Cybebe gracilentia)

14. Spores 3.5-5 um diam., ± dark brown. Asci cylindrical or irregular; croziers present. Apothecia 0.8-1.4 mm tall; stalks 0.06-0.1 mm wide, the upper part whitish dull brown, the lower part brown-black; capitulum globose; lower side of exciple and upper part of stalk covered by a loose, whitish pruina-like hyphal collar. Thallus green to bluish green. Photobiont Stichococcus. Thallus P+ yellowish red, K-, KC-, C- (two unknowns). C. stemonea (Ach.) Müll. Arg. [See Tibell, 1996 for fuller description]

15. Thallus whitish gray, verrucose, often with yellow-orange to rusty areas (K+ deep red, due to quinonoid pigment).

Capitulum obovate or broadly to narrowly obconical, with thick, persistent excipulum. Apothecia often absent, 0.8-1.7 mm tall, without pruina; Photobiont Trebouxia, globose. Spores (Purvis & James) 5.5-7.5 um diam., the mass with yellowish K+ red pigment. On acid bark and wood. Maine; elsewhere. C. ferruginea (Turner ex Sm.) Mig. [see Tibell 1996 for fuller description]

15. Thallus endoxylic or granular gray-green, without yellow-red areas; capitulum subglobose. 16

16. Thallus endoxylic, more rarely poorly developed on surface and then finely granular-verrucose, ecorticate, P+ yellow, K-, KC-, C- (baeomycesic and squamatic acids). Excipulum poorly developed. Asci in chains. Apothecia 0.6-1.6 mm tall, without pruina, or appearing somewhat white pruinose on underside of capitulum; capitulum ± globose. Photobiont Dictyochloropsis or Trebouxia. Spores (Purvis & James) 3.5-4.5 um diam. On wood of coniferous and deciduous trees, rarely on bark or on polypore fungi. Maine; elsewhere. C. brunneola (Ach.) Müll. Arg.

16. Thallus epiphloedic or epixylic, granular, ecorticate, or sometimes immersed, P+ yellow to red, K-, C-, KC- (unknowns).

Excipulum well-developed. Asci formed singly. Thallus forming a \pm contiguous crust of minute, spherical granules, dull greenish gray. Photobiont belonging to the Chlorococcales. Apothecia 0.8-1.3 mm tall, stalk 0.06-0.12 mm diam., dull dark brown, epruinose; capitulum lenticular; excipulum 0.2-0.3 mm across, without pruina but often pale brown or almost white below; hypothecium broadly obconical with flat or convex upper surface. Asci cylindrical, 12-16 x 1.7-2.2 μ m, with 3-6 μ m long stalk. Spores spherical, 2.7-4.3 μ m diam., smooth, uniseriately arranged. On bark or wood of quite diverse types of woody plants, in oceanic areas; on Thuja plicata in British Columbia; on Sabal palmetto in Florida.C. hygrophila Tibell

C. brunneola (Ach.) Müll. Arg.

Thallus endoxylic, more rarely poorly developed on surface and then finely granular-verrucose, ecorticate, P+ yellow, K-, KC-, C- (baeomycesic and squamatic acids). Excipulum poorly developed {more or less well developed according to Tibell, 1996!}. Asci in chains.

Photobiont Dictyochloropsis or Trebouxia.

Apothecia 0.6-1.6 mm tall, 9-23 times as high as width of stalk. Stalk 0.05-0.1 mm diam., shining black, without pruina, or appearing somewhat white pruinose on underside of capitulum, sometimes branched and carrying 2-5 capitula; capitulum \pm globose. Excipulum formed as a continuation of the stalk tissue; excipulum edge short and turned outwards or better developed and with several layers of parallel or slightly intertwined hyphae. Hypothecium broadly obconical, with a strongly convex upper surface. Capitulum without pruina, but the lower side sometimes appears pruinose due to the presence of pale hyphae projecting from the surface of the excipulum. Asci of variable shape, estipitate, with uni- to biserially arranged spores, 11-13 x 2-3.5 μ m, produced in chains with hooks or cylindrical, well-stalked with uniseriate spores. Spores 3.4-4.6 μ m diam., spherical, smooth or with irregular fissures.

Thallus K-, C-, KC-, P+ yellowish red or P-. Baeomycesic and squamatic acids, unknowns, or no substances.

On wood of coniferous and deciduous trees, rarely on bark or on polypore fungi. Maine; elsewhere.

Literature

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