

Two new species of *Caliciopsis* (Coryneliaceae) from Hunan Province, China

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Two new species of *Caliciopsis* (Ascomycota, Coryneliales) are described from temperate broad-leaved forests in Hunan Province, China. *Caliciopsis toonae* Rikkinen was found in bark crevices on trunks of *Toona sinensis* and *Choerospondias axillaris*. *Caliciopsis rhoina* (Juss.) Roem. Rikkinen was found on branches and twigs of *Rhus chinensis*, being associated with cankers in the bark, and on trunks of *Toona sinensis*.

Key words: Ascomycota, *Caliciopsis*, *Choerospondias*, China, Hunan, *Rhus*, *Toona*

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The genus *Caliciopsis* Peck (Ascomycota, Coryneliales), is characterized by long stipitate, deliquescent asci and non-septate ascospores. It differs from other ostiolate genera of the Coryneliaceae in the production of an elevated ascigerous cavity and in having gelatinous tissue (*textura intricata*) in the core of the ascocarp (Fitzpatrick 1920, 1942a, b; Funk 1963; Benny et al. 1985a, b, c, d). The ascocarp is swollen in the region of the ascigerous cavity when viewed externally. Above the swelling, the ascocarp neck may be very short to several times as long as the diameter of the swelling. Thin-walled asci lack apical pores, and contain eight ascospores; there are no paraphyses. Ascospores released from evanescent asci are forced up through the neck of the ascocarp. This process is partly mediated by a hygroscopic swelling of the asci and gelatinous tissue within the centrum. Mature ascospores accumulate to form a dry mazaedium at the tip of the ascocarp. As in many other mazaedial fungi, the spores are probably dispersed mainly by insects and other invertebrates (Rikkinen & Poinar 2000).

Size, morphology, and habit of the ascomata, position and size of the ascigerous swelling, and the size, shape, and ornamentation of ascospores have been considered to be valid crite-

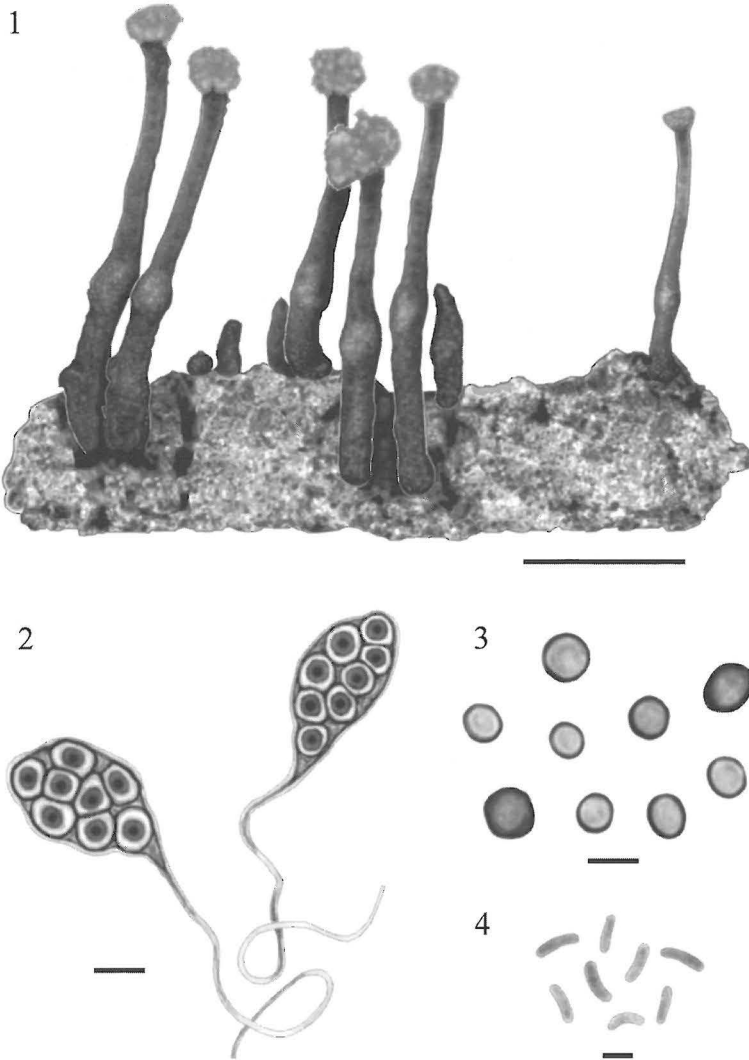
ria in distinguishing between species of *Caliciopsis*. In addition, Funk (1963) emphasized the desirability of corroborating morphological observations with cultural and pathogenity data whenever possible. The genus badly needs a world-wide revision, but unfortunately even relatively well-known species of the genus are poorly represented in major herbaria.

Several *Caliciopsis* species occur in temperate regions of Eurasia, North America, and South America, while others are restricted to tropical regions. All *Caliciopsis* species are either saprobic or parasitic on vascular plants. Some of them cause cankers or colonize tissues surrounding wounds in host plants, but they are not considered to be of major economic importance as plant pathogens. Species of *Caliciopsis* have been recorded from a wide variety of hosts, including species of *Abies*, *Chamaecyparis*, *Drimys*, *Elytranthe*, *Juniperus*, *Pinus*, *Podocarpus*, *Polypodium*, *Populus*, *Pseudotsuga*, *Quercus*, *Struthanthus*, *Symplocos*, *Tilia*, *Tsuga*, and *Xanthostemon* (Fitzpatrick 1942b; Benny et al. 1985a, d). Host specificity in the genus varies; while some *Caliciopsis* species are limited to single hosts, others can grow on plants of several genera within the same family.

During a recent expedition to northwestern Hunan, China (Sept–Oct 1999; Koponen et al. 2000), two undescribed *Caliciopsis* species were found growing on broad-leaved trees. One species was detected in bark crevices on trunks of *Toona sinensis* (Juss.) Roem. (Meliaceae) and *Choerospondias axillaris* (Roxb.) B.L. Burtt & A.W. Hill (Anacardiaceae), while the other species was mainly confined to cankered areas on branches of *Rhus chinensis* Mill. (Anacardiaceae). One collection of the latter species was also made on

the basal trunk of *Toona sinensis*. All three host trees are common in Hunan Province and of considerable economic importance in the area. The two new *Caliciopsis* species are described below.

Caliciopsis toonae Rikkinen, sp. nov. – Figs. 1–4
Ascomata dispersa vel gregaria, satis variabilia, vulgo 1.5–4.5 mm alta, nigra, recta vel curvata; loculo fertili submediano, 200–300 µm alta et 140–250 µm diam., apice rostro elonga-



Figs. 1–4. *Caliciopsis toonae*. – 1: Ascomata. Bar = 1.0 µm. – 2: Asci. Bar = 5.0 µm. – 3: Ascospores. Bar = 5.0 µm. – 4: Conidia. Bar = 2.0 µm.

to attenuato, 90–140 μm diam. Asci clavati, octospori, evanescentes. Ascosporae globosae vel subglobosae, hyalinae deinde brunneae, laeves, 3.5–5.0 μm diam. Pycnidia solitaria vel laxe aggregata, globosa, ostiolata, atra, usque ad 150 μm diam. Conidia eseptata, allantoidea, hyalina, 2.5–4.5 \times 0.7–1.5 μm . Hab. *Toona sinensis* (Juss.) Roem. (Meliaceae) et *Choerospondias axillaris* (Roxb.) B.L. Burt & A.W. Hill (Anacardiaceae).

Typus: China. Hunan Province. Dayong Co.: Wulingyan World Heritage Area, Zhangjiajie Village, Old-House Field, on basal trunk of solitary *Toona sinensis* by footpath through rice paddies. 29°16'N, 110°26'E, elev. 750 m, 18 Sept 1999 J. Rikkinen 990296 (holotypus, H; isotypi F, HMAS, Herb. of Hunan Forest Botanical Garden).

Ascomata dispersed or gregarious, variable in size, usually large, 1.5–4.5 mm high, black, straight or curved, with a submedian ascigerous swelling (loculus), 200–300 μm high and 140–250 μm diam., the upper part attenuated to an elongated beak, 90–140 μm diam. Asci clavate, eight-spored, evanescent. Ascospores globose or subglobose, at first hyaline, later becoming brown, smooth, 3.5–5.0 μm diam. Pycnidia solitary or in loose groups, globose, ostiolate, black, about 150 μm diam. Conidia non-septate, allantoid, hyaline, 2.5–4.5 \times 0.7–1.5 μm . On *Toona sinensis* (Juss.) Roem. (Meliaceae) and *Choerospondias axillaris* (Roxb.) B.L. Burt & A.W. Hill (Anacardiaceae).

Caliciopsis toonae belongs to a group of *Caliciopsis* species with relatively large, 1–4 mm high, ascomata. It produces submedian or basal ascigerous swellings, similar to those in *C. calicioides* (Ellis & Everh.) Fitzp. However, *C. calicioides* is readily distinguished from *C. toonae* by its large, ellipsoid to subfusiform ascospores. Morphologically, *C. toonae* is quite close to *C. subcorticalis* (Ellis & Everh.) Fitzp. and *C. tiliae* Arnaud. All three taxa share the habit of often growing deep in bark crevices and producing relatively large, curved ascomata, which frequently wind through cracks in bark to reach the surface. However, the ascigerous locules of the latter two species are subterminal to terminal, and their ascomata are frequently forked or bearing lateral branches. Some variation in the position of ascigerous swellings may be environmentally in-

duced, as ascomata of *C. toonae* growing deep in bark crevices tend to produce more central locules than those growing on smooth bark. However, subterminal to terminal ascigerous swellings have not been observed in *C. toonae*. It also differs from the two other species in producing larger, stouter, and more rigid ascomata, and in host range; *C. subcorticalis* has only been collected on *Quercus* and *C. tiliae* on *Tilia*. The ascospores of *C. toonae* and *C. subcorticalis* are very similar, subglobose and relatively small. In this context one could point out that some European and North American collections cited under *C. subcorticalis* by Fitzpatrick (1920, 1942) are far from being identical and may not represent one taxon (specimens examined: Zwackh, Lich. exs. 477, H-NYL 40611 as *Calicium ephemereum*; Ellis & Everhart, N. Am. Fungi 2123, H as *Hypothecca subcorticalis*). Apparently Fitzpatrick (1920) did not see a specimen of the material distributed by Zwackh, but based the synonymy on Rehm (1896).

Caliciopsis tiliae has larger, more ellipsoidal ascospores than *C. toonae* and *C. subcorticalis*. Also all other *Caliciopsis* species with relatively large ascomata and globose or ovoid ascospores, i.e., *C. confusa* Bat., *C. symploci* Fitzp., and *C. quercina* Marm., produce larger spores than *C. toonae*. Their host ranges are also quite different, including fruits of *Myrsine africana*, leaves of *Symplocos obtusa*, and wasp galls on oak twigs, respectively (Fitzpatrick 1942; Benny et al. 1985d; Marmolejo 1999). *Caliciopsis toonae* has so far been collected on trunks of *Toona sinensis* and *Choerospondias axillaris*. The only other *Caliciopsis* species known to attack related trees is *C. rhoina*. The later fungus is readily distinguished from *C. toonae* by its much smaller ascomata with subapical ascigerous swellings. The asci and ascospores of both species are quite similar, with the spores of *C. toonae* maybe exhibiting a slightly wider range of sizes and stronger tendency to become subglobose or slightly angular.

Additional specimens examined: Hunan Province. Dayong Co.: Wulingyan World Heritage Area, Zhangjiajie National Forest Park, Matianya. On basal trunk of large *Choerospondias axillaris* on mountain slope. 29°19'N, 110°27'E, elev. 900 m, 16 Sept 1999 J. Rikkinen 990132–990138 (H; Herb. Hunan Forest Botanical Garden). On felled logs of *Toona sinensis* by road-side on mountain slope. J. Rikkinen 990158, 990159 (H; Herb. Hunan Forest Botanical Garden). Zhangjiajie National Forest Park, Below Zhangjiajie Hotel. On basal trunk of

mature *Toona sinensis* in small opening in riparian forest. 29°19'N, 110°25'E, elev. 630 m, 16 Sept 1999 *J. Rikkinen 990177* (H; Herb. Hunan Forest Botanical Garden).

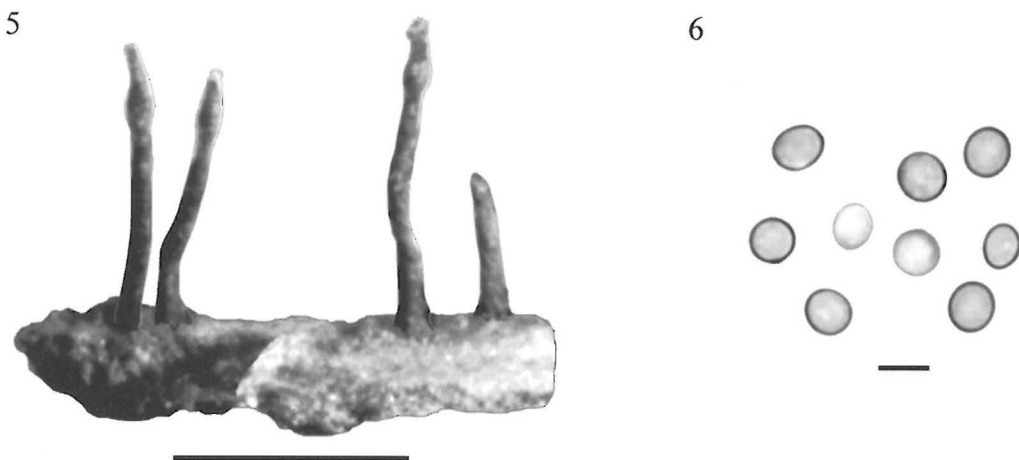
Caliciopsis rhoina Rikkinen, sp. nov. – Figs. 5–6
Ascomata dispersa vel laxe aggregata, 0.7–1.4 mm alta, nigra, recta, cum basi usque ad 100 µm diam; loculo fertili subrostrali vel mediano, 180–230 µm alto et 120–130 µm diam. Asci clavati, octospori, evanescenti. Ascospores globosae, hyalinae deinde brunneae, laeves, 4.0–5.0 µm diam. Hab. Rhus chinensis Mill. (Anacardiaceae) et Toona sinensis (Juss.) Roem. (Meliaceae).

Typus: China. Hunan Province. Sanzi Co.: Badagongshan National Nature Reserve. Yangjiatai, on lower branches of *Rhus chinensis* in open mixed forest. 29°45,7'N, 110°02,9'E, elev. 1400 m, 29 Sept 1999 *J. Rikkinen 991084* (holotypus, H; isotypi F, HMAS, Herb. of Hunan Forest Botanical Garden).

Ascomata dispersed or in loose groups, 0.7–1.4 mm high, black, straight, about 100 µm diam. at the base. Ascigerous swelling subapical or median, 180–230 µm high and 120–130 µm diam. Asci clavate, eight-spored, evanescent. Ascospores globose, at first hyaline later becoming brown,

smooth, 4.0–5.0 µm diam. Pycnidia not seen. On *Rhus chinensis* Mill. (Anacardiaceae) and *Toona sinensis* (Juss.) Roem. (Meliaceae).

Caliciopsis rhoina is characterized by medium size, production of subapical ascigerous swellings (usually laterally collapsed in dry specimens), and globose, relatively small spores. Young ascocarps are terminated by short tapering beaks, while older ascomata have dry, brownish mazaedia. In their general habit, the ascomata of *C. rhoina* are very similar to those of *C. orientalis* A. Funk and *C. pseudotsugae* Fitzp. However, both of these species have ellipsoidal ascospores, and grow on coniferous hosts. With regard to other similar species, *C. clavata* (Lev.) Fitzp. and *C. confusa* Bat. produce larger ascospores than *C. rhoina*, while the spores of *C. myrticola* Hug. and *C. thujina* (Ellis & Everh.) Fitzp. are smaller. *C. rhoina* has been collected on dead or dying branches of *Rhus chinensis* where it grew associated with conspicuous, rough cankers in the bark. The cankers are perennial, and the associated fungus is clearly capable of producing ascomata during more than one season. One collection of *C. rhoina* was made on the trunk of *Toona sinensis*, where it grew together with *C. toonae*. In this case there was no



Figs. 5–6. *Caliciopsis rhoina*. – 5: Ascomata. Bar = 1.0 µm. – 6: Ascospores. Bar = 5.0 µm.

obvious association with a cankered area. *C. toonae* is readily distinguished from *C. rhoina* by much larger ascomata with basal or submedian ascigerous swellings. As *C. rhoina* and *C. toonae* are not restricted to only one host species, they may as well occur also on other trees in the Sapindales/Rutales-complex.

Additional specimens examined: Dayong Co. Wulingyan World Heritage Area, Zhangjiajie National Forest Park, Matianya, on felled log of *Toona sinensis* by road-side on mountain slope. 29°19'N, 110°27'E, elev. 950 m, 16 Sept 1999 *J. Rikkinen 990159* (H).

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