A new species and new records of *Cercophora* from Argentina

Myriam del Valle Catania
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**Abstract:** Three species of *Cercophora* were found during a survey of the biodiversity of microfungi in northwest Argentina. *Cercophora argentina* possesses a unique combination of morphological characters and is described as a new species, while *C. costaricensis* and *C. solaris* are reported as new records for Argentina. Other species of *Cercophora* known from this region include *C. natalita* and *C. coprogena*, which is fully illustrated for the first time and determined herein to be a synonym of *C. californica*. All other species are described and illustrated.

**Key words:** Lasiosphaeriaceae, *Podocarpus parlatorei*, *Sambucus nigra*, Sordarioides, systematic, Yungas

**INTRODUCTION**

*Cercophora* Fuckel is characterized morphologically by large, membranaceous to carboxenous, ostiolate, papillate ascomata; ascii with an apical ring usually with a subapical globule and ascospores with a brown, swollen head and a hyaline pedicel at maturity. Its with a subapical globule and ascospores with a brown, papillate ascomata; asci with an apical ring usually large, membranaceous to carbonaceous, ostiolate, and ascospores are made on material mounted in distilled water, 5% KOH and phloxine with either an Olympus CX51 microscope and Olympus SP–350 digital camera or a Zeiss Axioskop microscope and a Dage MTI video camera. Material mounted in calcofluor (Romero and Minter 1988) was examined by epifluorescence (EF) microscopy with a Zeiss Axioplan to observe ascospores ac-
and apical rings in the asci. Drawings were made with a camera lucida.

Attempts were made to culture these species. Ascospores were removed from ascomata with a sterile needle and transferred to Petri plates containing potato dextrose agar (PDA) (Hawksworth et al. 1995). They were incubated under laboratory conditions with approximately 12 h fluorescent light per day at 25 C. No cultures were obtained due to lack of ascospore germination.

RESULTS AND DISCUSSION

Cercophora argentina Catania, A.I. Romero, Huhndorf & A.N. Mill., sp. nov. Figs. 1–20

Ascomata perithecialia ovalia, 750–900 × 450–500 μm, superficia; collum cilindricum vel conicum, leviter curvatum, nigrum, glabrum. Peridium membranaceum, brunneum, tristratosum, cellulis cum poris Munki. Asci 8–sporii, annulo apicali haud profundo, simplici; globulus subapicalis absens. Ascospora in statu hyalino unicellularis, annulo apicali haud profundo, simplici; globulus brunneum, tristratosum, cellulis cum poris Munki. Asci 8-curvatum, nigrum, glabrum. Peridium membranaceum, m

MycoBank MB519727

Etymology: Refers to the type country.

Ascomata perithecialia ovalia, 750–900 × 450–500 μm, numeros, in small groups or densely crowded, superficialis; neck cylindrical to conical, slightly bent, dark brown to black, glabrous; subiculum sparse at the base, composed of branched, pale to dark brown hyphae, 3–5 μm diam, thick-walled, septate. Ascomatal wall of textura angularis in surface view, cells thick-walled, irregular, brown cells, 5–9 μm diam; middle layer 72–90 μm thick, composed of thick-walled, irregular, brown cells, 5–9 μm diam; middle layer 72–90 μm thick, composed of thin-walled, isodiametric to rectangular, hyaline to pale brown cells, 12–14–(27) μm diam; inner layer 13–17 μm thick, composed of elongate, thin-walled, brown cells, 13–26–(35) × 4–5 μm. Asci cylindrical, part sporifera 150–240 × 12–18 μm, long–stipitatae, stipe 45–78(–96) μm long, unitunicate, ring narrow, shallow, refractive; subapical globule absent; with eight biseriate ascospores. Paraphyses hyaline, numerous, septate, 2–3 μm diam. Ascospores cylindrical, ends rounded, (58.5–)61–73 × (–4)5–6.5 μm, slightly sigmoid or geniculate, hyaline, aseptate, with granulate content; with bipolar appendages, up to 55 μm long, hyaline, appendages generally collapse and disappear with age; ascospore becoming differentiated into a swollen head and pedicel, transversely uniseptate; head clavate to elliptical, aseptate or with a transverse septum in the middle or slightly below the middle, 18–22 × 9.0–12 μm, truncate at the base, hyaline, becoming pale yellow to dark brown; pedicel 35–50 × 4.5–5 μm, 0–3(4–) septate, hyaline to pale brown, with granulate content and numerous oil drops.

Anamorph: unknown.

Habitat: on fallen branch of Sambucus nigra ssp. peruviana (Kunth) Bolli. This species belongs to the family Caprifoliaceae and is a native shrub or tree in Argentina occurring at 1500–2000 s.l.m, in several provinces including northwestern Catamarca, Jujuy, southwestern Neuquén and Tucumán (Zuloaga and Morrone 1999).

Geographic distribution: Argentina (Tucumán).

Material examined: ARGENTINA, TUCUMAN: Dpto. Tafí del Valle, La Heladera, 1300 s.l.m, 27°01′20″S, 65°39′10″W, 20–IV–2006, Hladki 2945, on stem of Sambucus nigra l.ssp. peruviana (HOLOTYPE LIL; ISOTYPE IILS 60485).

Cercophora argentina occurs on wood and possesses a non-areolate peridium with Munk pores and ascospores, 61–73 × 5–6.5 μm. Cercophora appalachia–nensis O. Hilber & R. Hilber and C. californica are two other species of Cercophora that are reported to have Munk pores in the peridial cells. However both are different from C. argentina. Cercophora appalachia–nensis possesses ascomata covered by long hairs, smaller ascospores, 37–48–(68) × 3.5–4.5 μm, and shorter ascospore appendages (Hilber et al. 1987), while C. californica, on dung, possesses an areolate ascomatal wall and longer ascospores (75.5–95 μm), although the original description incorrectly describes the ascospores as being 30–35 μm long (Plowright 1878). Molecular studies have shown that many genera in the Sordariales, including Cercophora, are polyphyletic (Miller and Huhndorf 2005). This new species is proposed within the genus based on morphological characters.

Cercophora californica (Plowr.) N. Lundq., Symb. Bot. Upsal. 20:106, 1972.

= Sordaria californica Plowr., Grevillea 7:72, 1878.

= Cercophora coprogena (Speg.) N. Lundq., Symb. bot. Upsal. 20:105, 1972.

= Podospora coprogena Speg., Bol. Acad. Nac. Ci. (Córdoba) 25:50, 1921.

Figs. 21–40

Ascomata ovoid to obpyriform, dark brown, firm consistency (cartilaginous), papillate, 600–900 μm diam, 850–1000 μm tall, numerous, clustered in large groups, immersed becoming erumpent; surface roughened; neck conical, deeply 7–8-sulcate, distinct; subiculum absent. Ascomatal wall weakly areolate in surface view; 60–70 μm thick in longitudinal section, two-layered, composed of thick-walled scleroplectenchymatous to pseudoparenchymatous cells, with an inner, hyaline layer with numerous Munk pores and an outer, unevenly brown pigmented layer. Ascomatal apex without apparent periphyses. Paraphyses
Figs. 1–9. *Cercophora argentina* sp. nov. (Holotype LIL Hladki 2945). 1. Ascomata on substrate. 2. Subiculum hairs. 3. Surface view of ascomal wall, cells with Munk pores. 4. Longitudinal section through ascomal wall. 5. Ascus with young ascospores. 6. Ascus with mature ascospores. 7. Young ascospores. 8. Ascospores with appendages. 9. Mature ascospores. Bars: 1 = 0.5 mm, 2–9 = 10 μm.
Figs. 10–20. *Cercophora argentina* sp. nov. (Holotype LIL Hladki 2945). 10–11. Ascomata on substrate. 12. Surface view of ascomal wall, cells with Munk pores. 13. Asci and paraphyses. 14. Ascus, plus detail of apex with EF (inset). 15. Ascus. 16–17. Ascospore with appendage (arrow) (EF). 18–19. Ascospores in different stages of development. 20. Mature ascospore. Bars: 10 = 1 mm; 11 = 0.5 mm; 12, 16–17 = 5 μm; 13–14 = 25 μm; 15, 18–20 = 10 μm.
filiform, 3–4 μm wide, abundant, septate, unbranched, persistent. Asci cylindrical, spore-bearing part 250–350 × 20–30 μm, numerous, uniseriate, thin-walled, apex blunt; ring narrow, shallow; subapical globule present; with eight biseriate ascospores. Ascospores cylindrical, ends rounded, slightly sigmoid, hyaline, aseptate; becoming differentiated into a swollen head and pedicel and transversely uniseptate; 70–90(–95) × 6–10 μm, head ellipsoid, 30–35 × 14–16 μm, conical at the apex, truncate at the base, hyaline to dark brown; bipolar appendages present, 20–40(–80) μm, gelatinous, lash-like.

Material examined: CHILE. Los Perales, 1918, on cow dung, C. Spegazzini 6856 (HOLOTYPE of *P. coprogena*, LPS). USA. CALIFORNIA, on cow dung, H.W. Harkness 513 (K(M): 68745, HOLOTYPE of *S. californica*, K; ISOTYPE, NY).

*Cercophora californica* appears to be the same as *C. coprogena*, which is a younger name and therefore a
synonym. Both species occur on cow dung with C. californica known only from the type collection from California, USA, and C. coprogena known only from the type collection from Chile. In both species the ascomata are large and obpyriform with a distinctly sulcate neck (Figs. 21, 35). The neck appears erumpent through a crusty surface on the dung with the entire ascomata eventually becoming erumpent (Figs. 22, 34). In both species the ascomatal wall in surface view is weakly areolate (Figs. 23, 36). The cells are arranged in a circular pattern around a central darkened area but are not sufficiently distinct to crack into plates along the lines of the thin-walled hyaline cells. Also present is an uneven brown pigmentation in the outer wall lines of the thin-walled hyaline cells. Also present is sufficiently distinct to crack into plates along the pattern around a central darkened area but are not dioid (Miller 2003) putatively similar to the walls dioid (Miller 2003) putatively similar to the walls of C. albicollis.

Ascomata perithecial ovoid, papillate, (350–)400–500 µm high, 300–400 µm diam, numerous, gregarious, occasionally separated, superficial; surface rugose or granulate; neck conical, black, glabrous; subiculum sparse at the base, composed of brown hyphae, 3–4.5 µm diam, thick-walled, sepa
tate. Ascomatal wall of textura angularis in surface view, cells thick-walled, radially arranged around a darker center; in longitudinal section three-layered, 90–123.5 µm wide; outer layer 10–19(–25) µm thick, composed of thick-walled, dark brown cells, 5–8 µm diam; middle layer 52–81(–84.5) µm thick, composed of thick-walled, gelatinized, hyphae, heman ca. 1.5–2 µm; inner layer 13–15(–17) µm thick, composed of elongate, hyaline to pale brown cells, 9–15 × 1–2 µm. Ascii cylindrical, 135–186 × 13–16 µm, long-stipitate, stipe 30–66 µm long, numerous, unitunicate, thin-walled, apex truncate; ring narrow, shallow, refractive; subapical globule absent; with eight bisericate ascospores. Paraphyses not seen. Ascospores cylindrical, ends rounded, 40–49 × 4–5 µm, slightly sigmoid or geniculate, hyaline, aseptate, plasmatic content granulate; with bipolar appendages, up to 20 µm long, becoming differentiated into a swollen head and pedicel, transversely uniseptate; head elliptical, ovoid, aseptate, 18–22 × 8–9(–10) µm, subacute to rounded at the apex, truncate at the base, hyaline to dark brown, with one or two oil drops; pedicel 22–27 × 4–5 µm, hyaline; appendages disappear with age.

Anamorph: unknown.

Habitat: on wood of fallen branch.

Geographic distribution: Argentina (Tucumán), Costa Rica (Hilber and Hilber 1979), Venezuela (Portuguesa).

Material examined: ARGENTINA: TUCUMÁN: Depto. Tafí Viejo, Parque Biológico Sierra de San Javier, Cumbres de Taficillo, Las Mentas, in forests of Podocarpus parlatorei, 1600 s.m, 26°42′820″, 65°19′530″O, 24–V–1999, Catania 1669 (LIL, ILLS 60486). VENEZUELA: PORTUGUESA: road between La Estacion and Santa Rosa del Guache, approx 3 mi S Santa Rosa, 16–I–1993, S.M. Huhndorf, et al., 368 (F).

Our material agrees with the description by Hilber and Hilber (1979), except for the smaller size of the ascospore appendages (material studied by Hilber and Hilber were 35 µm long, while material by Carroll and Munk [1964] were up to 100–200 µm long). However, as pointed out by Lundqvist (1972), measurements of these structures can vary greatly, depending on the amount of pressure placed on the cover slip at the time of slide preparation. The most striking feature of this species is the ascomal peridium, which was termed pseudo-bombaridoid by Lundqvist (1972) and Miller (2003) because the ascomal wall is non-stromatic. The pseudo-bombaridoid wall has been described in nine species in three genera of Lasiosphaeriaceae, Arnium ontariense (Cain)
J.C. Krug & Cain; *Cercophora albicollis, C. costaricensis, C. elephantina, C. palmicola* Hanlin & Tortolero, *C. scortea, Podospora appendiculata* (Auersw. ex Niessl) Niessl, *P. fimiseda* (Ces. & de Not.) Niessl, and *P. perplexans* (Cain) Cain (Carroll and Munk 1964, Furuya and Udagawa 1972, Lundqvist 1972, Hilber and Hilber 1979, Hanlin and Tortolero 1987, Bell and Mahoney 1997).

The morphology of the pseudo-bombardioid wall is slightly homoplasious in the Sordariales and it appears to have arisen independently in two distantly related groups, although relationships among these
groups were unsupported at that time according to Miller and Huhndorf (2005). They also pointed out that “while ascospore morphology cannot be used for delimiting genera, ascomal wall morphology alone or in combination with other characters is still useful at some level for distinguishing taxa”.

Cercophora natalitia (Speg.) N. Lundq., Symb. Bot. Upsal. 20:94, 1972.

Cercophora natalitia (Speg.) N. Lundq., Symb. Bot. Upsal. 20:94, 1972.

C. natalitia does not exist anymore. Today the locality (L.) Moq. (Cercophora natalitia (Speg.) N. Lundq., Symb. Bot. Upsal. 20:94, 1972). Ascomata obpyriform, dark brown, erumpent with the papillate ostioles visible, scattered, membranaceous, 250–300 μm diam, 310–350 μm high, numerous, covered with flexuouss, branched, septate, golden brown, 2–2.5 μm thick hairs; neck short, stout, darker brown than the rest of the peridium. Ascomatal wall of textura angularis in surface view; in longitudinal section two-layered, 20–40 μm thick, composed of pseudoparenchymatous cells, 3–5 × 7–10 μm. Paraphyses filiform, abundant, septate, unbranched, persistent. Ascis cylindrical, not possible to measure, numerous, unitunicate, thin-walled, apex blunt; ring not seen, subapical globule present; with eight biseriate ascospores. Ascospores becoming differentiated into a swollen head and pedicel, head 15–19 × 8–10 μm, conical at the apex, truncate at the base, pedicel hyaline, 4–6 × 30–40 μm, with a single appendage observed, although possibly bipolar, gelatinous, lash-like.

Material examined: ARGENTINA. BUENOS AIRES (FEDERAL CAPITAL), Recoleta, 20–IV–1880, on trunk of Pircuencia dioica (L.) Moq. (= Phytolacca dioica L.), C. Spegazzini (HOLOTYPE LPS 6841).

Lundqvist (1972) said “Cercophora natalitia is very close to the lignicolous Cercophora caudata (Curt.) N. Lundq., which differs by its short caudae and more pronounced swollen cells and hairs on the neck” (according to annotation label when Lundqvist examined Spegazzini’s collection). He also pointed out (1972: 94) “this species differs mainly by up to 55 μm long gelatinous caudae and a simple, narrower (3 μm) apical ring”. Cercophora aquatica P. Chaudhary, J. Fourn. & A.N. Mill. (Chaudhary et al. 2007) is similar to C. natalitia in that both share aquatic habitats, but the former can be distinguished by its areolate ascomatal wall, lack of a subapical globule and double ascus apical ring. Cercophora natalitia is distinguished from C. argentina by its mostly immersed ascomata with ascomatal hairs and a short, stout neck, and the presence of a subapical globule.

The habitat in the locality where Spegazzini found C. natalitia does not exist anymore. Today the locality is a tourist neighborhood in the middle of Buenos Aires. To look for this species today, one might search along the marginal forest on the Rio de La Plata north or south of the city.

Cercophora sol ein (Cooke & Ellis) R. Hilber & O. Hilber, Z. Mykol. 45:221, 1979.

= Sphaeria sol ein Cooke & Ellis, Grevillea 5:1876.

= Lasiosphaeria sol ein (Cooke & Ellis) Sacc., Syll. Fung. 2:2002, 1883.

= Thaxteria sol ein (Cooke & Ellis) Höhn, Ann. Mycol. 16:75, 1918.

Ascomata globose to subglobose, papillate, (300–)400–500 μm high, 300–450 μm diam, numerous, gregarious, superficial; surface rugose, short; neck sulcate or glabrous, black; subiculum sparse at the base, composed of branched, brown hyphae, 3–4.5 μm diam. Ascomatal wall areolate in surface view, irregular, carbonaceous, composed of dark brown to black, erect thin-walled, rectangular cells radially arranged around dark brown cells, up to 21 μm diam; in longitudinal section three-layered, 50–80 μm wide; outer layer 4–12.5 μm thick, composed of brown cells; middle layer 14–22 μm thick, composed of irregular, dark brown to black cells; inner layer 6.5–18.5 μm thick, composed of elongate, thin-walled slightly colored ascus. Ascis cylindrical, 110–127.5 × (−9)10–12 μm, unitunicate, thin-walled, apex truncate; ring narrow, shallow, refractive; subapical globule absent; with 8 biseriate ascospores. Paraphyses hyaline, numerous, septate, branched. Ascospores cylindrical, ends rounded, 19–25 × 4–4.5 μm, slightly sigmoid or geniculate, hyaline, aseptate, sometimes with 1–2-septate, without bipolar appendages, germination by germ tubes; becoming differentiated into a swollen head and pedicel, transversely uniseptate; head elliptical, truncate at the base, aseptate, 10–12(−13) × 5–6.5 μm, dark brown; pedicel 8–10(−12) × 3–4 μm, hyaline, collapsing.

Anamorph: Mammaria echinobotryoides Cesati, and a phialohora-like synanamorph, were obtained in culture by Samuels (pers comm in Barr 1990), from ascospores of Cercophora sol ein.

Habitat: on bark and wood of fallen branch.

Material examined: ARGENTINA. TUCUMAN: Depto. Tafi Viejo, Parque Biologico Sierra de San Javier, Cumbres de Taficillo, Las Mentas, in forests of Podocarpus parlatorei, 1600 s.l.m; 26°42′38″0′′S, 65°19′30″0′′W, I–III–1999, Catania 1326 (LIL); ibid., 24–V–1999, Catania 1664 (LIL, ILLS 60487).

Geographic distribution: Argentina (Tucuman); Germany, USA (Hilber and Hilber 1979); New Zealand (Pennycook and Galloway 2004) and Taiwan (Hsieh et al. 2000).

Our material agrees with the description by Hilber and Hilber (1979). This species possesses a weakly areolate wall, as in C. californica, but is easily distinguished by its short, comma-shaped ascospores. Only one other species of Cercophora, C. spinosa (Harkn.) M.E. Barr, possesses similarly shaped ascospores, but this species can be separated by its thick-walled setae on the ascomata and its shorter ascospores (11–12 vs. 19–25 μm) (Barr 1993). Although not commonly collected, C. sol ein appears to have a wide geographical distribution because ITS
Figs. 49–60. *Cercophora natalitia* (Holotype LPS 6841). 49. Macroscopic view of the type. 50. Spegazzini’s drawing on the front of the envelope. 51. Ascoma. 52–53. Ascomata immersed in the substratum and covered by sediments. 54, 56. Longitudinal section of an ascoma. 55. Ostiole surrounded by darker cells, with ascospore being released. 57. Surface view of the peridium with hairs. 58. Young ascus; note the subapical globule (arrow) and a gelatinous cauda (arrow). 59, 60. Ascospores. Bars: 49 = 1.5 cm; 51 = 150 μm; 52 = 1 mm; 53 = 0.2 mm; 54 = 50 μm; 55, 56 = 20 μm; 57 = 25 μm; 58–60 = 10 μm.
Fig. 61–69. *Cercophora solaris* (LIL Catania 1326). 61. Ascomata on substrate. 62. Subiculum hairs. 63. Surface view of ascomal wall. 64. Longitudinal section through ascomal wall. 65. Ascus with young ascospores. 66. Ascus with mature ascospores. 67. Young ascospores. 68. Ascospores with germ tube. 69. Mature ascospores. Bars: 61 = 0.5 mm, 62–69 = 10 μm.
and LSU sequences generated from specimens from New Zealand and USA differ by only a few base pairs (Miller pers data). Multiple attempts to sequence Argentinian material (Catania 1664) of *C. solaris* failed (Miller pers comm). Previous hosts given for this species were angiosperms (*Acer* sp. and *Populus* sp.), thus this is the first time *C. solaris* is reported on a gymnosperm.
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