

Apodospora, a new genus of the Sordariaceae¹

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Apodospora is a new coprophilous genus of the Sordariaceae with dark, ostiolate perithecia. The eight-spored ascus has a conspicuous thickened ring in the apex. The asci are mixed with abundant filiform paraphyses. The ascospore has one dark cell and no hyaline cells. They are surrounded by a gelatinous sheath and have a single apical germ pore. The three new species described and illustrated are *A. simulans* (type of genus), on moose dung, Ontario, Alberta, Idaho, and South Dakota; *A. thescelina*, on rabbit dung, Wyoming; and *A. viridis* on rabbit dung, Mexico.

Descriptions

Apodospora Cain & Mirza gen. nov.

Saprophytic, coprophilous. Peritheciis nigris, immersis vel partim immersis, ostiolatis, glabris, astromatibus. Peridio perithecii membranaceo, pseudoparenchymatico. Ascis octosporis, in fasciculo parallelo ad basem cavi singuli in perithecio alligato dispositis, annulo incrassato conspicuo in apice praeditis. Ascosporis ellipsoideis, una cellula praeditis, nigris, strato continuo gelatinoso circumventis, sine appendicibus. Foramine germinali rotundo, in apice sito.

Saprophytic, coprophilous. Perithecia black or yellowish green, immersed or partly immersed, ostiolate, bare, non-stromatic. Peridium membranaceous, pseudoparenchymatous. Asci eight-spored, arranged in parallel fascicle attached at base of single cavity in perithecium, with conspicuous thickened ring in apex. Paraphyses filiform, abundant, mixed with asci. Ascospores

ellipsoid, one-celled, black, surrounded by gelatinous sheath which is continuous over the germ pore, without appendages. Germ pore circular, apical.

TYPE SPECIES: *Apodospora simulans* Cain and Mirza

ETYMOLOGY: *a* = away from. *Podospora* = a genus having appendaged ascospores.

This genus resembles *Triangularia* Boedijn but differs from it essentially in the absence of the hyaline cell at the base of the ascospore. Both genera belong in the family Sordariaceae. The apical ring in the ascus of the species of *Apodospora* is conspicuous, resembling that in species of *Sordaria* (Rob.) Ces. & de Not. in this respect. The two genera differ in the structure of the paraphyses, the continuity of the gelatinous sheath, and the position of the germ pore. In species of *Sordaria* there are no slender filiform paraphyses mixed with the asci, and the gelatinous sheath does not cover the basal germ pore.

KEY TO THE SPECIES

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| 1. Perithecia greenish. Ascospores more than 33 μ in length..... | 3. <i>A. viridis</i> |
| 1. Perithecia not greenish. Ascospores less than 33 μ in length..... | 2 |
| 2. Ascospores oblong-ellipsoidal, 20-25 \times 9-11 μ | 1. <i>A. simulans</i> |
| 2. Ascospores ovoid-ellipsoidal, 24-32 \times 15-19 μ | 2. <i>A. thescelina</i> |

1. *Apodospora simulans* Cain & Mirza sp. nov.

Figs. 1-9

Peritheciis nigris, immersis vel parte superiore turbinata inter fibras substrati erumpente praeditis, dispersis vel in parvas uvas laxae congregatis, 500-600 \times 400-450 μ , late piriformibus vel subglobosis, levibus, glabris praeter tenues fibras

hypharum perithecia ad fibras substrati alligentibus superne constrictis, collo brevi, crasso, turbinato, ostiolato, 33 μ diametro in apice praeditis. Peridio perithecii valde rubido-brunneis, crasso 25-40 μ , membranaceo vel leviter coriaceo, forma cellularum haud clara praeditis cellulis in parte inferiore peridii tenuissimis parietibus praeditis, angulatis, rubido-brunneis, 5-15 μ diametris. Cellulis in parte superiore angulatis, polygoniis, in scutulis cingulis angustis linearium cellularum disjunctis dispositis, parietibus aliquantulum incrassatis praeditis, valde

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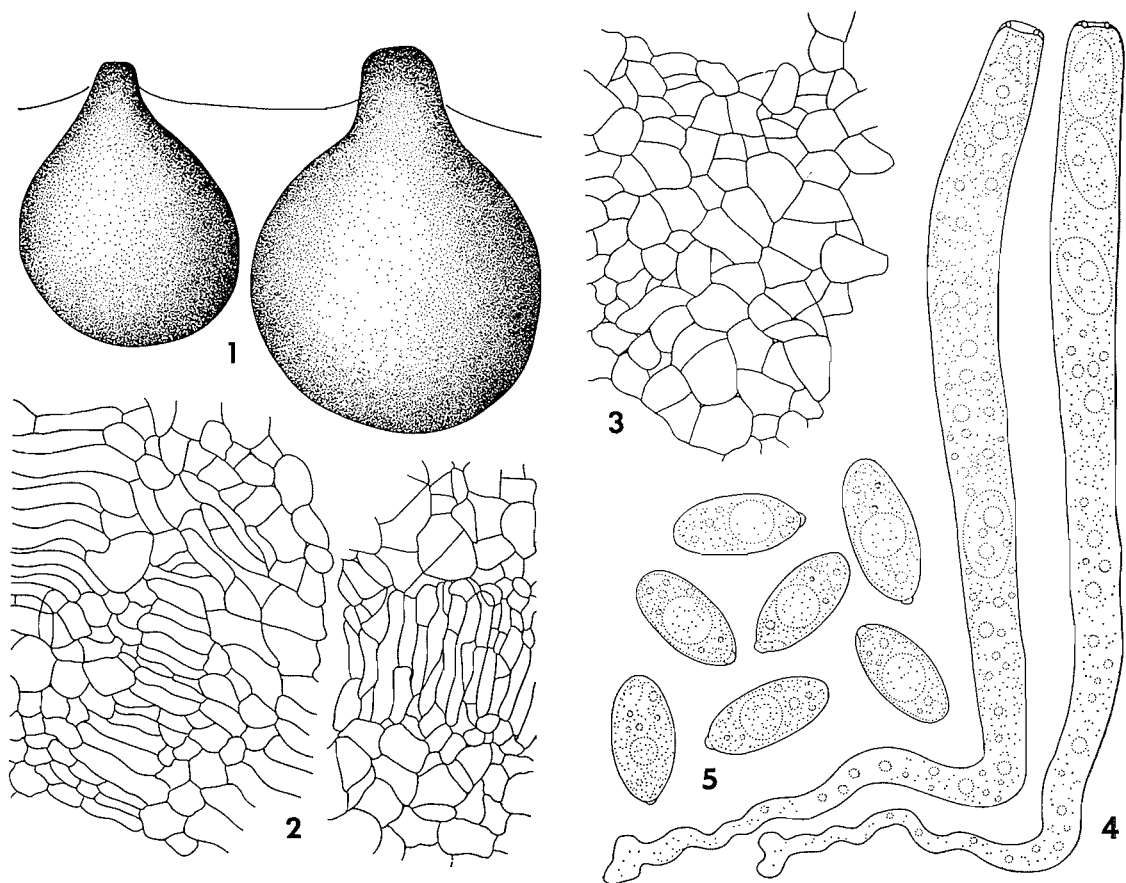
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rubido-brunneis, haud translucidis. Ascis octosporis, cylindraceutis, superne late rotundatis, annulo claro incrassato in apice sito praeditis, inferne in stipitem longissimum gracilem croca basi praeditum paulatim attenuatis, $250\text{--}350 \times 13\text{--}16 \mu$. Paraphysibus filiformibus, septatis, hyalinis, numerosis, cum ascis mixtis, $3\text{--}4 \mu$ diametris. Ascosporis uniseriatis, plerumque asco in parte superiore obliquis et in parte inferiore parallelis et minus stipatis, $20\text{--}25 \times 9\text{--}11 \mu$, oblongo-ellipsoideis, uniguttulatis, deinde olivaceo-brunneis, postremo paene nigris et haud translucidis, foramine germinali hyalino, rotundo, in apice sito, 2μ diametro, in parvo tuberculo posito praeditis, strato mucoso continuo, hyalino, crasso $3\text{--}5 \mu$, super foramen germinale non interrupto circumventis. Mycelio in agaro cano-brunneo, aereo; phialidibus numer-

osis in hyphis sparsis. Phialidibus pallido-brunneis, apice dilato praeditis. Phialosporis parvis, ovatis, in globo in apice phialidis dispositis.

TYPUS: in fimo *Alcis americanae*, Twp. 1B, Little White River, Algoma D., Ontario, Canada, 15 Sept. 1956, Cain, TRTC 32365. In University of Toronto Cryptogamic Herbarium.

Perithecia black, immersed or with upper conical part erumpent between fibers of substratum, dispersed or loosely aggregated in small clusters, $500\text{--}600 \times 400\text{--}450 \mu$, broadly pyriform to subglobose, smooth, bare except for fine hyphal filaments by means of which they are closely adherent to fibers of substratum, constricted above to form a very short, stout, conical neck with a circular ostiole, 35μ in diameter at apex. Perithecial peridium dark reddish-brown, $25\text{--}40 \mu$ in thickness, membranaceous to slightly coria-



FIGS. 1-2. *Apodospora simulans*. Fig. 1. Two perithecia. $\times 80$. Fig. 2. Cells in upper part of peridium showing areas of elongated cells, surface view. $\times 700$.

FIGS. 3-5. *A. simulans*. $\times 700$. Fig. 3. Cells of lower part of peridium, surface view. Fig. 4. Two asci with very young ascospores. Fig. 5. Immature ascospores.

ceous, with cellular structure obscure. Cells in lower part of peridium very thin-walled, angular, reddish-brown, 5–15 μ in diameter. Cells in upper part angular, polygonal, arranged in plates separated by narrow zones of linear cells, with walls slightly thickened, dark reddish-brown, very opaque. Asci eight-spored, cylindrical, broadly rounded above, with a distinct thickened ring in apex, tapering gradually below into a very long slender stipe with a crozier at the base, 250–350 \times 13–16 μ . Paraphyses filiform, septate, hyaline, abundant, mixed with asci, 3–4 μ in diameter. Ascospores uniseriate, usually lying oblique to ascus in upper part and parallel and less crowded in lower part, 20–25 \times 9–11 μ , oblong-ellipsoidal, with one large refractive globule, becoming olivaceous-brown and finally nearly black and opaque, with hyaline, circular,

apical germ pore measuring 2 μ in diameter located in a small, tubercular projection, surrounded by a continuous, gelatinous, hyaline sheath measuring 3–5 μ in thickness and not interrupted over germ pore. In culture producing colonies with gray-brown aerial mycelium with abundant phialides scattered on hyphae. Phialides light brown, with flaring collarete. Phialospores small, ovate forming globose mass at apex of phialide.

ETYMOLOGY: Latin, *simulans* = imitating, from the superficial resemblance to *Sordaria fimicola* (Rob.) Ces. & de Not.

HABITAT: on dung of moose. A single collection recorded on cow dung.

SPECIMENS EXAMINED: All specimens collected on moose dung by Cain unless stated otherwise. CANADA: ONTARIO: Algoma D.: Twp. 1 B, Little

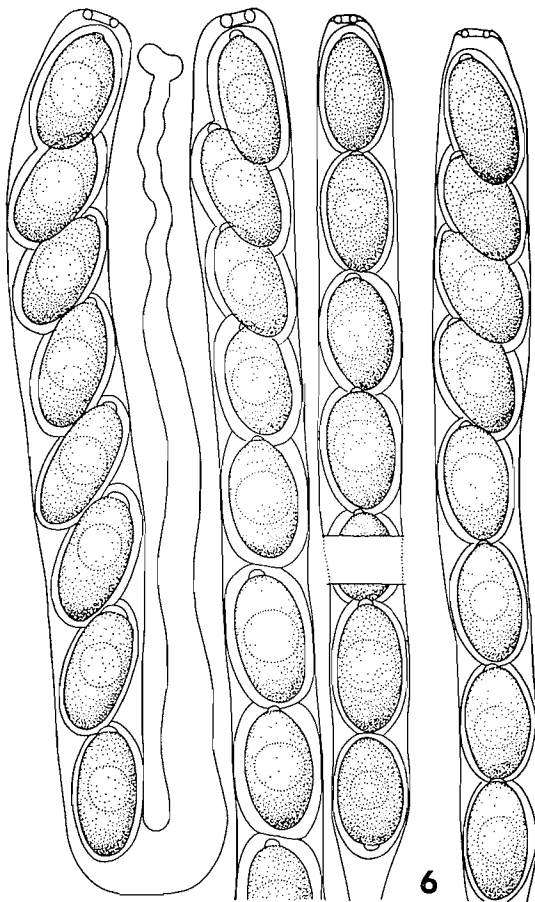
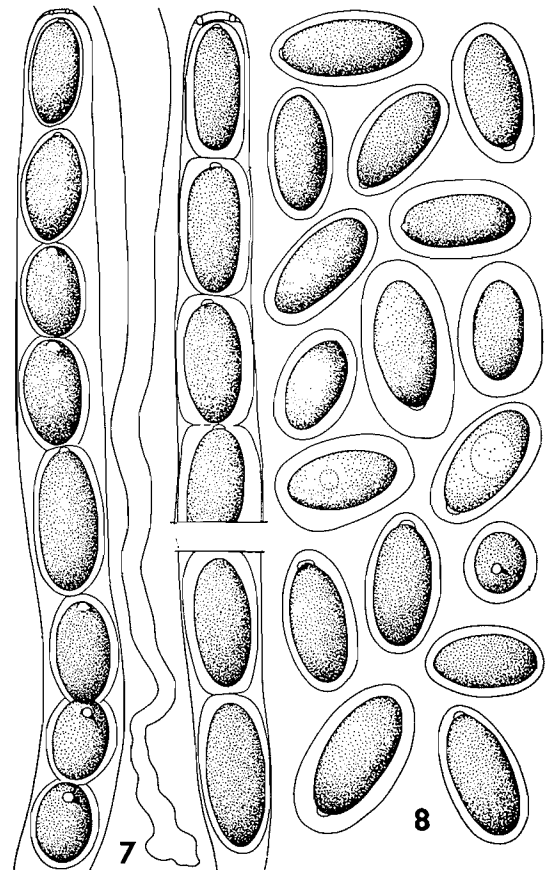


FIG. 6. *A. simulans*. \times 700. Asci with immature, partially colored ascospores.



FIGS. 7–8. *A. simulans*. \times 700. Fig. 7. Asci with mature ascospores. Fig. 8. Mature ascospores.

White River, 15 Sept. 1956, TRTC 32365 type, 33022; 14 Sept. 1956, TRTC 32376, 32362, 32615; Dayohessarah Lake, 22 June 1961, TRTC 37916, 40834. Kenora D.: Cedar Lake, 3 June 1956, TRTC 35764, 35888; 7 June 1956, TRTC 35858; Ethelma Lake, 10 Sept. 1957, TRTC 40836. Nipissing D.: Algonquin Park: Lake Opeongo, 25 June 1956, TRTC 32406; Cache Lake, 1 Sept. 1939, TRTC 36520; Pinetree Lake Portage, 9 Sept. 1958, TRTC 33855; Lake of Two Rivers, 26 Oct. 1963, TRTC 40444, 40465. Sudbury D.: Ivanhoe Lake near Foleyet, 25 June 1962, *Mirza*, TRTC 45676; Chapleau, 27 June 1962, *Mirza*, TRTC 45677. Thunder Bay D.: Nickel Twp., 21 June 1961, TRTC 40835; Poshkokagan R., W of Lake Nipigon, 5 Aug. 1965, TRTC 43510. ALBERTA: Jasper Natl. Park, Athabasca Falls, 8 Aug. 1962, TRTC 39022. U.S.A.: IDAHO: Fremont Co.: Targhee Pass, 1 Sept. 1962, TRTC 39854. SOUTH DAKOTA: Meade Co.: Wall, on cow dung, 3 Sept. 1962, TRTC 39443.

Superficially, this species resembles *Sordaria fimicola* (Rob.) Ces. & de Not. It can be distinguished by the immersed perithecia, more coriaceous peridium with more obscure angular cells, asci with longer stipes, apical germ pore located in a broader tubercular projection, slightly narrower and more oblong ascospores, and in having the gelatinous sheath continuous over the germ pore. In *S. fimicola*, the perithecia are more narrowly pyriform and the peridium is made up of larger, much more distinct and rounded cells. The asci have much shorter stipes and a somewhat more prominent thickened ring in the apex. The ascospores have the circular germ pore located at the more pointed basal end. The gelatinous sheath is not continuous over the germ pore but leaves a narrow channel to the exterior. In *A. simulans* there is an occasional spore which is reversed in position so that the germ pore is at the base but the broader tuberculate rather than pointed end serves to distinguish it clearly from *S. fimicola*.

The difference in the position of the germinal pore is probably fundamental. *Apodospora simulans* probably represents a line of evolution distinct from both *Sordaria* and *Podospora* rather than an intermediate position. The apical germ pore suggests a closer affinity with the latter genus but we have not placed it there because of the more prominent apical ring in the

ascus and the gelatinous sheath around the ascospore. This sheath is, however, not very important in indicating relationship since it has been evolved in several independent lines such as *Sordaria*, *Coniochaeta*, *Hypocopra*, *Delitschia*, and *Sporormia*.

In its conidial stage and other characteristics of the cultures *A. simulans* resembles species of *Podospora*, *Bombardia*, and *Lasiosphaeria*, and some species of *Sordaria*. Like most species of *Bombardia* and *Lasiosphaeria* as well as many species of *Podospora*, cultures of *A. simulans* have so far failed to produce perithecia on all of the types of agar media tested.

A. simulans has been found on the dung of moose and is common and widely distributed in Ontario and west to Alberta, Idaho and South Dakota. A single collection was found on cow dung collected near the Black Hills, South Dakota.

2. *Apodospora thescelina* Cain & Mirza sp. nov.

Figs. 10-14

Peritheciis dispersis, immersis vel partim immersis, 550-700 × 400-510 μ, globosis vel piriformibus, nigris et opace, glabris; collo crasso, papilliformi, circa 200 × 200 μ; peridio perithecii fusco-brunneis, membranaceo vel leviter coriaceo, cellulis angulatis parietibus crassis composito. Ascis octosporis, cylindraceis, 285-340 × 21-25 μ, superne late rotundatis, annulo incrassato in apice sito praeditis, inferne in stipitem 85-120 μ longum attenuatis. Paraphysibus filiformibus, septatis, circiter 4 μ diametris, numerosis. Ascosporis uniseriatis, ovoideo-ellipsoideis vel fere ellipsoideis, 24-32 × 15-19 μ, fusco-brunneis, strato mucoso continuo praeditis. Foramine germinali rotundo, circiter 2.0-2.5 μ diametro, ad apicem ascosporae sito.

TYPUS: in fimo cuniculorum, University of Wyoming Science Camp, Albany Co., Wyoming, U.S.A., 9 July 1955, *Cain*, TRTC 32329. In University of Toronto Cryptogamic Herbarium.

Perithecia scattered, immersed or semiimmersed, 550-700 × 400-510 μ, globose to pyriform, black and opaque, bare; neck stout, papilliform, about 200 × 200 μ; peridium dark brown, membranaceous to somewhat coriaceous, consisting of thick-walled angular cells. Asci eight-spored, cylindrical, 285-340 × 21-25 μ, each broadly rounded at apex and with a distinct apical ring, tapering below into stipe 85-120 μ long. Para-

physes filiform, septate, about 4 μ in diameter, as long as or longer than asci, abundant. Ascospores uniseriate, ovoid-ellipsoidal or nearly ellipsoidal, 24–32 \times 15–19 μ , dark brown, opaque, narrower toward the upper end, each surrounded by a gelatinous sheath which swells in water to a thickness of 20 μ . Germ pore apical about 2.0–2.5 μ in diameter.

ETYMOLOGY: Greek, *theskelos* = wonderful.

HABITAT: dung of rabbit and sheep.

SPECIMENS EXAMINED: U.S.A.: WYOMING: Albany Co., TRTC 32329 (type). Big Horn Co.: Greybull, sheep dung, 2 Sept. 1962, Luck-Allen, TRTC 39853.

This species can be distinguished from *A. simulans* by its larger ovoid-ellipsoidal ascospores. *Sordaria macrospora* Auerswald has ascospores which are similar in size but differ in shape and in having a basal germ pore.

3. *Apodospora viridis* Cain & Mirza sp. nov.

Figs. 15–19

Peritheciis dispersis, superficialibus vel paene superficialibus, 700–1300 \times 390–550 μ , piriformibus, subflavoviridis ad basas cum tomento fugaceo, tenui et viridi indutis, collo conico, crasso, nigro praeditis. Peridio perithecii tenui, membranaceo, semitranslucido, cellulis parvis, angulatis textis. Ascis octosporis vel quatuor-sporis, rare bisporis, cylindraceutis, superne anguste rotundatis, annulo in apice sito praeditis. Paraphysibus cylindraceutis, septatis, numerosis, cum ascis temperatis. Ascosporis uniseriatis, ellipsoideis, (34–)48–53(–66) \times (19–)29–31(–35) μ , paene nigris et haud translucidis, strato mucoso continuo, fugaceo. Foramine germinali ad apicem ascosporae sito, circa 2.5 μ diametro. Phialidibus numerosis, brevis, catenulatis; phialosporis parvis, ovatis, 3.0–3.5 \times 2.5–3.0 μ .

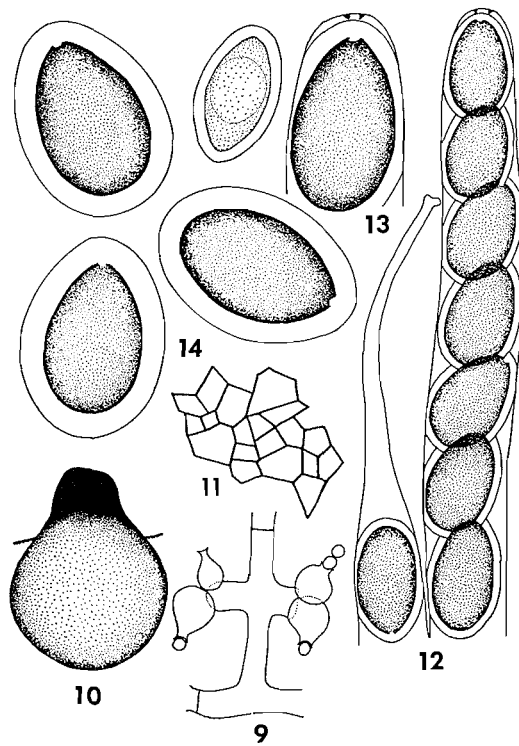
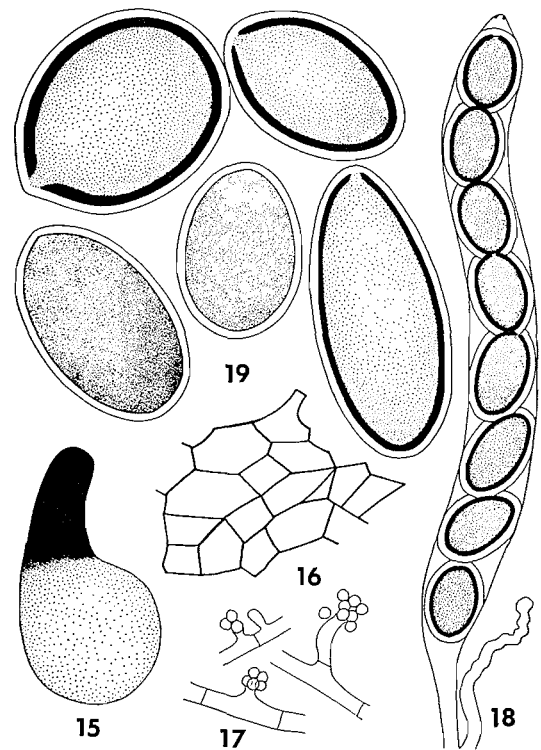


FIG. 9. *A. simulans*, hypha with phialides and phialospores. \times 700. FIGS. 10–14. *A. theskelina*. Fig. 10. Perithecium. \times 40. Fig. 11. Cells of peridium, surface view. \times 720. Fig. 12. Ascus with ascospores. \times 450. Fig. 13. Apex of ascus with one ascospore. \times 720. Fig. 14. Ascospores, one immature and three mature. \times 720.



FIGS. 15–19. *A. viridis*. Fig. 15. Perithecium. \times 27. Fig. 16. Cells of peridium, surface view. \times 600. Fig. 17. Hyphae with phialides and phialospores. \times 600. Fig. 18. Ascus with ascospores. \times 250. Fig. 19. Ascospores. \times 600.

TYPUS: in fimo cuniculorum, W of Durango, Mexico, 14 Aug. 1960, *Cain*, TRTC 36798. In University of Toronto Cryptogamic Herbarium.

Perithecia scattered, superficial or with base slightly immersed, $700\text{--}1300 \times 390\text{--}550 \mu$, pyriform; light yellowish green, lower part covered with thin, fugacious greenish tomentum; neck conical, stout, black, covered with thin papillae; peridium thin, membranaceous, semitransparent, with small angular cells. Asci eight-spored (or less commonly four- or two-spored by abortion of four or more spores), cylindrical, narrowly rounded above with an apical ring in apex. Ascospores uniseriate, ellipsoidal, $(34\text{--})48\text{--}53\text{--}(66) \times (19\text{--})29\text{--}31\text{--}(35) \mu$, almost black and opaque, gelatinous sheath very fugacious and continuous

over the germ pore. Germ pore apical, about 2.5μ in diameter. Conidial stage green, floccose, on surface of dung. Phialides of short cubical cells forming branched chains each with an opening and short collarette. Phialospores small, ovoid, $3.0\text{--}3.5 \times 2.5\text{--}3.0 \mu$.

ETYMOLOGY: Latin, *viridis* = green.

HABITAT: rabbit dung.

SPECIMENS EXAMINED: TRTC 36798, type.

This species can be separated from the other two by its greenish perithecia, and the larger dimensions of the asci and ascospores. The asci, although normally eight-spored, quite often become four-spored or rarely even two-spored because of the abortion of ascospores at an early stage of development.