# Additions to the genus *Delitschia*

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Species included in the taxon *Delitschia* are loculoascomycetes with dark, two-celled ascospores. Each cell of the ascospore is provided with an elongated germinal slit and each spore is surrounded by a hyaline gelatinous layer. A total of 46 species of *Delitschia* are recorded in an analytical key. Descriptions and illustrations are provided for the following 26 new species of *Delitschia* found on diverse substrata of herbivores from Canada, United States, and Mexico: ***D. anisomera, D. anomala, D. arestospora, D. chodocola, D. chorizomera, D. chrysina, D. crinita, D. didymastra, D. didymella, D. flavida, D. hexaspora, D. illinoisensis, D. intonsa, D. lachnothecium, D. lamprorhynchia, D. limasepta, D. megatetraspora, D. melanotricha, D. nephrospora, D. oligospora, D. pachylospora, D. simulans, D. tetrasporella, D. tomentosa, D. variispora, D. xanthodera***.

The remaining 20 species represent established and recognized taxa; for 11 of these, descriptions are vague and (or) inadequate. Species descriptions have been emended and illustrations are provided for 11 species: *D. canina* Mout., *D. chaetomioides* Karst., *D. consociata* Mout., *D. excentrica* Griff., *D. furfuracea* Niessl, *D. marchalii* Berl. & Vogl., *D. niesslii* Speg., *D. perpusilla* Speg., and *D. polyspora* Griff. Data are provided for one recently published species, *D. myriaspora* Breton & Faurel. For nine well-known species included in the key there are no descriptions provided; however, literature citations and photographs of type species are included. These species are as follows: *D. araneosa* Cain, *D. didyma* Auersw., *D. gigaspora* Cain, *D. griffithsii* Cain, *D. leporina* Griff., *D. leptospora* Oud., *D. timagamensis* Cain, *D. vulgaris* Griff., and *D. winteri* Phill. & Plowr.

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Les espèces comprises dans le genre *Delitschia* sont des loculoascomycètes avec des ascospores bicellulaires foncées. Chaque cellule de l'ascospore a une fente germinale allongée et chaque spore est entournée d'une gaine gélatineuse hyaline. Au total, 46 espèces sont rapportées dans une clef analytique. Des descriptions et des illustrations sont présentées pour les 26 espèces nouvelles suivantes, récoltées sur divers substrats d'herbivores au Canada, aux Etats-Unis et au Mexique: ***D. anisomera, D. anomala, D. arestospora, D. chodocola, D. chorizomera, D. chrysina, D. crinita, D. didymastra, D. didymella, D. flavida, D. hexaspora, D. illinoisensis, D. intonsa, D. lachnothecium, D. lamprorhynchia, D. limasepta, D. megatetraspora, D. melanotricha, D. nephrospora, D. oligospora, D. pachylospora, D. simulans, D. tetrasporella, D. tomentosa, D. variispora, D. xanthodera.***

Les 20 espèces qui restent représentent des taxons déjà reconnus, mais 11 d'entre eux étaient vaguement ou incomplètement décrits. Pour les 11 espèces suivantes, la description spécifique est émendée et des illustrations sont présentées: *D. canina* Mout., *D. chaetomioides* Karst., *D. consociata* Mout., *D. excentrica* Griff., *D. furfuracea* Niessl, *D. marchalii* Berl. & Vogl., *D. niesslii* Speg., *D. perpusilla* Speg. et *D. polyspora* Griff. Des renseignements additionnels sont présentés pour une espèce décrite récemment: *D. myriaspore* Breton & Faurel. Des références à la littérature et des photographies des spécimens-types sont présentées pour neuf espèces bien connues qui sont incluses dans la clef mais ne sont pas décrites ici: *D. araneosa* Cain, *D. didyma* Auersw., *D. gigaspora* Cain, *D. griffithsii* Cain, *D. leporina* Griff., *D. leptospora* Oud., *D. timagamensis* Cain, *D. vulgaris* Griff. et *D. winteri* Phill. & Plowr.

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## Introduction

When Auerswald established *Delitschia* in 1866, he indicated that the genus belonged to the Sphaeriaceae and was affiliated with the Sordariaceae and Amphisphaeriaceae.

*Delitschia* was placed in the Sordariaceae by Winter (1887) along with five other genera, namely, *Sordaria* Ces. & DeNot., *Podospora* Ces., *Hypocopra* (Fr.) Kickx., *Sporormia* DeNot., and *Phleophragmia* Fckl. In this sense, the family consisted of a heterogenous assemblage of coprophilous pyrenomycetes.

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Griffiths (1901) used Sordariaceae in the same sense as Winter (1887) and added *Sporormiella* Ellis & Everh. to the list; however, he substituted *Pleurage* Fr. for *Podospora* Ces. Griffiths and Seaver (1910) replaced Sordariaceae with Fimetariaceae and included *Fimetaria*, *Delitschia*, *Sporormia*, *Sporormiella*, and *Pleurage*. Kirschstein (1911), like Griffiths (1901), considered *Delitschia* to be a member of Sordariaceae.

Cain (1934) realized that the Sordariaceae represented a complex and artificial grouping of genera but elected to retain *Delitschia* in this assemblage because of "the present unsettled arrangement of the pyrenomycetes as a whole." At that time, he suggested that "possibly" *Delitschia* might be placed in the Pleosporaceae.

Since 1934, a number of students have been reevaluating certain of the coprophilous taxa in the light of more advanced concepts, and a more realistic disposition of some of the categories has been attained. The position of *Delitschia* remains uncertain.

To Moreau (1953) the Sordariaceae was a grouping of converging forms. He proposed transferring *Delitschia*, *Sporormia*, and *Sporormiella* from Sordariaceae to the Pleosporaceae.

Dennis (1968) followed Moreau. He listed 41 genera in the Pleosporaceae; one of these was *Delitschia*. The Pleosporaceae represents a complex made up of a varied assortment of unrelated genera, the limits of which defy definition and are, consequently, quite vague.

When Munk (1957) established Sporormiaceae (Pseudosphaeriales), he made *Sporormia* the type genus, and at this time, *Delitschia* also found its niche. He rejected the use of Pleosporaceae for the two genera.

In this paper, no attempt has been made to resolve the problem of the taxonomic status of *Delitschia*, but rather a report on a number of new species that we have encountered during recent years has been made. These and the older recognized species have been brought together in this treatment. The genus, a comparatively small one with 17 species (Cain 1934), has been considerably augmented by the addition of 26 new species. Most of the new species in this paper are described from dung collections obtained from western Canada, western United States, and Mexico.

We consider *Delitschia* allied to *Sporormiella* Ahmed and Cain 1972 and include *Delitschia*, at this time, in Sporormiaceae Munk. This genus is restricted to coprophilous loculoascomycetes with dark, two-celled ascospores. Each cell of the spore has a linear germinal slit and each ascospore is surrounded by a gelatinous layer.

Investigations of recognized species were made from authentic material and (or) type collections, a number of which are located in the Cryptogamic Herbarium at the University of Toronto. Holotypes of the new species are deposited in the Cryptogamic Herbarium of the University of Toronto (TRTC).

Measurements of perithecia were made before crushing. Immediately after squashing the perithecium, notations were made of the position of spores in the ascus (because of their immediate disarrangement) and of the nature of the gelatinous layer surrounding ascospores. The ascus may elongate and expand in water (Fig. 149); therefore, for species demonstrating this reaction, a solution of cotton blue in lactophenol was used as an inhibitor. Measurements of ascospores do not include the gelatinous layer.

Some studies of asci were also made with phase-contrast illumination. In the two species examined, *D. patagonica* and *D. pachylospora* sp. nov., the apical apparatus appears to be a reduced structure. When asci of *D. patagonica* were stained with Waterman's blue-black ink and Congo red in 2% KOH, the exoascus wall remained hyaline while the endoascus stained with these reagents (Figs. 152, 153, 159). Details of the apical structure observed indicated the following structures: an ocular chamber (Fig. 157), an apical cap, and an invagination of the dome through which the ascospores are liberated (Figs. 157–159).

Species have been arranged in the text in alphabetical sequence. References are found at the end of the paper for the nine unnumbered species in the key. Photographs of the nine species were made from type materials (slides) except for *D. leptospora* Oud. and *D. didyma* Auersw., which were photographed from slides of Ontario collections. *Delitschia didyma* was photographed from TRTC 39387, *D. leptospora* from TRTC 39363.

## Generic Concept

In 1866, Auerswald created the genus *Delitschia* for an astromatic pyrenomycete found growing on roe-deer and rabbit dung near Leipzig during March and April of 1866. The ascospores of the fungus were described as dark,

two-celled, and deeply constricted. Each spore was surrounded by a hyaline gelatinous layer. Auerswald called the organism *Delitschia didyma*, and it is the type of the genus. Though Auerswald (1866) did not state in his description that the ascospores were obliquely uniseptate and easily separable at the median septum, his illustrations clearly indicated these features. Fuckel (in Fungi Rhen. 2034 and in Symbol. Mycol. 1870) initiated confusion in the concept of the type by giving the name *Delitschia auerswaldii* to a pyrenomycete which he discovered and assumed to be the same as Auerswald's *D. didyma*. In the ensuing years, the two species, though obviously different, were not recognized as distinct. A number of authors, who have had specimens corresponding with Fuckel's *D. auerswaldii*, have used the name *D. didyma*, considering the two names to be synonymous. Following Fuckel's lead, Winter (1887), Rehm (1906), Saccardo (1910), and Bayer (1924) accepted *D. auerswaldii* (sensu Fuckel) and regarded *D. didyma* as its synonym. Griffiths (1901) failed to detect the distinction but treated *D. didyma* as the valid name and relegated *D. auerswaldii* to synonymy.

Specimens examined of *D. auerswaldii* in Fungi Rhen. 2034 have ascospores that are transversely uniseptate and slightly constricted. The cells of the spore do not separate at the median septum. It is quite clear that two distinct species are involved. *Delitschia auerswaldii* was established by Fuckel as a name change for *Delitschia didyma* but we think that such a disposition by Fuckel is illegitimate. The species represented by Fuckel's material is really *Delitschia patagonica* Speg. The species illustrated by Bayer (1924) should be called *D. patagonica*. Specimens in Krieger, Fung. Sax. 1950, distributed as *D. didyma* should also be designated as *D. patagonica* Speg.

von Höhnel (1920) rejected the use of the name *Delitschia* and substituted *Phorcys*, which was established by Niessl for "sphaeriaceous fungi growing on wood," von Höhnel transferred 12 species previously included in *Delitschia* to *Phorcys*. Müller and von Arx (1962) treated *Phorcys* Niessl as a synonym of *Amphisphaeria* Ces. & DeNot.

### *Delitschia*

*Delitschia* Auersw. Hedwigia, 5:49. 1866.
= *Delitschiella* Sacc. Syll. Fung. 17: 688. 1905.
= *Pachyspora* Kirscht. Verh. Bot. Vereins Prov. Brandenburg, 48: 49. 1906.

Fimicolous. Perithecia embedded, or partially embedded, scattered or in groups, varying from membranaceous to coriaceous; semitransparent to dark brown to almost black and opaque; smooth or rough; globose to subglobose or pyriform. Neck papilliform to long cylindric, smooth or roughened by appendages. Asci four- to many-spored, bitunicate, cylindric to clavate, short- or long-stipitate. Paraphyses hyaline, filamentous, septate, guttulate. Ascospores two-celled; when immature hyaline, becoming at maturity dark brown to almost black; septum median, transverse or oblique; separating into segments at the septum or remaining intact; germinal slit elongated, extending entire length of each cell, hyaline gelatinous layer surrounding each ascospore.

TYPE SPECIES: *Delitschia didyma* Auersw.

KEY TO SPECIES OF DELITSCHIA

1. Asci eight-spored ..... 2
1. Asci other than as above ..... 45

2. Ascospores transversely septate ..... 3
2. Ascospores obliquely septate ..... 37

3. Perithecia without appendages or tomentose layer ..... 4
3. Perithecia with appendages or otherwise provided with a tomentose layer ..... 19

4. Ascospores uniseriate ..... 5
4. Ascospores biseriate ..... 14

5. Ascospores less than 13 μ in length ..... 6
5. Ascospores more than 13 μ in length ..... 7

6. Ascospores 8–9(–10) × 3-4 μ ..... 31. *D. perpusilla*
6. Ascospores 10–12 × 5–6 μ ..... 22. *D. marchalii*

7. Ascospores deeply constricted at septum, cells usually separable at maturity....8
7. Ascospores nonconstricted at septum or only slightly so, cells nonseparable at maturity....10

8. Ascospores less than 20 μ in length....1. ***D. anisomera*** sp. nov.
8. Ascospores more than 20 μ in length....9

9. Ascospores 30–42 × 11–18 μ....36. ***D. variispora*** sp. nov.
9. Ascospores larger, 64–82 × 19.5–28 μ....6. ***D. chodocola*** sp. nov.

10. Ascospores 25 μ or less in length....11
10. Ascospores more than 25 μ in length....12

11. Ascospores 20–25 × 9–14 μ....33. ***D. simulans*** sp. nov.
11. Ascospores 14–18 × 6–10 μ....27. *D. niesslii*

12. Ascospores 47–65(–75) × 25–37 μ....29. ***D. pachylospora*** sp. nov.
12. Ascospores narrower than above....13

13. Ascospores (40–)42–55 × 16–21 μ....30. *D. patagonica*
13. Ascospores 55–62 × 24–28 μ....*D. winteri*

14. Ascospores deeply constricted at septum, cells generally separable at maturity....15
14. Ascospores not deeply constricted at septum, cells nonseparable at maturity....18

15. Ascospores more than 60 μ in length....16
15. Ascospores less than 60 μ in length....17

16. Ascospores 90–100 μ in length....7. ***D. chorizomera*** sp. nov.
16. Ascospores (60–)64–82 μ in length....6. ***D. chodocola*** sp. nov.

17. Ascospores 45–55 μ in length....4. *D. canina*
17. Ascospores 20–25 μ in length....*D. leptospora*

18. Ascospores 50–64 × 22–23 μ....15. *D. furfuracea*
18. Ascospores 18–20 × 6–7.5 μ....9. *D. consociata*

19. Perithecia with straight or flexuous hairs....20
19. Perithecia with tomentose layer....31

20. Hairs of perithecia hyaline, pale or bright-colored....21
20. Hairs of perithecia not as above, brownish or black....25

21. Ascospores uniseriate....22
21. Ascospores biseriate....24

22. Ascospores broad, over 30 μ in diameter....*D. griffithsii*
22. Ascospores less than 30 μ in diameter....23

23. Ascospores 24–28 μ in diameter....*D. winteri*
23. Ascospores 16–21 μ in diameter....30. *D. patagonica*

24. Ascospores 82–88 μ in length....*D. gigaspora*
24. Ascospores 64–82 μ in length....6. ***D. chodocola*** sp. nov.

25. Hairs of perithecia rough or smooth; ascospores nonconstricted at septa, cells nonseparable....26
25. Hairs of perithecia always smooth; ascospores deeply constricted at septa, cells separable at maturity....10. ***D. crinita*** sp. nov.

26. Ascospores uniseriate....27
26. Ascospores biseriate....30

27. Hairs rough or smooth; ascospores 38–50 × 17–20 μ....5. *D. chaetomioides*
27. Hairs always smooth; ascospores smaller than above....28

28. Ascospores 27–32 × 13–16 μ....*D. vulgaris*
28. Ascospores less than 13 μ in diameter....29

29. Ascospores 31–36 × 10–11 μ....*D. araneosa*
29. Ascospores 20–28 × 9–11 μ....24. ***D. melanotricha*** sp. nov.

30. Hairs smooth, ascospores 54–60 × 24–29 μ....17. ***D. illinoisensis*** sp. nov.
30. Hairs smooth; ascospores 48–54 × 16–18 μ....18. ***D. intonsa*** sp. nov.

31. Tomentose layer white or bright-colored; ascospores nonconstricted at septum; cells nonseparable...32
31. Tomentose layer dark-colored; ascospores deeply constricted at septum, cells separable.....
.....3. ***D. arestospora*** sp. nov.

32. Tomentose layer white.....33
32. Tomentose layer bright yellow or deep orange.....34

33. Ascospores 14–16 μ in diameter.....19. ***D. lachnothecium*** sp. nov.
33. Ascospores 19–22 μ in diameter.....35. ***D. tomentosa*** sp. nov.

34. Tomentose layer sulfur-yellow; ascospores 10–14 μ in length.....14. ***D. flavida*** sp. nov.
34. Tomentose layer deep-orange.....35

35. Ascospores 13–20 μ in length.....37. ***D. xanthodera*** sp. nov.
35. Ascospores more than 20 μ in length.....36

36. Ascospores 32–44 μ in length.....20. ***D. lamprorhynchia*** sp. nov.
36. Ascospores 24–30 μ in length.....8. ***D. chrysina*** sp. nov.

37. Ascospores uniseriate.....38
37. Ascospores biseriate.....44

38. Ascospores nonconstricted or slightly so; cells nonseparable at maturity.....39
38. Ascospores deeply constricted; cells separable at maturity.....40

39. Ascospores 45–50 × 21–24 μ.....13. ***D. excentrica***
39. Ascospores 24–37 × 12–14 μ.....21. ***D. limasepta*** sp. nov.

40. Ascospores more than 30 μ in length.....41
40. Ascospores less than 30 μ in length.....42

41. Ascospores 50–60 μ in length.....26. ***D. nephrospora*** sp. nov.
41. Ascospores 35–50 μ in length.....*D. didyma*

42. Ascospores 20–30 μ in length.....43
42. Ascospores less than 20 μ, 12–14(–17) × 4.5–6.5(–8) μ.....12. ***D. didymella*** sp. nov.

43. Ascospores 20–28 × 9–11 μ.....11. ***D. didymastra*** sp. nov.
43. Ascospores 21–25 × 6–7.5 μ.....*D. timagamensis*

44. Ascospores deeply constricted at septum, cells separable at maturity (40–)52–65 × 15–18 μ..*D. leporina*
44. Ascospores nonconstricted at septum, or slightly so; cells not as above, 48–54 × 16–18 μ.....
.....18. ***D. intonsa*** sp. nov.

45. Asci with less than eight ascospores.....46
45. Asci with more than eight ascospores.....50

46. Asci typically four-spored.....47
46. Asci typically six-spored.....16. ***D. hexaspora*** sp. nov.

47. Ascospores with deep constriction, cells separable or nonseparable at median septum.....48
47. Ascospores without deep constriction.....49

48. Ascospores with septum oblique, 90–105 × 34–36 μ.....23. ***D. megatetraspora*** sp. nov.
48. Ascospores with septum transverse; 18–25 × 5–8 μ.....28. ***D. oligospora*** sp. nov.

49. Ascospores 72–110 × 34–38 μ.....2. ***D. anomala*** sp. nov.
49. Ascospores 10–13 × 5–6 μ.....34. ***D. tetrasporella*** sp. nov.

50. Asci 16-spored.....32. ***D. polyspora***
50. Asci 256-spored.....25. *D. myriaspora*

1. ***Delitschia anisomera*** Luck-Allen & Cain, sp. nov. Figs. 4–7

Peritheciis sparsis, in substrato immersis, piriformibus levibus, atro-brunneis tum nigris opacisque, 750–800 × 500–600 μ; collo brevi, 250–350 × 200–300 μ. Ascis octosporis, cylindraceis, 90–112(–120) × 11–12 μ, ad summas rotundatis, stipite breve. Paraphysibus numerosis, filiformibus septatis hyalinis usque ad 2 μ crassas. Ascosporis oblique monostichis, oblongo-ellipsoideis, 15–19 × 6–8 μ, transverse uniseptatis, vade constrictis. Ascosporis ab hyalinis

ad flavo-brunneas postremo atro-brunneis, strato mucoso hyalino et angusto involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo equino, Fallon, Fallon Co., Montana, United States, 4 Sept. 1957, *Cain*, TRTC 35904. In Cryptogamic Herbarium, University of Toronto.

ETYMOLOGY: Greek, *aniso* = unequal and *meras* = part, referring to the unequal sizes of the two cells of each spore.

Perithecia embedded, scattered, smooth, dark brown to black and opaque, pyriform, 750–800 × 500–600 microns (μ). Neck black, short, broad, 250–350 × 200–300 μ. Asci eight-spored, cylindrical, 90–112(–120) × 11–12 μ, rounded at apices, each abruptly terminating in a short stipe. Paraphyses hyaline, filiform, septate, numerous, up to 2 μ in diameter. Ascospores obliquely uniseriate, oblong-ellipsoid, 15–19 × 6–8 μ, with one cell slightly longer than the other, the longer cell measuring 8–10 × 5–8 μ, the shorter 7–9 × (5–)6–7 μ, septum transverse, occasionally oblique, deeply constricted; at first hyaline, then yellowish, finally dark brown at maturity, surrounded by a narrow hyaline gelatinous layer. Germinal slit longitudinal, extending full length of cells.

HABITAT: on horse dung.

SPECIMENS EXAMINED: UNITED STATES: Montana: TRTC 35904 (TYPE). North Dakota: Billings Co.: Medora, on horse dung, 4 Sept. 1957, *Cain*, TRTC 44802. VENEZUELA: W of Barcelona, on burro dung, 19 July, 1972, *Cain*, TRTC 46881.

COMMENTS: This species resembles *D. timagamensis* and *D. arestospora* sp. nov. In *D. anisomera*, the ascospores are smaller with one cell larger than the other, and the septum is typically transverse; whereas in *D. timagamensis* the spores measure 21–25 × 6–7 μ, and the septum is conspicuously oblique. The presence of a prominent tomentose layer covering the perithecium distinguishes *D. arestospora*.

2. ***Delitschia anomala*** Luck-Allen & Cain, sp. nov. Figs. 82, 83

Peritheciis in substrato immersis, fuscis subglobosis aut piriformibus, 400–900 × 300–600 μ, pilis brunneis paucis usque ad 100 μ longa praeditus; collo nigro, brevi cylindraceo, 120–246 × 100–328 μ. Pilis colli flavo-brunneis, septatis usque ad 50 μ longa. Cellulis peridii brunneis angulatis, irregularibusque usque ad 15 μ longa. Ascis 4-sporis, cylindraceis, 350–500 × 56–60 μ, ad summas late rotundatis, stipite circiter 90–100 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, 1–2 μ crass. Ascosporis oblique, uniseriatis, oblongo-ellipsoideis, 72–110 × 34–38(–44) μ, transverse uniseptatis, medio non constrictis, ab hyalinis ad flavo-brunneas, postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo ovino, W of Cody, Park Co., Wyoming, United States, 1 Sept. 1962, *Cain & Luck-Allen*, TRTC 39050.

ETYMOLOGY: Greek, *anomalos* = deviating from the regular rule, referring to the four spores in the ascus.

Perithecia embedded, scattered, dark, pyriform or subglobose, 400–900 × 300–600 μ, sparingly provided with irregularly branched hairs, Neck black, short, cylindrical, provided with hairs, 120–246 × 100–328 μ. Hairs of neck yellowish brown, septate, with walls somewhat thickened, short, up to 50 μ long and 1–2 μ in diam; those on rest of perithecia longer, blunt at apex, yellow-brown, up to 100 μ or more in length. Cells of peridium brown, angular, irregular, up to 15 μ in length. Asci four-spored, cylindrical, 350–500 × 56–60 μ, broadly rounded above, each ascus tapering below in a stipe, 90–100 μ long. Paraphyses hyaline, filamentous, septate, numerous, intermixed with asci, 1–2 μ in diameter. Ascospores obliquely uniseriate, oblong-ellipsoid, 72–110 × 34–38(–44) μ, broadly rounded at the ends, transversely uniseptate, nonconstricted at septum; at first hyaline then yellowish brown, finally dark brown at maturity, surrounded by a hyaline gelatinous layer which swells in water and it shows a striation continuous with the septum of the spore. Germinal slit extending entire length of cells.

HABITAT: on dung of antelope, cow, horse and sheep.

SPECIMENS EXAMINED: UNITED STATES: Montana: Gallatin Co.: 60 mi S of Bozeman, on sheep dung, 2 Sept. 1957, *Cain*, TRTC 42049; Treasure Co.: Bighorn, on sheep dung, 3 Sept. 1957, *Cain*, TRTC 42361. Wyoming: Big Horn Co.: Upper Shell Canyon, on antelope dung, 2 Sept. 1962, *Luck-Allen*, TRTC 42101; Crook Co.: Sundance, on cow dung, 3 Sept. 1962, *Cain*, TRTC 39078; Laramie Co.: Cheyenne, on horse dung, 16 Aug. 1964, *Cain*, TRTC 39954; on sheep dung, 16 Aug. 1964, *Cain*, TRTC 44083; Niobrara Co.: N of Lusk, on cow dung,

2 Sept. 1964, *Cain*, TRTC 42466; Park Co.: TRTC 39050 (TYPE); Platte Co.: 12 mi SW of Wheatland, on cow dung, 1 Sept. 1964, *Cain*, TRTC 39674.

COMMENTS: This species belongs to the series with four-spored asci. Though the spores of *D. anomala* may be at times larger than those of *D. megatetraspora* sp. nov., the cells of spores of *D. anomala* do not separate at the median septum. The elements of *D. tetrasporella* and *D. oligospora* are very much smaller.

3. ***Delitschia arestospora*** Luck-Allen & Cain, sp. nov. Figs. 1–3

Peritheciis sparsis, in substrato immersis, globosis, nigris opacisque, membranaceis leniter ad coriaceos, circiter 600 μ diam; tomento ex pilis numerosis composito circum ostiolum. Hyphis tomenti septatis ab flavo-brunneis ad fuscos, 1–3 μ diam. Ascis octosporis, cylindraceis (80–)90–140 × 6–10(–12) μ, ad summas late rotundatis, stipite breve. Paraphysibus numerosis, filiformibus, septatis, hyalinis, usque ad 1 μ diam. Ascosporis monostichis, oblongo-fusiformibus, 18–22 × 6–10 μ, transverse uniseptatis, valde constrictis, segmentis ascosporarum maturis saepe sejunctis. Ascosporis ab hyalinis ad flavo-brunneas postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo burrici, Jalisco, Tequila, Mexico, 17 Aug. 1960, *Cain*, TRTC 39280.

ETYMOLOGY: Greek, *arestos* = pleasing and *spora* = seed, referring to the spores, which are pleasing to the eye.

Perithecia embedded, scattered, black and opaque, globose, about 600 μ in diameter; with scattered branching hyphal hairs which form a tomentose layer around the ostiole; neck negligible. Hyphae of tomentum at first yellowish brown later becoming dark brown, septate, with walls slightly thickened, 1–3 μ in diameter, over 500 μ long. Asci eight-spored, cylindrical, (80–)90–140 × 6-10(–12) μ, rounded at apices, each ascus terminating in a short stipe. Paraphyses hyaline, filiform, septate, numerous, up to 1 μ in diameter. Ascospores uniseriate, oblong-fusiform, 18–22 × 6–10 μ, end cells usually conical, occasionally broadly rounded, sometimes with one cell slightly smaller than the other, transversely uniseptate, at maturity deeply constricted with cells separating at the median septum; at first hyaline, then yellowish brown, becoming dark brown at maturity; each ascospore surrounded by a gelatinous layer. Germinal slit parallel, extending the full length of cells.

HABITAT: on dung of burro.

SPECIMEN EXAMINED: MEXICO: Jalisco, TRTC 39280 (TYPE).

COMMENTS: This species can be easily distinguished by its tomentose layer and deeply constricted separable ascospores.

4. *Delitschia canina* Mouton, Bull. Soc. R. Bot. Belg. 26: 175. 1887. Figs. 96–99

Perithecia embedded, in clusters, smooth, coriaceous, dark and opaque, globose or pyriform, when globose, 500–700 μ in diam, when pyriform, 450–700 × 350–500 μ. Neck black, rough, broad, cylindrical, up to 170 μ long, 190 μ in diam at ostiole. Peridium indistinct. Asci eight-spored, cylindric-clavate, 200–220 × 26–30 μ, biseriate with eighth spore separate, broadly rounded at apices, each narrowing below to a stipe, 55–75 μ long. Paraphyses hyaline, guttulate, filamentous, septate, numerous, 1.6–3 μ in diam. Ascospores biseriate, oblong-ellipsoid, 45–55 × (13–)14–16 μ (with one cell, either upper or lower, generally larger), end cells rounded or narrowed and conical, transversely uniseptate, each deeply constricted with cells easily separating at the septum; at first hyaline, then yellow-brown, at maturity dark and opaque, each surrounded by a hyaline gelatinous layer. Germinal slit longitudinal.

HABITAT: on cow, dog, and sheep dung.

HOLOTYPE: on old dog dung, Gomzé, Belgium, Europe.

SPECIMENS EXAMINED: EUROPE: Corsica: Bonifacio, at the bridge over Ventilegne River, 7 km NW of Bonifacio, on old cow dung, 13 May 1965, *Lundqvist* 4425-d (UPS). SOUTH AMERICA: Argentina: La Rioja, Cebolla, on mule dung, with *Podospora argentinensis* Speg., 14 Jan. 1910, Spegazzini 6843 (LPS). UNITED STATES: Montana: Stillwater Co.: Columbus, on cow dung, 3 Sept. 1957, *Cain*, TRTC 42416. Wyoming: Niobrara Co.: N of Lusk, on cow dung, 2 Sept. 1964, *Cain*, TRTC 42462. Park Co.: W of Cody, on sheep dung, 1 Sept. 1962, *Luck-Allen & Cain*, TRTC 45721; Platte Co.: 12 mi SW of Wheatland, on cow dung, 1 Sept. 1964, *Cain*, TRTC 39675.

COMMENTS: No type material was available for study. The interpretation of this species was derived from Mouton's original description and

illustrations, together with available specimens regarded as *D. canina*. Materials from N. Lundqvist helped greatly in the formulation of this concept. *Delitschia canina* is easily identified by its clavate asci and deeply constricted ascospores, which separate readily at septa.

5. *Delitschia chaetomioides* Karst., Mycol. Fenn. 11:60. 1873. Figs. 87–90
≡ *Phorcys chaetomioides* (Karst.) V. Höhn., Akad. Wiss, Wien Sitzungsber., Math.-Naturwiss, Kl. 129: 158. 1920.

Perithecia embedded, scattered or in clusters, black and opaque, globose or pyriform, when globose, 500–700(–900) μ in diam, pyriform, 500–900 × 600–1000 μ, surrounded by dark shaggy hairs. Neck black and opaque, variable in length from short papilliform with circular ostiole protruding through substratum to long, cylindric, provided with numerous hairs, 400–700 × 300–600 μ. Hairs brown, septate, flexuous, branched or unbranched with blunt apices, and with slightly thickened walls, 1.6–3 μ in diam, up to 400(–1000) μ long; those on rest of perithecia somewhat similar in morphology but generally rough, more hyphal and branched, thicker-walled, anastomosing, 3–5 μ in diam, up to 1000 μ long. Cells of peridium indistinct. Asci eight-spored, cylindrical, 200–250(–300) × (22–)26–30(–35) μ, broadly rounded at apices, each terminating in a stipe, 27–65(–75) μ long. Paraphyses hyaline, septate, filamentous, numerous, 1.4–2 μ in diam. Ascospores uniseriate, oblong-ellipsoid (37–)38–50 × 17–20 μ, broadly rounded to acutely narrowed, transversely uniseptate, nonconstricted; at first hyaline, then reddish brown, at maturity almost black and opaque, each surrounded by a gelatinous layer. Germinal slit longitudinal.

HOLOTYPE: on horse dung associated with No. 939 *Hypocopra fimeti* (P) in Mustiala, Finland, *Karsten*.

HABITAT: on horse and rabbit dung.

SPECIMENS EXAMINED: CANADA: Saskatchewan: Saskatoon, on Jack rabbit dung, 19 May 1934, *R. Russell*, TRTC 6623. EUROPE: Finland: Mustiala (TYPE, K). Sweden: Hälsingland: Mo Parish, pasture in pine forest, on old horse dung, 15 Aug. 1960, *Lundqvist* 2786a (UPS); Västergötland: Rongedala Parish, E of Rongedala railway station, on old horse dung after 23 days in moist chamber in laboratory in Uppsala, 12 June 1960, *Lundqvist* 2426c (UPS).

COMMENTS: *Delitschia chaetomioides* and *D. vulgaris* have in common numerous appendages on the ascocarps but can easily be separated on the basis of their ascospore measurements (those of *D. vulgaris* are smaller (27–32 × 13–16 μ)). In its measurements, *D. chaetomioides* more nearly approaches *D. patagonica*, from which it can be separated by its perithecial features.

6. ***Delitschia chodocola*** Luck-Allen & Cain, sp. nov. Figs. 91–95

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, atro-brunneis opacisque, levibus (frequenter pilis flexuosis), 700–1200 × 560–1050 μ; collo brevi-cylindraceo vel papilliformi, nigro, circiter 240 μ long. Pilis flavo-brunneis. Cellulis peridii brunneis, angulatis irregularibusque. Ascis octosporis, cylindraceis, 260–400 × 36-48 μ, ad summas late rotundatis, stipite usque ad 115 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, circiter 1 μ crass. Ascosporis biseriatis, ovato-ellipticis, (60–)64–79(–82) × 19.5–25(–28) μ, transverse uniseptatis valde constrictis, segmentis ascosporarum maturis saepe sejunctis. Ascosporis ab hyalinis ad flavo-brunneas postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali, longitudinaliter prolato.

HOLOTYPUS: in fimo ovino, Medora, Billings Co., North Dakota, United States, 5 Sept. 1957, *Cain*, TRTC 36199.

ETYMOLOGY: Greek, *chodos* = dung and *cola* = dweller, referring to the habitat of the fungus.

Perithecia embedded, scattered, dark brown and opaque, subglobose or pyriform, smooth, rarely with pale hairs, 700–1200 × 560–1050 μ. Neck black, papilliform or cylindrical, with circular ostiole, about 240 μ long. Hairs (when present) yellowish brown, thin-walled, flexuous, blunt, measuring up to 4 μ in diam and 100 μ long. Cells of the peridium dark brown, somewhat angular and irregular, up to 20 μ. Asci eight-spored (rarely four-spored), cylindric, 260–400 × 36–48 μ (swelling to 60 μ in water), broadly rounded at apices, each ascus abruptly terminating in stipe measuring up to 115 μ long. Paraphyses hyaline, filiform, septate, numerous, 1 μ wide. Ascospores uniseriate, immediately becoming biseriate, ovate-elliptical, (60–)64–79(–82) × 19.5–25(–28) μ, transversely uniseptate, deeply constricted, segments frequently separating at maturity; at first hyaline, then yellowish brown to red-brown, at maturity dark

brown and opaque, surrounded by a narrow hyaline gelatinous layer which swells up to more than 20 μ in water and it shows a striation continuous with the septum of the spore. Germinal slit longitudinal.

HABITAT: on dung of horse, pronghorn, rabbit, and sheep.

SPECIMENS EXAMINED: UNITED STATES: Colorado: Boulder Co.: N of Nederland, on rabbit dung, 27 Aug. 1964, *Cain*, TRTC 46771. Montana: Treasure Co.: Big Horn, on horse dung, 4 Sept. 1957, *Cain*, TRTC 42038; on sheep dung, 3 Sept. 1957, *Cain*, TRTC 42362; on pronghorn dung, 3 Sept. 1957, *Cain*, TRTC 42373. Nevada: Elko Co.: 30 mi S of Wendover, on rabbit dung, 21 Aug. 1957, *Cain*, TRTC 40449. North Dakota: Medora, TRTC 36199 (TYPE); on horse dung, 4 Sept. 1957, *Cain*, TRTC 39319. Wyoming: Niobrara Co.: N of Lusk, on horse dung, 2 Sept. 1964, *Cain*, TRTC 42463; on rabbit dung, 2 Sept. 1964, *Cain*, TRTC 42488; Platte Co.: Glendo, on horse dung, 2 Sept. 1964, *Cain*, TRTC 42542.

COMMENTS: This species resembles *D. gigaspora* but differs from it in having smaller ascospores with cells which separate more readily at the median septum. One collection from Wyoming, TRTC 42488, was found to have four spores per ascus but otherwise agreed with *D. chodocola* sp. nov. It has been placed here at this time on the assumption that it is possibly atypical.

7. ***Delitschia chorizomera*** Luck-Allen & Cain, sp. nov. Figs. 8–10

Peritheciis sparsis, in substrato immersis, piriformibus, nudis, nigris opacisque, 980–1000 × 620–650 μ. Cellulis peridii fuscis, angulatis, irregularibusque, plus minusve 15 μ diam. Ascis octosporis clavatis, 300–380 × 60–70 μ, ad summas late rotundatis, stipite breve usque ad 50 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, circiter 2 μ crass. Ascosporis 2–3 seriatis, oblongo-ellipsoideis, 90–100 × 24–25(–28) μ, utrinque late rotundatis, transverse uniseptatis valde constrictis, segmentis ascosporarum maturis saepe sejunctis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis, opacisque, strato mucoso, hyalino et angusto involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo *Alcis americanae*, Beaver Mines, Alberta, Canada, 28 July 1962, *Cain*, TRTC 38985.

ETYMOLOGY: Greek, *chorizo* = separate and *meros* = part, referring to the ascospore cells, which separate at the median septum.

Perithecia scattered, embedded, smooth, black and opaque, bare, pyriform, 980–1000 × 620–650 μ. Neck black, short, broad, bare, cylindrical, with a circular ostiole, 270–290 × 224–246 μ. Cells of peridium dark brownish black, opaque, angular, irregular, about 14–15 μ in diam. Asci eight-spored, clavate, 300–380 × 60–70 μ, broadly rounded above, abruptly terminating in a stipe measuring up to 50 μ long. Paraphyses hyaline, septate, guttulate, filamentous, numerous, about 2 μ in diam. Ascospores biseriate and (or) triseriate in the upper part of the ascus, eighth spore separate, oblong-ellipsoid, 90–100 × 24–25(–28) μ (frequently with one cell longer, about 2 μ, than the other), broadly to acutely rounded at the ends, transversely uniseptate, each deeply constricted at the septum and with cells frequently separating at maturity; in color ranging from hyaline to yellowish brown, at maturity dark brown and opaque, surrounded by a narrow hyaline gelatinous layer which swells in water. Germinal slit longitudinal.

HABITAT: on moose dung.

SPECIMEN EXAMINED: CANADA: Alberta: TRTC 38985 (TYPE).

COMMENTS: This is an interesting species with large ascospores. The cells separate very readily at the median septum at maturity. The asci and ascospores are similar in character to those of the four-celled *Sporormiella longispora* (Cain) Ahmed & Cain 1972. It would be of interest to study the genetics of these two species.

8. ***Delitschia chrysina*** Luck-Allen & Cain, sp. nov. Figs. 11–14, 156

Peritheciis sparsis, in substrato immersis, subglobosis, nigris, 750–800 × 550–650 μ. Collo brevi-cylindraceo, 300–350 diam usque ad 200 μ longa, tomento aurantio ex pilis numerosis circum ostium composito. Hyphis tomenti septatis, flexuosis, saepe junctis, 1–3 μ diam. Cellulis peridii angulatis usque ad 20 μ longa. Ascis octosporis, cylindraceis, 140–160 × 25–30 μ, ad summas late rotundatis, stipite breve. Paraphysibus numerosis, filiformibus, septatis, hyalinis, usque ad 1 μ diam. Ascosporis uniseriatis, ellipsoideis, 24–30 × 11–15 μ, transverse uniseptatis, medio nonconstrictis vel leniter constrictis;

ascosporis ab hyalinis ad rubido-brunneas, postremo atro-brunneis, fere nigris, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo leporino, Stockton, Rooks Co., Kansas, United States, 3 Aug. 1960, *Cain*, TRTC 39390.

ETYMOLOGY: Greek, *chrysinos* = pertaining to gold, referring to the color of the tomentum.

Perithecia embedded, scattered, dark brown, subglobose, 750–800 × 550–650 μ. Neck short, cylindrical or conical, up to 200 μ long, 300–350 μ wide, projecting to surface of substratum, provided with an orange-colored tomentose layer that surrounds the ostiole. Hyphae of tomentum (in mass) deep orange, thick-walled, septate, occasionally rough, branched or unbranched, and often anastomosing, with ends blunt, 1–3 μ in diam measuring over 250 μ long. Cells of the peridium angular, irregular, up to 20 μ long, 16 μ wide. Asci eight-spored, cylindrical, 140–160 × 25–30 μ, broadly rounded at apices, each terminating in a short stipe, less than 15 μ long. Paraphyses hyaline, filamentous, branched or unbranched, septate, numerous, up to 1 μ in diam. Ascospores uniseriate, ellipsoid, 24–30 × 11–15 μ, broadly rounded at the ends (rarely narrowing acutely), transversely uniseptate, nonconstricted or slightly so; at first hyaline then reddish brown, finally dark brown to almost black, each surrounded by a broad hyaline gelatinous layer which swells greatly in water. Germinal slit with a curve near the median septum.

HABITAT: on rabbit dung.

SPECIMENS EXAMINED: UNITED STATES: Kansas: TRTC 39390 (TYPE). North Dakota: Billings Co.: Medora, on rabbit dung, 4 Sept. 1957, *Cain*, TRTC 36075. South Dakota: Fall River Co.: Hot Springs, on rabbit dung, 3 Sept. 1964, *Cain*, TRTC 46381. Wyoming: Niobrara Co.: Mule Creek, on rabbit dung, 2 Sept. 1964, *Cain*, TRTC 42199; N of Lusk, on rabbit dung, 2 Sept. 1964, *Cain*, TRTC 42487; Platte Co.: Glendo, on rabbit dung, 2 Sept. 1964, *Cain*, TRTC 42580.

COMMENTS: Two other species are macrostructurally similar to *D. chrysina*. Each of the species has an irregular bright-yellow- to deep-orange-colored tomentose cap surrounding the ostiolar region. Of the three, *D. lamprorhynchia* sp. nov. has elements with the largest dimensions, the ascospores measuring 32–44 × 15–19 μ; *D. chrysina* sp. nov. is intermediate with spores ranging from 24–30 × 11–15 μ, while *D. xanthodera* sp. nov. is the smallest with spores 13–20 × 6–8 μ.

9. *Delitschia consociata* Mout., Bull. Soc. R. Bot. Belg. 26: 175. 1887. Fig. 15

Perithecia embedded, smooth, minute. Asci eight-spored, cylindric-clavate, 80 × 20 μ, each one terminating in a short stipe. Paraphyses filiform, branched. Ascospores biseriate, oblong, 18–20 × 6–7.5 μ, broadly rounded at the ends, transversely uniseptate, nonconstricted at the median septum, or only slightly so; at first hyaline, later dark brown at maturity; each ascospore surrounded by a gelatinous layer.

HOLOTYPE: on rabbit dung in association with *D. marchalii* and *D. moravica* in Belgium.

HABITAT: on dung of roe-deer.

COMMENTS: The description and illustration provided for this species are based on data published by Mouton. He suggested that *D. consociata* is closely affiliated with *D. leptospora* but pointed out that the latter could be separated from *D. consociata* by its deeply constricted ascospores. However, the fungus more nearly approaches *D. niesslii* in the character of its ascospores. Both *D. consociata* and *D. niesslii* have nonconstricted ascospores, but those of the latter are smaller and uniseriately arranged in the ascus while those of *D. consociata* are larger and biseriately arranged.

10. ***Delitschia crinita*** Luck-Allen & Cain, sp. nov. Figs. 24–28

Peritheciis in substrato semi-immersis, subglobosis vel piriformibus, nigris, pilis flexuosis praeditis, 300–465 × 250–420 μ. Collo brevi, nigro, pilis singulatim praedito usque ad 220 μ longa et 200 μ diam. Pilis atro-brunneis, septatis, rectis vel flexuosis usque ad 500 μ longa, 4–5 μ crass. Ascis octosporis, cylindraceis, 130–160 × 10–12 μ ad summas rotundatis, stipite breve usque 15 μ. Paraphysibus filiformibus, septatis, hyalinis, 1–2 μ crass. Ascosporis uniseriatis, ellipsoideis, 17–24 × 5–8(–9) μ, transverse uniseptatis, valde constrictis, segmentis, ascosporarum maturis saepe sejunctis. Ascosporis ab hyalinis ad olivaceos, postremo nigris opacisque, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo burrici, San Luis Potosi,

Cuidad del Maiz, Mexico, 19 Aug. 1960, *Cain*, TRTC 36739.

ETYMOLOGY: Latin, *crinita* = hairy, referring to the long hairs which embellish the perithecia.

Perithecia semiembedded, scattered or aggregated in small groups, black and opaque, subglobose or pyriform, 300–465 × 250–420 μ, completely enveloped in hairs. Neck black, short, broad, with circular ostiole, up to 220 μ long, 200 μ in diam, covered with numerous separate long hairs. Hairs black, straight or flexuous, tapering, septate, branched or unbranched, with walls slightly thickened anteriorly, thicker toward bases, frequently provided with short, spur-like appendages up to 500 μ long, 4–5 μ wide. Asci eight-spored, cylindrical, 130–160 × 10–12 μ rounded above, each ascus narrowed below in a short stipe up to 15 μ long. Paraphyses hyaline, filiform, septate, 1–2 μ in diam. Ascospores obliquely uniseriate, ellipsoid, 17–24 × 5–8(–9) μ with end cells acutely narrowed, transversely uniseptate, deeply constricted, cells separating at median septum at maturity; at first hyaline, then olivaceous, at maturity dark and opaque, ascospores surrounded by a hyaline gelatinous layer which swells in water and it shows a striation continuous with the septum of spore. Germinal slit longitudinal, extending the full length of cells.

HABITAT: on burro dung.

SPECIMENS EXAMINED: MEXICO: Durango: N of Durango, on burro dung, 13 Aug. 1960, *Cain*, TRTC 37001; El Casco, on burro dung, 13 Aug. 1960, *Cain*, TRTC 39591. Nayarit: N of Tepic, on burro dung, 16 Aug. 1960, *Cain*, TRTC 39156. Nuevo Leon: China, on burro dung, 20 Aug. 1960, *Cain*, TRTC 37039. San Luis Potosi: TRTC 36739 (TYPE).

COMMENTS: This species has long flexuous hairs that envelop the ascocarp and, in this respect, resembles *D. vulgaris* and *D. melanotricha* sp. nov. *Delitschia crinita* can be separated from *D. vulgaris* by its smaller, deeply constricted ascospores which separate at the median septum. In *D. melanotricha*, the ascospores are larger and nonconstricted.

11. ***Delitschia didymastra*** Luck-Allen & Cain, sp. nov. Figs. 29–31

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus atro-brunneis opacisque, piriformibus vel subglobosis, 400–700 × 250–540 μ. Collo crasso, nigro, 140–200 × 115–230 μ, levi vel pilis flavidis septatis parce praeditis, circiter 8 μ diam usque ad 100 μ longa. Cellulis peridii atro-brunneis angulatis usque ad 15 μ diam. Ascis octosporis, cylindraceis, 150–200 × 18–26 μ, ad summas late rotundatis, stipite breve usque ad 25 μ. Paraphysibus numerosis, filiformibus, septatis, hyalinis, usque ad 2 μ diam. Ascosporis oblique uniseriatis, ellipsoideis, 20–28 × 9–11 μ, utrinque attenuatis acutatis, oblique uniseptatis, valde constrictis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis, strato mucoso hyalino. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo ovino, Park Co., W of Cody, Wyoming, United States, 1 Sept. 1962, *Cain*, TRTC 38844.

ETYMOLOGY: Greek, *didymos* = twin and suffix *aster* = having the nature of, referring to the character of the spores.

Perithecia scattered, completely embedded, dark brown and opaque, subglobose or pyriform, 400–700 × 250–540 μ. Neck black, short, broad, 140–200 × 115–230 μ, bare or sparsely covered with branching thick-walled septate, slightly roughened yellowish hairs up to 100 μ long, about 8 μ in diam with substratum in the area of the neck sometimes greenish. Cells of peridium dark brown, angular, with walls thickened, up to 15 μ in diameter. Asci eight-spored, cylindrical, 150–200 × 18–26 μ, rounded at apices, each ascus terminating abruptly in a rather negligible stipe which occasionally reaches a length of 25 μ. Paraphyses hyaline, filamentous, septate, up to 2 μ in diameter. Ascospores obliquely uniseriate, ellipsoid, 20–28 × 9–11 μ, obliquely uniseptate, deeply constricted, with cells separable at median septum at maturity, each segment of spore oval with end usually broadly (rarely acutely) rounded, (12–)13–14 × (8–)9–11 μ; at first hyaline, then yellowish brown, at maturity dark brown, surrounded by a gelatinous sheath which swells to about 10 μ in water. Germinal slit lateral, extending entire length of cells.

HABITAT: on horse and sheep dung.

SPECIMENS EXAMINED: U.S.A.: Montana: Gallatin Co.: Gallatin River, 60 mi S Bozeman, on sheep dung, 2 Sept. 1957, *Cain*, TRTC 42052. Nevada: Elko Co.: Contact, on horse dung, 31 Aug. 1957, *Cain*, TRTC 41902. South Dakota: Custer Co.: Wind Cave National Park, on moose

dung, 3 Sept. 1964, *Cain*, TRTC 46503. Wyoming: Campbell Co.: Gillette, on horse dung, 2 Sept. 1962, *Cain*, TRTC 42428; Park Co.: TRTC 38844 (TYPE); Platte Co.: Glendo, on horse dung, 2 Sept. 1964, *Cain*, TRTC 42543.

COMMENTS: This species represents one of three in a complex wherein the spores are pronouncedly obliquely uniseptate with very deep constrictions and with cells separating at the median septum. It is intermediate in spore size between *D. didyma* and *D. didymella* sp. nov. The presence of a greenish pigment around the neck and ostiolar region of *D. didymastra* can aid in separating this species.

12. ***Delitschia didymella*** Luck-Allen & Cain, sp. nov. Figs. 32–36

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, levibus, nigris opacisque, 500–800 × 400–600 μ. Cellulis peridii angulatis, usque ad 13 μ diam. Ascis octosporis, cylindraceis, 80–90 × 10–12 μ ad summas rotundatis, stipite breve. Paraphysibus numerosis, filiformibus, septatis, hyalinis usque ad 2 μ diam. Ascosporis oblique uniseriatis, ellipsoideis, 12–14(–17) × 4.5–6.5(–8) μ oblique uniseptatis, valde constrictis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis, strato mucoso hyalino. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo cervino, Mariposa Co., Yosemite National Forest, Sierra Nevada, California, United States, 3 July 1966, *Luck-Allen*, TRTC 44412.

ETYMOLOGY: Greek, *didymos* = twin and suffix *ella*, referring to the small size of the ascospores.

Perithecia embedded, scattered, dark brown to black and opaque, bare, subglobose or pyriform, 500–800 × 400–600 μ. Neck negligible, black, opaque, with circular ostiole protruding from the substratum, up to 165 μ in diam. Cells of peridium thin-walled, angular, up to 13 μ in diam. Asci eight-spored, cylindrical, rounded at apices, 80–90 × 10–12 μ, each one terminating in a short stipe. Paraphyses hyaline, filamentous, septate, branching, numerous, up to 2 μ in diam, longer than the asci. Ascospores obliquely uniseriate, ellipsoid, 12–14(–17) × 4.5–6.5(–8) μ obliquely uniseptate, deeply constricted, cells separable at maturity, each segment of ascospore oval with ends usually rounded (occasionally conical) 6–8.5 × 4.5–6 μ; at first hyaline, then yellowish brown, becoming dark brown at maturity; each spore surrounded by a conspicuous gelatinous layer which swells in water. Germ slit longitudinal, extending entire length of cells.

HABITAT: on cow, horse, sheep, and rabbit dung.

SPECIMENS EXAMINED: UNITED STATES: California: Sierra Nevada: TRTC 44412 (TYPE). Wyoming: Niobrara Co.: N of Lusk, on cow dung, 2 Sept. 1964, *Cain*, TRTC 42565. Park Co.: W of Cody, on sheep dung, 1 Sept. 1962, *Cain*, TRTC 38845; on horse dung, 1 Sept. 1962, *Cain*, TRTC 39059.

COMMENTS: This species can be easily separated from *D. didyma* and *D. didymastra* sp. nov. by the distinctly smaller dimensions of asci and ascospores.

13. *Delitschia excentrica* Griff., Mem. Torrey Bot. Club, 11: 101. 1901. (*eccentrica.*) Figs. 100–102

≡ *Phorcys excentrica* (Griff.) v. Höhn., Akad. Wiss. Wien Sitzungsber., Math.-Naturwiss. Kl. 129: 159. 1920.

Perithecia scattered, embedded, pale brown, subtransparent to dark brown and opaque, subglobose or pyriform, 450–750(–950) × 300–500 μ, usually covered with short hairs. Neck black, rough, cylindrical, with apex truncated or rounded and provided with a circular ostiole, (130–)150–400 × 120–200 μ. Hairs of neck septate, flexuous, hyaline to yellowish brown, with walls slightly thickened, of varying length, occasionally over 500 μ, 1.4–2 μ in diam; those of rest of ascocarp shorter, less than 100 μ long, yellowish brown, septate, rather thick-walled, 1.4–2 μ in diam. Cells of peridium angular. Asci eight-spored, cylindrical, 330–370 × 34–40 (–45) μ, rounded at the apices, each terminating in a stipe 40–70 μ long. Paraphyses hyaline, filamentous, septate, guttulate, 1.4–2 μ in diam. Ascospores obliquely uniseriate, oblong-ellipsoid, 45–50 × (20–)21–24 μ, frequently flattened on one or both sides, with end cells narrowed acutely, sometimes broadly rounded, typically obliquely uniseptate (rarely transversely so), nonconstricted or slightly constricted and with cells remaining intact at median septum; ranging in color from hyaline to yellow, then yellowish brown, at maturity dark brown and opaque, each ascospore surrounded by a hyaline gelatinous layer which swells in water. Germinal slit longitudinal.

LECTOTYPE: on cow dung, Jan. 1900, Austin, Texas, United States, *Long* (NY).

SPECIMENS EXAMINED: EAST AFRICA: Kenya: Lake Amboseli, elevation 4000 ft, 2°33′ S, 37°10′ E, on cow dung, 18 Aug. 1966, *Cain, Griffin & Krug*, TRTC 46363; Tanzania: Kihurio, on cow dung, 14 Aug. 1966, *Cain, Griffin & Krug*, TRTC 46362. MEXICO: Durango: N of Durango, on rabbit dung, 13 Aug. 1960, *Cain*, TRTC 39242; on burro dung, 13 Aug. 1960, *Cain*, TRTC 36997; Durango: El Casco, on burro dung, 13 Aug. 1960, *Cain*, TRTC 36575. Hidalgo: N of Zimapan, on goat dung, 21 Aug. 1961, *Cain*, TRTC 38795. Jalisco: Amatitan, on cow dung, 17 Aug. 1960, *Cain*, TRTC 38784; Tequila, on burro dung, 17 Aug. 1960, *Cain*, TRTC 39277. Mazatlan: Sinaloa, on cow dung, 15 Aug. 1960, *Cain*, TRTC 36899. Puebla: N of Tehuacan, on cow dung, 13 Aug. 1961, *Cain*, TRTC 39238. San Luis Potosi: Ciudad del Maiz, on goat dung, 19 Aug. 1960, *Cain*, TRTC 36836; Dry Pass, on burro dung, 19 Aug. 1960, *Cain*, TRTC 36587. UNITED STATES: Montana: Gallatin Co.: 60 mi S of Bozeman, Gallatin River, on sheep dung, 2 Sept. 1957, *Cain*, TRTC 42048 (*D. excentrica* ?). Texas: Austin, (NY) (LECTOTYPE).

COMMENTS: No collections of *D. excentrica* from Canada are represented in TRTC. Except for the Long collection of 1900, and the Montana one housed in TRTC, the species appears to be rarely collected in temperate North America. It appears to be a tropical species and most of our collections are from Mexico. There are two collections from Africa as well.

The U.S. specimens may be interpreted as unusual with ascospores measuring 50–54(–58) × 22–26 μ, unquestionably larger than those specified for *D. excentrica*; however, the characters of the ascospores and the morphology of the other elements agree with *D. excentrica*. Until other collections from the U.S. and Canada are available, it is more feasible to regard this collection as questionable for *D. excentrica*. On the other hand, the African specimens are at the other extreme with ascospores smaller, but within the prescribed limits; they measure 37–43 × 19–22 μ. The dimensions of the Mexican collections for perithecia, asci, and ascospores conform with Griffiths' specifications.

The ascospores of *D. furfuracea* may at times be confused with those of *D. excentrica* especially when the septum, which is transverse in *D. furfuracea*, may occasionally be slightly oblique; however, the ascospores of the latter species are narrower and the ascospores are biseriate.

14. ***Delitschia flavida*** Luck-Allen & Cain, sp. nov. Figs. 37–44

Peritheciis sparsis, in substrato immersis, flavis, globosis vel piriformibus levibus vel pilosis, 400–540 × 400–500 μ. Collo brevi, nigro, tomento ex pilis numerosis composito, circum ostiolum. Hyphis tomenti septatis, flavis, amplius 500 μ longa. Cellulis peridii flavis usque 12 × 9 μ. Ascis octosporis, cylindraceis, 70–100 × 10–11 μ, ad summas rotundatis, stipite breve. Paraphysibus numerosis filiformibus septatis, hyalinis usque ad 1 μ diam. Ascosporis oblique uniseriatis, ellipsoideis, 9–12 × 4–6(–8) μ transverse uniseptatis, medio non constrictis. Ascosporis ab hyalinis ad olivaceas, postremo prope nigris, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo leporino, Peel Co., SW of Palgrave, Ontario, Canada, 7 Oct. 1962, *Cain*, TRTC 38846.

ETYMOLOGY: Latin, *flavida*, referring to the yellowish color of the tomentose layer around the ostiole of the ascocarp.

Perithecia scattered, embedded, semitransparent, yellow, globose or subglobose, 400–540 × 400–500 μ, at base bare or sparingly covered with yellow appendages. Neck short, papilliform, black, densely covered with hyphal hairs which form a tomentose layer around the ostiole. Hyphae of tomentum pale yellow (sulphur-yellow in mass), thin-walled, septate, straight or flexuous, blunt, branched, anastomosing, often provided with small spurs, 1.5–3 μ in diam, over 500 μ long, intermixed with other hyphae which are bright yellow, thick-walled, septate and minutely roughened, up to 4 μ in diam. Hairs on basal part of perithecia composed of septate anastomosing yellowish hyphae with brownish apices measuring 4–5 μ in diam. Cells of peridium with walls irregularly thickened, 12 × 9 μ. Asci eight-spored, cylindrical, 70–100 × 10–11 μ, rounded at apices, each one terminating in a negligible stipe. Paraphyses hyaline, filamentous, septate, numerous, simple or dichotomously branched, up to 1 μ in diam. Ascospores obliquely uniseriate, ellipsoid, 9–12 × 4–6(–8) μ, transversely uniseptate, nonconstricted or very slightly so; at first hyaline, then olivaceous, finally at maturity quite dark, each

ascospore surrounded by a hyaline gelatinous layer which swells greatly in water. Germinal slit longitudinal.

HABITAT: on rabbit dung.

SPECIMENS EXAMINED: CANADA: Ontario: TRTC 38846 (TYPE).

COMMENTS: This organism can be immediately distinguished macroscopically by its bright yellow tomentum.

15. *Delitschia furfuracea* Niessl; Rehm in Hedwigia 23: 75. 1884. Figs. 162, 163
≡ *Phorcys furfuracea* (Niessl) v. Höhn, Akad. Wiss. Wien Sitzungsber., Math.-Naturwiss, Kl. 129: 159. 1920.

Perithecia embedded, scattered, dark, smooth, subglobose to pyriform, 600–800 × 450–660 μ. Neck black, bare (rarely roughened with short hyaline hairs) short cylindric or papilliform with circular ostiole. Cells of peridium pale brown, pseudoparenchymatous. Asci eight-spored cylindric-clavate, 300–400 × 40–50 μ, broadly rounded at apices, often tapering below into a rather long stipe. Paraphyses guttulate, hyaline, simple, septate, up to 2 μ in diameter. Ascospores biseriate (readily becoming disarranged), ellipsoid-fusiform, (50–)56–64 × 19–23 μ, acutely rounded at the ends (often broadly rounded) frequently flattened on one side, transversely uniseptate (rarely obliquely septate), slightly constricted at the median septum; at first hyaline then yellowish brown, at maturity almost dark brown and opaque, surrounded by a hyaline gelatinous layer which swells in water. Germinal slit longitudinal.

HABITAT: on hare, goat, and burro dung.

HOLOTYPE: on dung of hare, near Brünn in Mahren, Czechoslovakia, 1883. Niessl, 747 (FH).

SPECIMENS EXAMINED: EUROPE: Czechoslovakia, (TYPE, FH). MEXICO: Zapotlanejo: Jalisco, on burro dung, 18 Aug. 1960, *Cain* 36810 (TRTC): on goat dung, 18 Aug. 1960, *Cain* 36490 (TRTC).

COMMENTS: The type slide of *D. furfuracea* was examined. The determination of how the ascospores are arranged in the ascus presented a problem. A few asci showed a uniseriate arrangement but there were other asci which also demonstrated the biseriate feature. Because ascospores of *Delitschia* in general become so readily displaced in the ascus that it is frequently impossible to arrive at a precise interpretation about them, we have decided to follow Niessl's description. In spore length, the two species *D. furfuracea* and *D. winteri* overlap; however, those of *D. winteri* are wider (24–28 μ) and the end cells are more broadly rounded.

16. ***Delitschia hexaspora*** Luck-Allen & Cain, sp. nov. Figs. 103–107

Peritheciis sparsis, in substrato immersis, piriformibus levibus vel pilis raro, pallido-brunneis deinde fuscis, vestitis, 650–820 × 450–615 μ. Collo nigro, cylindraceo, crasso, leve, 196–200 × 200–300 μ. Cellulis peridii angulatis, irregularibusque, 6–8 μ diam. Ascis 6-sporis, cylindraceis, 400–460 × 48–62 μ, ad summas late rotundatis, stipite circiter 60–90 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, 1.5 μ diam. Ascosporis oblique uniseriatis, ellipsoideis, (70–)74–86(–100) × 32–36(–48) μ, utrinque late rotundatis vel utrinque acutatis, oblique uniseptatis, medio valde constrictis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis opacisque, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo ovino, W of Cody, Park Co., Wyoming, United States, 1 Sept. 1962, *Cain*, TRTC 39051.

ETYMOLOGY: Greek, *hexa* = six and *spora* = seed, referring to the six spores of the ascus.

Perithecia scattered, embedded, at first pale brown, at maturity dark brown; smooth or sparingly covered with hairs, pyriform, 650–820 × 450–615 μ. Neck black, cylindric, broad, bare, 196–200 μ long, at ostiole 200–300 μ in diam. Cells of peridium composed of irregular angular cells, 6–8 μ in diam. Asci six-spored, cylindrical, broadly rounded at apices, 400–460 × 48–62 μ, each ascus tapering below in a stipe, 60–90 μ long. Paraphyses hyaline, filamentous, septate, numerous, up to 1.5 μ in diam. Ascospores obliquely uniseriate, ellipsoid, (70–)74–86(–100) × 32–36(–48) μ, obliquely uniseptate, frequently transversely septate, deeply constricted at median septum; at first hyaline, then yellowish brown, at maturity dark brown; each ascospore surrounded by a gelatinous layer which swells in water up to 20 μ. Germinal slit longitudinal.

HABITAT: on antelope, rabbit, sheep, and wapiti dung.

SPECIMENS EXAMINED: UNITED STATES: Colorado: Moffat Co.: Elk Springs, on wapiti dung, 20 Aug. 1957, *Cain*, TRTC 44888; May-

bell, on rabbit dung, 20 Aug. 1957, *Cain*, TRTC 45149. Montana: Gallatin Co.: Gallatin River, 60 mi S of Bozeman, on sheep dung, 2 Sept. 1957, *Cain*, TRTC 42050. Nevada: White Pine Co.: S of Wendover, on wapiti dung, 21 Aug. 1957, *Cain*, TRTC 42024. Wyoming: Big Horn Co.: Upper Shell Canyon, on antelope dung, 2 Sept. 1962, *Luck-Allen*, TRTC 42099. Park Co.: TRTC 39051 (TYPE).

COMMENTS: This is a very distinctive species with six-spored asci.

17. ***Delitschia illinoisensis*** Luck-Allen, sp. nov. Figs. 108–113

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, semitranslucidis, ad basem pilosis, 480–512 × 420–432 μ. Collo nigro brevi-cylindraceo, 120–130 × 100–144 μ. Pilis flavo-brunneis, levibus usque ad 1000 μ longa. Cellulis peridii angulatis, 7.5–11 × 4–9 μ. Ascis octosporis, cylindraceo-clavatis, 250–300 × 40–60 μ, ad summas late rotundatis, stipite usque ad 80 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, circiter 1–2 μ diam. Ascosporis biseriatis, oblongo-ellipticis, 54–60 × (20–)24–29 μ utrinque late rotundatis vel acutatis, transverse uniseptatis, medio non constrictis. Ascosporis ab hyalinis ad flavo-brunneas postremo atro-brunneis opacisque, strato mucoso hyalino et angusto involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo vaccino, McLean Co., Funks Grove, Illinois, United States, 13 Aug. 1965, *Luck-Allen*, TRTC 45713.

ETYMOLOGY: named in honor of the State of Illinois where the specimen was collected.

Perithecia embedded, scattered, subtransparent, subglobose or pyriform, 480–512 × 420–432 μ; at base, provided with brownish, unbranched, septate, hyphal hairs, up to 4 μ in diam. Neck black, short, cylindrical, 120–130 × 100–144 μ, covered with yellowish brown, smooth, thin-walled, flexuous, blunt hairs, 1–2 μ in diam, up to 1000 μ long. Cells of peridium with walls at times thickened, pale, yellowish brown, angular, 7.5–11 × 4–9 μ. Asci eight-spored, cylindric-clavate, 250–300 × 40–60 μ, broadly rounded at apices, each abruptly terminating in a stipe measuring up to 80 μ long. Paraphyses hyaline, numerous, filamentous, branched, septate, 1–2 μ in diam. Ascospores biseriate, oblong-ellipsoid, broadly rounded or narrowing acutely at the ends; 54–60 × (20–)24–29 μ, transversely uniseptate, nonconstricted at median septum; in color ranging from hyaline to yellowish brown then reddish brown, at maturity dark brown and opaque; each ascospore surrounded by a narrow hyaline gelatinous layer which swells in water up to 20 μ and it shows a striation continuous with the septum of the spore. Germinal slit longitudinal.

HABITAT: on cow dung.

SPECIMEN EXAMINED: UNITED STATES: Illinois: TRTC 45713 (TYPE).

COMMENTS: The nearest relative of *Delitschia illinoisensis* appears to be *D. chaetomioides* with ascospores of smaller dimensions (37–50 × 17–20 μ). In *D. illinoisensis*, the spores are biseriately arranged, whereas those of *D. chaetomioides* are uniseriate.

18. ***Delitschia intonsa*** Luck-Allen, sp. nov. Figs. 114–118

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, membranaceis usque leniter coriaceis, 560–600 × 400–500 μ, pilis brunneis, flexuosis. Collo nigro, cylindraceo vel papilliformi, 210–280 × 200–216 μ. Pilis colli septatis, usque ad 5 μ diam, circiter 100 μ longa, reliqui omnes magis quam 500 μ longa. Cellulis peridii atro-brunneis, semiangulatis usque ad 12 μ longa. Ascis octosporis, cylindraceo-clavatis 200–250 × 34–40 μ, ad summas late rotundatis, stipite usque ad 100 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, circiter 1–2 μ crass. Ascosporis biseriatis, oblongo-ellipticis (44–)48–54 × (15–)16–18 μ, utrinque acutatis (saepe late rotundatis), oblique uniseptatis (saepe transverse uniseptatis) medio non constrictis. Ascosporis ab hyalinis ad flavo-brunneas postremo atro-brunneis, strato mucoso hyalino et angusto involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo equino, Alpine Co., Kit Carson Pass, California, United States, 23 July 1966, *Luck-Allen*, TRTC 45711.

ETYMOLOGY: Latin, *intonsa* = bearded, rough, referring to the numerous appendages on the perithecia, most especially those on the neck.

Perithecia partially embedded, scattered, dark brown, subglobose or pyriform, 560–600 × 400–500 μ, covered with brownish hairs. Neck papilliform or cylindrical, black and opaque, with circular ostiole, 210–280 × 200–216 μ, covered with dark brown, smooth, thin-walled, straight, unbranched septate blunt hairs up to

5 μ in diam, and 100 μ long; other hairs flexuous, branched or unbranched, septate, 1.5–3 μ diam, up to 500 μ or more in length. Cells of peridium dark brown, with walls somewhat thickened, semiangular, up to 12 μ long. Asci eight-spored, cylindric-clavate, 200–250 × 34–40 μ, broadly rounded at apices, each terminating in a stipe measuring up to 100 μ long. Paraphyses hyaline, numerous, filamentous, septate, 1–2 μ in diam. Ascospores biseriate with the lower two spores uniseriate, oblong ellipsoid, obtusely rounded at the ends (rarely broadly rounded) (44–)48–54 × (15–)16–18 μ, rarely with one cell 2 μ or less shorter, obliquely uniseptate, (at times transversely septate), nonconstricted; ranging in color from hyaline to yellow-brown finally dark brown at maturity; each ascospore surrounded by a narrow hyaline gelatinous layer which swells in water up to 15 μ or more and shows a striation continuous with the septum of the spore. Germinal slit longitudinal.

HABITAT: on horse dung.

SPECIMENS EXAMINED: UNITED STATES: California: TRTC 45711 (TYPE).

COMMENTS: The larger biseriately arranged ascospores of *D. intonsa* sp. nov. will separate it from *D. limasepta*, a new species which it superficially resembles.

19. ***Delitschia lachnothecium*** Luck-Allen & Cain, sp. nov. Figs. 119–124

Peritheciis sparsis, in substrato immersis, subglobosis, 500–560 × 400–450 μ, albido tomento ex pilis numerosis composito tectis. Hyphis tomenti albidis, rectis vel flexuosis, septatis, primo tenuibus, postremo parietibus praediti, junctis, 1–4 μ diam. Collo nigro, breve cylindraceo usque 140 μ. Cellulis peridii brunneis, semi-angulatis usque ad 15 μ longa et 10 μ diam. Ascis octosporis, cylindraceis, 260–300 × 24–26 μ, ad summas late rotundatis, basi attenuatis; stipite usque ad 50 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis usque 2 μ diam. Ascosporis oblique uniseriatis, oblongo-ellipsoideis, 36–38(–43) × 14–16 μ, transverse uniseptatis, nonconstrictis vel leviter constrictis; ab hyalinis ad flavo-brunneas, postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo *Cynomydis ludoviciani*, Wind Cave National Park, Custer Co., South Dakota, United States, 3 Sept. 1964, *Cain*, TRTC 41270.

ETYMOLOGY: Greek, *lachno* = soft woolly hairs and *theke* = case, referring to the character of the perithecium.

Perithecia embedded, scattered, brown, subglobose, 500–560 × 400–450 μ, each covered with a white tomentum. Neck black, short, broad, cylindrical, up to 140 μ in length, 150–200 μ wide at apices, projecting to the surface of substratum, surrounded by a white tomentose layer. Appendages of tomentum hyphal, hyaline (white in mass), at first thin-walled, finally thick-walled, infrequently septate, often with small spurs, branched or unbranched, at apices blunt, anastomosing, 1–4 μ in diam, appendages at base of perithecia short, septate, branched, up to 6 μ in diam. Cells of peridium angular with walls slightly thickened, up to 15 μ long, and 10 μ wide. Asci eight-spored, cylindrical, 260–300 × 24–26 μ, broadly rounded at apices, each one narrowing terminally in a stipe measuring about 50 μ long. Paraphyses hyaline, filamentous, septate, numerous, up to 2 μ in diam. Ascospores obliquely uniseriate, oblong-ellipsoid, 36–38-(–43) × 14–16 μ, broadly rounded at the ends, frequently narrowing acutely, transversely uniseptate, nonconstricted at median septum or only slightly so; at first hyaline, then yellow-brown, finally becoming dark brown, each surrounded by a hyaline gelatinous layer. Germinal slit longitudinal.

HABITAT: on prairie dog dung.

SPECIMENS EXAMINED: UNITED STATES: South Dakota: TRTC 41270 (TYPE).

COMMENTS: This species is distinguished by a conspicuous white tomentose layer which envelops the ascocarp. It differs from *D. tomentosa* in its larger asci and ascospores.

20. ***Delitschia lamprorhynchia*** Luck-Allen & Cain, sp. nov. Figs. 45–47

Peritheciis sparsis, in substrato immersis, piriformibus, nigris, 525 × 600 μ. Collo brevi-cylindraceo circiter 210 μ diam; aurantio tomento ex pilis numerosis circum ostium composito. Hyphis tomenti septatis, flexuosis, saepe junctis, 1–3 μ diam. Cellulis peridii atro-brunneis, irregularibusque usque ad 21 μ longa circiter 12 μ diam. Asci octosporis, cylindraceis, 225–325 × 23–36 μ, ad summas late rotundatis, stipite usque ad 50 μ longa. Paraphysibus filiformibus septatis, hyalinis usque 1 μ diam. Ascosporis oblique uniseriatis, ellipsoideis, 32 40(–44) × 15–19 μ, transverse uniseptatis, medio

non constrictis; ab hyalinis ad rubido-brunneas, postremo nigris opacisque, strato mucoso, hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo leporino, Wendover, Elko Co., Nevada, United States, 21 Aug. 1957, *Cain*, TRTC 35772.

ETYMOLOGY: Greek, *lampros* = bright and *rhynchos* = beak, referring to the brilliantly colored tomentum around the beak.

Perithecia embedded, scattered, pyriform, dark brown, almost black, 525 × 600 μ. Neck short, cylindrical or conical, enlarged at ostiole to 210 μ in diam and provided with an orange-colored irregular tomentose layer. Hyphae of tomentum bright orange (in mass), thick-walled, septate, rough, blunt, branched or unbranched, anastomosing, 1–3 μ in diam, over 200 μ long. Cells of the peridium composed of interlocking, irregular, dark cells measuring up to 21 μ long and 12 μ wide. Asci eight-spored, cylindrical, 225–325 × 23–36 μ, broadly rounded at apices, each one terminating in a stipe measuring up to 50 μ. Paraphyses hyaline, filamentous, septate, branched or unbranched, numerous, up to 1 μ in diam. Ascospores obliquely uniseriate, oblong-ellipsoid, 32–40(–44) × 15–19 μ, slightly narrowing toward the ends and broadly rounded, transversely uniseptate, nonconstricted at septum or slightly so; in color ranging from hyaline through yellow-brown to reddish brown, finally almost black and opaque, each ascospore surrounded by a hyaline gelatinous layer which swells greatly in water. Germinal slit generally with a curve near the median septum.

HABITAT: on rabbit dung.

SPECIMEN EXAMINED: UNITED STATES: Nevada: TRTC 35772 (TYPE).

COMMENTS: *Delitschia lamprorhynchia* is related to two other species with orange-colored tomenta, *D. xanthodera* sp. nov. and *D. chrysina* sp. nov. It can be separated from the latter two by its larger asci and ascospores.

21. ***Delitschia limasepta*** Luck-Allen & Cain, sp. nov. Figs. 48–51

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, fuscis, opacisque, 700–880 × 640–810 μ, pilis praeditis. Collo nigro papilliformibus, circiter 200 μ diam. Pilis flavo-brunneis, septatis, flexuosis, circiter 2–3 μ diam. Ascis octosporis, cylindraceis, 200–336 × 14–17 μ, ad summas rotundatis, stipite circiter 50 μ longa. Paraphysibus filiformibus, septatis, hyalinis, 0.5–1.5 μ diam. Ascosporis uniseriatis, ellipsoideis, 24–35(–37) × 12–14(–16) μ, oblique uniseptatis, medio non constrictis; initio hyalinis, deinde flavis, postremo rubido-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo *Erethizonis dorsati*, Costello Lake, Algonquin Park, Nipissing Dist., Ontario, Canada, 30 Aug. 1939, *Cain*, TRTC 36074.

ETYMOLOGY: Latin, *lima* = oblique and *septum* = wall, referring to the position of the ascospore septum.

Perithecia embedded, scattered, dark and opaque, subglobose or pyriform, 700–880 × 640–810 μ, covered with hairs. Neck black, papilliform, enlarged at ostiole to 200 μ in diam and provided with hairs similar to those on rest of perithecium. Hairs flexuous, septate, blunt, yellowish brown, branched or unbranched, with walls slightly thickened, up to 160 μ long, about 2–3 μ in diam. Cells of peridium indistinct. Asci eight-spored, cylindrical, 200–336 × 14–17 μ, rounded at apices, each one tapering below in a stipe measuring about 50 μ long. Paraphyses hyaline, filamentous, septate, numerous, 0.5–1.5 μ in diam. Ascospores uniseriate, ellipsoid, 24–35(–37) × 12–14(–16) μ, acutely rounded at the ends (rarely with one or both ends abruptly narrowed, almost apiculate), typically obliquely uniseptate (occasionally septum transverse), nonconstricted at septum; at first hyaline, then yellowish, finally dark reddish brown; each ascospore surrounded by a hyaline gelatinous layer. Germinal slit longitudinal.

HABITAT: on porcupine dung.

SPECIMEN EXAMINED: CANADA: Ontario: TRTC 36074 (TYPE).

COMMENTS: This species is macrostructurally similar to *D. vulgaris* because of the hairy perithecia but it can easily be distinguished from the latter by its spore characters. In *D. vulgaris* the end cells are broadly rounded and the septum is transverse, whereas in *D. limasepta* the end cells are acutely rounded and the septum is oblique.

22. *Delitschia marchalii* Berl. & Vogl. in Sacc., Syll. Fung. Add. 1–4: 127. 1886. Figs. 16–20, 151

≡ *Delitschia* sp. (?) Marchal, Bull. Soc. Bot. Belg. 23 (2): 1884.

Perithecia embedded, black, smooth, sub-

globose or globose, 265–400 × 200–450 μ, when globose, 300–450 μ. Neck black and opaque, smooth, papillate, with circular ostiole, emergent to short-cylindric, 100–350 × 100–175 μ. Asci numerous, eight-spored, cylindrical, 60–100 × 7–11(–12) μ, rounded at apices, each terminating in a short stipe. Paraphyses filamentous, hyaline, septate, numerous, less than 1 μ in diam. Ascospores abundant, obliquely uniseriate, ellipsoid, 10–12(–14) × 5–6 μ, rounded at both ends, transversely uniseptate; nonconstricted at median septum or slightly so, cells nonseparable; when immature hyaline, later yellowish brown, finally dark brown and opaque, each ascospore surrounded by a narrow gelatinous layer which swells conspicuously in water. Germ slit lateral, extending entire length of cell.

HABITAT: common on dung of various animals especially rabbit, goat, and deer.

HOLOTYPE: on rabbit dung between Limette and the Baraque, Belgium, December 1883.

SPECIMENS EXAMINED: EAST AFRICA: Kenya: Mt. Kenya: Timau Track, elevation 13 000 ft, 0°5′ S 37°20′ E, on eland dung, 14 July 1966, *Cain, Griffin & Krug*, TRTC 66.640. CANADA: Alberta: Jasper National Park: Miette Hot Springs, on moose dung, 4 Aug. 1962, *Luck-Allen*, TRTC 38962. Ontario: Haliburton Co.: Hollow River, E of Kawagama Lake, on rabbit dung, 16 Aug. 1960, *Hamly J.*, TRTC 36408. Muskoka Dist.: Huntsville, Fairy Lake, on rabbit dung, 13 Sept. 1931, *Cain*, TRTC 36014. Peel Co.: SW of Palgrave, on rabbit dung, 7 Oct. 1962, *Cain*, TRTC 38819. Thunder Bay Dist.: Black Sturgeon Lake, on moose dung, 1 Aug. 1965, *Cain*, TRTC 46737. Timagami Dist.: Cattle Is., on rabbit dung, 30 Aug. 1945, *Cain*, TRTC 46738. Quebec: Laurentide Park, Le Gite, on rabbit dung, 1 Sept. 1959, *Cain*, TRTC 39359. Highway 9, 40 mi SW of Quebec City, on rabbit dung, 23 Aug. 1959, *Cain*, TRTC 39357. EUROPE: Czechoslovakia: Brünn: Mähren, on hare dung, Aug. 1883, with *Delitschia moravica* Niessl. Rehm Ascomyceten, 746 (G); Mahr: Schuttplatz "auf einer Bastdecke," Oct. 1913, *F. Petrak*, with *Preussia typharum* (as *Perisporium typharum* Sacc.) Flora Bohemiae et Moraviae Ex. 963(PR). Germany: near Rügen, on rabbit dung, 29 July 1909, with *Hypocopra merdaria* Fries, *Kirschstein* (B). Lapland: Gallivare Parish, in pine forest on deer dung after 6 days in moist chamber in laboratory in Uppsala, 13 Aug. 1960, *Lundqvist* 2764 (UPS). SOUTH AMERICA: Argentina: Mendoza, Punta de Vacaa, on dung of *Lagidium cuvierii*, March 1901, (as *Delitschia perpusilla* Spegazzini 5982 (LPS). Tierra del Fuego: Ushuaia, on goose dung, associated with *Sporormia grandispora* V-1882 (LPS). UNITED STATES: Idaho: Elmore Co.: 30 mi W of King's Hill, on rabbit dung, 31 Aug. 1962, *Luck-Allen*, TRTC 39871. Montana Park Co.: Springdale, on horse dung, 3 Sept. 1957, *Cain*, TRTC 42053. Treasure Co.: Big Horn, on cow dung, 4 Sept. 1957, *Cain*, TRTC 42055. Yellowstone Co.: 30 mi W of Billings, on dung of antelope, 3 Sept. 1957, *Cain*, TRTC 42771. New York: Allegheny State Park, Stoddard Brook, on deer dung, 11 June 1961, *Cain*, TRTC 37594. North Dakota: Billings Co.: Medora, on horse dung, 4 Sept. 1957, *Cain*, TRTC 44804. Wyoming: Crook Co.: Sundance, on rabbit dung, 3 Sept. 1962, *Cain*, TRTC 39129. Park Co.: W of Cody, on sheep dung, 1 Sept. 1962, *Cain*, TRTC 39039; on porcupine dung, 3 July 1955, *Cain*, TRTC 32340a. Teton Co.: Moran, Teton National Forest, on moose dung, 30 June 1955, *Cain*, TRTC 32016.

COMMENTS: In 1884, Marchal described a new *Delitschia* which he suspected could be related to *D. elephantina* but his inability to obtain authentic material of Beccari's *D. elephantina* prevented him from making a firm decision about his new fungus. He referred to the fungus as "*Delitschia* sp. (?)." Berlese and Voglin (1886) gave Marchal's fungus the epithet *marchalii* but used the description already provided by Marchal.

*Delitschia marchalii* appears to be one of the more common species of *Delitschia* and is found on a variety of dung. Its relationship is clearly with *D. perpusilla* and the two might present a confusing problem in identification at the extreme limits. The ascospores of *D. perpusilla* average 8–10 × 3–4 μ while those of *marchalii* are larger (10–12 × 5–6 μ).

There are no Mexican collections of *D. marchalii* in TRTC despite its wide geographical distribution. The Mexican collections conform to our interpretation of *D. perpusilla*. The two species are being retained as distinct pending further investigations.

23. ***Delitschia megatetraspora*** Luck-Allen & Cain, sp. nov. Figs. 125–128

Peritheciis in substrato immersis, piriformibus, fuscis, opacisque, 850–1000 × 500–800 μ. Collo nigro, brevi-cylindraceo, 287–390 × 200–250 μ. Cellulis peridii, angulatis, irregularibusque usque

ad 10 × 8 μ. Ascis 4-sporis, cylindraceis, 400–490 × 56–66 μ, ad summas late rotundatis, stipite 80–150 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, 1–2 μ diam. Ascosporis oblique uniseriatis, oblongo-ellipsoideis, (78–)90–105 × 34–36 μ, oblique uniseptatis, valde constrictis, segmentis ascosporarum maturis non sejunctis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis opacisque, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo ovino, W of Cody, Park Co., Wyoming, United States, 1 Sept. 1962, *Cain*, TRTC 39042.

ETYMOLOGY: Greek, *mega* = large, *tetra* = four, and *spora* = seed, referring to the large, four spores which occur in each ascus.

Perithecia deeply embedded, dark and opaque, pyriform, 850–1000 × 500–800 μ, smooth, rarely with a few hairs on the basal portion. Neck black, smooth, short, cylindrical, broad, 287–390 × 200–250 μ. Cells of peridium angular, walls irregularly thickened, measuring up to 10 × 8 μ. Asci four-spored, cylindrical, 400–490 × 56–66 μ, rounded above, each one tapering in stipe, 80–150 μ long. Paraphyses hyaline, filamentous, septate, numerous, 1–2 μ in diam. Ascospores obliquely uniseriate, oblong ellipsoid, (78–)90–105 × 34–36 μ, broadly to acutely rounded at the ends, obliquely uniseptate, at times transversely septate, deeply constricted at median septum (rarely one-celled, 80–90 × 38 μ, narrowing at each end to 15–20 μ); at first hyaline, then yellowish brown, finally dark brown and opaque, each ascospore surrounded by a gelatinous layer which swells in water to a diameter of 40 μ and it shows a striation continuous with the septum of the spore, Germinal slit longitudinal, extending the full length of cells.

HABITAT: on dung of moose and sheep.

SPECIMENS EXAMINED: UNITED STATES: Montana: Gallatin Co.: Gallatin R, 55 mi S of Bozeman, on moose dung, 2 Sept. 1957, *Cain*, TRTC 42394. Wyoming: TRTC 39042 (TYPE).

COMMENTS: *Delitschia megatetraspora* resembles *D. anomala* in being four-spored but the ascospores of the former are deeply constricted. The one-celled stage of the ascospores is suggestive of those seen in *Semidelitschia* Cain & Luck-Allen (1969); however, the condition found in *D. megatetraspora* is an exception rather than the rule. The one ascus with one-celled ascospores was seen in only 1 ascocarp (out of 12 examined). This species cannot be identified with *Semidelitschia* because of the shape and size of the ascospores as well as the lack of other characters specified for that genus.

24. ***Delitschia melanotricha*** Luck-Allen & Cain, sp. nov. Figs. 52–55

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, pilis nigris praeditis, 500–700 × 450–600 μ. Collo nigro, cylindraceo usque ad 1000 μ longa et 300 μ crass., pilis praedito. Pilis nigris septatis, rectis vel flexuosis, usque ad 500 μ longa. Ascis octosporis, cylindraceis, 150–200 × 12–15 μ ad summas rotundatis, stipite circiter 38–40 μ longa. Paraphysibus filiformibus, septatis, hyalinis 1.5–2 μ crass. Ascosporis uniseriatis oblongo-ellipsoideis, 20–28 × 9–11 μ, transverse uniseptatis, medio non constrictis. Ascosporis ab hyalinis ad flavo-brunneas, postremo nigris opacisque, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo leporino, Tamaulipas, Reynosa, Mexico, 20 Aug. 1960, *Cain*, TRTC 36567.

ETYMOLOGY: Greek, *melanos* = black and *thrix* = hair, referring to the black hairs on the perithecia.

Perithecia partially to completely embedded, scattered, dark and opaque, subglobose or pyriform, 500–700 × 450–600 μ, completely enveloped in hairs. Neck black, cylindrical, with circular ostiole, measuring up to 1000 μ long and 300 μ in diam, provided with numerous long hairs similar in structure to those on rest of perithecia but generally longer. Hairs black, straight or flexuous, septate, branched or unbranched, often tapering, with walls slightly thickened anteriorly, thicker toward base, measuring up to 500 μ long, 4–5 μ wide at base, frequently narrowing to 1.5–3 μ in diam at apices, with tips often paler in color, blunt. Cells of peridium indistinct, obscure. Asci eight-spored, cylindrical, 150–200 × 12–15 μ, rounded at apices, each terminating in a stipe, 38–40 μ long. Paraphyses hyaline, filamentous, septate, numerous, 1.5–2 μ in diam. Ascospores obliquely uniseriate, oblong ellipsoid, 20–28 × 9–11 μ, transversely uniseptate, nonconstricted at septum or only slightly so; at first hyaline, later yellow-brown, finally almost black and opaque, ascospores surrounded by a hyaline gelatinous layer which swells in water. Germinal slit longitudinal.

HABITAT: on dung of burro, cow, mule, and porcupine.

SPECIMENS EXAMINED: EAST AFRICA: Kenya: Aberdare Nat. Park, elevation 10 000 ft, 0°26′ S 36°44′ E, on elephant dung, 4 Sept. 1966, *Cain, Griffin & Krug*, TRTC 66.1541. Mt. Kenya, Castle, on elephant dung, 11 July 1966, *Cain, Griffin & Krug*, TRTC 66.381. CANADA: Ontario: Leeds Co.: 9 mi E of Brockville, on porcupine dung, 28 Sept. 1965, *J. Krug*, TRTC 45659. Timagami Dist.: Little Cross, Lake Portage, on porcupine dung, 21 Aug. 1933, *Cain*, TRTC 5925. MEXICO: Tamaulipas: TRTC 36567 (TYPE); on burro dung, 20 Aug. 1960, *Cain*, TRTC 39153. SOUTH AMERICA: Brazil: Rio Grande do Sul: Sao Leopoldo, on cow dung, 11 Mar. 1936. *Alfons Theobald* 6820 (TRTC). UNITED STATES: Montana: Treasure Co.: Big Horn, on cow dung, 4 Sept. 1957, *Cain*, TRTC 42057. Wyoming: Niobrara Co.: Mule Creek, on cow dung, 2 Sept. 1964, *Cain*, TRTC 40167. Platte Co.: 12 mi SW of Wheatland, on cow dung, 1 Sept. 1964, *Cain*, TRTC 45408.

COMMENTS: *Delitschia melanotricha* resembles *D. araneosa* macrostructurally in the hairy character of its perithecia but it can easily be separated from the latter by its smaller ascospores.

25. *Delitschia myriaspora* Breton & Faurel, Rev. Mycol. 35(1): 41. 1970. Figs. 56–60, 150

Perithecia black, carbonaceous, embedded with only the neck emergent or partially embedded, globose or slightly pyriform, 300–550 × 250 500 μ. Neck cylindrical, 200–300 μ long, at base 100–175 μ in diam. Hairs, when present, hyphal, flexuous, septate, very long, reddish brown, 3–4 μ in diam. Asci few in number, multispored, 256 (more or less) in number, fusiform, 200–250 × 50 μ, each terminating in a short stipe. Paraphyses hyaline, filamentous, sparse, 1–2 μ in diam. Ascospores two or three seriate at apices of asci, becoming four–six seriate below, and finally separate at base; ellipsoid, 14–15 × 6–8 μ, transversely uniseptate, nonconstricted or only slightly constricted at the median septum; at first hyaline, deep reddish brown at maturity, in mass black. Germinal slit bilateral.

HABITAT: on dung of rabbit and red rock hare.

HOLOTYPE: on rabbit dung, Plateau Biti, Massif de l'Ennedi about 1000 m altitude République du Tchad, Paris, France, 25 Dec. 1966, *Th. Monod* 13773 (PC).

SPECIMEN EXAMINED: FRANCE: Paris, PC. (HOLOTYPE).

COMMENTS: Studies of permanent slides of the type revealed the presence of numerous branched and unbranched flexuous hyphal hairs associated with squashed portions of the perithecium. Breton and Faurel reported that these occurred abundantly on the neck and superficial portions of the ascocarp at an early stage but disappeared as the perithecia matured. This is the first multispored *Delitschia* reported recently.

26. ***Delitschia nephrospora*** Luck-Allen & Cain, sp. nov. Figs. 84–86

Peritheciis sparsis, in substrato immersis, piriformibus, levibus, fuscis, 450–500 × 250–300 μ. Collo nigro, brevi-cylindraceo, 140–165 × 112–120 μ. Cellulis peridii irregularbusque usque 15 μ. Ascis octosporis cylindraceis, 385–540 × 46–65 μ, ad summas late rotundatis, stipite, 45–65 μ longa. Paraphysibus hyalinis, filiformibus, septatis, numerosis, usque ad 2 μ diam. Ascosporis uniseriatis, ovato-ellipsoideis (42–)50–65 × 24–35 μ, oblique uniseptatis, valde constrictis, segmentis ascosporarum maturis saepe sejunctis. Ascosporis ab hyalinis ad flavo-brunneas postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo ovino, W of Cody, Park Co., Wyoming, United States, 1 Sept. 1962, *Cain*, TRTC 39048.

ETYMOLOGY: Greek, *nephro* = kidney and *spora* = seed, referring to the shape of the ascospores.

Perithecia scattered, embedded, dark, smooth, pyriform, 450–500 × 250–300 μ. Neck black, cylindrical, smooth, 140–165 × 112–125 μ. Cells of peridium angular somewhat thin-walled, up to 15 μ in diam, and 20 μ long. Asci eight-spored, cylindrical, 385–540 × 46–65 μ, broadly rounded at apices, each one narrowed below in a stipe measuring 45–65 μ long. Paraphyses hyaline, filamentous, septate, numerous, 0.5–2 μ. Ascospores obliquely uniseriate, reniform, (42–)50–65 × 24–35 μ, broadly rounded at the ends (occasionally acutely rounded), obliquely uniseptate, deeply constricted at median septum with cells separable at maturity; each cell ovate, 35–46(–50) × 24–35 μ, at times globose; at first hyaline, then yellowish brown, finally becoming dark brown; each ascospore surrounded by a hyaline gelatinous layer which swells to 30 μ in

water, showing a striation continuous with septum of spore. Germinal slit longitudinal.

HABITAT: on sheep dung.

SPECIMENS EXAMINED: UNITED STATES: South Dakota: Fall River Co.: Hot Springs, on rabbit dung, 3 Sept. 1964, *Cain*, TRTC 46383. Wyoming: Big Horn Co.: Upper Shell Canyon, on sheep dung, 2 Sept. 1962, *Luck-Allen*, TRTC 42098; Park Co.: TRTC 39048 (TYPE).

COMMENTS: This species is recognized by its reniform ascospores. Its nearest relative is *D. didyma*, from which it can be separated by the shape of its ascospores and their larger size.

27. *Delitschia niesslii* Oud., Hedwigia, 21(11): 163. 1882. Figs. 79–81

Perithecia deeply embedded, dark, smooth, subglobose to globose, when globose 300–495 μ. Neck black, bare, short-cylindric, (dome-shaped), emergent, up to 250 μ long, 200 μ in diam. Asci eight-spored, cylindrical, 70–90 × 7–13(–16) μ, broadly rounded at apices, each one terminating abruptly in a short, narrow stipe up to 25 μ long. Paraphyses hyaline, filamentous, septate, numerous, branching, measuring up to 1.5 μ in diam. Ascospores obliquely uniseriate, readily becoming biseriate, oblong-ellipsoid, 14–16(–18) × 6–7(–10) μ, broadly rounded at each end, transversely uniseptate, slightly constricted at septum, cells nonseparable; hyaline when immature, later yellow to dark brown, each surrounded by a narrow hyaline gelatinous layer. Germinal slit oblique, generally curved at median septum.

HABITAT: on the dung of various animals.

HOLOTYPE: on rabbit dung, Holland, The Netherlands, Europe, 1882.

SPECIMENS EXAMINED: CANADA: Ontario: Nipissing Dist.: Algonquin Park, Macaulay Rd., on deer dung, 24 Aug. 1939, *Cain*, TRTC 35902. Sudbury Dist.: Vroonman Twp., S of Gogama, on rabbit dung, 22 June 1960, *Cain*, TRTC 39361. UNITED STATES: Idaho: Elmore Co.: 3 mi W of King's Hill, on rabbit dung, 31 Aug. 1962, *Luck-Allen*, TRTC 40198. Nevada: White Pine Co.: 40 mi SW of Ely, on rabbit dung, 21 Aug. 1957, *Cain*, TRTC 39666. North Dakota: Billings Co.: Medora, on horse dung, 4 Sept. 1957, *Cain*, TRTC 39315. Wyoming: Converse Co.: E of Orin, on horse dung, 2 Sept. 1964, *Cain*, TRTC 42514. Niobrara Co.: N of Lusk, on cow dung, 2 Sept. 1964, *Cain*, TRTC 42465; on horse dung, 2 Sept. 1964, *Cain*, TRTC 42563; on rabbit dung, 2 Sept. 1964, *Cain*, TRTC 42485; Mule Creek, on horse dung, 2 Sept. 1964, *Cain*, TRTC 42895. Platte Co.: Glendo, on horse dung, 2 Sept. 1964, *Cain*, TRTC 42560.

COMMENTS: The type of *D. niesslii* was not available for examination. The description is based on that provided by Oudemans. *Delitschia niesslii* resembles *D. marchalii* but has larger ascospores.

28. ***Delitschia oligospora*** Luck-Allen & Cain, sp. nov. Figs. 61–65

Peritheciis sparsis, in substrato immersis, subglobosis, levibus aut cum pilis nigris opacisque, 275–330 × 300–360 μ. Collo nigro, breve, papilliformi. Cellulis peridii angulatis, usque ad 17 μ crass. Ascis 4-sporis, (raro 2–3 sporis), cylindraceis, 40–60(–70) × 8–10(–12) μ, ad summas rotundatis, stipite breve. Paraphysibus numerosis, filiformibus, septatis, hyalinis, circiter 1 μ crass. Ascosporis uniseriatis, ellipsoideis, 18–21(–25) × 6–7(–8) μ, transverse uniseptatis, valde constrictis, segmentis ascosporarum maturis saepe sejunctis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis, strato mucoso hyalino et angusto involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo leporino, 6 mi S of Wendover, White Pine Co., Nevada, 21 Aug. 1957, *Cain*, TRTC 43768.

ETYMOLOGY: Greek, *oligos* = few and *spora* = seed, referring to the small number of ascospores produced in each ascus.

Perithecia embedded, scattered, dark and opaque, subglobose, 275–330 × 300–360 μ, rarely provided with sparse hyphal hairs. Neck bare, black, papilliform, with circular ostiole protruding through the substratum. Hairs (when present) on midportion and basal portion of ascocarp, hyphal, scant, hyaline, septate, branched or unbranched, thick-walled, up to 80 μ long, 3–5 μ in diam. Cells of peridium angular, thick-walled, measuring up to 17 μ long and 14 μ in diam. Asci typically four-spored, (rarely two- or three-spored), cylindrical 40–60(–70) × 8–10(–12) μ, rounded at apices, each narrowed to a short stipe less than 25 μ long. Paraphyses hyaline, filamentous, septate, numerous, less than 1 μ in diam. Ascospores uniseriate, parallel, oblong-ellipsoid, 18–21(–25) × 6–7(–8) μ, transversely uniseptate; at maturity deeply constricted with cells separating at septum; ascospores at first hyaline, then yellow-brown, finally becoming dark brown,

each spore surrounded by a narrow gelatinous layer. Germinal slit longitudinal.

HABITAT: on rabbit dung.

SPECIMEN EXAMINED: UNITED STATES: Nevada: TRTC 43768 (TYPE).

COMMENTS: Ascospores vary from two to four per ascus; however the typical number is four. The lesser numbers are due to incomplete cell divisions. *Delitschia tetrasporella* resembles *D. oligospora* in being four-spored but differs in possessing smaller ascospores with cells that do not separate at the septum.

29. ***Delitschia pachylospora*** Luck-Allen & Cain, sp. nov. Figs. 129–132,157

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, 900–1030 × 1000–1250 μ, hyalinis, tum flavo-brunneis postremo atro-brunneis opacisque. Collo nigro, cylindraceo, laeve, usque ad 400 μ longa. Cellulis peridii angulatis irregularibusque, usque ad 14 μ longa, usque 10 μ crass. Ascis octosporis, cylindraceis, 400–500 × (40–)50–70(–80) μ ad summas late rotundatis, in stipite attenuatis usque ad 50 μ longa. Paraphysibus numerosis, filiformibus, septatis, 1–2 μ crass. Ascosporis uniseriatis, ovalibus, 47–65(–75) × (25–)29–35(–37) μ, transverse uniseptatis, medio non constrictis. Ascosporis ab hyalinis ad flavo-brunneas postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo leporino, Duchesne, Duchesne Co., Utah, United States, 20 Aug. 1957, *Cain*, TRTC 36239.

ETYMOLOGY: Greek, *pachylos* = thickish and *spora* = seed, referring to the character of the ascospores.

Perithecia embedded, scattered, smooth, yellowish brown to dark and opaque, subglobose or pyriform, 900–1030 × 1000–1250 μ. Neck black, bare, cylindrical, up to 400 μ long. Cells of peridium angular, with walls thickened, up to 14 μ long and 10 μ wide. Asci eight-spored, cylindrical, 400–500 × (40–)50–70(–80) μ, broadly rounded at apices, each tapering below in a stipe measuring up to 50 μ long. Paraphyses hyaline, filamentous, septate, numerous, 1–2 μ in diam. Ascospores obliquely uniseriate, ovate, 47–65(–75) × (25–)29–35(–37) μ, broadly rounded at the ends, transversely uniseptate, nonconstricted at septum or only slightly constricted, at first hyaline, then yellow-brown, at maturity dark brown, each surrounded by a hyaline gelatinous layer which swells in water where it shows a striation continuous with the septum of the spore. Germinal slit longitudinal.

HABITAT: on dung of antelope, cow, horse, and sheep.

SPECIMENS EXAMINED: UNITED STATES: Colorado: Boulder Co.: 1 mi from Arapaho Picnic Ground, on cow dung, 22 Aug. 1964, *Luck-Allen*, TRTC 43770; N of Nederland, on rabbit dung, 27 Aug. 1964, *Cain*, TRTC 46770. Idaho: Elmore Co.: 3 mi W of King's Hill, on cow dung, 31 Aug. 1962, *Luck-Allen*, TRTC 40679. Montana: Treasure Co.: Bighorn, on sheep dung, 3 Sept. 1957, *Cain*, TRTC 42360. Nevada: White Pine Co.: 60 mi S of Wendover, on sheep dung, 21 Aug. 1957, *Cain*, TRTC 42025; 30 mi S of Wendover, on sheep dung, 21 Aug. 1957, *Cain*, TRTC 39642. Utah: Duchesne, TRTC 36239 (TYPE). Wyoming: Bighorn Co.: Upper Shell Canyon, on antelope dung, 2 Sept. 1962, *Luck-Allen*, TRTC 42100; Crook Co.: on horse dung, 3 Sept. 1962, *Cain*, TRTC 39089; Platte Co.: 12 mi SW of Wheatland, on cow dung, 1 Sept. 1964, *Cain*, TRTC 39673.

COMMENTS: *Delitschia pachylospora* resembles *D. griffithsii* in having large, nonconstricted ascospores, and they may overlap with those of the latter species. The presence of numerous flexuous white hairs covering the ascocarp of *griffithsii* and their absence in *pachylospora* provides a satisfactory criterion for separating the two species.

30. *Delitschia patagonica* Speg., Fungi Patagonici Bol. Acad. Nac. Cienc. Cordoba, 2: 46. 1887. Figs. 153, 154, 158, 159
≡ *Phorcys patagonica* (Speg.) v. Höhn, Akad. Wiss. Wien Sitzungsber., Math.-Naturwiss, Kl. 129: 159. 1920.
= *Delitschia kriegeriana* Kirschst., Ann. Mycol. 34(3): 197. 1936.

Perithecia embedded, scattered, dark, smooth, globose or pyriform, when globose 500–700 μ in diam, when pyriform 500–700 × 450–560 μ. Neck black, opaque, bare, papilliform or short-cylindric, with circular ostiole protruding through the substratum, at times extending up to 300 μ long and 200 μ in diam. Cells of peridium angular up to 16 μ long, 10 μ wide. Asci eight-spored, cylindric, 200–260 × 20–30 μ, broadly rounded at apices, each abruptly terminating in a stipe 45–50 μ long. Paraphyses hyaline, guttulate, simple, septate, few, up to 1 μ in diam. Ascospores obliquely uniseriate, oblong-ellipsoid, (40–)42–55 × 16–21 μ, broadly rounded at the

ends (occasionally narrowed acutely), transversely uniseptate, nonconstricted or slightly constricted at septa; at first hyaline, later dark brown, at maturity almost black and opaque, each surrounded by a hyaline gelatinous layer which swells in water. Germinal slit longitudinal.

HABITAT: on dung of sheep.

HOLOTYPE: on dung of "*Auchenia guanaco*," Jan. 1882, near Mount Entrance at the Port of Rio Santa Cruz, Patagonica, Argentina, South America. *Spegazzini* 5985 (NY).

SPECIMENS EXAMINED: CANADA: Alberta: N of Beaver Mines, on moose dung, 28th July 1962, *Cain*, TRTC 38983. Stevensville Provincial Pk., on antelope dung, Aug. 1965, *Guccione*, TRTC 42530. Ontario: Algonquin Pk., Sproule R., on deer dung, 28 Aug. 1939, *Cain*, TRTC 45346. Grey Co.: Balaclava, on rabbit dung, 14 July 1930, *Cain*, TRTC 5326. York Co.: Westhill, on rabbit dung, 20 Oct. 1929, *Cain*, TRTC 5325. MEXICO: Durango: N of Durango, on burro dung, 13 Aug. 1960, *Cain*, TRTC 36981. SOUTH AMERICA: Argentina: Patagonica (TYPE, NY.). Tierra del Fuego: Ushuaia, on sheep dung, 1 June 1882, Spegazzini 5984 (NY). UNITED STATES: Colorado: Larimer Co.: Roosevelt National Forest, Buckhorn, on porcupine dung, 17 Aug. 1957, *Cain*, TRTC 41422. Montana: Gallatin Co.: Gallatin R., 55 mi S of Bozeman, on moose dung, 2 Sept. 1955, *Cain*, TRTC 42391. Treasure Co.: Bighorn, on horse dung, 4 Sept. 1957, *Cain*, TRTC 42037. North Dakota: Billings Co.: Medora, on pronghorn dung, 5 Sept. 1957, *Cain*, TRTC 41963. South Dakota: Meade Co.: Wall, on cow dung, 3 Sept. 1962, *Cain*, TRTC 39439. Wyoming: Laramie Co.: Cheyenne, on sheep dung, 16 Aug. 1964, *Cain*, TRTC 42307.

COMMENTS: The holotype of *D. patagonica* was examined. On the outside of the packet, Spegazzini described ascospores as 35 × 16 μ. We did not find ascospores as small as those indicated by Spegazzini. A second authentic collection (No. 5984) designated by Spegazzini as *D. patagonica* was also studied. In all cases, spores measured (40–)42–55 × 16–21 μ.

*Delitschia auerswaldii* according to Fuckel's description and specimen is *D. patagonica*.

31. *Delitschia perpusilla* Speg., Anal. Mus. Nacion. de Buenos Aires, 6: 275. 1899. Figs. 21–23

Perithecia embedded, black, usually smooth, at times with hairs sparingly present on basal portion, globose, 200–500 μ in diam. Neck black, smooth, papillate, with circular ostiole, emergent to short-cylindric, 110–225 × 100–150 μ. Asci eight-spored, cylindrical, 50–75 × 6–8(–9) μ, rounded at apices, each abruptly terminating in a stipe which may exceed 50 μ in length. Paraphyses hyaline, filamentous, septate, numerous, less than 1 μ in diam. Ascospores obliquely uniseriate, oblong-ellipsoid, 8–10(–11) × 3–4(–5) μ, rounded at both ends, transversely uniseptate, nonconstricted at median septum or slightly so, cells nonseparable; at first hyaline, then yellowish brown, finally dark and opaque, each ascospore surrounded by a narrow gelatinous layer which swells conspicuously in water. Germinal slit longitudinal.

HABITAT: on dung of various animals.

NEOTYPE: on goat dung, Nuevo Leon, China, Mexico, 20 Aug. 1960, *Cain*, TRTC 36720.

SPECIMENS EXAMINED: CANADA: Alberta: Banff National Park: Sunwapta Pass, on moose dung, 9 Aug. 1962, *Luck-Allen*, TRTC 39170. Ontario: Algoma Dist.: Mississagua River, Twp. 196, on porcupine dung, 29 July, 1956, *Cain*, TRTC 39299. EUROPE: Germany: between Königstein and Glashüten, on deer dung in pine forest, 1894, mixed with *Delitschia minuta* (G). MEXICO: El Sueco: Chihuchua, on cow dung, 11 Aug. 1960, *Cain*, TRTC 39161; Nuevo Leon: China, TRTC 36720 (NEOTYPE); San Luis Potosi: Cd. del Maiz, on burro dung, 19 Aug. 1960, *Cain*, TRTC 39164; Cd. del Maiz, on cow dung, 19 Aug. 1960, *Cain*, TRTC 39244; Villa Hidalgo; on rodent dung, 18 Aug. 1960, *Cain*, TRTC 36806. Sinaloa: E of Mazatlan, on burro dung, 15 Aug. 1960, *Cain*, TRTC 36892.

COMMENTS: A packet dated May 25, 1888 and recorded as "*Delitschia* (?) *perpusilla*" on cow dung, collected near La Plata by Spegazzini (No. 5981) and bearing the notation "asci 50–60 × 7–8 μ, spores 9–10 × 4 μ, *sine exemplar*," is available. According to the literature, this organism is a *Delitschia* and agrees with the description of *D. perpusilla* published by Spegazzini in 1899. Unfortunately, the type material is lost. This being so, a neotype has been selected.

Another Spegazzini collection (No. 5982), designated as *D. perpusilla* Speg., on *Lagidium cuvierii* from Mendoza, Punta de Vocaa, and collected March 1901, is also available. In this collection, asci measured 70–100 × 10 μ, the ascospores 11–13(–14) × 5–6 μ. The dimensions

of the elements are too large for *D. perpusilla* but agree with those of *D. marchalii*.

32. *Delitschia polyspora* Griff., Mem. Torrey Bot. Club, 11: 105. 1901. Figs. 133–135
≡ *Delitschiella polyspora* (Griff.) Sacc. et D. Sacc., Syll. Fung. 17: 688. 1905.

Perithecia scattered, embedded, dark brown to black and opaque, subglobose or pyriform, measuring up to 1000 μ long, 400–700 μ wide, provided with hairs. Neck bare, black, cylindrical, of variable length. Hairs flexuous, septate. Asci 16-spored, cylindric-clavate, 340–375 × 85–100 μ, broadly rounded at apices, abruptly terminating in a short stipe. Paraphyses hyaline, filamentous, septate, numerous, longer than the asci and mixed with them, about 1.4–2 μ in diam. Ascospores triseriate, becoming disarranged, crowded, ellipsoid, 52–62 × 18–21(–24) μ, broadly rounded at the ends, frequently acutely narrowed (almost fusiform), transversely uniseptate, each deeply constricted with cells separating at the septum; at first hyaline, then yellow to yellowish brown, at maturity dark brown and opaque; each surrounded by a hyaline, gelatinous layer and it shows a striation continuous with the septum of the spore.

HABITAT: on cow dung.

HOLOTYPE: on cow dung, Tucson, Arizona, United States, Jan. 1900, *Tyler* (NY).

COMMENTS: This is known only from the type collection. The description is basically that of Griffiths. *Delitschia polyspora* was one of the first species to be described with more than eight spores per ascus and can be easily identified by its 16 deeply constricted ascospores each of which separates readily at the median septum.

33. ***Delitschia simulans*** Luck-Allen & Cain, sp. nov. Figs. 68–72

Peritheciis sparsis, in substrato semi-immersis, subglobosis vel piriformibus, levibus, nigris, opacisque, 500–900 × 400–700 μ. Collo nigro brevi-cylindraceo usque ad 270 μ longa, circiter 255 μ diam. Cellulis peridii angulatis. Ascis octosporis, cylindraceis, 60–100 × 14–20 μ, late rotundatis, stipite usque ad 55 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, circiter 2 μ diam. Ascosporis uniseriatis ellipsoideis, 20–25(–27) × 9–13(–14) μ, utrinque late rotundatis, transverse uniseptatis, medio non constrictis, ab hyalinis ad rubido-brunneas postremo nigris opacisque. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo burrici, El Casco, Durango, Mexico, 13 Aug. 1960, *Cain*, TRTC 36574.

ETYMOLOGY: Latin, *simulans* = imitating, referring to the general morphological character of the fungus resembling any other species in the taxon and having no exceptional features.

Perithecia scattered, partially embedded, smooth, dark and opaque, subglobose or pyriform, 500–900 × 400–700 μ. Neck black, smooth, short-cylindric, up to 270 × 255 μ. Cells of peridium angular, irregular. Asci eight-spored, cylindrical, 60–100 × 14–20 μ, rounded at apices, each tapering below into a slender narrow stipe measuring up to 55 μ long. Paraphyses hyaline, filamentous, septate, branching, numerous, measuring up to 2 μ in diam. Ascospores obliquely uniseriate, readily becoming biseriate, ellipsoid, 20–25(–27) × 9–13(–14) μ, broadly rounded at each end, transversely uniseptate, nonconstricted at median septum or very slightly constricted with cells nonseparable; at first hyaline then red-brown, at maturity almost black and opaque; each ascospore surrounded by a hyaline gelatinous layer which swells in water. Germinal slit longitudinal.

HABITAT: on dung of burro, cow, and rabbit.

SPECIMENS EXAMINED: MEXICO: Durango: TRTC 36574 (TYPE). UNITED STATES: Nevada: White Pine Co.: 40 mi SW of Ely, on cow dung, 21 Aug. 1957, *Cain*, TRTC 39648. Wyoming: Niobrara Co.: N of Lusk, on rabbit dung, 2 Sept. 1964, *Cain*, TRTC 42495.

COMMENTS: The two recognized species, *D. vulgaris* and *D. araneosa*, with abundant flexuous hairs covering the perithecia seem to be nearest *D. simulans* but since the latter species lacks hairs, it can be readily separated from the former two. The three species have in common dark, opaque, ellipsoid, nonconstricted ascospores but those of *D. simulans* are shorter. Of the new species being described, it approaches *D. melanotricha* in spore dimensions, but again this species, like *D. araneosa* and *D. vulgaris*, has numerous hairs on the ascocarp.

34. ***Delitschia tetrasporella*** Luck-Allen & Cain, sp. nov. Figs. 66, 67

Peritheciis sparsis, in substrato immersis, subglobosis vel piriformibus, levibus, nigris, opacisque, 598–600 × 490–500 μ. Collo nigro, papilliformi, 170–180 × 100–110 μ. Ascis quatuorsporis, cylindraceis, 40–64 × 7–9 μ, ad summas rotundatis, stipite breve, 9–15 μ longa. Paraphysibus filiformibus, septatis, hyalinis, nu-

merosis. Ascosporis oblique uniseriatis, oblongo-ellipsoideis, (10–)11–13 × 5–6 μ, transverse uniseptatis, medio non constrictis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo vaccino, Tonopah, Nye Co., Nevada, United States, 22 Aug. 1957, *Cain*, TRTC 37498.

ETYMOLOGY: Greek, *tetra* = four, *spora* = seed, and diminutive suffix, *ella*.

Perithecia deeply embedded, scattered, smooth, black and opaque, subglobose or pyriform, 598–600 × 490–500 μ. Neck bare, black, papilliform, with circular ostiole protruding through the substratum, 170–180 × 100–110 μ. Cells of peridium dark, indistinct. Asci four-spored, cylindrical, 40–64 × 7–9 μ, rounded at apices, each terminating in a short stipe 9–15 μ long. Paraphyses hyaline, filamentous, septate, numerous, less than 1 μ in diam. Ascospores obliquely uniseriate, oblong-ellipsoid, (10–)11–13 × 5–6 μ, broadly rounded at the ends, transversely uniseptate, nonconstricted at median septum; at first hyaline, then yellowish brown, finally at maturity dark brown, each ascospore surrounded by a narrow hyaline gelatinous layer which swells in water up to 5 μ. Germinal slit longitudinal, more or less diagonal, generally with a curvature at the median septum.

HABITAT: on dung of cow and rabbit.

SPECIMENS EXAMINED: UNITED STATES: Nevada: Nye Co.: TRTC 37498 (TYPE). South Dakota: Fall River Co.: Hot Springs, on rabbit dung, 3 Sept. 1964, *Cain*, TRTC 46384.

COMMENTS: This species is the smallest representative of the four-spored series. It can be very easily distinguished because of its small asci and ascospores.

35. ***Delitschia tomentosa*** Luck-Allen & Cain, sp. nov. Figs. 136–143

Peritheciis sparsis, in substrato immersis, piriformibus, 500–700 × 300–730 μ, albido tomento ex pilis numerosis composito tectis. Hyphis tomenti albidis, septatis rectis vel flexuosis, primo tenuibus, postremo parietibus, praeditis junctis, usque ad 500 μ longa, 1.5–3 μ crass. Collo nigro, cylindraceo, 160–200 × 150–160 μ. Cellulis peridii fuscis, irregularibus, usque ad 25 μ longa, 10 μ crass. Ascis octosporis, cylindraceis, 280–330 × 34–38 μ, ad summas rotundatis, stipite breve. Paraphysibus numerosis, filiformibus, septatis, hyalinis, circiter 2 μ crass. Ascosporis oblique uniseriatis, oblongo-ellipsoideis, (36–)40–52 × (16–)19–22 μ, transverse uniseptatis, leviter constrictis vel nonconstrictis. Ascosporis ab hyalinis ad flavo-brunneas, postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo vaccino, 12 mi SW of Wheatland, Platte Co., Wyoming, United States, 1 Sept. 1964, *Cain*, TRTC 39678.

ETYMOLOGY: Latin, *tomentum* = wooly hairs, referring to the appendages surrounding the ascocarp.

Perithecia partially embedded, scattered, pyriform, 500–700 × 300–730 μ, each covered with a white tomentose layer. Neck black, cylindrical, 160–200 × 150–160 μ, surrounded by straight or flexuous hyaline hairs. Appendages of tomentum hyaline (in mass white), at first thin-walled, later thick-walled, branched or unbranched, septate, at apices blunt, anastomosing, up to 500 μ long, 1.5–3 μ in diam. Cells of peridium dark, irregular, at times angular, with walls frequently thickened, up to 25 μ long and 10 μ wide. Asci eight-spored, cylindrical, 280–330 × 34–38 μ, rounded at apices, each narrowing terminally into a short stipe. Paraphyses hyaline, filamentous, septate, numerous, 2 μ in diam. Ascospores obliquely uniseriate, oblong-ellipsoid, (36–)40–52 × (16–)19–22 μ, broadly rounded at the ends, transversely uniseptate, nonconstricted or slightly constricted at the median septum; at first hyaline, then yellow-brown, finally at maturity dark brown, each ascospore surrounded by a prominent hyaline, gelatinous layer which swells in water. Germinal slit longitudinal.

HABITAT: on dung of cow, horse, and rabbit.

SPECIMENS EXAMINED: UNITED STATES: Kansas: Rooks Co.: Stockton, on rabbit dung, 3 Aug. 1960, *Cain*, TRTC 39384. Nevada: White Pine Co.: McGill, on horse dung, 21 Aug. 1957, *Cain*, TRTC 42007. Wyoming: Albany Co.: Bosler, on rabbit dung, 1 Sept. 1964, *Cain*, TRTC 42486; Platte Co. TRTC 39678 (TYPE).

COMMENTS: *Delitschia tomentosa* sp. nov. and *D. lachnothecium* sp. nov. cannot be separated on the basis of macromorphological characters but they can be easily separated microstructurally by the differences in ascospore dimensions.

36. ***Delitschia variispora*** Luck-Allen & Cain, sp. nov. Figs. 144–148

Peritheciis sparsis, in substrato immersis, piriformibus, 700–1050 × 400–960 μ, levibus, nigris opacisque. Collo nigro, papilliformi vel cylin-

draceo, 155–300 × 164–240 μ. Ascis octosporis, cylindraceis, 260–300 × 21–27 μ, ad summas late rotundatis, in stipite attenuatis usque ad 70 μ longa. Paraphysibus numerosis, filiformibus, septatis, hyalinis, usque ad 1.5 μ crass. Ascosporis uniseriatis, oblongo-ellipsoideis, vel cylindraceis, 30–42 × 11–15(–18) μ, utrinque late rotundatis, aliquando acuatis, transverse uniseptatis, valde constrictis, segmentis ascosporarum sejunctis. Ascosporis ab hyalinis ad olivaceas, postremo brunneo-nigris opacisque, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo equino, Sundance, Crook Co., Wyoming, United States, 3 Sept. 1962, *Cain*, TRTC 39118.

ETYMOLOGY: Latin, *varia* = diverse, varied, and *spora* = seed, referring to the diversity in shape of ascospores.

Perithecia embedded, scattered, smooth, dark and opaque, pyriform, 700–1050 × 400–960 μ. Neck black, smooth, varying from papilliform, with circular ostiole emerging through the substratum, to cylindric, 155–300 × 164–240 μ. Cells of peridium angular. Asci eight-spored, cylindrical, 260–300 × 21–27 μ, broadly rounded at apices, each tapering below into a stipe up to 70 μ long. Paraphyses hyaline, filamentous, septate, numerous, up to 1.5 μ in diam. Ascospores obliquely uniseriate, varying from cylindrical to oblong-ellipsoid to occasionally oblong-fusiform, 30–42 × 11–15(–18) μ, end cells broadly to acutely rounded and hemispherical, sometimes almost conical (with one cell slightly larger than the other), transversely uniseptate, deeply constricted with cells separating at the median septum; at first hyaline, then olivaceous to dark brown, finally black and opaque, each ascospore surrounded by a prominent, hyaline gelatinous layer which swells in water and shows a striation continuous with the septum of the spore. Germinal slit longitudinal.

HABITAT: on horse and rabbit dung.

SPECIMENS EXAMINED: UNITED STATES: Colorado: Larimer Co.: Rocky Mt. National Park, Trail Ridge, on rabbit dung, 19 Aug. 1957, *Cain*, TRTC 41597. Wyoming: Sundance, TRTC 39118 (TYPE).

COMMENTS: The most characteristic feature of *D. variispora* is the variability in the shape of its ascospores. It most nearly approaches *D. patagonica* in its spore dimensions but differs from *patagonica* in possessing deeply constricted ascospores which separate at the septum.

37. ***Delitschia xanthodera*** Luck-Allen & Cain, sp. nov. Figs. 73–78

Peritheciis sparsis, in substrato semi-immersis, globosis, nigris opacisque, 500–800 μ crass, aliquando pilis praeditis. Collo nigro, cylindraceo usque ad 1000 μ longa, tomento aurantio ex pilis numerosis tecto. Hyphis tomenti septatis, junctis, 1–5 μ crass. Cellulis peridi angulatis. Ascis octosporis, cylindraceis, 90–120 × 12–18 μ, ad summas late rotundatis, stipite breve, circiter 10 μ longa. Paraphysibus filiformibus, hyalinis, septatis, numerosis, 1–1.5 μ crass. Ascosporis oblique uniseriatis, ellipsoideis, 13–20 × 6–8 (–10.5) μ, transverse uniseptatis, medio leniter constrictis; ascosporis ab hyalinis ad flavo-brunneas postremo atro-brunneis, strato mucoso hyalino involutis. Hilo germinali longitudinaliter prolato.

HOLOTYPUS: in fimo leporino, Fallon, Fallon Co., Montana, United States, 4 Sept. 1957, *Cain*, TRTC 35777.

ETYMOLOGY: Greek, *xanthos* = yellow and *deire* = neck, referring to the tomentose layer around the perithecial neck.

Perithecia partially embedded, scattered, globose, dark brown to black and opaque, 300–500(–800) μ in diam. Neck black, cylindrical, up to 1000 μ long, up to 150 μ in diam, covered by thick tufts of mycelium which form a tomentose layer around the neck and ostiolar region. Hyphae of tomentum (in mass) deep yellow to orange, thick-walled, septate, frequently rough, branched or unbranched, often anastomosing, with ends blunt, up to 5 μ in diam. Appendages at base of ascocarp, olivaceous, septate, with walls only slightly thickened, 2–4 μ in diam. Cells of peridium angular. Asci eight-spored, cylindric, rounded above, 90–120 × 12–18 μ, each terminating abruptly in a short stipe about 10 μ long. Paraphyses hyaline, filamentous, branched or unbranched, numerous, 1–1.5 μ in diam. Ascospores obliquely uniseriate, ellipsoid, 13–20 × 6–8(–10.5) μ, readily becoming disarranged in the ascus, broadly rounded to acutely rounded at the ends, transversely uniseptate, slightly constricted, occasionally nonconstricted, nonseparable at septum; at first hyaline, then yellow-brown, finally becoming dark brown, each ascospore surrounded by a narrow gelatinous layer which swells in water. Germinal slit longitudinal.

HABITAT: on horse and rabbit dung.

SPECIMENS EXAMINED: UNITED STATES: Montana: TRTC 35777 (TYPE); Fallon Co.: Fallon, on horse dung, 4 Sept. 1957, *Cain*, TRTC

35780. Wyoming: Niobrara Co.: Mule Creek, on rabbit dung, 2 Sept. 1964, *Cain*, TRTC 42194.

COMMENTS: This species resembles *D. chrysina* sp. nov. and *D. lamprorhynchia* sp. nov. It is easily separated from these two by its smaller ascospores. *Delitschia xanthodera* grows very well on artificial media at 21°C, producing perithecia within 3 weeks.

## Reference Citations for Older Species

1. *Delitschia araneosa* Cain, Figs. 160, 161. Cain, R. F. Studies of coprophilous sphaeriales in Ontario. Univ. Toronto Stud. Biol. Ser. 38: 81 (1934), Fig. 59.
2. *Delitschia didyma* Auersw., Fig. 155. Auerswald, B. Hedwigia, 5: 49 (1866). Illustrations: Hedwigia, 7: 72 (1868), Tab. 1. Fig. 9. Cain, R. F. Univ. Toronto Stud. Biol. Ser. 38: 78 (1934), Fig. 54.
3. *Delitschia gigaspora* Cain, Figs. 164, 165. Cain, R. F. Univ. Toronto Stud. Biol. Ser. 38: 86 (1934), Fig. 64.
4. *Delitschia griffithsii* Cain, Fig. 166. Cain, R. F. Univ. Toronto Stud. Biol. Ser. 38: 84 (1934), Fig. 62.
5. *Delitschia leporina* Griff., Fig. 167. Cain, R. F. Univ. Toronto Stud. Biol. Ser. 38: 79 (1934), Fig. 55.
   Griffiths, D. North American Sordariaceae. Mem. Torrey Bot. Club, 11: 101 (1901), Pl. 13, Figs. 14–16.
6. *Delitschia leptospora* Oud., Fig. 168. Cain, R. F. Univ. Toronto Stud. Biol. Ser. 38: 85 (1934), Fig. 63. Oudermans, C. A. J. A. Hedwigia, 21: 163 (1882), Pl. 6, Fig. 17.
7. *Delitschia timagamensis* Cain, Fig. 170. Cain, R. F. Univ. Toronto Stud. Biol. Ser. 38: 79 (1934), Fig. 56.
8. *Delitschia vulgaris* Griff. Fig. 169. Cain, R. F. Univ. Toronto Stud. Biol. Ser. 38: 81 (1934), Fig. 58. Griffiths, D. North American Sordariaceae. Mem. Torrey Bot. Club, 11: 104 (1901), Pl. 14, Figs. 4–6.
9. *Delitschia winteri* Phill. & Plowr., Figs. 171, 172. Griffiths, D. North American Sordariaceae. Mem. Torrey Bot. Club, 11: 103 (1901), Pl. 14, Figs. 10–12. Massee, G. E., and Salmon E. S. Researches on coprophilous fungi. Ann. Bot. 15: 345. 1901. Phillips. W., and Plowright, C. New and rare British fungi. Grevillea 2: 188. 1874. Saccardo, P. Syll. Fung. 1: 734. 1882.

## Species Excluded—Coprophilous

*Delitschia auerswaldii* Fuckel, Jahrb. Nassauischen vereins Naturk. 23–24. 241. 1869 (1870).

HOLOTYPE: on dung of roe.

The name *D. auerswaldii* was created by Fuckel (1870) as a name change for *D. didyma* Auersw. 1866; however, such a disposition is illegitimate according to the code. The holotype of *D. auerswaldii* in Fungi Rehn. 2034 was examined and it is clearly distinct from *D. didyma*. The species represented by Fuckel's material is *D. patagonica* Speg.

*Delitschia bisporula* (Cr. & Cr.) Hansen, Vidensk. Medd. Dan. Naturhist. Foren. Kbh. 313. 1876.

This species has been transferred from *Delitschia* to *Trichodelitschia*. The ascospores are dark and two-celled but there are two germ pores, one at each end of the ascospore.

*Delitschia elegans* Santermeister, Jahrb. Vereins Naturk. Würtemb. 66: 399. 1910.

HOLOTYPE: on rabbit dung associated with *Sordaria bombardioides* and *Sporormia ambigua*, near Sigmaringen.

The asci are 16-spored. Ascospores are oblong, 48 × 16 μ. No other essential data were given in the literature. The holotype was not available for examination.

*Delitschia elephantina* Pass., Nuova Giorn. Bot. Ital. 7: 190. 1875.

HOLOTYPE: on elephant dung, Abyssinia, Africa, Beccari.

Perithecia small, asci subclavate, eight-spored, about 27 μ long (exicone); ascospores obscurely biseriate, fusiform, about 10 μ long, septate, scarcely constricted at the septum.

The collection was made by Becarri in Africa and apparently no longer exists; unfortunately this Passerini specimen was not distributed through exsiccati. The description is inadequate; therefore, proper disposition of the fungus is impossible.

*Delitschia insignis* Mout., Bull. Soc. R. Belg. 36: 13. 1897.

≡ *Zygospermella insignis* (Mout.) Cain, Mycologia, 27: 227. 1935.

HOLOTYPE: on cow dung from Gomzé near Liége, Belgium.

This fungus was transferred to *Zygospermum* 1935 because of its *Sordaria*-like unitunicate ascus, its mode of ascospore discharge, and the

germ pore and gelatinous appendage at each end of the ascospore.

*Delitschia kriegeriana* Kirschst., Ann. Mycol. 34(3): 197. 1936.
= *Delitschia patagonica* Speg., Fungi Patagonica. Bol. Acad. Nac. Cienc. Cordoba, 11: 46. 1887.

HOLOTYPE: on deer and roe dung in woods near Königstein.

Specimens examined from Krieger, Fungi Sax. 1950, distributed as *D. didyma* are collections of *D. patagonica* Speg.

*Delitschia microspora* Oud., Hedwigia, 21: 164. 1882. Also in Nederl. Kruidkund. Arch. 2(4): 273. 1885.

HOLOTYPE: on goat dung associated with *Sporormia intermedia*, *Sporormia megalospora*, and *Delitschia bisporula*. Holland. 1882.

This species is doubtful because of the dearth of data. Oudemans question-marked *D. microspora* in 1882 when he included it in a table with 10 *Delitschia* spp. The data given were scanty. "Perithecia glabra. Sp. 9–10 × $3\frac{1}{2}$, vix constricta, utrinque obtusa." In his 1885 publication no additional data were provided; in fact, there is this note: "Ascos non vidi." Oudemans commented that there were spores of a *Delitschia* species on goat pellets for which he could find no asci and that should he ever find them he would like to call the fungus *D. microspora*.

*Delitschia minuta* Fuckel, Jahrb. Nass. vereins Naturk. 23–24. p. 242. 1870.

This is a *Trichodelitschia*.

*Delitschia moravica* Niessl, Verh. Naturf. Ver. Brünn, 14: 208. 1876.

This species is also a *Trichodelitschia*.

*Delitschia proboscidea* Munk, Dansk. Bot. Ark. 12: 4. 1948.
= *Delitschia marchalii* Berl. Vogl., in Sacc., Syll. Fung. Add. 1–4: 127. 1886.

HOLOTYPE: on horse and rabbit dung, Copenhagen, Denmark.

This species is a synonym of *D. marchalii*. Munk 1948 described *D. proboscidea* as a new species strictly on the basis of the long neck of its perithecium. He later reversed his concept and relegated *D. proboscidea* to synonymy. We agree with Munk's decision to include *D. proboscidea* in the *marchalii* concept. The length of the neck is a variable character and is generally related to environmental conditions.

*Delitschia sordarioides* Speg., Anal. Soc. Argent. 10: 18. 1880.
≡ *Cercophora sordarioides* (Speg.) Lundq., Nordic Sordariaceae s. lato. Symb. Bot. Upsal. 20: 1. 112. 1972.

HOLOTYPE: on cow dung, Recoleta, Buenos Aires, Argentina.

The fungus does not belong in *Delitschia* because of its unitunicate asci and caudate-appendaged ascospores. The spores are initially vermiform but later become ellipsoid and dark. It was transferred to *Cercophora* by Lundqvist.

*Delitschia tetraspora* Ahmed & Asad, Trans. Br. Mycol. Soc. 52(2): 340. 1969.

HOLOTYPE: on cow dung, Chittagong, Pakistan.

This species does not belong in *Delitschia*. The ascus is not of the loculoascomycete type; there is a ring in the apex of the sac. The ascospores when first formed, are eight in number, one-celled, globose and hyaline, later becoming united, two-celled. The two cells are enclosed in a thick membranous layer. This thick layer intercepts the two cells suggesting the presence of a septum which is certainly unlike that seen in *Delitschia*. No germ slit was seen. The holotype is scanty and inadequate; therefore it is impossible to determine conclusively what the species is.

*Delitschia vaccina* Passer. (Saccardo, Syll. Fung. 9: 748. 1891.)
= *Phorcys vaccina* (Passer.) v. Höhn., Akad. Wiss. Wien Sitzungsber, Math.-Nat. Kl. 129: 159. 1920.

HOLOTYPE: on cow dung associated with *Hypocopra minima* and *Sporormia intermedia*, Parma, Italy.

This species is, according to its description, *D. patagonica*. *Delitschia vaccina* is excluded pending the location of the original reference and the availability of authentic material of this species.

### Species Excluded—Noncoprophilous

*Delitschia apiculata* Griff., Mem. Torrey Bot. Club, 11: 104. 1901.
≡ *Arnium apiculatum* (Griff.) Lundq., Nordic Sordariaceae s. lato. Symb. Bot. Upsal. 20: 1. 243. 1972.

HOLOTYPE: on dead stems of *Salsola kalitragus*, Aberdeen, South Dakota, U.S.A.

The holotype was examined. Ascospores are ellipsoid, two-celled, nonconstricted at septum and provided at each end with a triangular shaped apiculum. The species was justifiably transferred to *Arnium* by Lundqvist.

*Delitschia bispora* Eaton & Jones, Nova Hedw. 19: 781. 1970.

≡ ***Sporormiella bispora*** (Eaton & Jones) Luck-Allen & Cain, comb. nov.

HOLOTYPE: On *Fagus* test-block placed in the wood packing of a water-cooling tower at Elland Power Station, Yorkshire for 24 weeks (February 23 – August 10, 1967). IMI 134864, Herb. CMI, England.

Perithecia 195–370 × 225–420 μ. Asci bitunicate, two-spored, clavate, 115–170 × 25–33 μ. Ascospores 51–64 × 23–33 μ, oblong-ellipsoid, transversely uniseptate, markedly constricted, with a lateral germ slit extending the length of each cell.

Eaton and Jones comment that "mature asci of *D. bispora* appear to contain a single triseptate ascospore. These spores look very much like the ascospores of *Sporormiella* and *Preussia*. *D. bispora* has immature asci containing two bicelled ascospores and appear to become triseptate at maturity."

Our interpretation is that the ascus normally contains one four-celled ascospore which separates readily into two segments at the median septum, sometimes at a very early stage. Less frequently, separations may occur at either one or both ends of the ascospores so that one can occasionally see separate one-celled segments. We are transferring the species to *Sporormiella*.

*Delitschia congregata* Speg., Anal. Soc. Ci. Argent. Pugillus IV, 12: 177. 1881.

HOLOTYPE: On branches of decaying *Salix*, May 1881, Buenos Aires, Recoleta, Argentina.

The holotype was seen. The asci are eight-spored and measure 110–120 × 8 μ. Each ascospore is two-celled with a circular pore at each end. The spores are nonconstricted, four-guttulate, 15–20 × 6–7 μ. The fungus possibly belongs to *Didymosphaeria*.

*Delitschia geminispora* Sacc. & Flag., Grevillea, 21: 66. 1893.

≡ *Pachyspora geminispora* (Sacc. & Flag.) v. Höhn., Akad. Wiss. Wien Sitzungsber, Math.-Nat. Kl. 129(1): 159. 1920.

= *Pachyspora gigantea* Kirschst., Verh. Bot. Vereins Prov. Brandenburg, 48: 49. 1906.

HOLOTYPE: on fragments of decaying *Quercus* ("an stercoratis"), Rigny-sur-Arroux, France. Flageolet.

Perithecia carbonaceous, smooth. Asci clavate, 150–160 × 30 μ, two-spored. Ascospores ellipsoid, 56–60 × 30 μ, uniseptate, constricted, separable at the median septum.

*Delitschia geminispora* should be compared with *D. bispora* Eaton & Jones; illustrations of the fungus appear similar to those of *D. bispora*. The type of *D. geminispora* was not seen by the writers. Müller and von Arx (1962) included the species in *Delitschia*.

*Delitschia graminis* Niessl, Verh. Naturf. Ver. Brünn, 14: 208. 1876.

≡ *Cainia graminis* (Niessl) von Arx & Müller, Acta Bot. Neerl. 4(1): 112. 1955.

HOLOTYPE: On culms of *Avena* in Steiermark, Germany.

The valid name for this species is *Cainia graminis*. The apical structure of the ascus, and the two-celled ascospores equipped, with germ pores rather than germ slits is distinctly not *Delitschia*-like.

*Delitschia gymnospora* Munk, Bot. Not. 119(2): 183. 1966.

HOLOTYPE: on rotten stump of *Fagus sylvatica*, 1964. Sjaelland, Rude Skov., Selandiae, Denmark.

Perithecia 500–600 × 700–800 μ. Neck 200 μ wide. Peridium about 50 μ thick, black, almost opaque, composed of small cells, 2–4 μ in diam. Asci eight-spored, about 150 × 18–22 μ diam, bitunicate and thick-walled, but both the outer and inner membranes are delicate and fugacious. Ascospores one or two seriate, 26–31 × 9.5–12 μ equally bicellular, strongly constricted, easily separating. Each cell with longitudinal germ slit extending only along the middle third of the cell.

According to the description and illustrations, this appears to be justifiably placed in *Delitschia*; however, unlike the coprophilous members, the germ slit of the spore extends only along the middle third of the cell and the spore lacks the gelatinous layer. It is being excluded because it is not coprophilous.

*Delitschia lignicola* Mout., Bull. Soc. R. Bot. Belg. 25: 151. 1886.

≡ *Sydowia lignicola* (Mout.) Petr., Ann. Mycol. 23: 96. 1925.

≡ *Herpotrichia lignicola* (Mout.) Bose, Phytopathol. Z. 41: 201. 1961.

= *Herpotrichia melasperma* (Cooke) Sivanesan, C.M.I. Mycol. Pap., No. 127. p. 8. 1971.

HOLOTYPE: on fragments of decayed wood, Sept., Tilff., Belgium.

The accepted name is *Herpotrichia melasperma*.

*Delitschia sydowiana* Kirschst., Krypt. Fl. Brandenburg, 7: 192. 1911.

HOLOTYPE: on decayed seeds of *Prunus domestica* in Berlin, Germany, Sydow.

Ascospores irregularly biseriate, fusiform, 23–30 × 9–12 μ, two-celled, nonconstricted at septum; at first hyaline later dark brown, without gelatinous layer and provided with a semispherical colorless appendage on both ends, which is attached with a flat base. The presence of semispherical appendages on each end of the spore would necessitate the exclusion of this species.

*Delitschia trigonospora* Batista & Peres, Univ. do Recife Inst. de Micologia Publ. 440. p. 4. 1964.

HOLOTYPE: isolated from forest soil, 31 Oct. 1961, Maranhao, Brasil. J. Oliveira da Silva. Type 1821.

An examination of the type indicates that this species does not belong in *Delitschia* but rather in *Herpotrichia*.

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### EXPLANATION OF FIGURES

FIGS. 1–3. *Delitschia arestospora*. TRTC 39280. Fig. 1. Ascus with immature ascospores. Fig. 2. Hyphal hairs. Fig. 3. Ascospores, two with gelatinous layer. Segments of ascospores also figured. FIGS. 4–7. *Delitschia anisomera*. TRTC 35904. Fig. 4. Apex of ascus. Fig. 5. Ascospores, one (atypical) with greatly enlarged cell. Fig. 6. Ascus with ascospores. Fig. 7. Perithecium.

FIGS. 8–10. *Delitschia chorizomera*. TRTC 38985. Fig. 8. Ascus with ascospores. Fig. 9. Upper portion of ascus showing arrangement of ascospores. Fig. 10. Ascospores, some with cells separated at median septum.

FIGS. 11–14. *Delitschia chrysina*. TRTC 39390. Fig. 11. Mature ascus. Fig. 12. Ascospores. TRTC 36075. Fig. 13. Two ascospores, one with expanded gelatinous layer. Fig. 14. Perithecium.

FIG. 15. *Delitschia consociata.* Ascospores. (Based on Mouton, Bull. Soc. R. Bot. Belgique, 26: 175. 1887.) FIGS. 16–20. *Delitschia marchalii.* TRTC 39356. Fig. 16. Perithecium. TRTC 39129. Fig. 17. Mature ascus. TRTC 44804. Fig. 18. Three ascospores, each slightly constricted at median septum. TRTC 38819. FIG. 19. Ascospores without constriction; one with expanded gelatinous layer. LPS 5982. FIG. 20. Six ascospores. FIGS. 21–23. *Delitschia perpusilla.* TRTC 36720. Fig. 21. Perithecium. Fig. 22. Mature ascus. Fig. 23. Mature ascospores, one with expanded gelatinous layer.

FIGS. 24–28. *Delitschia crinita.* TRTC 36739. Fig. 24. Mature ascus. Fig. 25. Perithecium. Fig. 26. Branched and unbranched hairs. Fig. 27. Mature ascospores. TRTC 37001. Fig. 28. Ascospore with expanded sheath.

FIGS. 29–31. *Delitschia didymastra.* TRTC 38844. Fig. 29. Mature ascus. Fig. 30. Ascospores. Fig. 31. Neck hair. FIGS. 32–36. *Delitschia didymella.* TRTC 39059. Fig. 32. Four ascospores, one with expanded gelatinous layer. TRTC 44412. Fig. 33. Seven ascospores, two with cells separated at median septum. Fig. 34. Mature ascus. TRTC 39059. Fig. 35. Cells of the peridium. TRTC 44412. Fig. 36. Perithecium.

FIGS. 37–44. *Delitschia flavida.* TRTC 38846. Fig. 37. Mature ascus. Fig. 38. Semitransparent perithecium. Fig. 39. Dichotomously branched paraphysis. Fig. 40. Immature ascus with unbranched paraphysis. Fig. 41. Ascospores, four with expanded gelatinous layer. Fig. 42. Hairs of tomentum; left, smooth, thin-walled; far right, rough, thick-walled. Fig. 43. Cells of peridium. Fig. 44. Hyphal hairs from base of perithecium.

FIGS. 45–47. *Delitschia lamprorhynchia.* TRTC 35772. Fig. 45. Mature ascus. Fig. 46. Ascospores. Fig. 47. Cells of peridium.

FIGS. 48–51. *Delitschia limasepta.* TRTC 36074. Fig. 48. Mature ascus. Fig. 49. Six ascospores, one atypical. Fig. 50. Perithecial hairs. Fig. 51. Perithecium.

FIGS. 52–55. *Delitschia melanotricha.* TRTC 36567. Fig. 52. Perithecium. Fig. 53. Perithecial hairs. Fig. 54. Mature ascus. Fig. 55. Ascospores.

FIGS. 56–60. *Delitschia myriaspora.* PC 13773. Fig. 56. Portion of mature ascus showing arrangement of ascospores. Fig. 57. Ascospores. Fig. 58. Branched and unbranched hairs (above and below peridial cells). Fig. 59. Cells of peridium. Fig. 60. Perithecium.

FIGS. 61–65. *Delitschia oligospora.* TRTC 43768. Fig. 61. Thick-walled peridial cells. Fig. 62. Perithecium. Fig. 63. Portion of a hyphal hair from perithecium. Fig. 64. Ascospores, two with cells separated at median septum. Fig. 65. Two-, three-, and four-spored asci. FIGS. 66–67. *Delitschia tetrasporella.* TRTC 37498. Fig. 66. Sixteen ascospores; one showing two separated cells. Fig. 67. Two asci, one showing expanded gelatinous layer around each ascospore.

FIGS. 68–72. *Delitschia simulans.* TRTC 36574. Fig. 68. Mature ascus. Fig. 69. Fourteen ascospores, two with expanded gelatinous layer; one showing thick wall. Fig. 70. Dichotomously branched paraphysis. Fig. 71. Immature ascus with ascospores disarranged in the upper portion. Fig. 72. Perithecium.

FIGS. 73–78. *Delitschia xanthodera.* TRTC 35777. Fig. 73. Mature ascus. Fig. 74. Branched hyphal hairs from base of perithecium. Fig. 75. Hairs of tomentose layer (left and right of perithecium). Fig. 76. Perithecium. Fig. 77. Six ascospores, each slightly constricted at septum. TRTC 35780. Fig. 78. Two ascospores, one nonconstricted at median septum. FIGS. 79–81. *Delitschia niesslii.* TRTC 35902. Fig. 79. Perithecium. Fig. 80. Two asci, left showing uniseriate arrangement of ascospores and gelatinous layers of spores; at right, ascospores disarranged and without gelatinous layers. Fig. 81. Ascospores.

FIGS. 82 and 83. *Delitschia anomala.* TRTC 39050. Fig. 82. Mature ascus. Fig. 83. Four ascospores, one with expanded gelatinous layer. FIGS. 84–86. *Delitschia nephrospora.* TRTC 39048. Fig. 84. Mature ascus. Fig. 85. Cells of peridium. Fig. 86. Eleven ascospores, one immature, guttulate; one with expanded gelatinous layer and two segments of an ascospore each with germinal slit.

FIGS. 87–90. *Delitschia chaetomioides.* Karsten holotype. Fig. 87. Mature ascus. Fig. 88. Hairs of perithecium. Fig. 89. Perithecium. Fig. 90. Ascospores.

FIGS. 91–95. *Delitschia chodocola.* TRTC 36199. Fig. 91. Ascus with disarranged ascospores. Fig. 92. Ascospores; two with cells separated at median septum; one with expanded gelatinous layer. Fig. 93. Four-spored ascus with expanded gelatinous layer around each ascospore. Fig. 94. Perithecium. Fig. 95. Cells of peridium.

FIGS. 96–99. *Delitschia canina.* UPS 4425 d. Fig. 96. Mature ascus. Fig. 97. Two ascospores, each with cells separating at septum. LPS 6843. Fig. 98. Constricted ascospores. TRTC 42416. Fig. 99. Three ascospores, one with expanded gelatinous layer. FIGS. 100–102. *Delitschia excentrica.* TRTC 36899. Fig. 100. Two ascospores; upper with oblique septum, flattened sides; lower with transverse septum and expanded gelatinous layer. TRTC 39238. Fig. 101. Mature ascospore. Fig. 102. Portion of ascus showing ascospores uniseriately arranged and each spore with expanded gelatinous layer.

FIGS. 103–107. *Delitschia hexaspora.* TRTC 39051. Figs. 103–106. Fig. 103. Mature ascus. Fig. 104. Six ascospores; three with expanded gelatinous layer, three with transverse median septum. Fig. 105. Perithecium. Fig. 106. Cells of peridium. TRTC 44888. Fig. 107. Three ascospores, one with slightly oblique septum and one with expanded gelatinous layer.

FIGS. 108–113. *Delitschia illinoisensis.* TRTC 45713. Fig. 108. Portion of ascus with immature ascospores. Fig. 109. Cells of peridium. Fig. 110. Perithecial hairs. Fig. 111. Perithecium. Fig. 112. Mature ascus with disarranged ascospores. Fig. 113. Six ascospores.

FIGS. 114–118. *Delitschia intonsa.* TRTC 45711. Fig. 114. Mature ascus. Fig. 115. Perithecial hairs. Fig. 116. Perithecium; at right, part of a hair from neck region. Fig. 117. Cells of peridium. Fig. 118. Ascospores, two with a median transverse septum; one with expanded gelatinous layer.

FIGS. 119–124. *Delitschia lachnothecium*. TRTC 41270. Fig. 119. Mature ascus with ascospores; each spore surrounded by expanded gelatinous layer. Fig. 120. Hyphae of tomentum. Fig. 121. Perithecium; at right, portion of a hair. Fig. 122. Cells of peridium. Fig. 123. Part of ascus showing obliquely arranged ascospores. Fig. 124. Eleven ascospores, upper right one immature, thick-walled.

FIGS. 125–128. *Delitschia megatetraspora*. TRTC 39042. Fig. 125. Ascus with uniseriate ascospores. Fig. 126. Eight ascospores; one with median transverse septum; two with broad gelatinous layer; two immature. Fig. 127. Ascus with one-celled "atypical" ascospores. Fig. 128. Cells of peridium.

FIGS. 129–132. *Delitschia pachylospora*. TRTC 36239. Figs. 129–131. Fig. 129. Mature ascus. Fig. 130. Seven ascospores, one with expanded gelatinous layer. Fig. 131. Cells of peridium. TRTC 39089. Fig. 132. Three ascospores.

FIGS. 133–135. *Delitschia polyspora*. Holotype. Fig. 133. Mature ascus. Fig. 134. Perithecium. Fig. 135. Ascospores; two with cells separated at median septum; also a segment of an ascospore.

FIGS. 136–143. *Delitschia tomentosa*. TRTC 39678. Figs. 136–141. Fig. 136. Two paraphyses. Fig. 137. Ascus with immature, thick-walled ascospores. Fig. 138. Cells of peridium. Fig. 139. Hyphae from tomentum. Fig. 140. Perithecium. Fig. 141. Seven ascospores, three immature, thick-walled; four mature. TRTC 42007. Fig. 142. Three ascospores. Fig. 143. Hyphae of tomentum.

FIGS. 144–148. *Delitschia variispora*. TRTC 39118. Figs. 144–147. Fig. 144. Mature ascus containing ascospores with end cells elongated. Fig. 145. Eight ascospores; two with expanded gelatinous layer. Fig. 146. Portion of mature ascus containing ascospores with end cells hemispherical. Fig. 147. Perithecium. TRTC 41597. Fig. 148. Two ascospores.

FIG. 149. *Delitschia vulgaris*. Bitunicate ascus showing elongated endoascus and (at arrow) the annuli (phase-contrast). × 255. FIG. 150. *Delitschia myriaspora*. Ascus with ascospores (bright-light). × 165. FIG. 151. *Delitschia marchalii*. Peridium cross section. × 130. FIG. 152. *Delitschia vulgaris*. Mature asci showing (arrows) endoascus, exoascus, ocular chamber, and paraphyses (phase-contrast). × 390. FIGS. 153 and 154. *Delitschia patagonica*. Fig. 153. Upper portion of two immature asci before ascospore cleavage, showing lipids and other cytoplasmic contents and a mature ascus showing (arrows) wall layers (phase-contrast). × 325. Fig. 154. Ascospores (bright-light). × 170. FIG. 155. *Delitschia didyma*. Ascus with ascospores (bright-light). × 160. FIG. 156. *Delitschia chrysina*. Peridium cross section. × 175. FIG. 157. *Delitschia pachylospora*. Ascus apex showing (arrows) orifice and apical dome (phase-contrast). × 535.

FIGS. 158 and 159. *Delitschia patagonica*. Ascus apex showing (arrows) dome, flaring cushion, and the two invaginations of dome (phase-contrast). Fig. 158, × 910; Fig. 149, × 780.

FIGS. 160 and 161. *Delitschia araneosa*. Fig. 160. Ascus with uniseriate ascospores. × 88. Fig. 161. Lower five ascospores (× 140); upper, one spore enlarged (× 500). FIGS. 162 and 163. *Delitschia furfuracea*. Fig. 162. Ascus with disarranged ascospores. × 120. Fig. 163. Ascospores. × 267. FIGS. 164 and 165. *Delitschia gigaspora*. Fig. 164. Ascus with biseriate ascospores. × 80. Fig. 165. Thick-walled ascospores. × 165. FIG. 166. *Delitschia griffithsii*. Ascospores. × 165. FIG. 167. *Delitschia leporina*. Upper, ascus (× 90); lower, ascospores (× 150). FIG. 168. *Delitschia leptospora*. Asci and ascospores. × 210. FIG. 169. *Delitschia vulgaris*. Left, ascus with uniseriate ascospores; right, two ascospores and a portion of a perithecium showing hairs. × 130. FIG. 170. *Delitschia timagamensis*. Ascus with ascospores. × 210. FIGS. 171 and 172. *Delitschia winteri*. Fig. 171. Ascus and ascospores. × 75. Fig. 172. Ascospores; upper, mature showing thick walls, (× 160); lower, immature one ascospore showing germ slit.

NOTE: Figs. 1–172 follow.