

## STUDIES ON DISCOMYCETES—II

### On four species of *Fimaria*

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(With five Text-figures)

Four species of *Fimaria* Vel. are described. The following new combinations are made: *Fimaria hepatica* (Batsch per Pers.) Brumm., *F. cervaria* (Phill. apud J. Stevenson) Brumm., and *F. theioleuca* (Roll.) Brumm. *Ascobolus vinosus* Berk., *A. fuckelii* J. Kunze, *A. piceus* (Limminghe) ex Cooke, and *Fimaria murina* Vel. are reduced to the synonymy of *Fimaria hepatica*.

While investigating the taxonomy of the dark-spored Ascobolaceae the author came across a number of species that had been wrongly placed in the genus *Ascobolus*. Among these was a small group of closely related species of operculate Discomycetes with smooth, hyaline ascospores, transferred by various authors to such genera as *Ascophanus*, *Coprobia*, and *Humaria* sensu auct. non Fuckel (= *Octospora* Hedw. per S. F. Gray emend. Korf). Close examination of herbarium specimens or fresh material of four different species shows that there is only a superficial resemblance with *Ascophanus* and that the affinity with *Coprobia* and *Octospora* is rather remote. *Fimaria* Velenovský of which the author was able to study the type is a valid generic name available for these species.

#### F I M A R I A Vel.

*Fimaria* Vel., Monogr. Discom. Boh. 1: 331. 1934. — Lectotype: *Fimaria murina* Vel.

Velenovský's generic description of *Fimaria* runs: "Genus, omnino generi *Humaria* affine, sed apoth. margine late membranaceo-lobata, plerumque in ciliis acutas fimbriata, paraph. simpl.-filif. vel ramosae. — In fimis, raro in limis."

*Fimaria* was published with four species, two of which are also described in this paper. Although Velenovský's generic description is rather clear, a more detailed one is given here:—

Apothecia superficial or partly immersed, often sessile on a narrow base, sometimes with a short stalk, up to 5 mm across. Receptacle at first closed and subglobular, then opening and expanding, with a broad membranaceous, lobed, dentate, crenulate or fimbriate margin, usually covered with a thin net-work of septate, branched hyphae, often reddish-brown, purplish-brown, brown or pale yellowish-brown. Excipulum clearly differentiated, of large cells, with intercellular pigment. Asci operculate, cylindrical, with short stalk, rounded above, the wall not blue in Melzer's reagent. Ascospores uniseriate, shortly ellipsoid to oblong-ellipsoid, at first colourless, finally with yellowish-brown contents, without oil drops or granules when mature,

smooth. Paraphyses very thin, filiform, hyaline, with the upper parts often surrounded by intercellular, amorphous pigment.

On dung or on soil contaminated with dung.

The amount of pigment in the fruit-bodies varies considerably even in the same species. The yellowish-brown contents of ripe ascospores show a strong fluorescence in ultra-violet light, a phenomenon common to many species of Humariaceae and Ascobolaceae.

The genus differs from *Ascophanus* in the form of the asci, the structure of the excipulum, and the development of the fruit-bodies. Some species of *Fimaria* show a superficial resemblance with *Ascophanus* because of their occurrence on dung or on soil contaminated with it, and also because the hyaline tips of the ripe asci surrounded by a dark pigment give the disk a dotted or even roughened appearance (Fig. 1b). *Fimaria* may be separated from *Octospora* and *Coprobia* chiefly by its different pigmentation, the typical development of the fruit-bodies, and the broad membranaceous margin of the receptacle.

The genus should be placed in the Humariaceae near *Octospora* and *Lamprospora*.

### ***Fimaria hepatica* (Batsch per Pers.) Brumm., comb. nov.**

*Peziza hepatica* Batsch, Elench. Fung. Contin. 1: 199, pl. 26, f. 138. 1786 (devalidated name). — *Peziza hepatica* Batsch per Pers., Mycol. eur. 1: 243. 1822. — *Aleuria hepatica* (Batsch per Pers.) Gillet, Champ. franç. 208. 1886. — *Humaria hepatica* (Batsch per Pers.) Sacc., Syll. Fung. 8: 140. 1889. — *Ascophanus hepaticus* (Batsch per Pers.) Boud., Hist. Class. Discom. Eur. 76. 1907. — *Humarina hepatica* (Batsch per Pers.) Seaver, North Am. cup-fungi, Operc. 139. 1928. — Type: represented by Batsch l.c. fig. 138. — Illustrative specimen: Broome, Bowood, Bathford, Wiltshire, Great Britain, I. 1864, in Rabenhorst, Fungi eur. exs. No. 612 (*Peziza hepatica*).

*Ascobolus vinosus* Berk. in Hooker, Engl. Fl. 5 (2): 209. 1836. — *Ascophanus vinosus* (Berk.) Dennis, Brit. Cup Fungi 41. 1960. — Holotype: Berkeley, "on a mole-hill overgrown with moss, and covered with rabbits' and sheeps' dung", England (K-A1927).\*

[*Ascobolus testaceus* (Moug. apud Fr.) Wallr. sensu Fuckel in Jb. nass. Ver. Naturk. 27-28: 58. 1873; Fuckel, Fungi rhen., fasc. 12, No. 2680. 1874; not *Ascobolus testaceus* (Moug. apud Fr.) Wallr. sensu Moug. in Wallr., Fl. Crypt. Germ. 2: 513. 1833; nor *Ascobolus testaceus* P. Henn. in Hedwigia 41: 32. 1902. —] *Ascobolus fuckelii* J. Kunze, Fungi sel. fasc. 3, No. 286. 1879; in Oest. bot. Z. 30: 67. 1880. — *Ascophanus fuckelii* (J. Kunze) Rehm in Rabenh., Krypt.-Fl., Ed. 2, Pilze 3: 1090. 1895. — Type: Fuckel, Fungi rhen. No. 2680.

[*Peziza picea* Limminghe in Herb. —] *Ascobolus piceus* (Limminghe) ex Cooke in Grevillea 21: 74. 1893. — Type: Limminghe, on sandy soil, s. loc., I. 1818 ("Peziza picea in herb. Limminghe", BM-A2815, K-A1998).

*Fimaria murina* Vel., Monogr. Discom. Boh. 1: 331; 2: pl. 24, f. 15. 1934. — Lectotype: PR 150853 (as *Boudiera murina*).

MISAPPLIED NAME.—*Humaria testacea* (Moug. apud Fr.) J. Schroeter sensu J. Schroeter in Cohn, Krypt.-Fl. Schles. 3 (2): 36. 1893; Pilze Schlesiens No. 1753 = *Fimaria hepatica*.

EXCLUDED.—*Ascobolus vinosus* Berk. & Broome in Ann. Mag. nat. Hist. 15: 448, pl. 16, f. 25. 1865 = *Saccobolus versicolor* (P. Karst.) P. Karst. overgrown by a sporulating Hyphomycete (K-A1939).

\* For a more accurate indication of herbarium specimens, especially when insufficiently labelled, the usual abbreviation of the herbarium is followed by the author's revision-number.

*Ascobolus vinosus* Berk. *sensu* Broome in Rabenhorst, Fungi eur. No. 658. 1864 = *Lamprospora miniata* (Cr.) De Not. (BM, G, M).

*Ascobolus vinosus* Berk. *sensu* Fuckel, Fungi rhen. No. 1852. 1866; in Jb. nass. Ver. Naturk. 23-24: 289. 1870; P. Syd., Myc. march. No. 2168. 1888 = *Ascophanus carneus* (Pers. per Pers.) Boud.

*Ascobolus vinosus* Berk. *sensu* Boudier in Ann. Sci. nat. (Bot.) V, 10: 221-222, pl. 6, f. 11. 1869 = *Ascobolus roseopurpurascens* Rehm. This name is used for this species by most authors of floras and handbooks since 1869.

*Ascobolus vinosus* Berk. *sensu* Ellis & Everhart, N. Am. Fungi No. 2620. 1891 = *Ascobolus amoenus* Oudemans.

Apothecia densely crowded or gregarious, superficial or partly immersed, 1-3 (-4) mm diameter, 0.3-0.8 mm high. Receptacle at first closed and sub-globular, then opening by a lacinate orifice and lenticular or hemispherical, finally often more or less saucer-shaped; vinaceous-brown, pale or dark reddish-brown; smooth, often covered with a thin layer of colourless hyphae which are also connected with the substrate; with a rather broad, lobed or crenulate, membranaceous, often paler coloured margin which may disappear in old fruit-bodies. Disk concave, then flat, of about the same colour as the receptacle, dotted with the hyaline tips of ripe

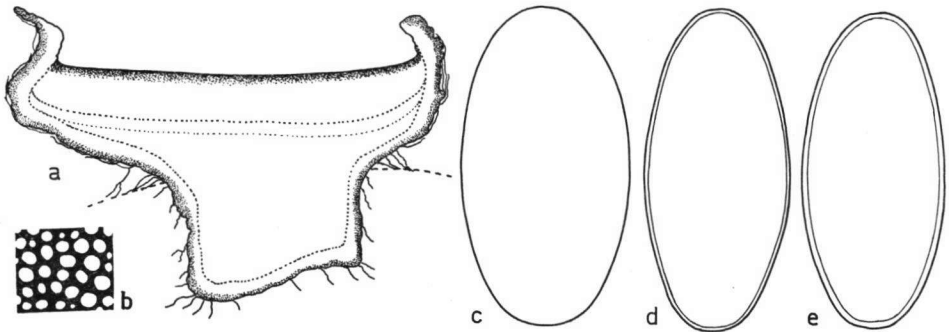


Fig. 1. *Fimaria hepatica*. — a. Diagrammatic section of apothecium ( $\times 40$ ). — b. Top view of hymenium ( $\times 125$ ). — c-e. Ascospores ( $\times 1600$ ); c. lateral view; d, e. optical section (a-d from Schoeter, Pilze Schlesiens 1753, e from type of *Fimaria murina*).

and almost ripe asci. Hymenium 170-190  $\mu$  thick. Hypothecium about 15  $\mu$  thick, but often not clearly differentiated, of closely compacted isodiametric cells 4-9  $\mu$  diameter. Flesh of varying thickness, of subglobular or oblong cells 10-26 (-35)  $\times$  8-10 (-30)  $\mu$ , hyaline. Excipulum 29-55  $\mu$  thick, often of only a few layers of sub-globular, thick-walled cells 20-35  $\mu$  diameter (textura globulosa), with intercellular, amorphous, vinaceous-brown pigment, covered with hyaline, branched hyphae 5-8  $\mu$  thick. Asci broadly cylindrical, with a short stalk, rounded above, 170-200  $\times$  19-25  $\mu$ , 8-spored, the wall not blue in Melzer's reagent. Ascospores uniseriate, ellipsoid or oblong-ellipsoid, at first colourless, but at maturity with pale yellowish-brown contents, 22-35 (-38.5)  $\times$  10-13  $\mu$ , smooth. Paraphyses simple or branched, septate, cylindrical, sometimes slightly swollen underneath the septa, 2.5-3.5  $\mu$  thick, clavate at the 4-8  $\mu$  thick tip, with hyaline contents, sometimes the walls in the upper part pale brownish, covered in the upper part (up to 60  $\mu$  from the tip) by intercellular, amorphous, vinaceous-brown pigment.

**HABITAT.**—On dung of mouse and rabbit and on soil which has been in contact with dung of these animals.

**ILLUSTRATIONS.**—Batsch, Elench. Fung. Contin. 1: pl. 26, f. 138. 1786; Berkeley, Outl. Brit. Fungol. pl. 23, f. 1. 1860; Berkeley & Broome in Ann. Mag. nat. Hist. III, 15: pl. 15, f. 19. 1865; Cooke, Mycographia pl. 22, f. 85. 1876; Patouillard, Tab. anal. Fung. 1: f. 485. 1886; Velenovský, Monogr. Discom. Boh. 2: pl. 24, f. 15. 1934; Dennis, Brit. Cup Fungi pl. VIII, f. I. 1960.

**SPECIMENS EXAMINED.**—GREAT BRITAIN: *Berkeley*, s. loc., s. dat., in British fungi 159 (*Ascobolus vinosus*, BM, E, K); *Berkeley* No. 42, s. loc., s. dat. (PC-A 2312); *Berkeley*, Badminton, Gloucestershire, XII. 1864 (K-A1937); *Berkeley*, s. loc., s. dat. (K-A 1925); *Berkeley*, "on a mole-hill overgrown with moss, and covered with rabbits' and sheeps' dung", s. loc., s. dat. (holotype of *Ascobolus vinosus*, K-A 1927).

BELGIUM: *Libert*, Malmédy, s. dat, in Reliquia Libertianae No. 95 (BR-A336).

FRANCE: *Léveillé*, on rabbit dung, Bois de Boulogne, 1850 (PC-A2315<sup>1</sup>); *Persoon*, near Versailles, s. dat. (*Ascobolus purpureus*, an unpublished name, L 910.256-878).

GERMANY: *J. Kunze*, in fields, "Oberfeld" near Eisleben, X. 1878, in Fungi sel. No. 286 (*Ascobolus fuckelii*, BM, BRSL, GRO).

POLAND: *Schroeter*, on rabbit dung, Wroclaw: Oswitz, s. dat., in Pilze Schlesiens No. 1753 (*Humaria testacea*, HBG).

CZECHOSLOVAKIA: *Velenovský*, on soil near nest of mice, Solopisky, Bohemia, 31. X. 1925 (lectotype of *Fimaria murina*, PR 150853); *Velenovský*, on dung of mouse, Hubičkov, Mnichovice, Bohemia, X. 1927 (PR 151039).

UNKNOWN COUNTRY: *Limminghe*, on sandy soil, s. loc., I. 1818 ("Peziza picea in herb. Limminghe", type of *Ascobolus piceus*, BM-A2815, K-A1998).

This is probably the most common species of the genus. According to Seaver (1928: 139) this species is also found in Colorado, U.S.A. The ascospores show a considerable variation in length, sometimes even in the same fruit-body.

Although Batsch's description is rather short and only based on full-grown fruit-bodies, a striking unanimity as to the conception of his species exists in literature. The description and illustration of Berkeley & Broome (1865: 445) certainly established the stability we find in the works of Cooke (1876: 42), Phillips (1887: 99), Rehm (1894: 946) and Seaver (1928: 139).

#### FIMARIA LEPORUM (Alb. & Schw. per Pers.) Vel. sensu Fuckel

*Peziza granulosa* var.  $\beta\beta$ , *leporum* Alb. & Schw., Consp. Fung. 337. 1805 (devalidated name). — *Peziza granulosa* var. *leporum* Alb. & Schw. per Pers., Mycol. eur. 1: 298. 1822. — *Pezzia leporum* (Alb. & Schw. per Pers.) Fuck., Fungi rhen. 1877. 1866. — *Ascobolus leporum* (Alb. & Schw. per Pers.) Fuck. in Jb. nass. Ver. Naturk. 23-24: 288. 1870. — *Humaria leporum* (Alb. & Schw. per Pers.) Sacc., Syll. Fung. 8: 138. 1889. — *Coprobria leporum* (Alb. & Schw. per Pers.) Boud., Hist. Class. Discom. Eur. 69. 1907. — *Fimaria leporum* (Alb. & Schw. per Pers.) Vel., Monogr. Discom. Boh. 1: 331. 1934. — Type locality: Germany, Ober Lausitz.

The modern conception of this species is based on Fuckel, Fungi rhen. No. 1877. 1866; in Jb. nass. Ver. Naturk. 23-24: 288. 1870.

Apothecia gregarious, sessile or substipitate, 1-3 mm diameter. Receptacle at first closed and subglobular, then opening and more or less scutellate; reddish-brown or purplish-brown; almost smooth, covered with a thin net-work of hyphae, often with small fragments of the substratum adhering, with a prominent membranaceous margin almost disappearing with age. Disk concave or flat, brown or

purplish-brown, smooth, dotted with the hyaline tips of ripe asci. Hymenium about  $140\ \mu$  thick. Hypothecium about  $15\ \mu$  thick, of closely compacted hyphae  $1.7-3.5\ \mu$  thick, also with some larger cells up to  $13 \times 7.5\ \mu$ . Flesh of varying thickness, up to  $210\ \mu$  thick in the centre consisting of strongly branched hyphae with oblong or irregularly shaped cells  $10-24 \times 5-14\ \mu$  (of which the contents strongly stain in cotton blue or congo red) and of subglobular cells  $10-30\ \mu$  diameter, hyaline. Excipulum  $15-30\ \mu$  thick, of rather thick-walled, subglobular or oblong cells  $9-15 \times 5-13\ \mu$  (textura globulosa or textura angularis), brownish, with intercellular pigment and pigment in the cell-walls, covered with a net-work of strongly branched hyphae  $3-5.5\ \mu$  thick. Asci cylindrical, with a short stalk, rounded above, up to about  $140\ \mu$  long and  $14-15\ \mu$  wide, 8-spored, the wall not blue in Melzer's reagent. Ascospores uniseriate, broadly ellipsoid, at first hyaline, finally with pale yellowish-brown contents,  $14.4-15.9 \times 9.8-10.8\ \mu$ , smooth; sometimes with a single, central oil drop when immature. Paraphyses branched, septate, filiform,  $2.0-2.5\ \mu$  thick, shortly clavate and  $3-5\ \mu$  thick at the tip, hyaline, with reddish- or purplish-brown, amorphous pigment among the upper parts.

HABITAT.—On dung of rabbit and hare.

ILLUSTRATIONS.—Cooke, *Mycographia* pl. 19, f. 75. 1875; Cooke in *Grevillea* 3: pl. 43, f. 201. 1875.

SPECIMENS EXAMINED.—*J. Kunze*, on rabbit dung, Nonnenthal near Eisleben, Germany, end IV. 1875, in *J. Kunze*, *Fungi sel.* No. 188 (GRO, HBG, PAD).

The material in *Fuckel's Fungi rhen.* No. 1877 is in very poor condition.

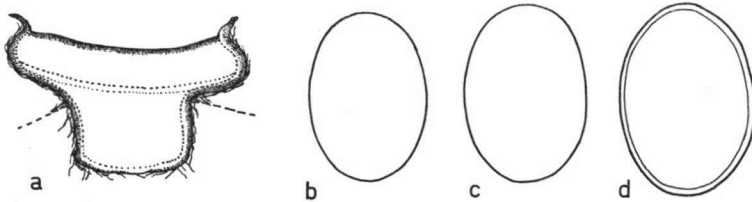


Fig. 2. *Fimaria leporum*. — a. Diagrammatic section of apothecium ( $\times 40$ ). — b-d. Ascospores ( $\times 1600$ ); b, c. lateral view; d. optical section. — From *J. Kunze*, *Fungi sel.* No. 188 (GRO).

This species is well-characterized by its broadly ellipsoid ascospores. It was also collected by Svrček (1959: 96) from different localities in Bohemia.

***Fimaria cervaria*** (Phill. apud J. Stevenson) Brumm., *comb. nov.*

*Peziza cervaria* Phill. apud J. Stevenson, *Mycologia scotica* 308. 1879. — *Humaria cervaria* (Phill. apud J. Stevenson) Sacc., *Syll. Fung.* 8: 143. 1889. — *Ascophanus cervarius* (Phill. apud J. Stevenson) Boud., *Hist. Class. Discom.* Eur. 76. 1907. — Type locality: East Scotland, Great Britain.

Apothecia gregarious, superficial, sessile or substipitate,  $1.5-3\ \text{mm}$  diameter, about  $1\ \text{mm}$  high. Receptacle at first subglobular, then more or less scutellate, with a short stalk-like base; chestnut-brown or purplish-brown; smooth and covered with a net-work of brown hyphae; margin thin, crenulate or fimbriate. Disk concave, chestnut-brown or purplish-brown, almost smooth. Hymenium about  $150\ \mu$  thick. Hypothecium about  $25\ \mu$  thick, of closely compacted cells  $4-10 \times 3-7\ \mu$ . Flesh up to  $900\ \mu$  thick in the central part, of small isodiametric cells  $7-14\ \mu$  diameter and of large oblong cells  $19-53 \times 5-12\ \mu$ , hyaline. Excipulum near the margin

25–40  $\mu$  thick, near the base up to 75  $\mu$  thick, of subglobular, angular or slightly elongated cells 8–40  $\mu$  diameter (textura angularis or textura globulosa), with intercellular, amorphous, purplish-brown pigment, especially in the outer few layers of cells and between the hyphae which cover the excipulum; covering hyphae 2–3.5  $\mu$  thick, near the margin often forming a more or less fimbriate layer. Asci

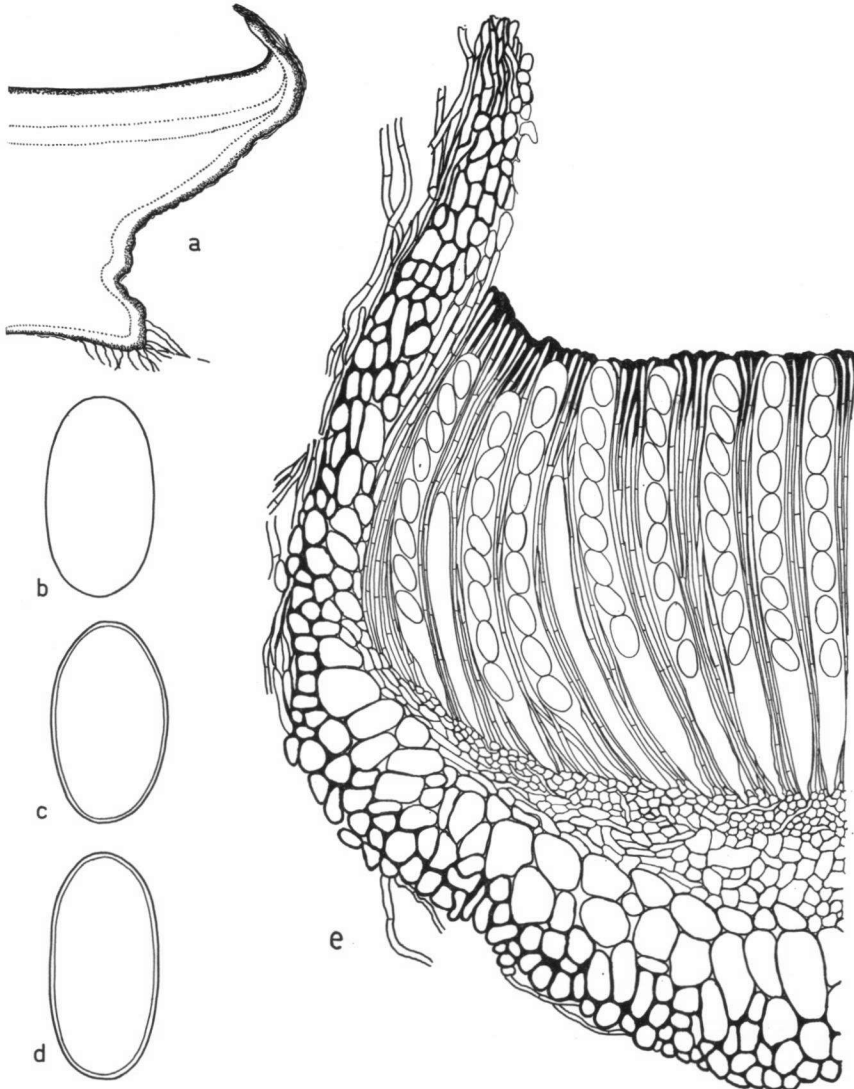


Fig. 3. *Fimaria cervaria*. — a. Diagrammatic section of apothecium ( $\times 40$ ). — b–d. Ascospores ( $\times 1600$ ); b. lateral view; c, d. optical section. — e. Section of margin of apothecium ( $\times 400$ ) (from *Gremmen 1712*).

cylindrical, with a very short stalk, rounded above,  $150-175 \times 10-12.5 \mu$ , 8-spored, the wall not blue in Melzer's reagent. Ascospores uniseriate, ellipsoid or oblong-ellipsoid, at first colourless, finally often with pale yellowish-brown contents,  $14.4-17.0 \times 7.0-8.5 \mu$ , without oildrops or granules when mature, smooth. Paraphyses branched, especially in the upper parts, septate, filiform, about  $2.0 \mu$  thick, not or only very slightly enlarged,  $2.0-3.0 \mu$  thick at the tip, hyaline but near the tip often with pale brownish walls, with intercellular, amorphous, purplish-brown pigment covering the tips.

HABITAT.—Only known from dung of deer.

ILLUSTRATIONS.—None published thus far.

SPECIMEN EXAMINED.—GREAT BRITAIN: *Gremmen 1712*, on dung of deer, Loch-an-Eilean, near Aviemore, Scotland, 29. V. 1960 (L, Herb. Gremmen).

U.S.A.: *Cain*, on deer dung, Ringwood, near Ithaca, New York, 6. IX. 1952 (TRTC 24287).

Both collections fully agree with Phillips' description.

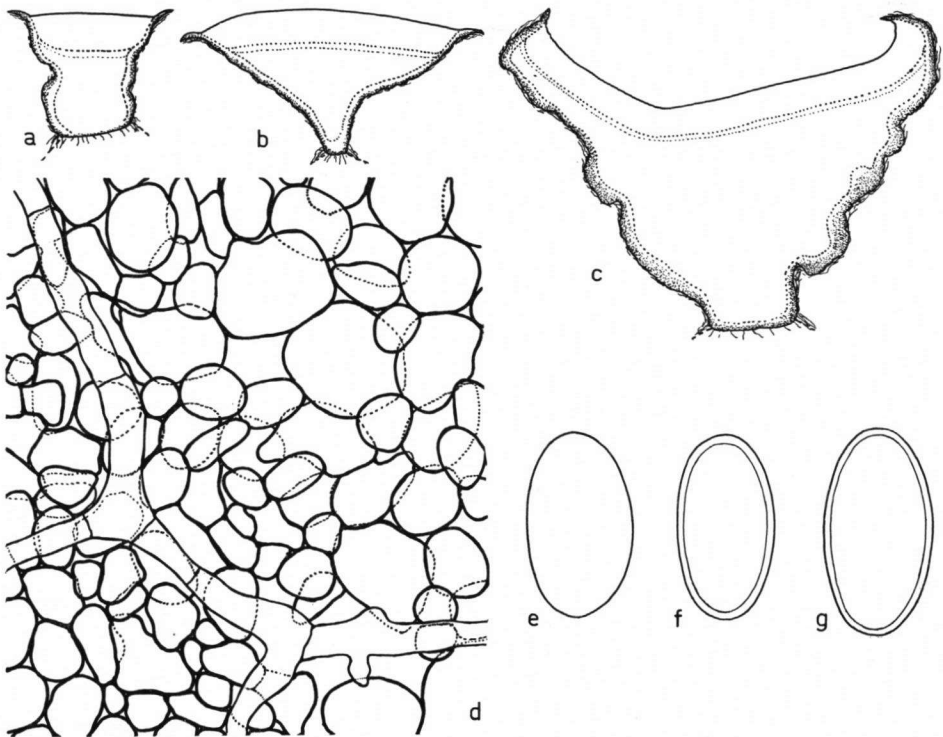


Fig. 4. *Fimaria theiroleuca*. — a-c. Diagrammatic sections of apothecia ( $\times 25$ ). — d. Surface view of portion of excipulum ( $\times 750$ ). — e-g. Ascospores ( $\times 1600$ ); e. lateral view; f, g. optical section (a, b, d-g from *van Brummelen 648*, c. from Webster's collection).

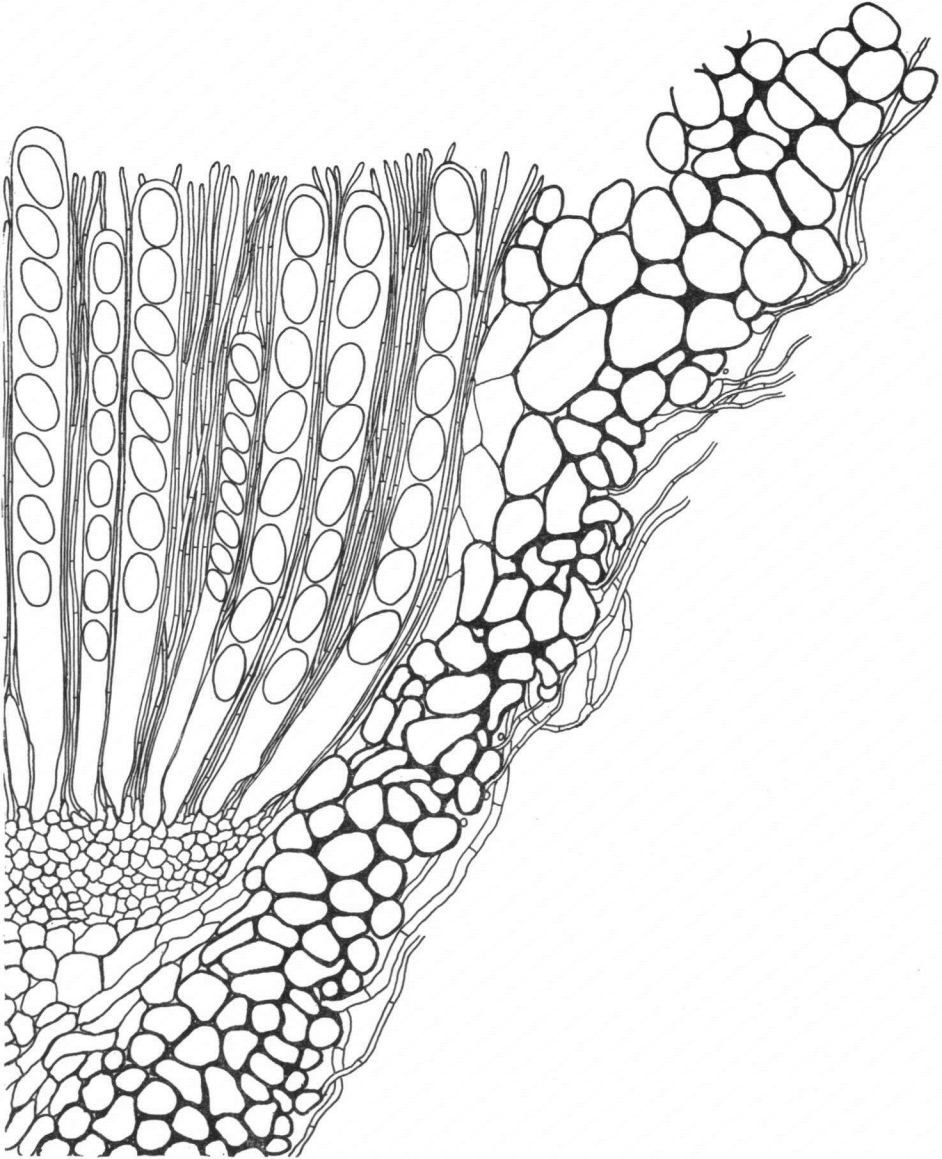


Fig. 5. *Fimaria theioleuca*. — Section of margin of apothecium ( $\times 600$ ) (from *van Brummelen* 648).



***Fimaria theioleuca* (Roll.) Brumm., *comb. nov.***

*Pseudombrophila theioleuca* Rolland in Bull. Soc. mycol. Fr. 4: 57, pl. 15, f. 3a-c. 1888. — *Humaria theioleuca* (Roll.) Sacc., Syll. Fung. 8: 126. 1889.—Type locality: France, Paris, Botanic Garden.

Apothecia solitary or gregarious, substipitate or stipitate, 1–4 mm diameter, up to 1.5 mm high. Receptacle at first closed and subglobular, then opening and turbinate with a narrow or stalk-like base; pale yellowish-brown or darker brown; smooth or folded, covered with a net-work of branched hyphae; margin entire, membranaceous, brown, often somewhat fimbriate at the outside. Disk flat, then convex, pale yellowish, smooth. Hymenium 155–175  $\mu$  thick. Hypothecium 20–30  $\mu$  thick, of closely compacted, isodiametric cells 5–9  $\mu$  diameter. Flesh of varying thickness, in the central part up to about 1000  $\mu$ , of subglobular of oblong cells 11–43  $\times$  9–28  $\mu$ , hyaline. Excipulum near the margin 25–35  $\mu$  thick, in the margin 20–28  $\mu$  thick, in the lower parts up to 72  $\mu$  thick, of subglobular, thick-walled cells 11–30 (–40)  $\mu$  diameter (textura globulosa), with brownish cell-walls and intercellular pigment especially in the outer layers, covered with a net-work of septate, branched, hyaline or encrusted 3–9  $\mu$  thick hyphae which is often more dense and fimbriate toward the margin. Asci cylindrical, with a short stalk, rounded above, 155–180  $\times$  13–15  $\mu$ , 8-spored, the wall not blue in Melzer's reagent. Ascospores uniseriate, ellipsoid, at first colourless, finally with pale yellowish-brown contents, 13.2–15.7  $\times$  7.7–8.3  $\mu$ , smooth, without oil drops or granules. Paraphyses branched, septate, filiform 1.2–1.8  $\mu$  thick, not enlarged upward, hyaline, with granular contents, without any pigment.

HABITAT.—Known from dung of deer, rabbit and sheep.

ILLUSTRATIONS.—Rolland, l.c.

SPECIMENS EXAMINED.—GREAT BRITAIN: *Webster*, on rabbit dung, University of Sheffield, 5. XII. 1961 (L).

NETHERLANDS: *van Brummelen* 648, on dung of deer, Elspeet, Gelderland, 3. IV. 1959 (L).

This species was incorrectly placed by Rolland and Boudier (1907: 65) in the genus *Pseudombrophila* Boud. which is characterized by small clusters of short, coloured, septate, obtuse hairs on the outside of the receptacle. These hairs are quite different from the hyphae covering the outer surface of the apothecia in the present species. The collection mentioned above fully agrees with Rolland's description and certainly belongs to the genus *Fimaria*.

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