

## TWO SPECIES OF ASCOBOLUS NEW TO BRITAIN

J. VAN BRUMMELEN

*Rijksherbarium, Leiden*

The coprophilous *Ascobolus rhytidosporus* sp. nov. and the wood-inhabiting  
*Ascobolus hansenii* Paulsen & Dissing are described from British collections.

### *Ascobolus rhytidosporus* Brumm., spec. nov.—Fig. 1

Apothecia solitaria, sessilia, (0.2–) 0.3–0.6 mm diam. Receptaculum initio subglobulare vel pulvinare, denique lenticulare, hyalinum, prope basem dilute lutescenti-brunneum, laeve, immarginatum. Excipulum textura globulosa vel angulari. Asci crasse clavati, apicibus rotundatibus, (115–)120–135(–145) × 20–30(–35)  $\mu\text{m}$ , 8-spori, parietibus cum iodo caerulescentibus. Ascosporae ellipsoideae, (11.6–)12.1–14.4(–16.0) × (6.5–)6.8–8.4(–9.3)  $\mu\text{m}$ , pigmentorum stratis valde rugosis vel irregulariter vesiculosus ornatae. Paraphyses simplices vel ramosae, cylindricae, 1.8–2.5(–4.0)  $\mu\text{m}$  crassae, apice valde incrassatae. In fimo murinum aut in reliquis plantarum prope fimum murinum crescit. — Typus: *M. C. Clark*, Broadway, Worcestershire, Anglia, 23.II.1979 (K).

Apothecia solitary, superficial, sessile, sometimes on a narrow base, (0.2–)0.3–0.6 mm diameter, 0.2–0.4 mm high. Receptacle at first subglobose to pulvinate, becoming more expanded, finally lenticular, hyaline, pale yellowish brown near the base; surface smooth; without margin. Disc convex, hyaline, at maturity roughened by the protruding purple tips of ripe asci. Hymenium 120–140(–150)  $\mu\text{m}$  thick. Hypothecium scarcely differentiated, of isolated groups of thin-walled subglobular to elongated cells, 4–9 × 4–6  $\mu\text{m}$ . Flesh 100–140  $\mu\text{m}$  thick, of isodiametric to elongated cells 8–18 × 6–9  $\mu\text{m}$ , intermingled with hyphae 2–4  $\mu\text{m}$  wide, hyaline. Excipulum clearly differentiated, 30–40  $\mu\text{m}$  thick, near the base up to 50  $\mu\text{m}$  thick, hyaline with some pale brownish intercellular pigment near the base, consisting of subglobular or somewhat polyhedral cells (9–)15–30(–37) × (8–)12–25(–30)  $\mu\text{m}$  (textura globulosa to angularis). Asci broadly clavate, with a short stalk, rounded at the apex, (115–)120–135(–145) × 20–30(–35)  $\mu\text{m}$ , 8-spored; the wall staining blue in Melzer's reagent. Ascospores irregularly biseriata, sometimes irregularly arranged in a loose cluster, ellipsoid (length/breadth ratio 1.6–1.9, rarely 1.5 or 2.1), at first hyaline, then purplish red, becoming purplish brown at maturity, (11.6–)12.1–14.4(–16.0) × (6.5–)6.8–8.4(–9.3)  $\mu\text{m}$  (without ornamentation), with homogeneous contents, rather thick-walled (1.0–1.2  $\mu\text{m}$ ), ornamented with a strongly wrinkled or irregularly vesiculose layer (0.2–0.4  $\mu\text{m}$ ) of pigment; ornamentation up to 1.5  $\mu\text{m}$  thick. Paraphyses septate, slender cylindrical, simple or branched, hyaline, 1.8–2.5(–4.0)  $\mu\text{m}$  thick, strongly swollen up to 15(–18)  $\mu\text{m}$  at the tip, not embedded in mucus, containing many small granules and globules especially in the terminal element.

HABITAT.—On mouse dung or debris associated with mouse dung.

ETYMOLOGY.—From Greek, *ῥυτίς*, a fold, a wrinkle and *σπορα*, a seed: with wrinkled spores.

SPECIMENS EXAMINED.—GREAT BRITAIN: *M. C. Clark 1371*, on mouse dung, near Yarningale Common, Warwickshire, 25.IV.1973 (L); *M. C. Clark 2013*, on mouse dung, Yarningale Common, Warwickshire, 2.IV.1977 (drawing and notes only, K); *M. C. Clark s.n.*,

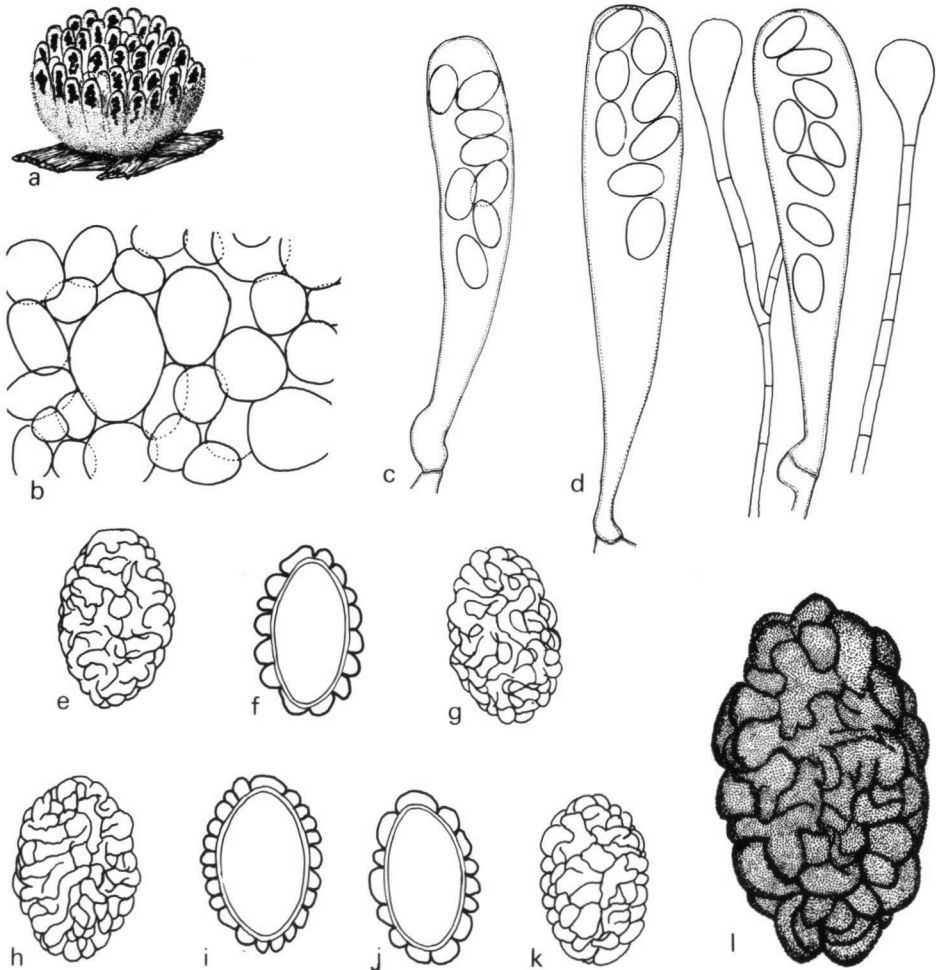


Fig. 1. *Ascobolus rhytidosporus*. — a. Habit of fruit body  $\times 50$ . — b. Texture of excipulum seen from outside  $\times 630$ . — c, d. Asci and paraphyses  $\times 630$ . — e, g, h, k. Ascospores  $\times 1600$ . — f, i, j. Ascospores in optical section  $\times 1600$ . — l. Ascospore  $\times 3200$ . (a, c, e-l from type of *A. rhytidosporus*; b, d from *M. C. Clark*, Weatheroak, 9.II.1980, K.).

on mouse dung, Broadway, Worcestershire, 23.II.1979 (holotype of *A. rhytidosporus*, K); *M. C. Clark s.n.*, on mouse dung, near Anchor Inn, Kerry, Montgomeryshire, 23.V.1979 (K); *M. C. Clark s.n.*, on litter associated with mouse dung, Bentley Thrift, near Bromsgrove, Worcestershire, 24.I.1980 and 21.III.1980 (K); *M. C. Clark s.n.*, on debris associated with mouse dung, Weatheroak, Worcestershire, 9.II.1980 (K); *J. T. Palmer 2306* and *2307*, on dead plant debris under a large heap of myomorphic droppings, Houghton Green, near Denton, Greater Manchester County, 8.III.1964 (L).

The distinctive ornamentation of the ascospores and the strongly inflated tips of paraphyses make this fungus a readily recognizable species.

In *Ascobolus rhytidosporus* the purplish pigment is deposited in a thin layer of uniform thickness which is strongly wrinkled or forming vesicles on the primary spore wall (Fig. 1f, i, j). This layer of pigment is only in contact with the underlying layer according to an irregular pattern of curved lines (Fig. 1e, g, h, k). As this phenomenon is constantly present from the beginning in all pigmented ascospores, it cannot be an artifact, as was presumed at first. As far as could be studied from dried specimens, the development of the pigment layer in this species is quite unique within the Ascobolaceae.

Although the variation in the shape (length/width ratio 1.53–1.83) and the measurements ( $12.1\text{--}13.6 \times 7.0\text{--}8.4 \mu\text{m}$ ) of the ascospores in the type specimen is rather restricted, some other collections (especially *Palmer 2306* and *2307*) show a wider range of variability in these characters.

This species with minute fruit bodies has been collected only from a few localities in England. It is certainly due to the special attention of the collectors that it was discovered.

The tendency of the ascospores to form irregular, loose clusters and the paragymnohymenial to eugymnohymenial ascomata justify a disposition in *Ascobolus* sect. *Pseudosaccobolus* Brumm. (van Brummelen, 1967). In no instance were the ascospores found to be arranged in compact or regular clusters, nor were they found glued together by their pigment layers, which is characteristic of the genus *Saccobolus* Boud.

*Ascobolus candidus* Schroet. described from hare dung near Wrocław, Poland (Schroeter, 1893) might be related because of the minute, smooth, white fruit bodies and the size of the ascospores, but this latter species differs in the smooth surface of the ascospores and the absence of swollen tips of the paraphyses. Since no type material of Schroeter's species seems to be in existence, it will be difficult to clarify its name.

## ASCOBOLUS HANSENI Paulsen & Dissing—Fig. 2

*Ascobolus hanseii* Paulsen & Dissing in Bot. Tidsskr. 74: 75. 1980 ('1979').

Apothecia solitary or gregarious, superficial, sessile, 0.5–1.0 mm diameter, 0.3–0.5 mm high. Receptacle at first closed and subglobular, then opening by an irregular aperture, becoming cup-shaped, finally expanding and discoid, brown to purplish brown, surface covered with rather regularly disposed warts; margin crenulate or granulose. Disc concave then flat, roughened by the protruding tips of ripe asci, yellowish, becoming purplish or brownish with age. Hymenium 150–180  $\mu\text{m}$  thick. Hypothecium 15–25  $\mu\text{m}$  thick, of groups of closely compacted thin-walled isodiametric cells, 4–8  $\mu\text{m}$  diameter. Flesh of varying thickness of thin walled polyhedral cells 5–22  $\times$  5–12  $\mu\text{m}$ . Excipulum clearly differentiated, 30–40  $\mu\text{m}$  thick, near the base up to 55  $\mu\text{m}$  thick, consisting of subglobular or elongate rather thick-walled cells 9–28  $\times$  7–21  $\mu\text{m}$  (textura globulosa), with amorphous or granular brownish intercellular pigment, covered with small groups of globular cells 14–25  $\mu\text{m}$  diameter with amorphous and semi-crystalline purplish-brown pigment on the outside. Asci cylindrical-clavate narrower towards the base, rounded above 120–140  $\times$  13–15  $\mu\text{m}$ , 8-spored; the wall not or scarcely blue in Melzer's reagent. Ascospores biseriate or obliquely uniseriate, fusiform (length/breadth ratio 2.5–2.8(–2.9), average 2.68), at first hyaline, then violet, purplish brown at maturity, (18.6–)19.5–21.4(–22.0)  $\times$  7.4–8.4  $\mu\text{m}$  (without ornamentation), with homogeneous contents, ornamented with rather broad longitu-

dinal occasionally anastomosing lines, 3 to 5 of which are visible in each view of the spore, locally with caps or semi-globular deposits of pigment up to  $2.5\ \mu\text{m}$  thick. Paraphyses septate, cylindrical, simple or branched, hyaline,  $1.9\text{--}2.8\ \mu\text{m}$  thick, enlarged up to  $7\ \mu\text{m}$  at the tip, embedded in yellowish mucus (containing small yellowish crystals in dried material).

HABITAT.—On wood partly covered with algae.

SPECIMEN EXAMINED.—GREAT BRITAIN: *D. L. Hawksworth 4951*, on *Salix* wood associated with algae, Rivership L.N.R., Middlesex, 9.VI.1979 (part of IMI 239401 in K).

*Ascobolus hansenii* has been described recently as a new species by Paulsen & Dissing (1980). They reported it only from a single locality in Denmark growing on pigeon droppings. A recent acquisition of the Kew Herbarium (*Hawksworth 4951*) appears to be conspecific with the Danish fungus. There is a high degree of similarity of macroscopic and microscopic characters between both collections.

Among its relatives in *Ascobolus* sect. *Ascobolus*, *A. hansenii* can be distinguished by (i) the rather regularly disposed warts of the excipulum, (ii) the semi-crystalline purplish brown pigment on the exposed surface of excipular and wart cells, (iii) the clearly fusiform ascospores, and (iv) the pattern of spore ornamentation with rather broad longitudinal striae and locally semi-globular deposits of pigment.

A slight discrepancy between the characters of Hawksworth's collection and the Danish material is observed in the shape and the size of the ascospores, mainly due to their somewhat greater length and smaller width in the British material. A considerable variation of spore-measurements, however, is not uncommon in closely related species like *A. epimyces* (Cooke) Seaver, *A. viridis* Curr., and *A. denudatus* Fr.

According to Paulsen & Dissing (l.c.), the ascospores in the type specimen are fusiform, measuring  $17.3\text{--}19.0\text{--}20.3 \times 8.3\text{--}9.2\text{--}10.5\ \mu\text{m}$  (with an estimated length-breadth ratio varying between 2.0 and 2.25).

In the very closely related *A. epimyces* the ascospores are fusoid or ellipsoid with pointed ends ( $15.5\text{--}17.5\text{--}19.5\text{--}(20) \times (6.5\text{--})7\text{--}9\text{--}(10)\ \mu\text{m}$  (length-breadth ratio 2.1–2.5) and an ornamentation pattern of rather closely spaced longitudinal anastomosing lines (cf. van Brummelen, 1967).

*Ascobolus viridis* is clearly distinct by the rather large, stalked apothecia and the ascospores. The latter are fusiform or ellipsoid with strongly pointed ends ( $23.5\text{--}28.5\text{--}37.5 \times (10\text{--})11\text{--}14\ \mu\text{m}$  (exceptionally up to  $52 \times 24\ \mu\text{m}$ ), ornamented with long or short longitudinal ridges of pigment up to  $2\ \mu\text{m}$  thick (van Brummelen, l.c.).

In *A. denudatus* the apothecia are sessile, often on a small base. The ascospores are ellipsoid with blunt ends ( $16\text{--}18\text{--}22\text{--}(23) \times (8.5\text{--})9.5\text{--}11.5\ \mu\text{m}$  and a wide variation in the pattern of ornamentation (cf. van Brummelen, l.c.).

The occurrence of ascospores with irregularly disposed, rather thick lumps or caps of pigment, is a phenomenon well-known from *A. denudatus* and somewhat less-pronounced from *A. viridis* and *A. demangei* Pat. In contrast to *A. hansenii*, where this character is constant, pustulate ascospores occur in these species only as a percentage of the total number.

Forms with pustulate ascospores have been distinguished at species-level as *Ascobolus angulisporus* Boud. and *A. pani* Velen. or at variety-level as *A. fimiputris* Qué. var. *lindaviana* P. Henn. These taxa were placed in the synonymy of *A. denudatus* (van Brummelen, l.c.) because of their ellipsoid ascospores without pointed ends and other characters.

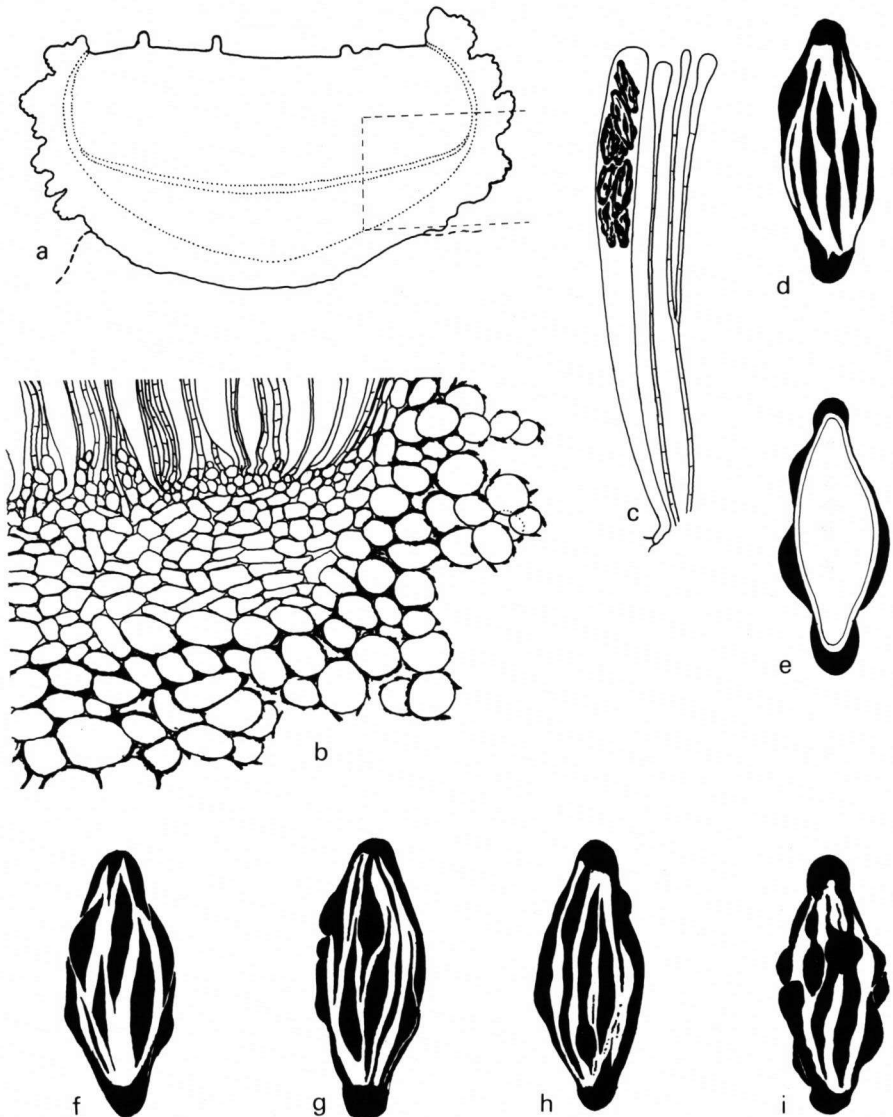


Fig. 2. *Ascobolus hansenii*. — a. Diagrammatic section of fruit body  $\times 100$ . — b. Detail of median section of fruit body  $\times 400$ . — c. Ascus and paraphyses  $\times 400$ . — d, f-i. Ascospores  $\times 1600$ . — e. Ascospore in optical section  $\times 1600$ . (From D. L. Hawksworth 4951.)

## ACKNOWLEDGEMENTS

The author is indebted to both Mr. J. T. Palmer and Mr. M. C. Clark for sending him their collections; Mr. B. M. Spooner is acknowledged for his interest and the loan of specimens from the Herbarium of the Royal Botanic Gardens at Kew.

## REFERENCES

- BRUMMELEN, J. VAN (1967). A world-monograph of the genera *Ascobolus* and *Saccobolus* (Ascomycetes, Pezizales). In *Persoonia* (Suppl.) 1.
- PAULSEN, M. D. & DISSING, H. (1980). The genus *Ascobolus* in Denmark. In *Bot. Tidsskr.* 74: 67–78 ('1979').
- SCHROETER, J. (1893). Die Pilze Schlesiens. In *Krypt.-Fl. Schles.* (ed. Cohn) 3(2): 1–256.