

Five interesting Ascomycetes from herbal drugs

Yoshikazu Horie¹⁾ and Dongmei Li²⁾

¹⁾ Natural History Museum and Institute, Chiba, 955–2, Aoba-cho, Chuo-ku, Chiba-shi, Chiba 260, Japan

²⁾ Research Center for Medical Mycology, Beijing Medical University, No. 8 Xishiku Street, Western District, 100034 Beijing, China

Accepted for publication 14 July 1997

Among strains isolated from herbal drugs in a mycological survey conducted in 1977–1980, five noteworthy species of pyrenomycetous ascomycetes are described and illustrated: *Gelasinospora mirabilis* var. *gigaspora* var. nov., isolated from Taraxaci Herba (Japanese name, Hokoei); *Lophotrichus ampullus*, isolated from Trichosanthis Radix (Japanese name, Karokon); *L. bartlettii*, isolated from Chamomillae Flos (Japanese name, Kamitsure); *Sordaria conoidea*, isolated from Plantaginis Semen (Japanese name, Shazenshi); and *Thielavia subthermophila*, isolated from wood of *Abies web-biana*, Plantaginis Semen and Plantaginis Herba (Japanese names, Shazenshi and Shazenso).

Key Words—*Gelasinospora mirabilis* var. *gigaspora*; herbal drug; *Lophotrichus*; *Sordaria*; *Thielavia*.

During a mycological and mycotoxicological survey of herbal drugs in 1977 to 1980 (Horie, 1978, 1979; Horie et al., 1979; Yamazaki et al., 1980; Horie and Yamazaki, 1985; Horie and Udagawa, 1990), five uncommon Pyrenomycetes were isolated from Indian and Japanese herbal drugs by the direct-plate method. They are herein described and illustrated as interesting ascomycetous fungi. Dried specimens and living cultures of the fungi are deposited at the Natural History Museum and Institute, Chiba, Japan (CBM).

Gelasinospora mirabilis Furuya & Udagawa var. *gigaspora* Horie & Li, var. nov. Figs. 1, 6, 7

A typo differt ascosporis majoribus, et poris germinationis 8 instructis.

Holotypus CBM-FA-0010, colonia exsiccata in cultura ex medicina herbacea, in Japonia, 15, iv. 1978, a Y. Horie isolata et ea collectione fungorum Musei et Instituti Historiae Naturalis Chiba (CBM) conservata.

Etymology: giga- = giant (GK. comp.); spora = seed, referring to the larger size of the ascospores.

Colonies on potato-carrot agar (PCA) spreading broadly, consisting of a thin mycelial felt, more or less floccose, Brownish Grey (5E2, after Kornerup and Wanschler, 1978) to Yellowish Brown (5F5); perithecia granular in appearance; reverse Greyish Brown (6D3) to Brownish Black (6F5).

Perithecia superficial to semi-immersed, scattered, dark brown to brownish black, pyriform to ovate, 600–800 × 480–620 μm, surrounded by hyaline to pale yellow, undulate, smooth to minutely roughened, septate, basally 2–3 μm diam hairs; neck dark brown, conical to cylindrical, 280–430 × 140–240 μm; peridium dark brown to dark olivaceous brown, opaque, membranaceous, consisting of irregularly angular cells, mea-

suring 5–15 × 5–17.5 μm. Asci 8-spored, cylindrical, 170–350 × 35–47.5 μm, truncated above with a distinct apical ring measuring 4–5 μm in diam; tapering below into a short stipe. Paraphyses hyaline, filiform, septate. Ascospores obliquely uniseriate, olivaceous black to black, opaque, broadly elliptical, (36–)38–45(–47.5) × 28–32.5 μm, with walls ornamented with reticulate ridges measuring 2–4.5 μm wide and subglobose to ovate hollows measuring 2.5–7 × 2.5–5 μm, containing totally eight germ pores measuring 1.0 μm in diam, which may be concentrated near both ends.

Colonies on oatmeal agar (OA) spreading broadly, floccose, Olive Brown (4E4) to Yellow Brown (5F4); perithecia scattered; reverse Olive Brown (4E4) to Dark Brown (6F6).

At 37°C, growth is spreading broadly, but perithecia not produced.

Specimen examined: CBM-FA-0010 (holotype), in culture isolated from the Japanese commercial herbal drug Taraxaci Herba (Japanese name, Hokoei), as strain No. 79-Sh-277-6, Y. Horie, 15 April 1978.

This variety differs primarily from the type variety of *G. mirabilis* in having larger ascospores with commonly eight germ pores; while ascospores of the type variety measure 32–36(–38) × 22–28 μm and have 2–6 germ pores (Furuya and Udagawa, 1976).

Gelasinospora hippopotama Krug, Khan & Jeng has ascospores which are somewhat similar in size and the presence of multiple germ pores, but differs in its ascospore ornamentation characterized by morphologically variable pits (Krug et al., 1994). *Gelasinospora hap-sidophora* Khan & Krug may also be comparable but differs in its smaller ascospores with two germ pores and the narrow-ridged nature of the reticulum (Khan and Krug, 1989).

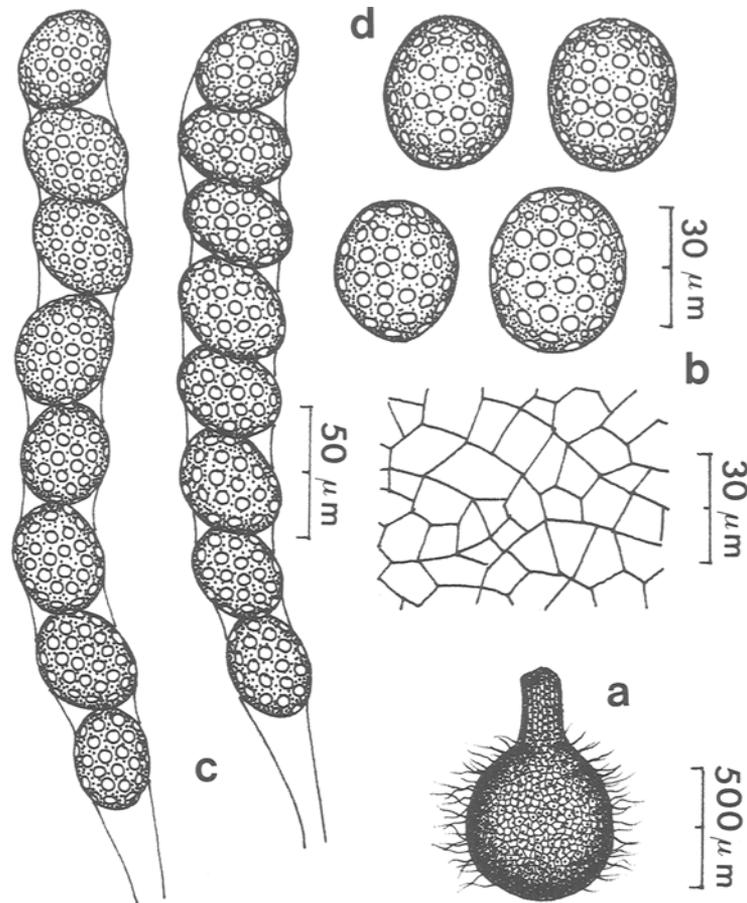


Fig. 1. *Gelasinospora mirabilis* var. *gigaspora*, CBM-FA-0010. a, Perithecium. b, Peridium. c, Asci. d, Ascospores.

Lophotrichus ampullus Benjamin, *Mycologia* **41**: 347. 1949; Ames, A monograph of the Chaetomiaceae, p. 51. 1961 (1963). Figs. 2, 8, 9

Colonies on PCA growing rather rapidly, consisting of a thin mycelial felt and loose aerial hyphae, floccose, Orange White (6A2) to Olive Brown (4E3); perithecia granular in appearance; reverse Brownish Orange (6C3) to Dark Brown (6F5).

Perithecia superficial to semi-immersed, scattered, dark brown to brownish black, globose to subglobose, $130\text{--}210 \times 140\text{--}260 \mu\text{m}$; neck dark brown to brownish black, cylindrical, up to $470 \mu\text{m}$ long, $25\text{--}45 \mu\text{m}$ in diam; peridium dark olive to dark olivaceous brown, membranaceous, consisting of angular cells. Terminal hairs dark brown to dark olivaceous brown, undulate, unbranched, septate, smooth to minutely roughened, up to $2,600 \mu\text{m}$ long, $4\text{--}5 \mu\text{m}$ wide at the base, with a curved to circinate tip. Lateral hairs dull yellowish brown to dark brown, undulate, smooth to nearly so, $3\text{--}5 \mu\text{m}$ wide. Asci 8-spored, subglobose to ovate or pyriform, $15\text{--}25\text{--}(30) \times (11\text{--})12.5\text{--}17.5 \mu\text{m}$, evanescent. Ascospores yellow to olive, broadly elliptical to lemon-shaped, apiculate, smooth, $7\text{--}8\text{--}(9) \times 5\text{--}6 \mu\text{m}$, with a germ pore at each end, measuring $0.5 \mu\text{m}$ in diam.

Colonies on OA growing rather rapidly, floccose, Yellowish Brown (5E4) to Dark Brown (6F5); perithecia few in number, scattered; reverse Yellowish Brown (5E6) to Olive Grey (3F2).

At 37°C , growth is nil.

Specimen examined: CBM-FA-0011, in culture isolated from the Japanese commercial herbal drug *Trichosanthis Radix* (Japanese name, Karokon), as strain No. 79-Sh-536-6, Y. Horie, 22 April 1978.

This species, first isolated from goat dung, is characterized by cylindrical neck of the perithecium, long undulate and finally curved terminal hairs, and lemon-shaped ascospores (Benjamin, 1949). *Lophotrichus martinii* Benjamin is similar to this species (Benjamin, 1949), but terminal hairs of *L. martinii* are of two sorts, a few long hairs and short ones grouped around the ostiole of perithecium.

Lophotrichus bartlettii (Masse & Salmon) Malloch & Cain, *Can. J. Bot.* **49**: 866. 1971; Furuya and Udagawa, *Trans. Mycol. Soc. Japan* **14**: 18. 1973; Otani, *Mycol. Fl. Japan* **3**(2):133. 1988. Figs. 3, 10, 11 \equiv *Magnusia bartlettii* Masse & Salmon, *Ann. Bot.* **15**: 333. 1901.

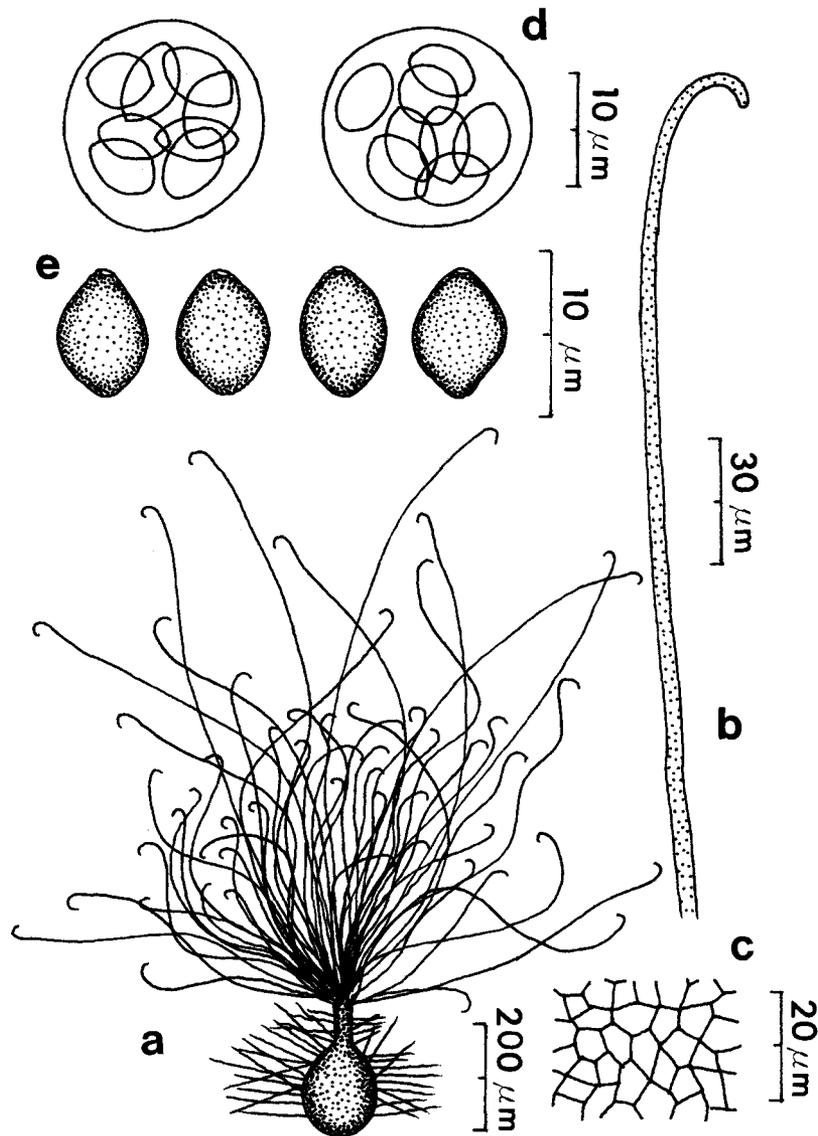


Fig. 2. *Lophotrichus ampullus*, CBM-FA-0011.

a, Perithecium. b, Terminal hair. c, Peridium. d, Asci. e, Ascospores.

≡ *Kernia bartlettii* (Masse & Salmon) Benjamin, El Aliso 3: 344. 1956.

≡ *Kernia bartlettii* (Masse & Salmon) Tandon & Bilgrami, Lloydia 24: 168. 1961.

= *Lophotrichus brevisstratus* Ames, A monograph of the Chaetomiaceae, p. 52. 1961 (1963).

Colonies on PCA growing rapidly, consisting of a thin mycelial felt and rather loose aerial hyphae, floccose, Orange White (6A2) to Greyish Green (30C3); perithecia granular in appearance; reverse Brownish Grey (6C2) to Greyish Brown (6F3).

Perithecia superficial to immersed, scattered, dark olive to olive black, globose to subglobose, 230–300 × 210–330 μm; neck dark olive to olivaceous black, papilliform to conical, 30–40 × 50–90 μm; peridium dark olive to olivaceous black, membranaceous, consisting of angu-

lar cells. Terminal hairs dark olive to olivaceous gray, very long, straight to undulate, unbranched, smooth, septate, up to 3,600 μm long, 4–6 μm wide at the base. Lateral hairs light olivaceous gray to olivaceous gray, straight to undulate. Asci 8-spored, subglobose to ovate, (18–)20–25 × 15–20 μm, evanescent. Ascospores olive to light olive, broadly elliptical, 7–8 × 6–7 μm, subapiculate at both ends, with a germ pore at each end.

Colonies on OA growing fairly rapidly, floccose, Greyish Brown (6D3) to Greyish Brown (7E3); perithecia abundantly produced; reverse Brown (6E5) to Dark Brown (7F4).

At 37°C, growth is nil.

Specimen examined: CBM-FA-0012, in culture isolated from the Japanese commercial herbal drugs,

Chamomillae Flos (Japanese name, Kamitsure), as strain No. 79-Sh-346-5, Y. Horie, 11 May 1978.

This species occurs on various kinds of dung, roe deer, guinea pig, wild sheep, rat and Japanese deer. It is characterized by very long and straight to undulate terminal hairs, and broadly elliptical ascospores.

Sordaria conoidea Cailleux, Bull. Soc. Mycol. France **87**: 479. 1971. Figs. 4, 12–14

≡ *Asordaria conoidea* (Cailleux) von Arx & Guarro, Per-
sooniana **13**: 266. 1987.

Colonies on PCA spreading broadly, consisting of a thin mycelial felt and very sparse aerial growth, Yellowish Grey (4B2); perithecia abundantly produced, granular in appearance; reverse Yellowish Grey (4B2).

Perithecia superficial to semi-immersed, scattered, dark brown to dark olive brown, pyriform, $270\text{--}330 \times 180\text{--}210 \mu\text{m}$, provided with hyaline to pale yellowish brown hairs; neck dark olivaceous black, short cylindrical to conical, $110\text{--}160 \times 80\text{--}100 \mu\text{m}$; peridium dark brown to brownish black, rather thin, membranaceous, consisting of angular cells. Asci 8-spored, cylindrical, $130\text{--}162 \times 10\text{--}12.5 \mu\text{m}$, truncate above, with a small ring-like structure in the apex, tapering below into a short stipe. Paraphyses hyaline, septate. Ascospores uniseriate, dark brown to dark olivaceous brown, finally brownish black to olivaceous black, opaque, elliptical to broadly elliptical, smooth, $17\text{--}19 \times 10\text{--}11 \mu\text{m}$ (with a length/width ratio of 1.71); with a germ pore at the base, surrounded by a narrow gelatinous sheath.

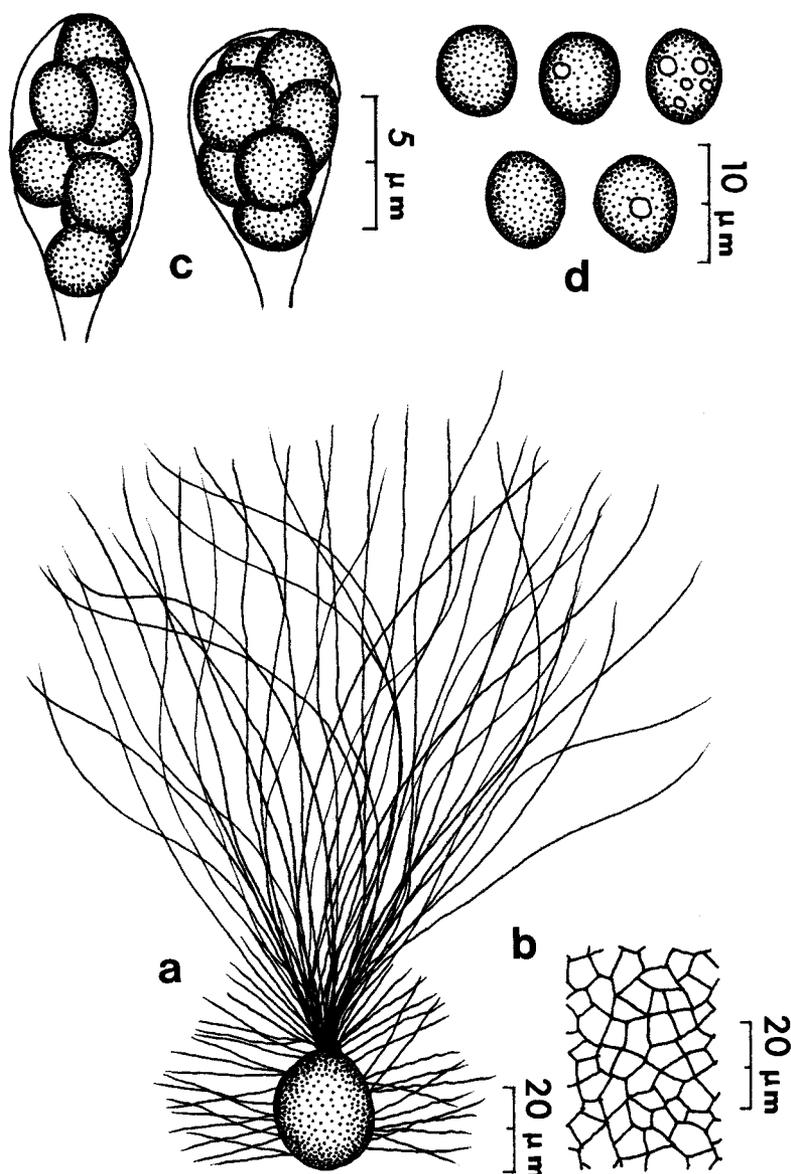


Fig. 3. *Lophotrichus bartlettii*, CBM-FA-0012.
a, Perithecium. b, Peridium. c, Asci. d, Ascospores.

Colonies on OA similar to those of PCA, but perithecia more abundantly produced.

At 37°C, growth is spreading broadly, but perithecia not produced.

Specimen examined: CBM-FA-0268, in culture isolated from the Japanese commercial herbal drug *Plantaginis Semen* (Japanese name, Shazenshi), as strain No. 78-Sh-258-3, Y. Horie, 10 July 1978.

This species, first isolated from dung of animal at the Central Africa by Cailleux (1971), is characterized by having rather small ascospores in the genus *Sordaria* (Guarro and Arx, 1987; Arx et al., 1988). It is similar to *Sordaria goundaensis* Cailleux, but can be distinguished by slightly narrower ascospores ($16\text{--}19 \times 11\text{--}13 \mu\text{m}$ in *S. goundaensis*, with a length/width ratio of 1.46).

Thielavia subthermophila Mouchacca, Bull. Soc. Mycol. France 89: 297. 1973; Arx, Stud. Mycol. 8: 12. 1975; Udagawa and Muroi, Trans. Mycol. Soc. Japan 20: 17. 1979; Otani, Mycol. Fl. Japan 3(3): 50. 1995.

Figs. 5, 15–17

Colonies on PCA spreading broadly, consisting of a thin mycelial felt and loose aerial hyphae, Olive Brown (4F3) to Brownish Grey (4F2), floccose; cleistothecia

abundantly produced, granular in appearance; reverse Brownish Grey (4F2) to Olive Grey (2F2).

Cleistothecia superficial, scattered, brownish black to olivaceous black, globose to subglobose, 120–180 μm in diam, covered by dark brownish olive hairs; peridium dark brown to dark olivaceous brown, membranaceous, consisting of angular cells, measuring $5\text{--}15 \times 5\text{--}17.5 \mu\text{m}$. Asci 8-spored, subglobose to ovate, $20\text{--}30 \times 15\text{--}22.5 \mu\text{m}$, very evanescent. Ascospores dark olive to olivaceous black, elliptical, smooth, $13\text{--}15\text{--}(16) \times 7.5\text{--}8 \mu\text{m}$, with a subapical germ pore, measuring 1 μm in diam.

Anamorph: aleurioconidia type. Conidiophores lacking. Conidia hyaline to pale yellowish brown, ovate, smooth, $3\text{--}4 \times 2.5\text{--}3 \mu\text{m}$.

Colonies on OA similar to those of PCA, but aerial hyphae more loose.

At 37°C, growth is spreading broadly; cleistothecia produced.

Specimens examined: CBM-FA-0014, in culture isolated from wood of *Abies webbiana* Lindley, an Indian herbal drug, as strain No. 77-Sh-74-1, Y. Horie, 15 June 1977; CBM-FA-0015, in culture isolated from *Plantaginis Semen* (Japanese name, Shazenshi), an Indian herbal drug, as strain No. 77-Sh-6-6, Y. Horie, 25 May 1977;

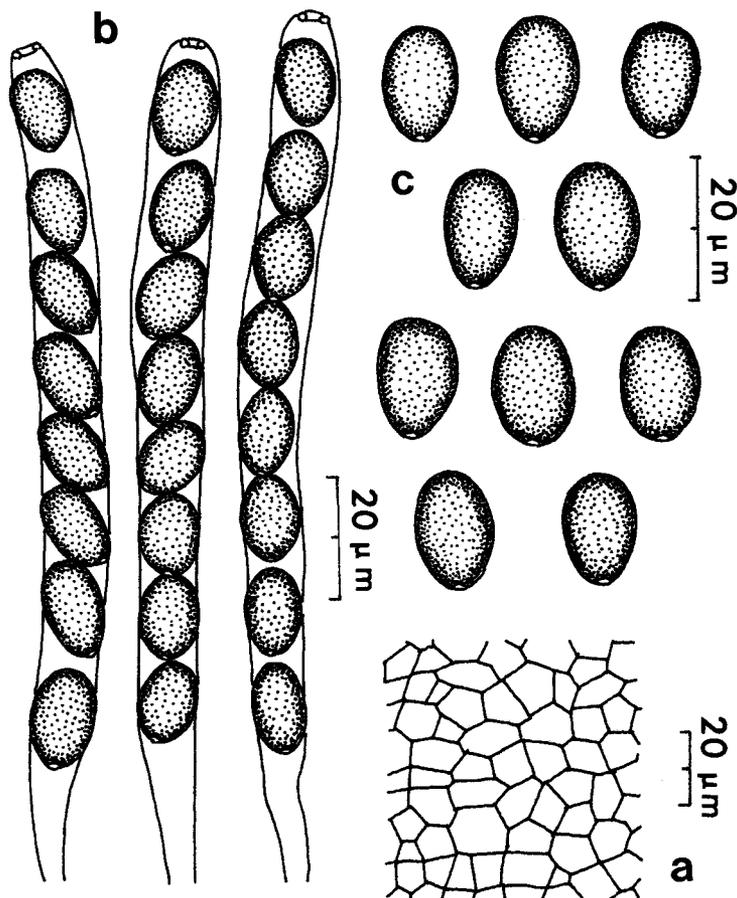


Fig. 4. *Sordaria conoidea*, CBM-FA-0268.
a, Peridium. b, Asci. c, Ascospores.

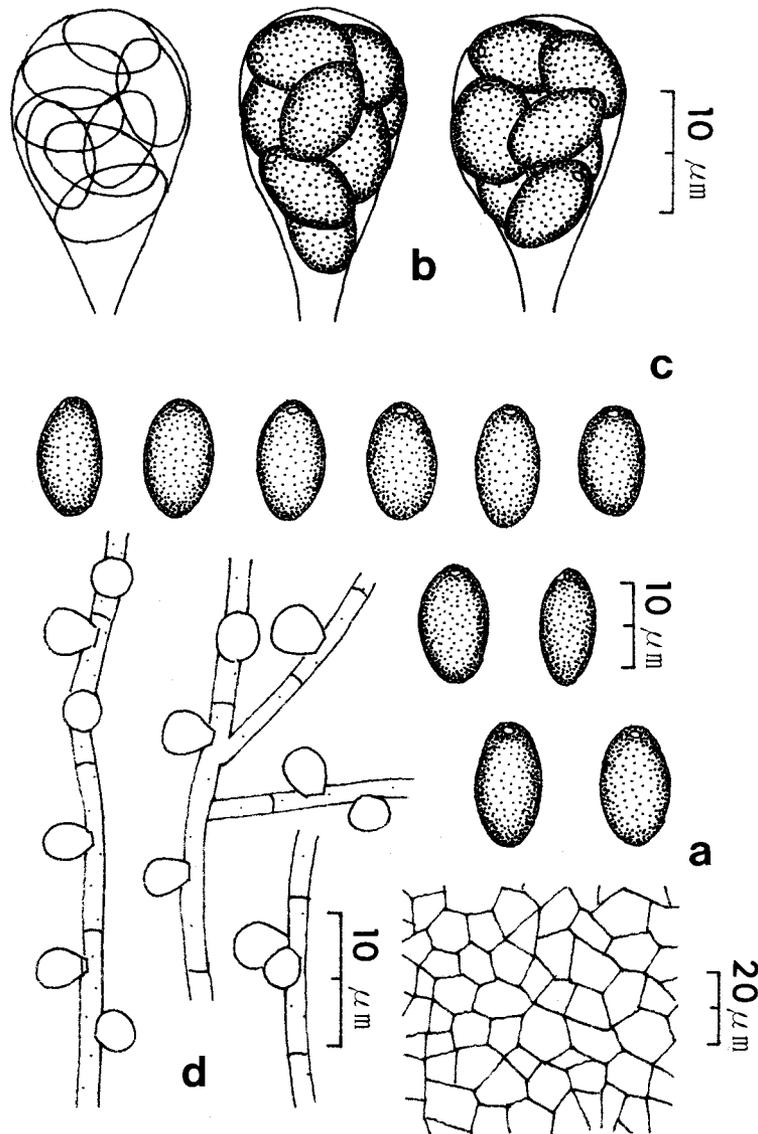


Fig. 5. *Thielavia subthermophila*, CBM-FA-0014.
a, Peridium. b, Asci. c, Ascospores. d, Conidiogenous cells and conidia.

CBM-FA-0016, in culture isolated from Plantaginis Semen, an Indian herbal drug, as strain No. 77-Sh-61-2, Y. Horie, 15 June 1977; CBM-FA-0017, in culture isolated from Plantaginis Herba (Japanese name, Shazensou), an Indian herbal drug, as strain No. 77-Sh-57-1, Y. Horie, 4 June 1977.

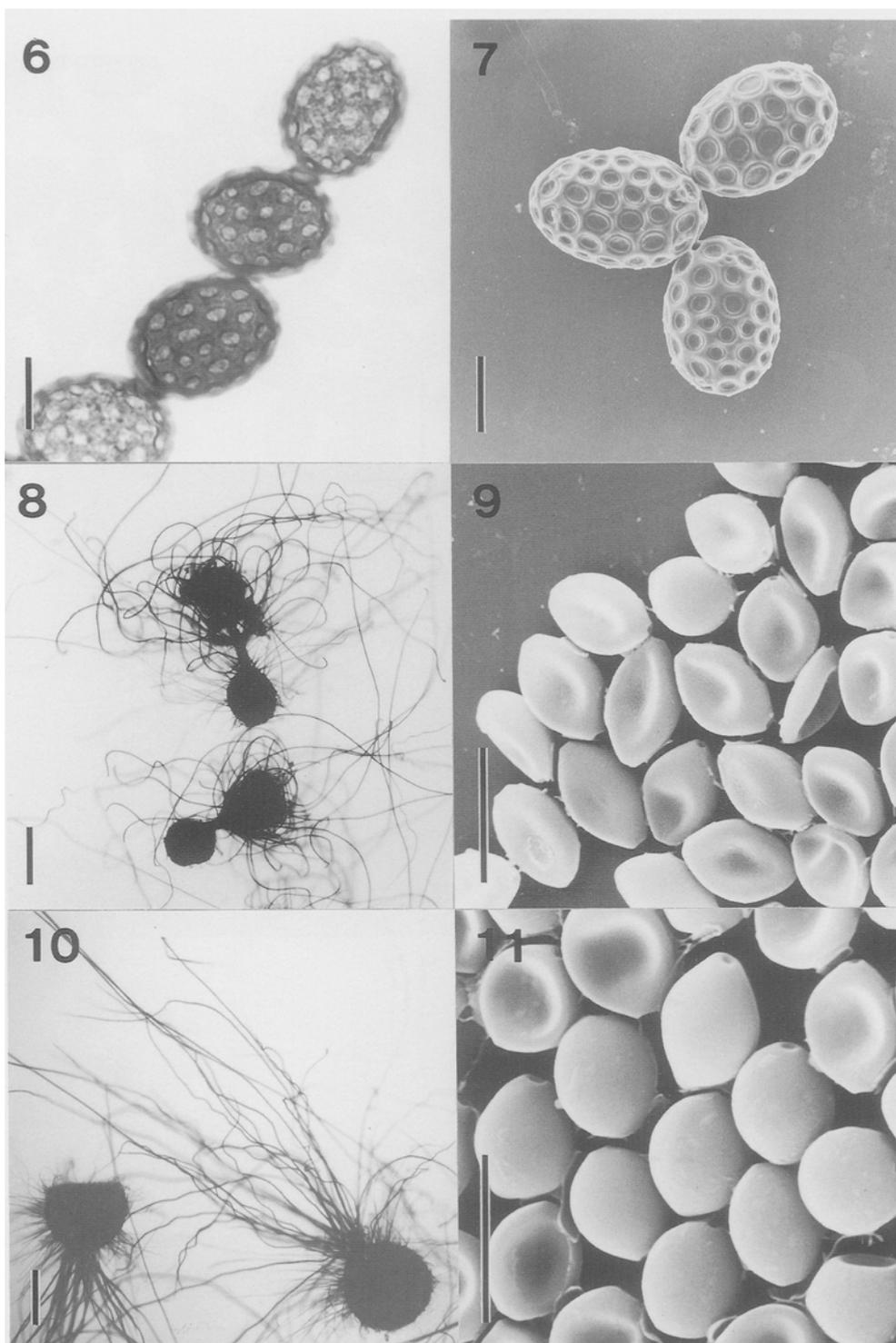
This species, reported as a thermotolerant *Thielavia* by Mouchacca (1973), is characterized by elliptical ascospores with a subapical germ pore at one end, and aleurioconidia. Two other thermotolerant members of the genus, *Thielavia arenaria* Mouchacca and *Thielavia microspora* Mouchacca, also produce aleurioconidia, but the ascospores of both species are smaller (Mouchacca, 1973; Arx et al., 1988).

Acknowledgements—The authors thank Dr. Shun-ichi Uda-

gawa, Nodai Research Institute, Tokyo University of Agriculture, for reading the manuscript and making helpful suggestions. This work was supported as Goho Life Sciences International Fund.

Literature cited

- Ames, L. M. 1961 (1963). A monograph of the Chaetomiaceae. U.S. Army Res. Dev., Ser. 2.
 Arx, J. A. von. 1975. On *Thielavia* and some similar genera of Ascomycetes. *Stud. Mycol.* **8**: 1–32.
 Arx, J. A. von, Guarro, J. and van der Aa, H. A. 1987. *Asordaria*, a new genus of the Sordariaceae, and a new species of *Melanocarpus*. *Persoonia* **13**: 263–272.
 Arx, J. A. von, Figueras, M. J. and Guarro, J. 1988. Sordariaceous Ascomycetes without ascospore ejaculation. *Beih. Nova Hedwigia* **94**: 1–104.



Figs. 6, 7. *Gelasinospora mirabilis* var. *gigaspora*, CBM-FA-0010.

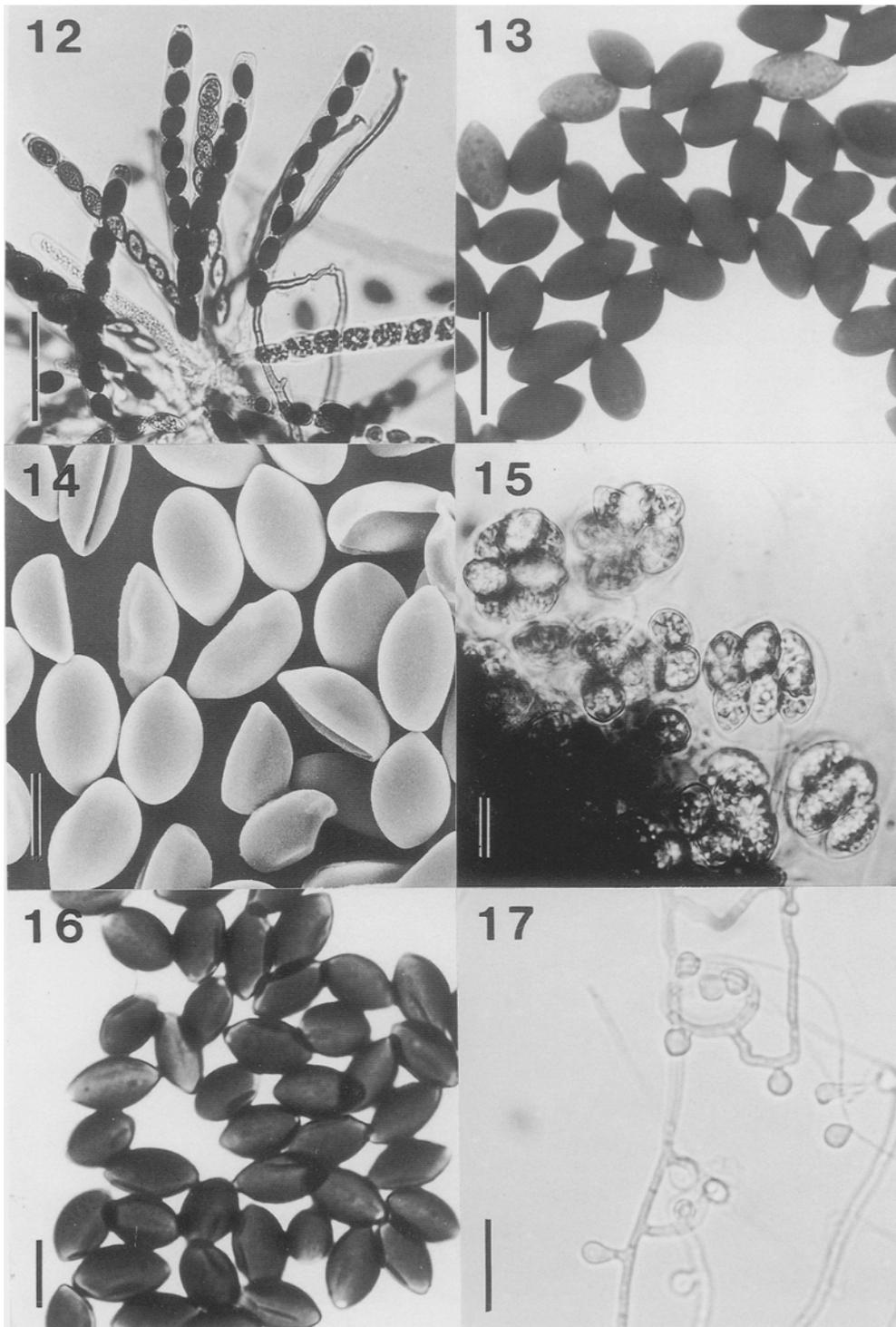
6. Ascospores (LM), (scale bar = 20 μm); 7. Ascospores (SEM), (scale bar = 20 μm).

Figs. 8, 9. *Lophotrichus ampullus*, CBM-FA-0011.

8. Perithecia (scale bar = 200 μm); 9. Ascospores (SEM), (scale bar = 10 μm).

Figs. 10, 11. *Lophotrichus bartlettii*, CBM-FA-0012.

10. Perithecia (scale bar = 200 μm); 11. Ascospores (SEM), (scale bar = 10 μm).



Figs. 12–14. *Sordaria conoidea*, CBM-FA-0268.

12. Asci (scale bar = 50 μm); 13. Ascospores (LM), (scale bar = 20 μm); 14. Ascospores (SEM), (scale bar = 10 μm).

Figs. 15–17. *Thielavia subthermophila*, CBM-FA-0014.

15. Asci (scale bar = 10 μm); 16. Ascospores (scale bar = 10 μm); 17. Conidiogenous cells and conidia (scale bar = 10 μm).

- Benjamin, R. K. 1949. Two species representing a new genus of the Chaetomiaceae. *Mycologia* **41**: 346–354.
- Cailleux, R. 1971. Recherches sur la mycoflora coprophile centrafricaine, Les genres *Sordaria*, *Gelasinospora*, *Bombardia*. *Bull. Soc. Mycol. France* **87**: 461–567.
- Furuya, K. and Udagawa, S. 1973. Coprophilous Pyrenomycetes from Japan III. *Trans. Mycol. Soc. Japan* **14**: 7–30.
- Furuya, K. and Udagawa, S. 1976. New species of *Gelasinospora* and *Anixiella*. *Trans. Mycol. Soc. Japan* **17**: 313–320.
- Guarro, J. and Arx, J. A. von. 1987. The ascomycete genus *Sordaria*. *Persoonia* **13**: 301–313.
- Horie, Y. 1978. A new species of *Emericella* from Indian herbal drug. *Trans. Mycol. Soc. Japan* **19**: 313–317.
- Horie, Y. 1979. New or interesting *Emericella* from herbal drugs. *Trans. Mycol. Soc. Japan* **20**: 481–491.
- Horie, Y. and Udagawa, S. 1990. New or interesting *Chaetomium* species from herbal drugs. *Trans. Mycol. Soc. Japan* **31**: 249–258.
- Horie, Y. and Yamazaki, M. 1985. Production of carcinogenic mycotoxins, sterigmatocystin and its allied compounds, by *Emericella* species. *Trans. Mycol. Soc. Japan* **26**: 411–419. (In Japanese.)
- Horie, Y., Yamazaki, M., Itokawa, H. and Kinoshita, H. 1979. Fungal flora in herbal drugs from India, with particular reference to mycotoxin producibility. *Trans. Mycol. Soc. Japan* **20**: 203–210. (In Japanese.)
- Khan, R. S. and Krug, J. C. 1989. New species of *Gelasinospora*. *Mycologia* **81**: 226–233.
- Kornerup, A. and Wanscher, J. H. 1978. *Methuen handbook of colour*, 3rd ed. Eyre Methuen, London.
- Krug, J. C., Khan, R. S. and Jeng, R. S. 1994. A new species of *Gelasinospora* with multiple germ pores. *Mycologia* **86**: 250–253.
- Malloch, D. and Cain, R. F. 1971. The genus *Kernia*. *Can. J. Bot.* **49**: 855–867.
- Mouchacca, J. 1973. Les *Thielavia* des sols arides: Espèces nouvelles et analyse générique. *Bull. Soc. Mycol. France* **89**: 295–311.
- Otani, Y. 1988. *Mycological flora of Japan*, vol. 3, Ascomycotina, no. 2, Onygenales·Eurotiales·Ascospaerales·Microascales·Ophiostomatales·Elaphomycetales·Erysiphales. Yokendo, Tokyo. (In Japanese.)
- Otani, Y. 1995. *Mycological flora of Japan*, vol. 3, Ascomycotina, no. 3, Sordariales·Diaporthales. Yokendo, Tokyo. (In Japanese.)
- Udagawa, S. and Muroi, T. 1979. Some interesting species of Ascomycetes from imported spices. *Trans. Mycol. Soc. Japan* **20**: 13–22.
- Yamazaki, M., Horie, Y. and Itokawa, H. 1980. On the toxigenic fungi contaminating crude drugs. I. Mycoflora of commercially available crude drugs and productivity of mycotoxins in some species. *Yakugaku Zasshi* **100**: 61–68. (In Japanese.)