

Emericella appendiculata, a new species from Chinese soil

Yoshikazu Horie¹⁾, Dong Mei Li²⁾, Toshimitu Fukiharū¹⁾, Ruoyu Li²⁾, Paride Abliz³⁾, Kazuko Nishimura⁴⁾ and Duan Li Wang²⁾

¹⁾ Natural History Museum and Institute, Chiba, 955–2, Aoba-cho, Chuo-ku, Chiba-shi, Chiba 260–8682, Japan

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

³⁾ Department of Dermatology, First Hospital, Xinjiang Medical University, No. 1 Xinyi Street, District 830003, Urumuqi, Xinjiang, China

⁴⁾ Research Center for Pathogenic Fungi and Microbial Toxicoses, Chiba University, 1–8–1, Inohana, Chuo-ku, Chiba-shi 260–8673, Japan

Accepted for publication 30 March 1998

Emericella appendiculata, a new species isolated from soil of the Pamire Plateau, is described and illustrated. It is characterized by grayish green non-ostiolate ascomata surrounded by a thick layer of hülle cells, membranaceous peridium, prototunicate asci, violet-brown, lenticular ascospores which are ornamented by two stellate equatorial crests, capitate convex surfaces, and long filiform appendages, and an *Aspergillus* anamorph with biseriate conidiogenous cells.

Key Words—*Aspergillus appendiculatus*; China; *Emericella appendiculata*; Pamire; soil fungus.

During the course of a survey of soil-borne hazardous fungi in China in 1994, 1995 and 1997, an interesting ascomycete was isolated from Pamire mountain soil by the soil-plate method (Warcup, 1950). The isolate is characterized by non-ostiolate ascomata surrounded by thick layer of hülle cells, prototunicate asci, violet-brown, bivalved ascospores, and an *Aspergillus* anamorph with biseriate aspergilla. From these characters, the fungus is assignable to the genus *Emericella*, Eurotiales (Malloch and Cain, 1972b). However, its ascospores are peculiar in that the ornamentation is composed of two stellate equatorial crests, capitate hemispheres and filamentous appendages. Thus the fungus proved to be sufficiently different from all described species of *Emericella* to warrant its description as a new species herein (Christensen and Raper, 1978; Christensen and States, 1982; Christensen et al., 1978; Horie, 1978, 1979, 1980; Horie and Udagawa, 1995; Horie et al., 1989, 1990, 1996a, b; Kong and Qi, 1986; Malloch and Cain, 1972a; Mehrotra and Prasad, 1969; Raper and Fennell, 1965; Samson and Mouchacca, 1974, 1975; Udagawa and Horie, 1976; Udagawa and Muroi, 1979).

Living cultures of the new species as well as dried materials are deposited at the Natural History Museum and Institute, Chiba (CBM).

Emericella appendiculata Horie et D.-M. Li, sp. nov.

Figs. 1–10

Coloniae in agar maltoso expansae, ex mycelio basali coacto tenuiter constantes; ascomata abundanter producentia, griseo-viridia; conidiogenesis limitata, sparsa; reversum aurantio-griseum vel griseo-rubineum.

Ascomata superficialia, dispersa, non ostiolata,

globosa vel subglobosa, 140–260 μm diam, cum cellulis dictis “hülle” numerosis, crassitunicatis, globosis vel ovoideis, 10–22 μm diam circumcincta; peridium griseo-flavum vel olivaceo-brunneum, membranaceum, tenue, bi- vel tri-stratum, ex “textura intricata” compositum. Asci 8-spori, primo stellati, deinde globosi vel ovoidei, 11–13 \times 10–12 μm , evanescentes. Ascosporae violaceo-brunneae, late lenticulares, sine ornamento 4.5–5.5 \times 3.8–4.5 μm , cristis aequatorialibus duabus stellatis ornatae, superficies convexae capitatae et appendiculatae. Status anamorphus: *Aspergillus appendiculatus*.

Holotypus: CBM-FA-865, colonia exsiccata in cultura ex solo, in Lacu Kara Kuri, Mt. Kungur, Altit. Pamire, Req., Xinjiang, Sina, 4. VIII. 1997, a Y. Horie isolata et ea collectione fungorum Musei et Instituti Historiae Naturalis Chiba (CBM) conservata.

Etymology: Lat. appendiculatus = appendaged, referring to the appendaged ascospores.

Anamorphosis: *Aspergillus appendiculatus* Horie et D.-M. Li, anam. st. nov.

Capitula conidica obscure grisea vel griseo-viridia, radiantia vel brevi-columnaria. Conidiophora ex mycelio basali oriunda, plus minusve sinuosa, 120–280 \times 3–5 μm , hyalina vel flavo-grisea, levia; vesiculae ampulliformes vel clavatae, hyalinae vel flavo-griseae, 8–19 μm diam. Aspergilla in summa 1/2 vesicula insidentia, biseriate; metulae 4–7.5 \times 1.5–2 μm ; phialides 6–8 \times 1.5–2 μm . Conidia flavo-grisea, globosa vel subglobosa, 3–4 μm diam, minute echinulata. Status teleomorphus: *Emericella appendiculata*.

Holotypus CBM-FA-865, loc. cit.

Colonies on malt extract agar (MEA) spreading broadly, attaining a diam of 80–83 mm in 14 d at

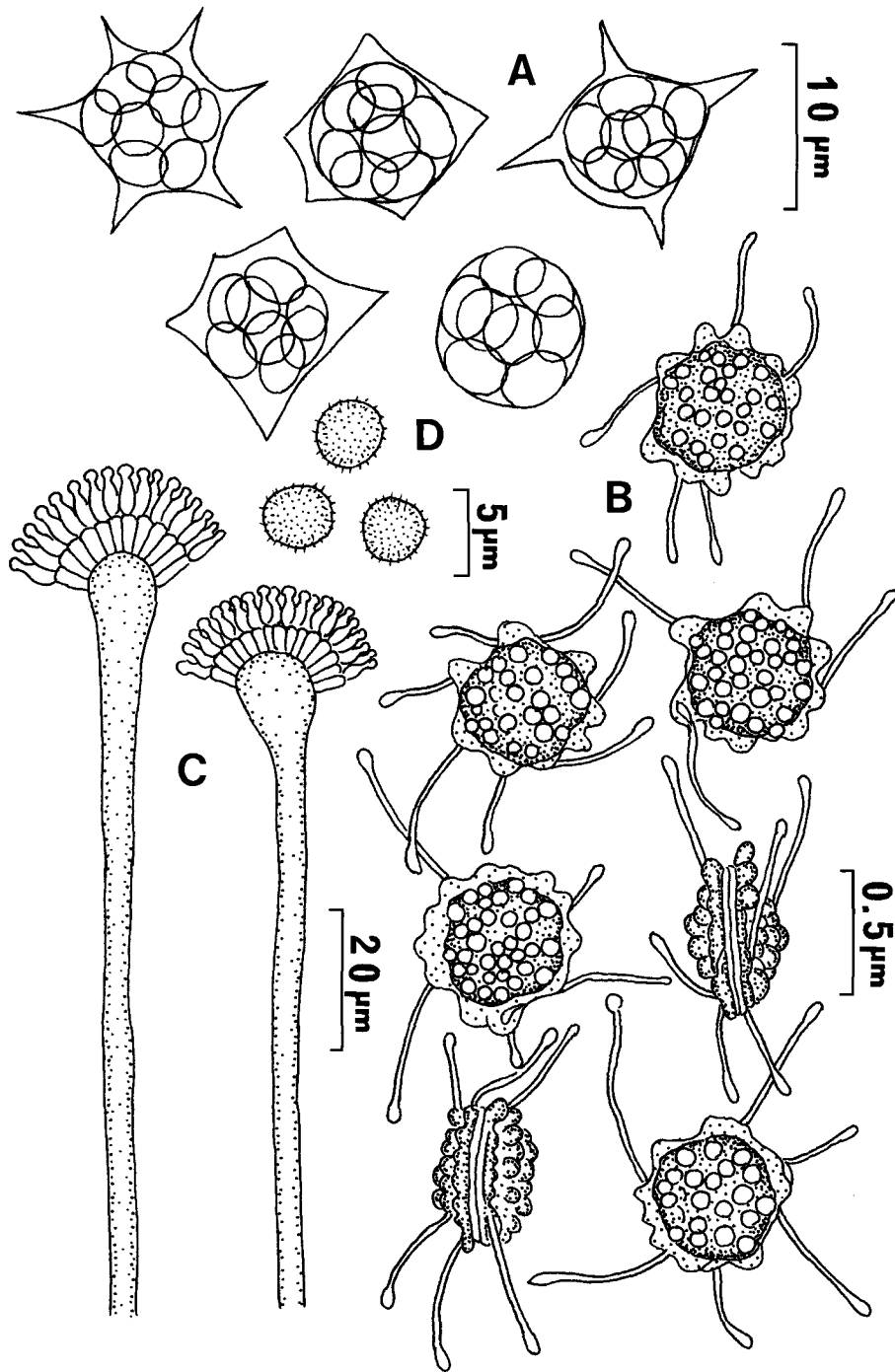
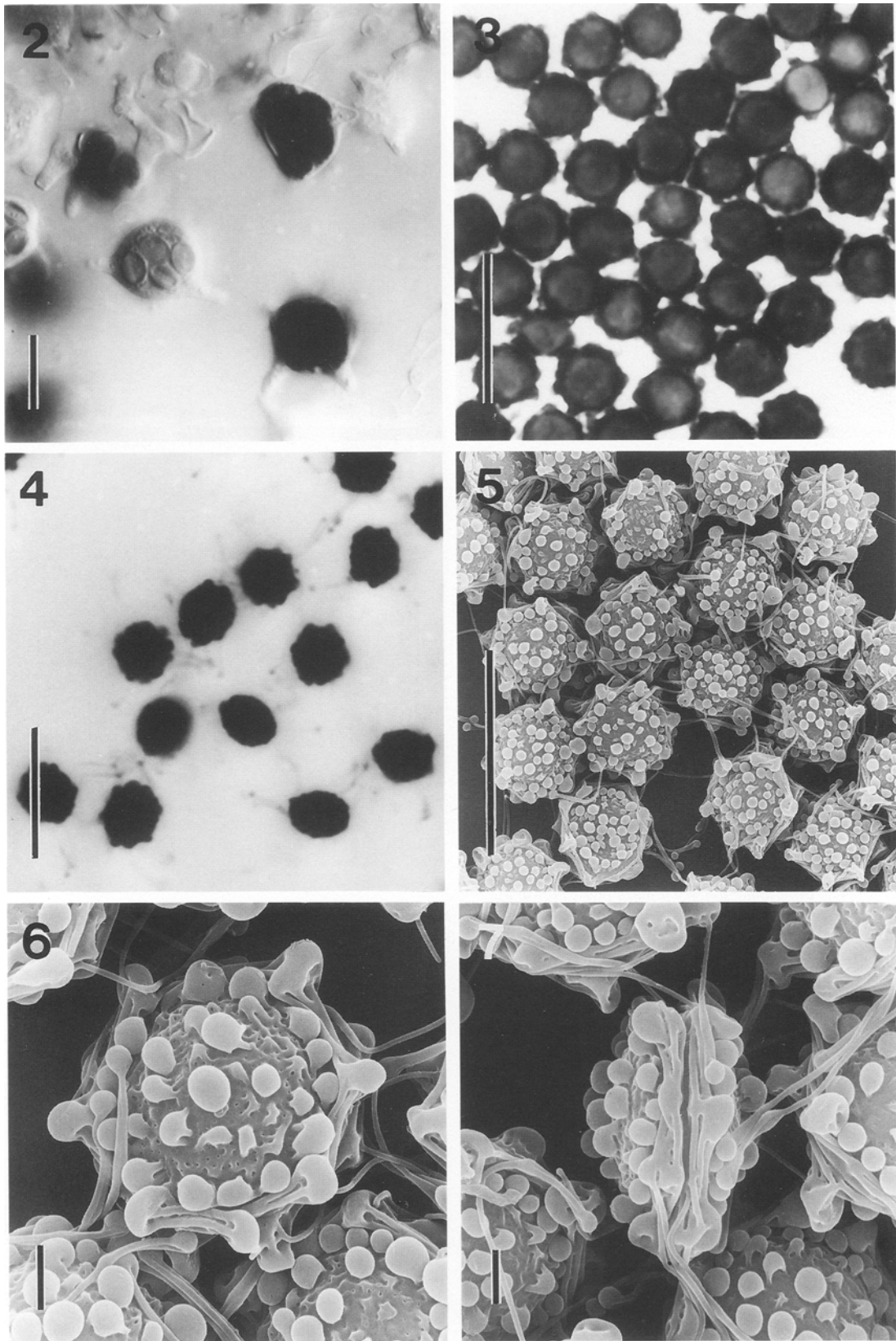


Fig. 1. *Emericella appendiculata*.
A. Asci. B. Ascospores. C. Aspergilla. D. Conidia.

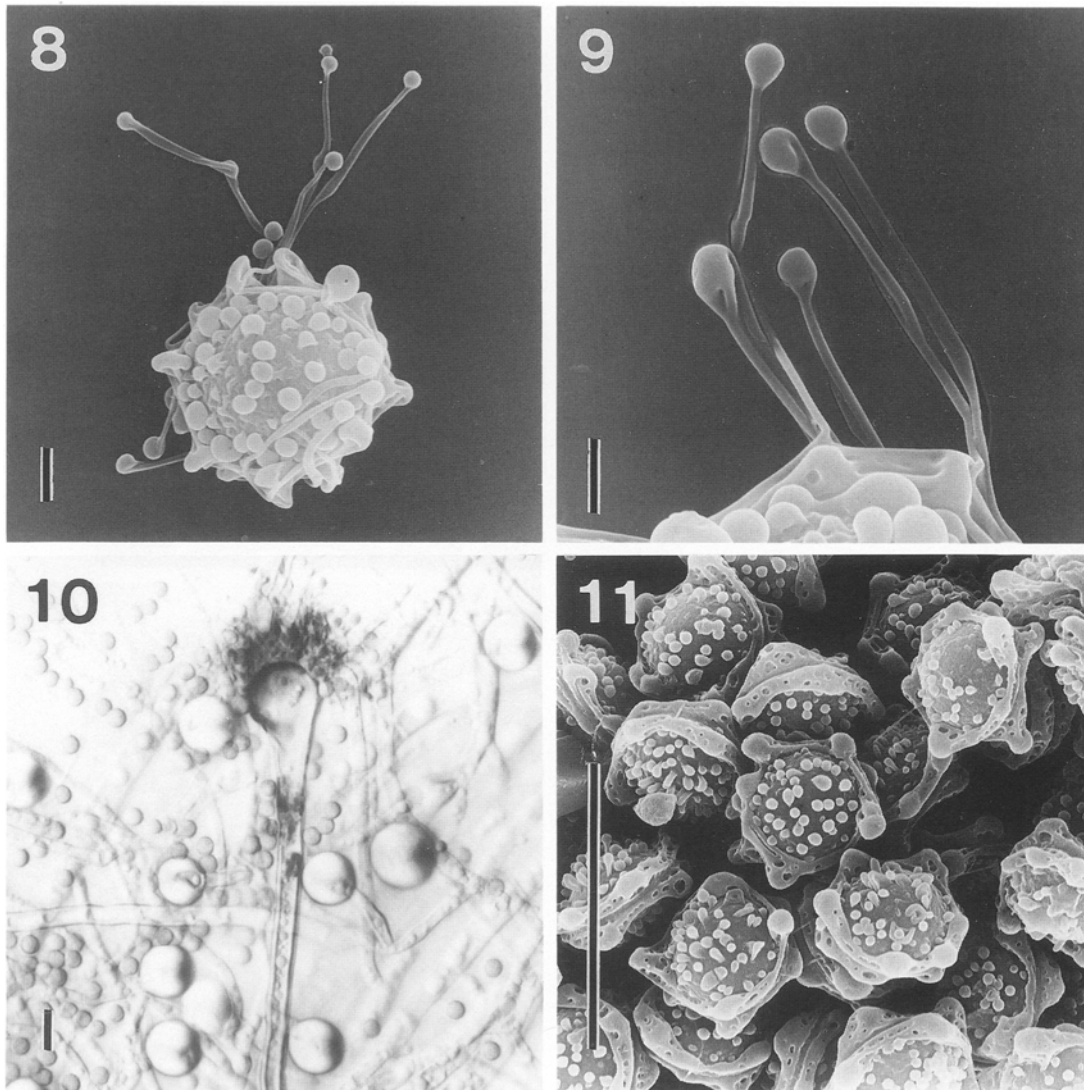
25°C, consisting of a thin mycelial felt, granular in appearance due to the very abundant production of ascomata with hülle cells, Greyish Green (28D5 to 30D6, after Kornerup and Wanscher, 1978); conidiogenesis limited, scattered; reverse Orange Grey (6B2) to Greyish Ruby (12E4).

Ascomata superficial, scattered, non-ostiolate, globose to subglobose, 140–260 µm in diam, surrounded by

a thick layer of numerous hülle cells, hyaline to pale yellowish brown, totally 320–470 µm in diam; hülle cells globose to ovoid, thick-walled, 10–22 µm in diam; peridium grayish yellow to olive brown, thin, 2–3-layered, "textura intricata," consisting of irregular cells measuring 8–15 × 1–3 µm. Asci 8-spored, stellate when young, then globose to ovoid, 11–13 × 10–12 µm, evanescent. Ascospores at first Dull Red (9C4) to Brownish Red



Figs. 2-7. *Emericella appendiculata*.
2. Asci (LM). 3. Ascospores (LM). 4. Ascospores with appendages (LM). 5-7. Ascospores (SEM).



Figs. 8–11. *Emericella appendiculata* and *E. undulata*.
 8–10. *E. appendiculata*. 8. Ascospore with appendages (SEM). 9. Appendages (SEM). 10. Aspergillum (LM).
 11. *E. undulata*. Ascospores (SEM). Scales: Figs. 2–5, 10, 11 = 10 μm ; Figs. 6–9 = 1 μm .

(9C6), then becoming Violet-Brown (10E5 to 10F5), broadly lenticular, spore body 4.5–5.5 \times 3.8–4.5 μm , with two stellate equatorial crests measuring 1–1.5 μm wide, the ornamentation of surfaces convex composed of capitate swellings, measuring up to 0.5 μm in diam (Figs. 5–7) and hyaline, filiform appendages, measuring 3–6 μm long, 0.4–0.7 μm in diam and swollen at the end (Figs. 4, 8, 9).

Specimen examined: CBM-FA-865 (holotype), a dried culture derived from an isolate of damp grassland soil at Kara Kuri lake, near Mt. Kungur, Pamire plateau, Xinjiang Province, China, collected by Y. Horie, isolated and developed by Y. Horie in the laboratory of the Research Center of Medical Mycology, Beijing Medical University, Beijing, as strain No. 97-SN-709-1, 4 August 1997, and deposited in the Natural History Museum and Institute, Chiba (CBM).

Conidial heads dull green to grayish green, radiate to short columnar, 55–105 \times 50–85 μm . Conidiophores mostly arising from basal mycelium; stipes more or less sinuous, 120–280 \times 3–5 μm , hyaline to yellowish gray, smooth; vesicles flask-shaped to clavate, hyaline to yellowish gray, 8–19 μm in diam, fertile over the upper half. *Aspergilla* biseriata; metulae hyaline to pale yellowish brown, 4–7.5 \times 1.5–2 μm ; phialides hyaline to pale yellowish brown, 6–8 \times 1.5–2 μm . Conidia yellowish gray, globose to subglobose, 3–4 μm in diam, minutely echinulate.

Colonies on Czapek's solution agar growing rapidly, attaining a diam of 38–42 mm in 14 d at 25°C, consisting of a thin mycelial felt; ascomata abundantly produced, granular in appearance; conidiogenesis limited, Dull Green (28D3 to 29E4); reverse Orange Grey (5B2) to Yellowish Brown (5F6).

Colonies on oatmeal agar spreading broadly, attaining a diam of 60–65 mm in 14 d at 25°C, resembling those on MEA but overgrown by loose network of aerial hyphae, Greyish Green (29E4); reverse Greenish Grey (29E2).

At 37°C, growth is slower than at 25°C; ascospores are limited in number.

In the surface ornamentation observed by scanning electron microscopy (SEM), ascospores of the new species are somewhat similar to those of *Emericella undulata* Kong et Qi (Kong and Qi, 1986; Horie et al., 1996b; Fig. 5). However, *E. undulata* differs in having smaller ascospores without appendages (spore body 3.5–4.5 × 3–4 μm, by Horie et al., 1996b).

Acknowledgements—The authors thank Dr. Shun-ichi Udagawa, Nodai Research Institute, Tokyo University of Agriculture, for reading the manuscript and making helpful suggestions. This work was supported as an International Scientific Research Program of The Ministry of Education, Science, Sport and Culture in Japan by a grant-in-aid for Scientific Research (Field Research).

Literature cited

- Christensen, M. and Raper, K. B. 1978. Synoptic key to *Aspergillus nidulans* group species and related *Emericella* species. *Trans. Br. Mycol. Soc.* **71**: 177–191.
- Christensen, M., Raper, K. B. and States, J. S. 1978. Two new *Aspergillus nidulans* group members from Wyoming soils. *Mycologia* **70**: 332–342.
- Christensen, M. and States, J. S. 1982. *Aspergillus nidulans* group: *Aspergillus navahoensis*, and a revised synoptic key. *Mycologia* **74**: 226–235.
- 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 drug. *Trans. Mycol. Soc. Japan* **20**: 481–491.
- Horie, Y. 1980. Ascospores ornamentation and its application to the taxonomic re-evaluation in *Emericella*. *Trans. Mycol. Soc. Japan* **21**: 483–493. (In Japanese.)
- Horie, Y., Fukiharu, T., Nishimura, K., Taguchi, H., Wang, D. and Li, R. 1996a. New and interesting species of *Emericella* from Chinese soil. *Mycoscience* **37**: 323–329.
- Horie, Y., Miyaji, M., Nishimura, K., Franco, M. F. and Coelho, K. L. R. 1996b. New and interesting species of *Emericella* from Brazilian soil. *Mycoscience* **37**: 121–128.
- Horie, Y., Miyaji, M., Nishimura, K. and Udagawa, S. 1989. *Emericella falconensis*, a new species from Venezuelan soil. *Trans. Mycol. Soc. Japan* **30**: 257–263.
- Horie, Y. and Udagawa, S. 1995. *Emericella omanensis*, a new species from Oman soil. *Mycoscience* **36**: 391–394.
- Horie, Y., Udagawa, S., Abdullah, S. K. and Al-Bader, S. M. 1990. *Emericella similis*, a new species from Iraqi soil. *Trans. Mycol. Soc. Japan* **31**: 425–430.
- Kong, H. and Qi, Z. 1986. A species of *Emericella*. *Acta Mycol. Sinica* **5**: 211–214.
- Kornerup, A. and Wanscher, J. H. 1978. *Methuen handbook of colour*, 3rd ed. Eyre Methuen, London.
- Malloch, D. and Cain, R. F. 1972a. New species and combinations of cleistothecial ascomycetes. *Can. J. Bot.* **50**: 61–72.
- Malloch, D. and Cain, R. F. 1972b. The Trichocomataceae: Ascomycetes with *Aspergillus*, *Paecilomyces*, and *Penicillium* imperfect states. *Can. J. Bot.* **50**: 2613–2628.
- Mehrotra, B. S. and Prasad, R. 1969. *Aspergillus dimorphicus* and *Emericella cleisto-minuta* spp. nov. from Indian soils. *Trans. Br. Mycol. Soc.* **52**: 331–336.
- Raper, K. B. and Fennell, D. I. 1965. The genus *Aspergillus*. Williams and Wilkins, Baltimore.
- Samson, R. A. and Mouchacca, J. 1974. Some interesting species of *Emericella* and *Aspergillus* from Egyptian desert soil. *Antonie van Leeuwenhoek* **40**: 121–131.
- Samson, R. A. and Mouchacca, J. 1975. Additional notes on species of *Aspergillus*, *Eurotium* and *Emericella* from Egyptian desert soil. *Antonie van Leeuwenhoek* **41**: 343–351.
- Udagawa, S. and Horie, Y. 1976. A new species of *Emericella*. *Mycotaxon* **4**: 535–539.
- Udagawa, S. and Muroi, T. 1979. Some interesting species of Ascomycetes from imported spices. *Trans. Mycol. Soc. Japan* **20**: 13–22.
- Warcup, J. H. 1950. The soil plate method for isolation of fungi from soil. *Nature (Lond.)* **166**: 117–118.