

New and rare microfungi from the island of Hachijo-jima

Takashi Yaguchi¹⁾, Ayako Someya¹⁾ and Shun-ichi Udagawa²⁾

¹⁾ Pharmaceutical Research Center, Meiji Seika Kaisha, Ltd., 760, Morooka-cho, Kouhoku-ku, Yokohama 222, Japan

²⁾ Nodai Research Institute, Tokyo University of Agriculture, 1-1-1, Sakuragaoka, Setagaya-ku, Tokyo 156, Japan

Accepted for publication 14 March 1996

Two striking fungi, isolated from soils from the island of Hachijo-jima in Japan, are described and illustrated. One of these represents a new species of *Talaromyces* (Ascomycetes), for which the name *Talaromyces hachijoensis* is proposed. The new species is distinctive among all other recognized species in its restricted growth on common media, yellow ascomata characterized by asci developing in chains, striate ascospores, and the absence of an anamorph. The other is *Heterocephalum taiense*, a rare hyphomycete which has only previously been recorded from Ivory Coast soil and probably from Panama soil.

Key Words—Hachijo-jima island; *Heterocephalum taiense*; Japan; soil fungi; *Talaromyces hachijoensis*.

Hachijo-jima, a small volcanic island, is situated 300 km south of Tokyo in the southern part of the Izu islands. Due to its warm climate, several tropical and subtropical plants are found in the island. The isolation of the island and the subtropical nature of the vascular plant flora suggest that some of the native fungi might also be restricted in their distribution. In fact, Matsushima (1975, 1983) described the following hyphomycetes as new species from the plant materials and soil in the various localities of the island: *Blastophorum truncatum* Matsushima, *Calceispora hachijoensis* Matsushima, *Dactylaria fusarioidea* Matsushima, *D. obtriangularia* Matsushima, *Denticularia hachijoensis* Matsushima, *Endophragma inaequiseptata* Matsushima, *Isthmolongispora quadricellularia* Matsushima, *Paratrichoconis biseptata* Matsushima, *Phaeoramularia hachijoensis* Matsushima (teleom. *Capronia hystrioides* Dungan, Roberts et Hanlin), *Pseudospiropes hachijoensis* Matsushima, *Torula fasciculata* Matsushima (non *Torula fasciculata* Penzig), *Trichocladium cylindroclavatum* Matsushima, *Tricladium minimum* Matsushima, and *Virgariella sphaerica* Matsushima. Iijima et al. (1985) also reported *Exobasidium hachijoense* Otani, Kakishima et Iijima, a new species on the trunk of *Cinnamomum japonicum* Sieb., on the costal skirt of Mt. Hachijo-fuji. According to Watanabe, an intensive survey of soil microfungi in pineapple field, paddy field and uncultivated mountain habitats on the island yielded more than 55 species belonging to 37 genera of Mastigomycotina, Zygomycotina, Ascomycotina and Deuteromycotina (Watanabe, 1989). Among these, he described three new microfungi: *Mucor hachijoensis* T. Watanabe from pineapple field soil, *Nectria hachijoensis* T. Watanabe (anam. *Stachybotryna hachijoensis* T. Watanabe) from uncultivated mountain soil, and *Taeniolella phialosperma* T. Watanabe from paddy field soil (Watanabe, 1990, 1992, 1994).

A short survey of soil microfungi of Hachijo-jima was undertaken during a one-wk period in late May 1995. In this paper, *Talaromyces hachijoensis*, a new ascomycete, and *Heterocephalum taiense* Persiani et Maggi, a hyphomycete described by Persiani and Maggi (1986), are added to the list of known microfungi of Hachijo-jima.

Taxonomy

Talaromyces hachijoensis Yaguchi, Someya et Udagawa, sp. nov. Figs. 1, 2

Coloniae in agar "Czapek-yeast extract" (CYA) valde restrictae, velutinae vel aliquantum funiculosae, fere planae, ex mycelio basali coacto compacto constantes, ascomatibus abundantibus formantes, flavae; conidiogenesis nulla; reversum brunneo-aurantiacum vel aurantiacum.

Coloniae in agar maltoso (MEA) restrictae, velutinae vel floccosae, ex mycelio basali coacto incrassato constantes, albae vel dilute flavae; ascomata limitata; conidiogenesis nulla; reversum griseo-aurantiacum vel ochraceum.

Coloniae in agar farinae avenaceae restrictae, radiatim sulcatae, plus minusve zonatae, ex mycelio basali coacto tenuiter constantes, funiculosae, ascomatibus abundantibus formantes, flavae; conidiogenesis nulla; reversum griseo-aurantiacum vel luteolum vel cinnameum.

Ascomata discreta vel saepe confluentia, non ostiolata, flava, tarde maturescentia, globosa vel subglobosa, 300–350 μm diam, mollia, hyphis flavis incrustatis ramosis flexuosis septatis laxe obiecta; paries ex hyphis hyalinis vel flavis intertextis 1–2 μm diam compositus. Asci catenulati, 8-sporei, globosi vel ovoidei, 10.5–12.5 \times 9–11 μm , evanescentes. Ascosporeae hyalinae, dilute flavae in massa, ellipsoideae, 5.5–7 \times 3.5–4.5 μm ,

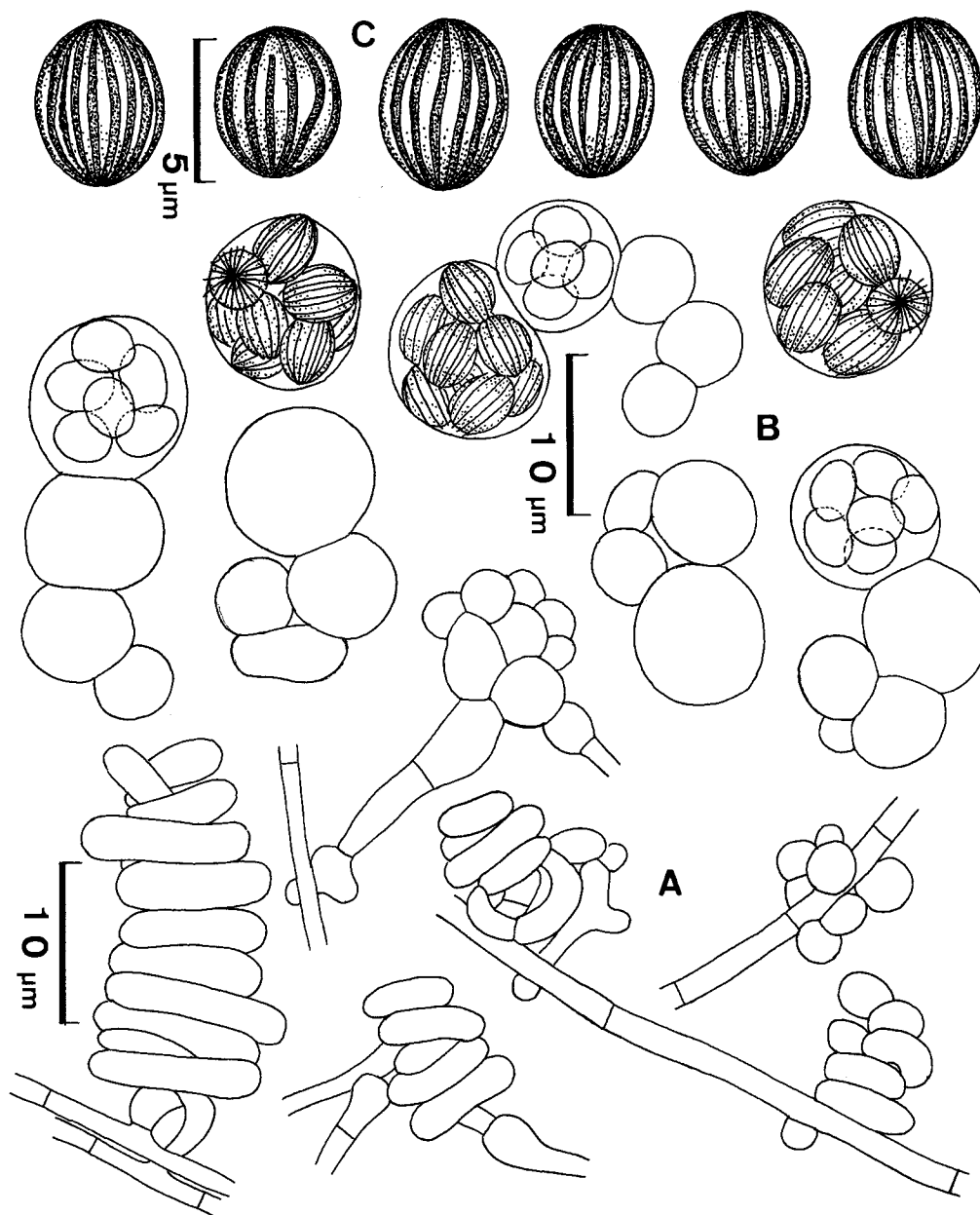


Fig. 1. *Talaromyces hachijoensis*, PF 1174.
A. Ascomatal initials. B. Asci. C. Ascospores.

longitudinaliter striatae. Anamorphosis abest.

Ubiquinonum majus: Q-10 (H₂).

Holotypus PF 1174, colonia exsiccata in cultura ex solo sativo, Hachijo-jima, in Japonia, 30. v. 1995, a A. Someya isolata et ea collectione fungorum Musei et Instituti Historiae Naturalis Chiba (CBM) conservata.

Etymology: Latin, *hachijoensis*, pertaining to Hachijo-jima, the type locality.

Colonies on CYA growing very restrictedly, attaining a diameter of 3 mm in 7 d and 10–12 mm in 14 d at 25°C, velvety to somewhat funiculose, almost plane, consisting of a compact basal felt, producing abundant ascomata on the felt within 21 d, Light Yellow (M. 3A5, after Kornerup and Wanscher, 1978) or Pure Yellow (af-

ter Rayner, 1970), overgrown by pigmented aerial hyphae; margins entire, narrow; conidiogenesis absent; exudate small, clear; reverse Brownish Orange (M. 5C6) or Orange (R).

Colonies on MEA growing restrictedly, attaining a diameter of 8–10 mm in 7 d and 17–20 mm in 14 d at 25°C, velvety to floccose, centrally raised, consisting of a thick basal felt, white to Light Yellow (M. 2A5) or Straw (R); ascomata very limited in number; conidiogenesis absent; exudate abundant, clear to pale brown; margins entire; reverse Greyish Orange (M. 5B4) or Ochreous (R).

Colonies on oatmeal agar growing restrictedly, attaining a diameter of 5–8 mm in 7 d and 15–17 mm in

14 d at 25°C, radially sulcate, more or less zonate, consisting of a thin basal felt with funiculose aerial hyphae, granular due to the abundant production of ascomata within 21 d, Pastel Yellow (M. 3A4) or Pure Yellow (R); margins thin, broad, entire; conidiogenesis absent; exudate abundant, clear, rather large; reverse Greyish Orange (M. 5B4) or Pale Luteous to Cinnamon (R).

Colonies on cornmeal agar growing somewhat more rapidly up to 40 mm in 14 d at 25°C, plane, thin, consisting of a spreading, submerged vegetative mycelium, with limited development of funiculose aerial hyphae, producing yellow ascomata in limited numbers in central area;

conidiogenesis absent; exudate abundant, clear; reverse uncolored.

Ascomata superficial, discrete or often confluent, nonostiolate, yellow, maturing slowly within 21 d, globose to subglobose, 300–350 μm in diam, soft, loosely covered by yellow-encrusted, branched, flexuous, septate hyphae; ascomatal wall consisting of a network of hyaline to yellow, densely interwoven, undifferentiated hyphae measuring 1–2 μm in diam. Ascomatal initials consisting of swollen, branching hyphae which become gnarled, then develop into a coiled ascogonium. Asci borne in short chains, 8-spored, hyaline to pale yellow,

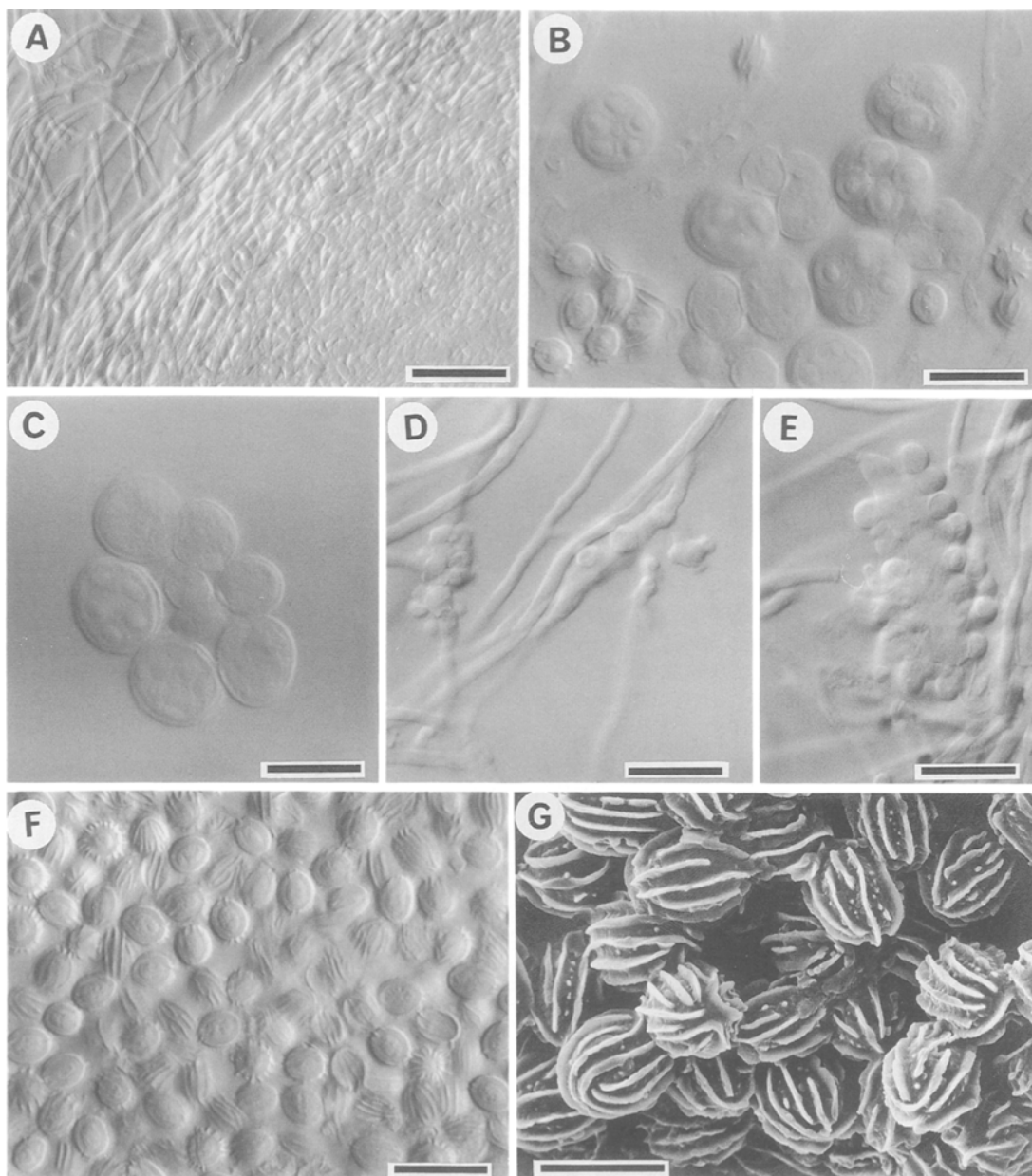


Fig. 2. *Talaromyces hachijoensis*, PF 1174.

A. A portion of ascoma, showing hyphal peridium. B, C. Asci in short chains. D, E. Ascomatal initials. F. Ascospores (LM). G. Ascospores (SEM).

Scale bars: A = 20 μm ; B–F = 10 μm ; G = 5 μm .

Table 1. Differential characteristics of *Talaromyces* with striate ascospores.

	<i>T. hachijoensis</i>	<i>T. mimosinus</i>	<i>T. striatus</i>
Growth on CYA (7 d, 25°C)	3 mm	10–15 mm	10–15 mm
Growth on MEA (7 d, 25°C)	8–10 mm	20–25 mm	55–60 mm
Coloration on CYA	bright yellow	white or slightly yellow	white to pale buff
Ascomata (μm)	pure yellow 300–350	pure yellow to sulphur yellow up to 2500	white to yellow brown 100–150
Asci (μm)	in chains 10.5–12.5 \times 9–11	singly borne 13–16	singly borne 18–22 \times 14–16
Ascospores (μm)	ellipsoidal 5.5–7 \times 3.5–4.5	subglobose 7–8 \times 6–7	ellipsoidal 8–11 \times 7–8
Anamorph	absent	<i>Penicillium</i>	<i>Penicillium</i>

globose to ovoid, 10.5–12.5 \times 9–11 μm , evanescent. Ascospores hyaline, pale yellow in mass, ellipsoidal, 5.5–7 \times 3.5–4.5 μm , 4–6 μm long excl. flanges, bearing 12 to 15 longitudinal, somewhat sinuous flanges about 0.5 μm wide, usually converging at the two ends.

Mycelium composed of hyaline, branched, septate, often encrusted by yellow granules, 1–4 μm diam hyphae; anamorph not observed.

Major ubiquinone: Q-10 (H₂).

At 37°C, growth is nil.

Specimen examined: PF 1174 (holotype), a dried culture derived from an isolate from cultivated soil, Hachijo-jima, Hachijo-machi, Tokyo-to, Japan, 30 May 1995, isolated by A. Someya. The holotype has been deposited in the herbarium at the Natural History Museum and Institute, Chiba, Japan (CBM).

The outstanding characteristics of *T. hachijoensis* are: 1) its extremely restricted growth on CYA, 2) colony coloration in CYA and oatmeal agar—a pure yellow mycelium with an orange reverse, 3) yellow ascomata composed of clusters of asci which are borne distinctly in chains, 4) ellipsoidal ascospores with a striate ornamentation, and 5) the absence of an anamorph. *Talaromyces hachijoensis* is most similar to *T. mimosinus* Hocking and *T. striatus* (Raper et Fennell) C. R. Benjamin (Stolk and Samson, 1971; Pitt, 1979). It differs from both primarily in the production of asci in short chains and in several other characteristics, as shown in Table 1. *Talaromyces leycettanus* Evans et Stolk somewhat resembles *T. hachijoensis* in its formation of ellipsoidal ascospores with longitudinal ridges, but differs in its thermophilic growth, small greenish yellow ascomata, and the *Paecilomyces* anamorph (Stolk and Samson, 1972).

Heterocephalum taiense Persiani et Maggi, Trans. Br. Mycol. Soc. **87**: 631. 1986. Fig. 3

Colonies on CYA growing rapidly, attaining a diameter of 45–48 mm in 14 d at 25°C, floccose, consisting of a thin white mycelial felt, producing a layer of abundant conidial heads which falls away en masse when mature, Yellowish Orange (M. 4A7-6) or Leticous (R); margins thin and irregular; exudate scattered, clear to pale yellow; reverse Reddish Brown (M. 8D6) or Siemna (R).

Colonies on oatmeal agar spreading broadly, attaining a diameter of 48–50 mm in 14 d at 25°C, comparatively deeply floccose, loose-textured; conidial heads as on CYA; reverse uncolored.

Conidial heads yellow, globose to subglobose, 200–300 μm in diam (excl. radiating setae), consisting of vesicle, conidiogenous cells, conidia, all included in a loose net-like hyphal envelope with numerous setae; the envelope hyphae hyaline to pale brown, 6–10 μm in diam, asperulate; setae radially extending from the net-like envelope, straight, rigid, septate, 400–650 \times 8–12 μm , finely asperulate below, smooth and inflated up to 20 μm at the apex. Conidiophores arising from the basal mycelium, scattered, macronematous, erect, straight, hyaline, with a corticating envelope which surrounds to give the appearance of synnema; stipes 500–1250 \times 10–14 μm , unbranched, smooth and thick-walled, usually aseptate, swelling at the apex to form a vesicle, more or less constricted below the vesicle; the conidiophore envelope composed of parallel sterile hyphae which are sinuous, hyaline, smooth-walled, septate, 3–5 μm in diam, originating from the basal mycelium, extending to the apex and radiating out to give rise to whorls of branches which intertwine to form the net-like envelope; vesicles globose, 50–80 μm in diam, thick-walled, fertile over the surface, bearing three to four series of cylindrical branches and terminating in a series of phialides; branches in the first series 25–75 \times 9–15 μm , those in the second series 12–20 \times 6–10 μm , and those in the third and the fourth series 6–8 \times 4.5–5 μm . Phialides hyaline, lageniform, 7–12 \times 2–2.5 μm , with a narrow tip. Conidia one-celled, hyaline, often accumulating as a light yellow mass in the head, ovoid to ellipsoidal, 3–4.5(–5) \times 2.5–3 μm , or subglobose, 2.5–3 μm in diam, smooth-walled. Vegetative mycelium composed of hyaline to pale yellow, branched, septate, smooth-walled, 2–4 μm diam hyphae, often forming bundles.

At 37°C, growth is nil.

Specimen examined: PF 1175, a culture derived from an isolate from bank soil, Hachijo-jima, Hachijo-machi, Tokyo-to, Japan, 31 May 1995, isolated by A. Someya.

The two species of *Heterocephalum*, *H. aurantiacum* Thaxter and *H. taiense*, are quite similar to one another in

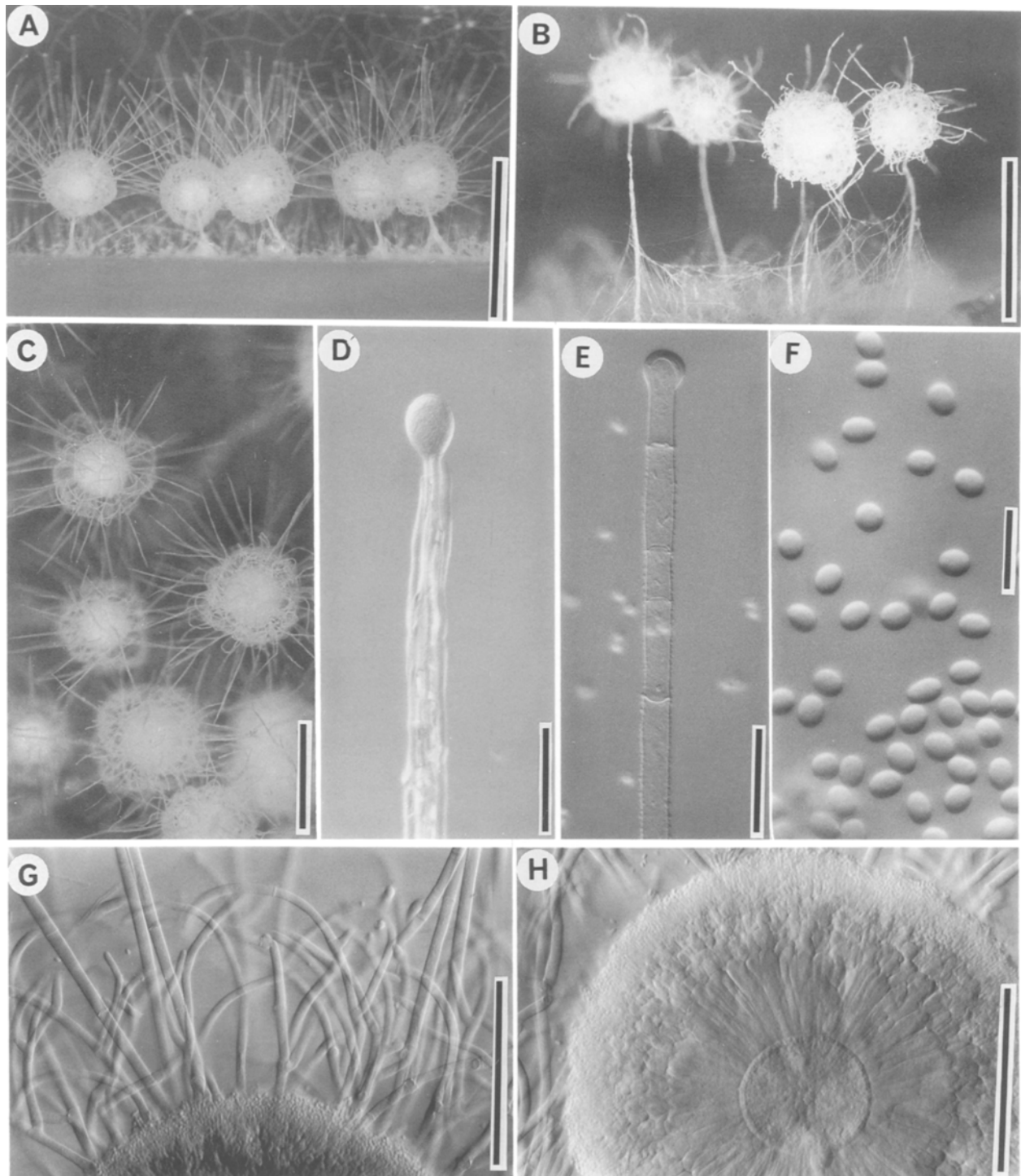


Fig. 3. *Heterocephalum taiense*, PF 1175.

A-C. Growth habit, in lateral and vertical views. D. Development of conidiophore, showing origin of the vesicle and advancing envelope of corticating hyphae. E. A terminal portion of a seta. F. Conidia. G. A marginal portion of head, showing enveloping hyphae. H. A central portion of head, showing vesicle, branches and conidiogenous cells.

Scale bars: A, B=100 μ m; C=50 μ m; D, E=50 μ m; F=10 μ m; G, H=100 μ m.

morphological characteristics, and the colors of conidial heads are of prime utility in recognizing these species (Thaxter, 1903; Persiani and Maggi, 1986). *Hetero-*

cephalum aurantiacum is readily distinguished by its bright orange conidial heads in contrast to the pure yellow color in *H. taiense*, while the latter species has short-

er conidiophores and somewhat different conidial heads.

Heterocephalum taiense has been reported only once from Ivory Coast soil by Persiani and Maggi. However, it might have been recorded from the island of Barro Colorado (Panama) in Farrow's studies on tropical soil fungi, because she described her strain of *H. aurantiacum* as "bright yellow" in color (Farrow, 1954). The distribution of *H. aurantiacum* is more common and, according to the available data (Morris, 1963; Barron, 1968; Anonymous, 1992), appears to be widespread in tropical and subtropical regions: toad dung collected from Jamaica, goat dung from the Philippines and Bahamas, Liberian soil, Zaire soil, Indian soil, and lesion on turtle in Australia. In Japan, it was isolated from cockroach dung collected from Okinawa (Indoh and Oyatsu, 1965).

Literature cited

- Anonymous. 1992. C.A.B International Mycological Institute, Catalogue of the Culture Collection, 10th ed., C.A.B International, Wallingford, Oxon, U.K.
- Barron, G. L. 1968. The genera of hyphomycetes from soil, Williams and Wilkins, Baltimore.
- Farrow, W. M. 1954. Tropical soil fungi. *Mycologia* **46**: 632-646.
- Iijima, T., Kakishima, M. and Otani, Y. 1985. A new species of *Exobasidium* on *Cinnamomum japonicum* Sieb. *Trans. Mycol. Soc. Japan* **26**: 161-167.
- Indoh, H. and Oyatsu, A. 1965. On *Heterocephalum aurantiacum* Thaxter, newly found in Okinawa. *Trans. Mycol. Soc. Japan* **5**: 79-82. (In Japanese.)
- Kornerup, A. and Wanscher, J. H. 1978. *Methuen handbook of colour*, 3rd ed., Eyre Methuen, London.
- Matsushima, T. 1975. *Icones microfungorum a Matsushima lectorum*, Matsushima Fungus Collection, Kobe.
- Matsushima, T. 1983. *Matsushima mycological memoirs*. No. 3. Matsushima Fungus Collection, Kobe.
- Morris, E. F. 1963. The synnematosous genera of the Fungi Imperfecti, Western Illinois Univ., Biol. Sci. Publ. No. 3, Macomb, Illinois.
- Persiani, A. M. and Maggi, O. 1986. A new species of *Heterocephalum* from Ivory Coast soil. *Trans. Br. Mycol. Soc.* **87**: 631-635.
- Pitt, J. I. 1979. The genus *Penicillium* and its teleomorphic states *Eupenicillium* and *Talaromyces*, Academic Press, London.
- Raper, K. B. and Fennell, D. I. 1952. Two noteworthy fungi from Liberian soil. *Amer. J. Bot.* **39**: 79-86.
- Rayner, R. W. 1970. A mycological colour chart, Commonwealth Mycological Institute, Kew and British Mycological Society.
- Stolk, A. C. and Samson, R. A. 1971. Studies on *Talaromyces* and related genera I. *Hamigera* gen. nov. and *Byssochlamys*. *Persoonia* **6**: 341-357.
- Stolk, A. C. and Samson, R. A. 1972. The genus *Talaromyces*. Studies on *Talaromyces* and related genera II. *Studies in Mycology*, No. 2, pp. 15-6. Centraalbureau voor Schimmelcultures, Baarn.
- Thaxter, R. 1903. New or peculiar North American Hyphomycetes. III. *Bot. Gaz.* **35**: 153-159.
- Watanabe, T. 1989. Soil fungal flora in Hachijo-jima island. *Trans. Mycol. Soc. Japan* **30**: 427-435.
- Watanabe, T. 1990. Three new *Nectria* species from Japan. *Trans. Mycol. Soc. Japan* **31**: 227-236.
- Watanabe, T. 1992. *Taeniolella phialosperma* sp. nov. from Japan. *Mycologia* **84**: 478-483.
- Watanabe, T. 1994. Two new species of homothallic *Mucor* in Japan. *Mycologia* **86**: 691-695.