

Short Communication

Materials for the fungus flora of Japan (55)*

Shun-ichi Udagawa¹⁾ and Shigeru Uchiyama^{2)**}¹⁾ Japan Food Research Laboratories, 6–11–10, Nagayama, Tama-shi, Tokyo 206–0025, Japan²⁾ Banyu Tsukuba Research Institute, Banyu Pharmaceutical Co., Ltd., 3, Ookubo, Tsukuba-shi, Ibaraki 300–2611, Japan

Accepted for publication 27 March 2000

From recent isolates of microfungi on soil materials collected at several localities in Japan, three onygenalean species are described and photographed as new to Japan: *Aphanoascus durus*, *Kuehniella racovitzae*, and *Shanorella spirotricha*.

Key Words—ascmycetes; Japan; Onygenales; soil fungi.

115. *Aphanoascus durus* (Zukal) Cano et Guarro, Mycol. Res. **94**: 356. 1990. Figs. 1–4

≡ *Gymnoascus durus* Zukal, Ber. deut. bot. Ges. **8**: 295. 1890.

≡ *Keratinophyton durum* (Zukal) Currah, Mycotaxon **24**: 156. 1985.

≡ *Ascocalvatia dura* (Zukal) von Arx, Persoonia **13**: 178. 1986.

= *Anixiopsis biplanata* Gueho et De Vroey, Can. J. Bot. **64**: 2207. 1986.

Colonies on potato-carrot agar (PCA) spreading rapidly, attaining a diam of 53–67 mm in 14 d at 25°C, floccose, plane, thin, with submerged vegetative mycelium and loose aerial hyphae, producing irregularly scattered ascospores and limited conidia, at first white, becoming Greenish Grey (M. 25D2, Kornerup and Wanscher, 1978) or Pale Olivaceous Grey (Rayner, 1970); reverse uncolored. Colonies on phytone yeast extract agar (PYE) growing rapidly, floccose, white to Yellowish White (M. 2A2); ascospores not produced; conidiogenesis prominent; reverse Greyish Orange (M. 5B5) or Pale Luteous to Ochraceous (R).

Ascomata globose to subglobose, 280–800 µm in diam, pale yellowish brown to dark reddish brown, surrounded with white aerial hyphae and conidia, non-ostiolate; peridium pale yellowish brown, semitransparent, thin, 4–6 µm thick, membranaceous, of textura angularis; outer layer consisting of pale yellow, thick-walled, 6–20(–25) × 4–13 µm, angular cells and inner layer of hyaline, large, flattened cells. Asci 8-spored, pyriform or elongate to ovoid, 7–12 × 6–8 µm, evanescent. Ascospores yellow to yellowish brown, reddish brown in mass, oblate, 3–3.5 × 2–2.5 µm including rim, provided with a broad equatorial rim and somewhat flat-

tened polar thickenings, ellipsoidal or often rhomboid in side view, with surface foveate-reticulate in the equatorial wall and smooth in the poles.

Anamorph: *Chrysosporium*-like. Vegetative mycelium consisting of hyaline, branched, smooth, septate, 1–3 µm diam hyphae; racquet hyphae present. Aleurioconidia variable in shape, ovoid, dacryoid, ellipsoidal, pyriform or clavate, 3–10(–20) × 1.5–4 µm, truncate at the base, hyaline, smooth-walled. Arthroconidia cylindrical, 4–26(–50) × 2–4 µm, truncate at both ends, hyaline, smooth-walled.

Keratinolytic.

At 37°C, growth is nil.

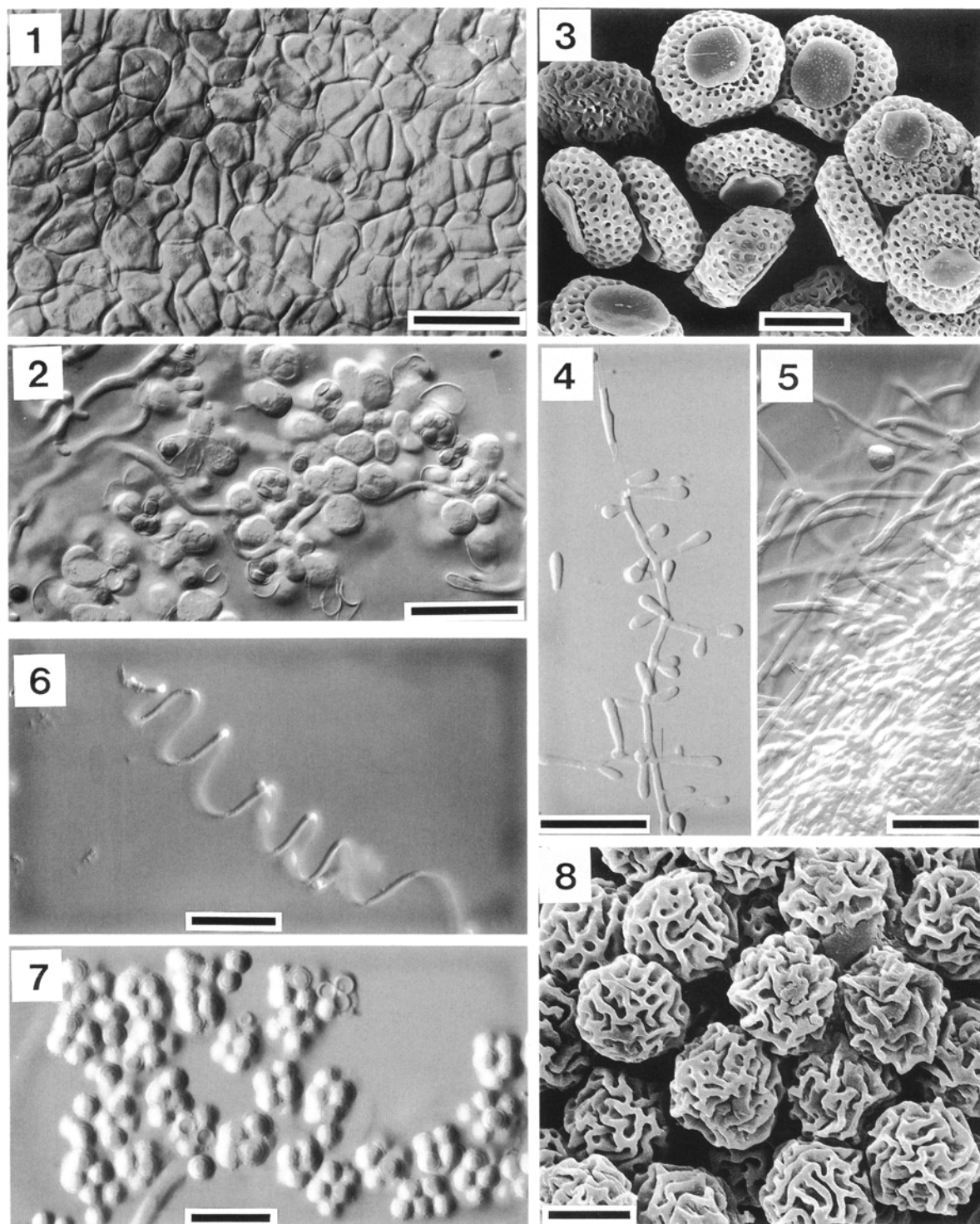
Distribution: Canada, Poland, Spain, Ivory Coast, Japan.

Specimen examined: SUM 3048, a dried culture isolated from feather of brown-eared bulbul (*Hypsipetes amaurotis*) on ground, Kiyomizuyama, Higashiyama-ku, Kyoto-shi, Japan, 20 Sept. 1996, col. N. Sugiyama. The dried specimen has been deposited with the Natural History Museum and Institute, Chiba, Japan (CBM).

Note: *Aphanoascus durus* is similar to *A. clathratus* Cano et Guarro, *A. hispanicus* Cano et Guarro, and *A. terreus* (Randhawa et Sandhu) Apinis (Cano and Guarro, 1990); these species together compose a group of formerly separated taxa (viz. *Keratinophyton* Randhawa et Sandhu) which are characterized by ascospores with a punctate equatorial rim and broad flattened poles (Randhawa et Sandhu, 1964). *Aphanoascus durus* is most closely related to *A. clathratus*, but the latter species has ascospores which are ornamented by a less crowded and broadly hollowed reticulation. *Aphanoascus durus* differs from the remaining two species by its smaller and rhomboid ascospores, while those of *A. hispanicus* resemble a wheel and those of *A. terreus* are saturnoid (Cano and Guarro, 1990).

* (54) Yokoyama, T. and Nasu, H., Mycoscience **41**: 91–93, 2000.

** Corresponding author; e-mail: utiyasg@banyu.co.jp



Figs. 1–8. *Aphanoascus durus* and *Kuehniella racovitzae*.

1–4. *A. durus*. 1. Membranaceous peridium; 2. Asci; 3. Ascospores (SEM); 4. Conidiogenous cells and conidia. 5–8. *K. racovitzae*. 5. Peridial hyphae; 6. Coiled appendage; 7. Asci; 8. Ascospores (SEM). Scale bars: 1, 2, 4–6=20 μm ; 3, 8=2 μm ; 7=10 μm .

116. *Kuehniella racovitzae* (Lagarde) Orr, Mycotaxon 4: 172. 1976; Currah, Mycotaxon 24: 160. 1985.

Figs. 5–10

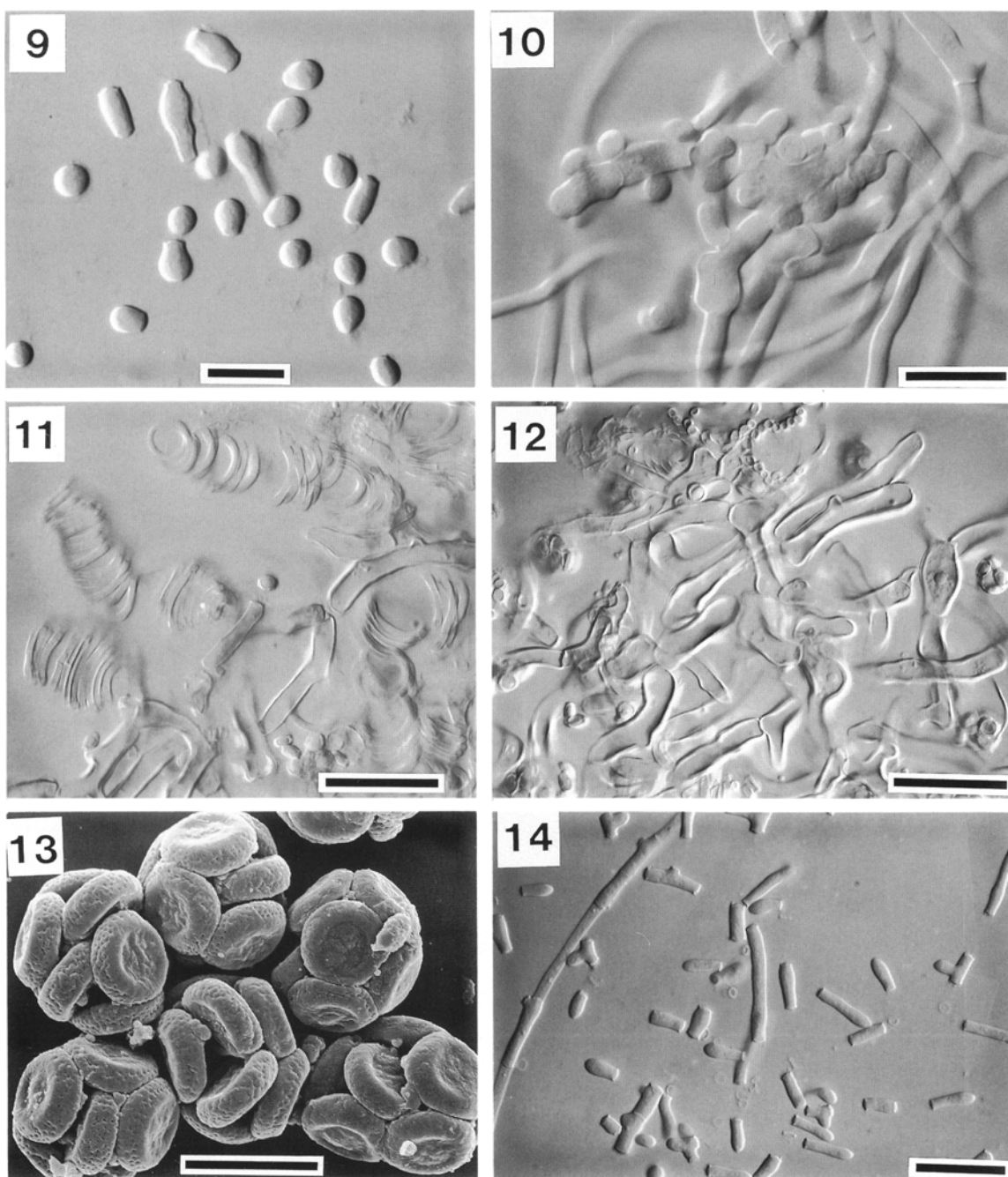
≡ *Myxotrichum racovitzae* Lagarde, Arch. Zool. Exper. Gener. 53: 280. 1913.

≡ *Gymnoascus racovitzae* (Lagarde) Lagarde, Arch. Zool. Exper. Gener. 53: 281. 1913.

≡ *Apinisia racovitzae* (Lagarde) Guarro, Cano et De

Vroey, Mycotaxon 42: 199. 1991.

Colonies on oatmeal agar (OA) growing slowly, attaining a diam of 26–28 mm in 35 d at 15°C, floccose, irregularly wrinkled, consisting of a thin mycelial felt, gradually producing white ascomata in the aerial tomentum; conidiogenesis scattered but not affecting the colony appearance; reverse Yellowish White (M. 3A2) or somewhat Primrose (R). Colonies on PYE growing more



Figs. 9–14. *Kuehniella racovitzae* and *Shanorella spirotricha*.

9, 10. *K. racovitzae*. 9. Conidia; 10. Ascomatal initials. 11–14. *S. spirotricha*. 11. Coiled appendages; 12. Disarticulated peridial hyphae showing irregularly thick-walled cells. 13. Ascospores in ascus clusters (SEM); 14. Conidia. Scale bars: 9, 10=10 μ m; 11, 12, 14=20 μ m; 13=5 μ m.

rapidly, floccose, similar to the above in general pattern and texture; ascomata not produced; reverse Light Orange (M. 5A4) or Pale Luteous (R).

Ascomata often confluent, almost globose, 400–2,000 μm in diam excl. coiled appendages, white, with a white to pale yellow centrum, maturing within 35 d. Peridial hyphae at first undifferentiated, hyaline, delicate, thin-walled, smooth or somewhat roughened by granules, septate, 2–3 μm in diam, branched and anastomosed, forming a loose network (telaperidium) in age. Appendages forming at the periphery of matured ascoma, slender, hyaline, coiling spirally with 10 or more turns, 2–3 μm in diam, septate, smooth-walled; spirals variable in length, 16–24 μm wide. Asci 8-spored, globose to ovoid, 7–8 \times 5.5–7 μm , hyaline, evanescent. Ascospores hyaline to pale yellow, globose to subglobose, 2.8–3.2 μm in diam, thick-walled, finely and irregularly punctate-reticulate.

Anamorph: *Chrysosporium*-like. Vegetative mycelium consisting of hyaline, branched, septate, smooth-walled, 1–3 μm diam hyphae; racquet hyphae present. Aleurioconidia pyriform, 3–7 \times 2.5–4.5(–5) μm , truncate at the base, rounded above, hyaline, smooth-walled, terminal or lateral. Arthroconidia more or less cylindrical, 4–22 \times 2–6.5 μm , truncate at both ends, hyaline, smooth-walled.

Weakly keratinolytic.

At 37°C, growth is nil.

Distribution: France, Spain, USA, Canada, Japan.

Specimen examined: SUM 3153, dried culture isolated from swampy soil, the Oonuma Seminal Park, Nanae-machi, Kameda-gun, Hokkaido, Japan, 3 Aug. 1994, col. S. Uchiyama. The dried specimen has been deposited with CBM.

Note: The genus *Kuehniella* was erected by Orr (1976) on a single species, *Myxotrichum racovitzae* Lagarde (\equiv *K. racovitzae*). Guarro et al. (1991) placed the genus in synonymy with *Apinisia* (La Touche, 1968), but in this latter genus the peridial hyphae are thick-walled and tend to disarticulate at maturity. It is also close to *Arachnotheca* (Arx, 1971) but differs in having ascospores with walls irregularly ridged and punctate, while those of the latter have an irregularly tuberculate sheath when young and then becoming distinctly reticulate.

117. *Shanorella spirotricha* R. K. Benjamin, El Aliso 3: 319. 1956; Apinis, Mycol. Pap. 96: 31. 1964; Currah, Mycotaxon 24: 180. 1985. Figs. 11–14

Colonies on OA growing rapidly, attaining a diam of 51–54 mm in 21 d at 25°C, floccose, thin, with vegetative mycelium submerged and compact aerial growth, more or less zonate, producing abundant ascomata and scattered conidia in the aerial tomentum, white to Pastel Yellow or Greyish Yellow (M. 3A4–4B4), or Honey (R); reverse Pale Yellow (M. 3A4) or Straw (R). Colonies on yeast-starch agar (YpSs) growing somewhat less rapidly than on OA, with texture and color as described on OA; reverse uncolored.

Ascomata often confluent, globose to subglobose,

200–875 μm in diam incl. appendages, at first white, becoming yellow or grayish yellow in age, maturing within 21 d. Peridial hyphae hyaline to pale yellow, thick and smooth-walled, septate, branched, disarticulating at maturity; cells straight, curved or contorted, elongate, 12–50 \times 3–6 μm , simple or branched, sometimes septate, nodulose. Appendages forming as terminal or lateral outgrowths of peridial hyphae, slender, hyaline, coiling spirally with 10–25 turns, 1.5–2 μm in diam, septate, smooth-walled; spirals 20–40 μm long and 10–20 μm wide. Asci 8-spored, globose to ovoid, 6–8 \times 5–7 μm , pale yellow, evanescent. Ascospores bright yellow, oblate, 3–4 \times 2–2.5 μm , thick-walled, finely punctate.

Anamorph: *Chrysosporium*-like. Vegetative mycelium consisting of hyaline, branched, septate, smooth-walled or roughened, 1–4 μm diam hyphae; racquet hyphae present. Aleurioconidia ovoid to pyriform, 4–10 \times 2–6 μm , truncate at the base, rounded above, hyaline, smooth-walled, usually terminal or lateral. Arthroconidia cylindrical, 6–24 \times 2–4 μm , truncate at both ends, hyaline, smooth-walled.

Weakly keratinolytic.

At 37°C, growth is nil.

Distribution: USA, Canada, UK, Australia, India, Japan.

Specimen examined: SUM 3135, a dried culture isolated from grassland soil, Toyama-shi, Japan, 3 Nov. 1995, col. S. Uchiyama. The dried specimen has been deposited with CBM.

Note: The distinguishing features of *S. spirotricha* are yellow ascomata with spiral appendages, peridial hyphae which are composed of irregularly shaped cells and fall apart at maturity, and bright yellow, oblate, punctate ascospores (Benjamin, 1956; Apinis, 1964; Currah, 1985, 1988).

Acknowledgements—We thank Mr. N. Sugiyama for providing the feather materials from Kiyomizuyama in Kyoto.

Literature cited

- Apinis, A. E. 1964. Revision of British Gymnoascaceae. Mycol. Pap. 96: 1–56.
- Arx, J. A. von. 1971. On *Arachniotus* and related genera of the Gymnoascaceae. Persoonia 6: 371–380.
- Arx, J. A. von. 1986. The ascomycete genus *Gymnoascus*. Persoonia 13: 173–183.
- Benjamin, R. K. 1956. A new genus of the Gymnoascaceae with a review of the other genera. El Aliso 3: 301–328.
- Cano, J. and Guarro, J. 1990. The genus *Aphanoascus*. Mycol. Res. 94: 355–377.
- Currah, R. S. 1985. Taxonomy of the Onygenales: Arthrodermataceae, Gymnoascaceae, Myxotrichaceae and Onygenaceae. Mycotaxon 24: 1–216.
- Currah, R. S. 1988. An annotated key to the genera of the Onygenales. Syst. Ascomycet. 7: 1–12.
- Guarro, J., Cano, J. and de Vroey, C. 1991. *Nannizziopsis* (Ascomycotina) and related genera. Mycotaxon 42: 193–200.
- Gueho, E. and de Vroey, C. 1986. A new species of *Anixiopsis*. Can. J. Bot. 64: 2207–2210.
- Kornerup, A. and Wanscher, J. H. 1978. Methuen handbook

- of colour, 3rd ed. Eyre Methuen, London.
- La Touche, C. J. 1968. *Apinisia graminicola* gen. et sp. nov. Trans. Br. Mycol. Soc. **51**: 283–285.
- Orr, G. F. 1976. *Kuehniella*, a new genus of the Gymnoascaceae. Mycotaxon **4**: 171–178.
- Randhawa, H. S. and Sandhu, R. S. 1964. *Keratinophyton terreum* gen. nov., sp. nov., a keratinophilic fungus from soil in India. Sabouraudia **3**: 251–256.
- Rayner, R. W. 1970. A mycological colour chart. Commonw. Mycol. Inst., Kew and Br. Mycol. Soc.