

Talaromyces euchlorocarpus, a new species from soil

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A new species of *Talaromyces*, characterized by development of unusual deep green ascomata on common media, is described and given the name *Talaromyces euchlorocarpus*. This species, isolated from soil, also produces ellipsoidal, spinose ascospores, typically biverticillate penicilli, large ellipsoidal, smooth-walled conidia, and is assigned to the series *Lutei* of the section *Talaromyces*.

Key Words—Eurotiales; soil fungus; *Talaromyces euchlorocarpus*.

A striking and apparently undescribed species of *Talaromyces* C. R. Benjamin (Eurotiales) was isolated from soil during an exploratory survey of soil-borne ascomycetes as producers of metabolites useful to the pharmaceutical industry. Its green pigmentation in the colony surface and ascomata when grown on malt extract and oatmeal agars (MEA, OA) superficially resembled that of *Chromocleista malachitea* Yaguchi et Udagawa (Yaguchi et al., 1993). However, its ascomata show no definite walls and are bounded only by networks of interwoven hyphae that remain essentially unmodified (telaperidium, fide Currah, 1985), unlike those of *Chromocleista*, which are characterized by sclerotoid peridia composed of many layers of compacted thick-walled cells.

Furthermore, our microscopic observation of its associated anamorph showed this to be typically biverticillate penicilli of subgenus *Biverticillium* Dierckx in the genus *Penicillium* Link (Pitt, 1979) and to bear acerose or lanceolate phialides that differ distinctly from those of *C. malachitea*. Since many members of *Talaromyces* seldom develop deep green ascomata (Stolk and Samson, 1972; Pitt, 1979; Frisvad et al., 1990), this fungus is clearly different from previously known species of the genus and is herein described as a new species.

Taxonomy

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

Coloniae in agar "Czapek-yeast extract" (CYA) restrictae, velutinae, ad centrum rugosae, ex mycelio basali coacto compacto constantes, flavo-virentes vel obscure virentes vel malachiteae; ascomata limitata vel nulla; conidiogenesis multa; reversum flavum vel brunneum vel succineum. Coloniae in agar maltoso paulo effusae, fere planae, ex mycelio basali tenuiter constantes, veluti-

nae, ad centrum flavo-virentes, ascomatibus abundantibus formantes, ad marginem integres, albae vel flavae, tenues; conidiogenesis inconspicua; reversum flavo-griseum vel citrinum. Coloniae in agar farinae avenaceae mixto paulo effusae, floccosae, tenues, zonatae, granulares, ascomatibus abundantibus formantes, flavo-virentes vel atrovirentes vel griseo-virentes; conidiogenesis inconspicua; reversum aureum vel brunneum vel succineum.

Ascomata non ostiolata, discreta vel saepe confluentia, atro virentia, globosa vel subglobosa, 150–300 μm diam, mollia, cum hyphis radiatis tortis flavo-virentibus circumcincta, modice maturescentia; paries ex hyphis laxis virentibus ramosis septatis incrustatis intertextis compositus. Asci breviter catenulati, 8-sporei, globosi vel subglobosi, 6–8 μm diam, vel ovoidei, 8–10 \times 5–8 μm , evanescentes. Ascosporae dilute flavae, ellipsoideae, 3.5–5 \times 2.5–3 μm , spinosae. Status anamorphus: *Penicillium euchlorocarpium*.

Ubiquinonum majus: Q-10 (H₂).

Holotypus: PF 1203; colonia exsiccata in cultura ex solo, in Kanagawa, Japonia, iii. 1998, a T. Yaguchi isolata et ea collectione fungorum Musei et Instituti Historiae Naturalis Chiba (CBM) conservata.

Etymology: from Greek, *euchloro* = well greenish and *-carpius* = fruited, referring to the deep green ascomata.

Anamorphosis: *Penicillium euchlorocarpium* Yaguchi, Someya et Udagawa, stat. anam. nov.

Conidiophora ex mycelio basali vel hyphis aeriis oriunda; stipites hyalini, septati, leves, 30–150 \times 2.5–3.5 μm . Penicilli typice biverticillati, adpressi, raro monoverticillati. Metulae 4–8 verticillatae, 10–12 \times 2.5–3.5 μm . Phialides 3–6 verticillatae, parallelae, acerosae, (9–)10–14(–16) \times 2.5–3 μm . Conidia hyalina vel dilute flavo-virentia, vulgo ellipsoidea, 3–5.5(–6) \times 1.5–2.5 μm , levia, saepe connectivis prominentibus in-

structa. Status teleomorphus: *Talaromyces euchlorocarpus* Yaguchi, Someya et Udagawa.

Holotypus: PF 1203, loc. cit.

Colonies on Czapek agar (CzA) growing restrictedly, attaining a diam of 10–11 mm in 7 d at 25°C, velvety, raised in center, consisting of a tough mycelial felt, Green to Dull Green (M. 26C8-E3, after Kornerup and Wanscher, 1978) or Glaucus Blue-green (Rayner, 1970); ascomata scattered, covered by greenish aerial hyphae; margins rather irregular, abrupt; conidiogenesis inconspicuous; exudate small, clear; odor mushroom-like; reverse Violet Brown (M. 10F8) or Chestnut (R).

Colonies on CYA growing restrictedly, attaining a diam of 11–13 mm in 7 d at 25°C, velvety, raised and wrinkled in center, consisting of a compact mycelial felt, Yellowish Green to Dull Green (M. 30A6-26E4) or Malachite Green (R); ascomata limited or absent; margins entire, thin; conidiogenesis heavy; exudate none; odor mushroom-like; reverse Yellow to Brown (M. 3A6-6E6) or Amber (R), with surrounding agar yellow.

Colonies on MEA growing rather rapidly, attaining a diam of 25–27 mm in 7 d at 25°C, almost plane, consisting of rather thin mycelial felt, with surface appearing velvety but consisting of short, closely interwoven vegetative hyphae, central area gradually developing Yellowish Green (M. 29B7) due to the production of abundant ascomata; margins entire, white to Greenish Yellow (M. 1A7) or Sulphur Yellow (R), thin; conidiogenesis inconspicuous, not influencing the colony appearance; reverse Yellowish Grey (M. 3D3) or Citrine (R), with some traces of Pastel Red (M. 7A5).

Colonies on OA growing rather rapidly, attaining a diam of 18–20 mm in 7 d at 25°C, floccose, thin, zonate,

becoming granular in appearance due to the production of abundant ascomata borne in a loose mycelial felt, Yellowish Green to Deep Green (M. 29A7-27E8) or Greyish Green (R); margins entire, white to pale yellow, thin; conidiogenesis inconspicuous; exudate pale yellow; reverse Golden to Brown (M. 4C6-4D7) or Citrine to Amber (R).

Colonies on cornmeal agar (CMA) growing rather rapidly, attaining a diam of 22–24 mm in 7 d at 25°C, thin, consisting of a submerged mycelium, Greyish Green (M. 27C5), granular in appearance due to the production of abundant ascomata; conidiogenesis lacking; reverse uncolored.

Ascomata non-ostiolate, superficial, scattered or often confluent, deep green, globose to subglobose, 150–300 μm in diam, soft, surrounded by radiating, twisted, yellowish green hyphae which are branched, septate, smooth-walled or encrusted, 120–250 \times 1.5–2 μm , maturing within 14–21 d; ascomatal wall consisting of a loose network of green, branched, septate, encrusted, interwoven, 2–3 μm diam hyphae. Ascomatal initials consisting of swollen branches or intercalary portions of aerial hyphae, which become often large, septate ascogonia, around which thin antheridia tightly coil several times. Asci irregularly disposed, in short chains, 8-spored, globose to subglobose, 6–8 μm in diam, or ovoid, 8–10 \times 5–8 μm , evanescent. Ascospores pale yellow, ellipsoidal, 3.5–5 \times 2.5–3 μm , spinose.

Mycelium consisting of hyaline, branched, smooth-walled or encrusted, septate, 1–3 μm diam hyphae, sometimes forming bundles. Conidiophores variable in size; stipes arising from the basal mycelium and measuring 100–150 \times 2.5–3.5 μm , or borne as lateral branches

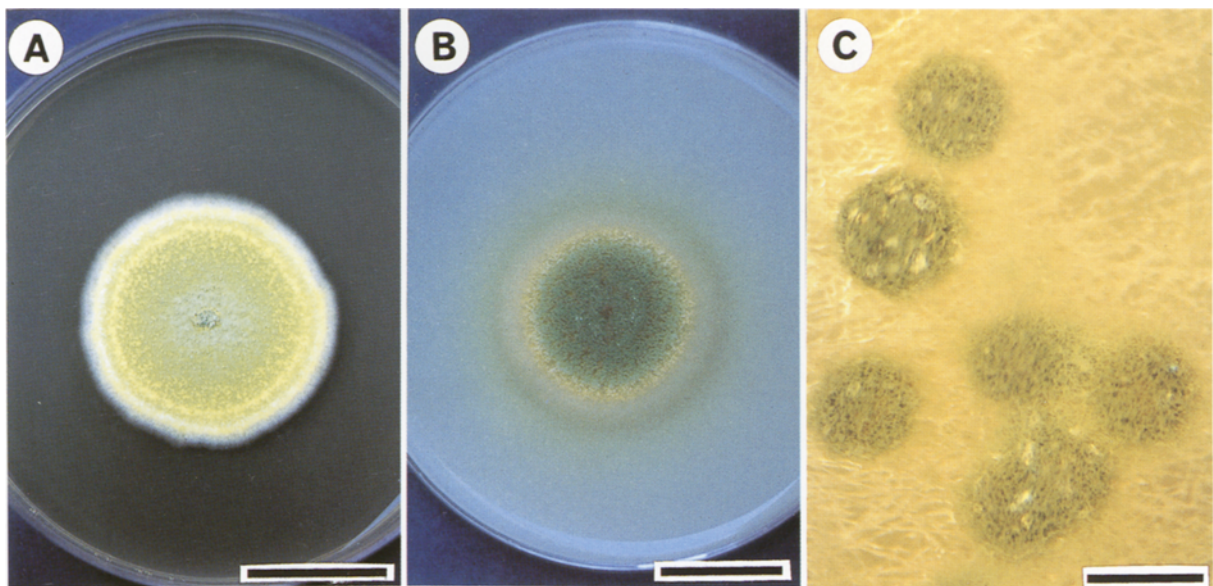


Fig. 1. *Talaromyces euchlorocarpus*, PF 1203. A. Colony on MEA after 7 d at 25°C. B. Colony on OA after 7 d at 25°C. C. Ascomata on CMA. Scale bars: A, B = 2 cm; C = 200 μm .

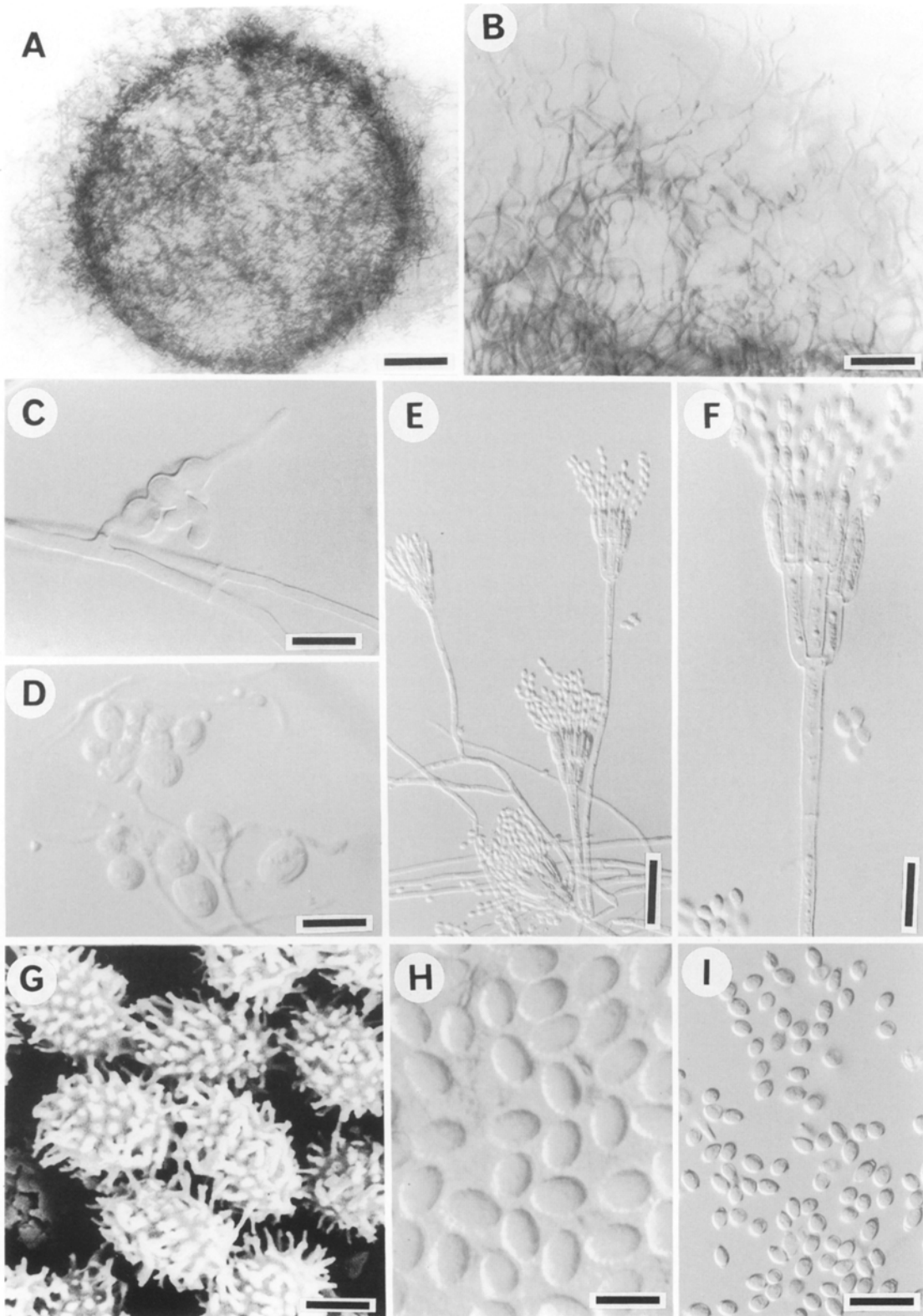


Fig. 2. *Talaromyces euchlorocarpus*, PF1203.

A. Ascoma. B. Hyphae surrounding ascoma. C. Ascomatal initial. D. Asci. E, F. Penicilli. G. Ascospores (SEM). H. Ascospores. I. Conidia.

Scale bars: A = 50 μm ; B-D, F, I = 10 μm ; E = 20 μm ; G = 2 μm ; H = 5 μm .

on trailing aerial hyphae, shorter and mostly 30–100 μm in length, hyaline, septate, smooth-walled. Penicilli typically biverticillate, appressed, consisting of verticils of 4 to 8 metulae, and 3 to 6 phialides, bearing loose columns of conidia up to 300–500 μm in length, rarely monoverticillate. Metulae 10–12 \times 2.5–3.5 μm . Phialides parallel, acerose, (9–)10–14(–16) \times 2.5–3 μm . Conidia hyaline to pale yellowish green, ovoid to more commonly ellipsoidal, 3–5.5(–6) \times 1.5–2.5 μm , smooth-walled, often with prominent connectives.

At 37°C, growth is nil.

Major ubiquinone: Q-10 (H₂).

Specimen examined: PF1203 (holotype), in dried culture isolated from soil, at Yokohama-City, Kanagawa-Pref., Japan, March 1998, by T. Yaguchi.

The outstanding features of this species are: (1) yellowish green to deep green surface on CYA, MEA, OA, CMA, etc.; (2) deep green ascomata; (3) ellipsoidal, spinose ascospores; (4) typically biverticillate penicilli with acerose phialides; and (5) large, ellipsoidal, smooth-walled conidia.

Species of *Talaromyces* are characterized by the production of ascomata, usually in abundance, which are surrounded by loose coverings of coarse, encrusted hyphae. In the majority of species, this enveloping mycelium is highly pigmented in yellow to golden or orange-yellow shades, and it is this aerial growth which imparts to the colonies their characteristic coloration. In only three species, namely, *T. derxii* Takada et Udagawa (Takada and Udagawa, 1988), *T. helicus* (Raper et Fennell) C. R. Benjamin var. *boninensis* Yaguchi et Udagawa (Yaguchi et al., 1992) and *T. leycettanus* Evans et Stolk (Evans and Stolk, 1971), do the ascomatal coverings show green shades rather than yellow or orange-yellow.

Talaromyces derxii differs from the new species in growing well at 37°C, having heterothallic sexual reproduction and Q-10 (H₂)+Q-10 (H₄) ubiquinone system (Takada and Udagawa, 1988; Kuraishi et al., 1991).

Ascomata of *T. leycettanus* are usually greenish-yellow, consisting of a thin network of pale yellow encrusted hyphae. Ascospores are ellipsoidal, ornamented with 2–6 thin, somewhat jagged, irregular, mostly longitudinal ridges. The anamorph of *T. leycettanus* is *Paecilomyces*. *Talaromyces leycettanus* is classified in the section *Emersonii* Stolk et Samson; all members of this section appear to be thermotolerant-thermophilic in their growth temperatures. Thus, *T. leycettanus* is quite distinct from the new species.

The new species seems to be more closely related to *T. helicus* var. *boninensis* than to the other two species in question, although it differs from the latter in certain striking characteristics. Ascomata of *T. helicus* var.

boninensis are grayish green rather than yellow color in the type variety. Ascospores are broadly ellipsoidal (mostly 3.5–4 \times 2–3 μm) and ornamented with minute spines. Conidia are ellipsoidal to fusiform, sometimes subglobose and smaller, 2–4 \times 1.5–2.5 μm . *Talaromyces helicus* var. *boninensis* is primarily distinguished from the new species by its more rapid growth at 25°C and 37°C, and the coiled helix-like pattern of its ascomatal initials.

Talaromyces euchlorocarpus can be best assigned to the series *Lutei* in the section *Talaromyces* of the genus as reappraised by Yaguchi et al. (1996), because of its slow growth-rate (less than 30 mm in diam) on MEA at 25°C in 7 d and its lack of growth at 37°C. From the chemotaxonomic point of view, its ubiquinone system Q-10 (H₂) is also coincident with those of other species in the series *Lutei* (Kuraishi et al., 1991). Within the series *Lutei*, it can easily be distinguished by its deep green ascomata and large, prominent ascomatal initials.

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