

Shun-ichi UDAGAWA* & Yoshikazu HORIE** : **New or noteworthy ascosporic *Penicillia* from Philippines**

宇田川俊一*・堀江義一** : フィリッピン産
子のう胞子形成アオカビ属について

(Plate VIII)

In this communication we report isolations from Philippine soil of two hitherto undescribed species of the genus *Eupenicillium* and two rare species of ascosporic *Penicillia*. The soil sample, a source of all cultures discussed here, was collected from pine forest, at Sinipsis (altitude 7,300 fts.), the vicinity of Baguio, Luzon Island.

Subcultures of two new taxa have been placed in the Centraalbureau voor Schimmelcultures, Baarn, and the Institute for Fermentation, Osaka.

Eupenicillium luzoniacum Udagawa et Horie sp. nov. (Figs. 1, 4, 5, 8)

St. conid. *Penicillium luzoniacum* Udagawa et Horie stat. nov.

Coloniis in agaro Czapekii late crescentibus, e coacta firmo mycelica constitutis, floccosis, cleistotheciis lente crescentibus, albis vel ravidis rubropurpureis; fructificationibus conidicis paucis; exsudato brunneo-purpureo; reverso dilute flavo-brunneo vel dilute flavo, cum agaris subcolorato; in agaris maltoso effusis, planis, cleistotheciis abundantibus, obscure aurantiacis vel pallido-brunneis, cum myceliis aeriis laxis, fructificationibus conidicis paucis et aggregatis in coloniae centro, dilute viridibus; reverso incolorato vel parum dilute flavo-brunneo. Cleistotheciis dilute flavo-brunneis, subsphericis vel aliquantum oblongis, 150-240 μ diam., ex hyphis dilute rubro-brunneis rare limitatis, primo valde duris, e cellulis crasse tunicatis compositis, tarde maturescentibus. Ascis singulis et terminalibus vel lateralibus in hyphis ascogenis, ovatis vel oblongis, 10-12 \times 7-10 μ , octosporis. Ascosporis hyalinis vel pallido-flavis, lenticularibus, sine cristis 3.2-4 μ longis, totaliter 4-5 (-5.5) \times 3-3.8 (-4) μ , cum aequatorialibus sulco et duabus distinctis cristis,

* Department of Microbiology, National Institute of Hygienic Sciences, Kamiyoga 1-chome, Setagaya-ku, Tokyo 158. 国立衛生試験所

** Institute of Food Microbiology, Chiba University, 3-chome, Izumicho, Narashino-shi, Chiba-ken 275. 千葉大学腐敗研究所

superficiebus convexis vulgo spinulosis; cristis $0.5-1\ \mu$ latis. Conidiophoris ex hyphis aereis orientibus, vulgo $30-130$ (-200) $\times 2.5-3.5$ (-3.8) μ , septatis, minute asperatis, cum apice parum vesicula. Penicillis variabilibus, plerumque biverticillatis et asymmetricis, sed saepe monoverticillatis. Metulis in 2-3 verticillis, $11.5-20 \times 2.5-3.5\ \mu$, arcte appressis. Phialidibus in 4-6 verticillis,

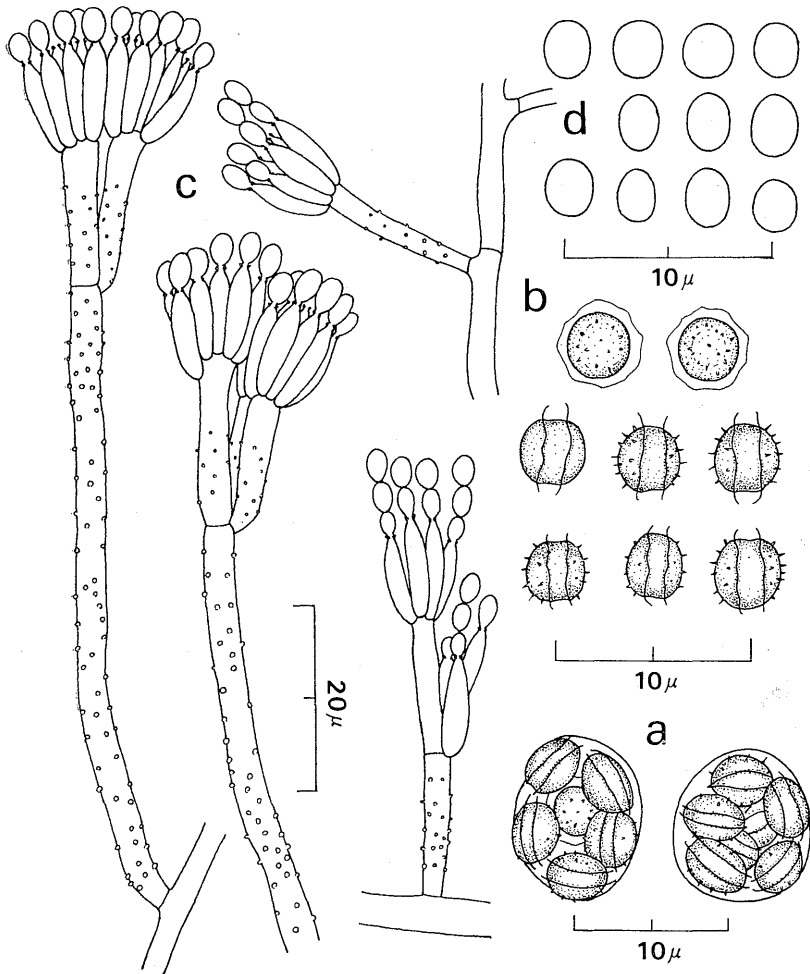


Fig. 1. *Eupenicillium luzoniacum*. a. Asci. b. Ascospores. c. Penicilli. d. Conidia.

8-10 (-12.5) \times 2.5-3 μ . Conidiis ovatis vel late ellipticis, 2.2-3 \times 2-2.8 μ , levibus, in catenis implicatis usque 120 μ longis.

Hab. in solo Philippinae, NHL 6128.

Colonies on Czapek's agar growing rapidly, consisting of a fairly tough basal felt with thin aerial growth appearing floccose, deeply and irregularly furrowed, producing numerous incipient cleistothecia on the basal felt, white to grayish red purple; conidial structures limited in number, not influencing the colony appearance; exudate clear, brown purple; reverse pale yellowish brown to pale yellow, with surrounding agar slightly yellowish.

Colonies on malt agar spreading broadly, plane, consisting of a dense layer of cleistothecia at the agar surface, colony surface appearing granular, dull orange to light brown, partially obscured by a limited development of white aerial hyphae, sometimes showing a tendency to develop pale-colored sectors, conidial structures limited and concentrated in central colony areas, pale green; exudate lacking; reverse uncolored or slightly pale yellowish brown.

Colonies on oat-meal agar similar to those on malt, conidial structures more abundant than on the above media, pale green to light greenish gray; cleistothecia abundantly produced and usually in localized sectors; exudate abundant in light reddish orange shades.

Cleistothecia pale yellowish brown, subspherical to somewhat oblong, 150-240 μ in diam., surrounded by a thin network of light reddish brown hyphae, at first very hard, composed of thick-walled, polygonal cells, maturing slowly from center outwards, with asci and ascospores usually appearing after 50 days or more. Asci borne singly as terminal or lateral branches from a network of ascogenous hyphae, ovate to oblong, 10-12 \times 7-10 μ , 8-spored. Ascospores hyaline to pale yellow, lenticular, spore bodies 3.2-4 μ in length, overall dimensions 4-5 (-5.5) \times 3-3.8 (-4) μ , showing a conspicuous equatorial furrow with two distinctly separated ridges and convex walls mostly spinulose; ridges 0.5-1 μ wide, thick. Conidiophores borne as rather short branches from aerial hyphae, mostly 30-130 (-200) \times 2.5-3.5 (-3.8) μ , septate, with walls finely roughened, apices slightly enlarged. Penicilli variable, mostly biverticillate and asymmetric but with monoverticillate structures often mixed. Metulae usually in groups of 2 or 3, 11.5-20 \times 2.5-3.5 μ , closely appressed. Phialides borne in small clusters of 4 to 6,

8-10(-12.5) \times 2.5-3 μ , terminating rather abruptly. Conidia ovate to broadly elliptical, 2.2-3 \times 2-2.8 μ , smooth-walled, borne in tangled chains up to 120 μ or more in length.

At 37°C, very slight growth.

Habitat: on soil of pine forest, Sinipsip near Baguio, Luzon Is., Republic of the Philippines, April 1968.

Holotype: NHL 6128, deposited in the Herbarium, National Institute of Hygienic Sciences, Tokyo.

This species is basically very similar to *E. terrenum* Scott.²⁾ Both have lenticular ascospores that are provided with two prominent equatorial ridges, and biverticillately asymmetric penicilli. *E. terrenum* differs from this species in the lighter pigmentation of its colonies on most laboratory media, and in the narrower dimension and smooth surfaces of its ascospores.

The conidial structures of this species is also somewhat suggestive of *E. lapidosum* Scott et Stolk^{1,3)}, but the latter has much larger ascospores and different pigmentation.

Eupenicillium philippinense Udagawa et Horie sp. nov. (Figs. 2, 6, 7, 9)

St. conid. *Penicillium philippinense* Udagawa et Horie stat. nov.

Coloniis in agarō Czapekii restrictis, tenuis, cum mycelio aërio paulo, cleistotheciis et fructificationibus conidicis paucis; reverso incolorato; in agarō maltoso late crescentibus, planis, cleistotheciis abundantibus, pallido-brunneis, cum hyphis aëriis laxis et plus minusve floccosis; fructificationibus conidicis abundantibus sed sparsis, dilute viridibus; reverso incolorato vel parum dilute flavo-brunneo. Cleistotheciis fere subsphericis, 50-150 μ diam., stramineis, primo e cellulis crasse tunicatis compositis, sclerotioideis, tarde maturescentibus. Ascis singulis in hyphis ascogenis, octosporis, subglobosis vel ellipsoideis, 7.5-10 \times 6-7.5 μ . Ascosporis late lenticularibus, cum duabus distinctis aequatorialibus cristis, sine cristis 3-3.5 \times 2.5-3 μ , totaliter 3.5-4 μ longis, superficiebus convexis subtiliter asperis, interdum cum obscuris, secundariis cristis. Conidiophoris ex hyphis aëreis orientibus, levibus, plerumque 20-80 \times 2-2.5 μ , cum apice parum vesicula. Penicillis districte monoverticillatis, plerumque 6-10 phialidibus in verticillo terminali compositis. Phialidibus 8.5-10.5 \times 2-2.5 μ , apicibus aliquantum attenuatis. Conidiis vulgo ovatis vel ellipticis, interdum subglobosis, 2-3 \times 1.8-2.5 μ , levibus, in catenis satis columnaribus usque 600 μ longis.

Hab. in solo Philippinae, NHL 6130.

Colonies on Czapek's agar growing very restrictedly, thin, vegetative mycelium largely submerged, showing little aerial growth with few incipient cleistothecia, conidial structures limited in number; reverse uncolored.

Colonies on malt agar growing rapidly, plane, consisting of a thin basal mycelium with surface appearing granular from the abundant production of pale brown cleistothecia, loosely overgrown by a thin, more or less flocculent network of white aerial hyphae; conidial structures abundant but not affecting the colony appearance, pale green in color; reverse uncolored or slightly pale yellowish brown.

Colonies on oat-meal agar as on malt in rate of growth but producing conidia less abundantly, thin; cleistothecia as on malt.

Cleistothecia mostly subspherical, 50–150 μ in diam., straw-colored, at first consisting of thick-walled, polygonal cells, sclerotoid, ripening late from the center outwards, developing asci and ascospores after 40 days. Asci borne singly on ascogenous hyphae, 8-spored, subglobose to ellipsoid, 7.5–10 \times 6–7.5 μ . Ascospores broadly lenticular with two distinctly separated equatorial ridges, spore bodies 3–3.5 \times 2.5–3 μ , 3.5–4 μ long including ridges, with convex surfaces finely roughened, sometimes with a secondary pair of less prominent ridges.

Conidiophores arising from trailing aerial hyphae, smooth-walled, 20–80 \times 2–2.5 μ or more, with apices slightly enlarged. Penicilli strictly monoverticillate, with phialides in compact clusters of 6 to 10 or more, rarely branched. Phialides 8.5–10.5 \times 2–2.5 μ , with conidium-bearing tips somewhat narrowed. Conidia usually ovate to elliptical, sometimes subglobose, 2–3 \times 1.8–2.5 μ , smooth-walled, bearing in fairly columnar chains up to 600 μ in length.

At 37°C, very little growth.

Habitat: on soil of pine forest, Sinipsip near Baguio, Luzon Is., Republic of the Philippines, April 1968.

Holotype: NHL 6130, deposited in the Herbarium, National Institute of Hygienic Sciences, Tokyo.

Colonies of this species on Czapek's and malt agars bear a striking resemblance to those of *E. meridianum* Scott²⁾, especially with regard to growth rate and surface color. However, the ascospores of the latter species

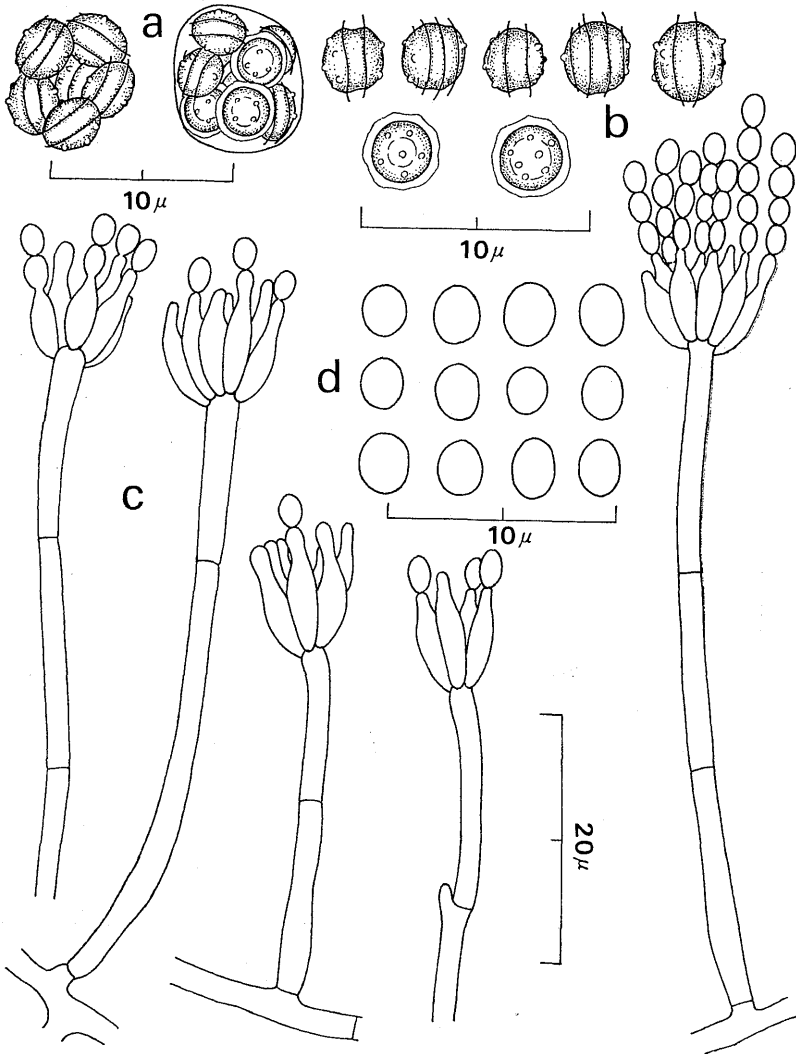


Fig. 2. *Eupenicillium philippinense*. a. Asci. b. Ascospores. c. Penicilli. d. Conidia.

are larger than those of *E. philippinense*, show more closer crests, and they develop more quickly, maturing in 28 days.

Talaromyces rotundus (Raper et Fennell) C. R. Benjamin, in *Mycologia*

47: 683, 1955; Raper & Fennell, in *Mycologia* 40: 518, 1948; Raper & Thom, *Manual of the Penicillia* p. 591, 1949; Tubaki & Asano, in *Trans. Mycol. Soc. Japan* 4: 59, 1963.

St. conid. *Penicillium rotundum* Raper et Fennell.

Colonies on malt agar growing rather restrictedly, velvety, with abundant cleistothecia in a layer on a basal felt, obscured by an overlying encrusted hyphae, at first yellow, becoming reddish yellow in age, conidial structures limited; reverse dark red to dull yellow.

Cleistothecia spherical to ovate, 175-375 μ or more in diam. Asci 8-spored, globose to ovate, 11.5-12.5(-13.8) \times 10-11.5 μ . Ascospores globose, 4-5 μ in diam., spinulose. Conidial structures abundantly produced on Czapek's agar with 20% sucrose, in grayish green shades. Conidiophores up to 180 \times 2-3 μ , smooth. Penicilli usually biverticillate and symmetrical, consisting of a terminal verticil of 4 to 6 metulae, less commonly monoverticillate or fragmentary. Metulae 10-12.5 \times 2.5-3(-3.8) μ . Phialides in clusters of 3-6 or more, 10-12.5(-14.5) \times 2-2.5 μ , lanceolate. Conidia ovate to elliptical, 2.5-3(-4.5) \times 2-2.5(-3.8) μ , smooth-walled.

Habitat: on soil of pine forest, Sinipsip near Baguio, Luzon Is., Republic of the Philippines, April 1968, NHL 6122.

Hamigera striata Stolk et Samson, in *Persoonia* 6: 347, 1971; Raper & Thom, *Manual of the Penicillia* p. 603, 1949. (Figs. 3, 10)

Penicillium striatum Raper et Fennell, 1948; *Talaromyces striatus* (Raper et Fennell) Benjamin, 1955.

St. conid. *Penicillium striatum* Raper et Fennell, in *Mycologia* 40: 521, 1948.

Colonies on malt agar spreading broadly, plane, vegetative mycelium thin, producing numerous cleistothecia in a dense layer at the agar surface to give a granular appearance, usually rather obscured by an overlying mycelial network, white to pale olive, conidial structures limited in number, not influencing the colony appearance, with margin irregularly dissected; reverse pale yellowish brown to pale brown.

Cleistothecia white to pale yellowish gray (ivory), subspherical to elongate, 100-150 μ in diam.; peridium consisting of a loose network of interwoven hyphae, ripening quickly. Asci 8-spored, ovate to broadly clavate, 22.5-28 \times 17.5-20 μ . Ascospores elliptical, 7.5-10 \times 6.5-7.5 μ , striate,

with about 16 frills running longitudinally and extending the entire length of the spore. Conidiophores arising mostly as branches from aerial hyphae, 25–50(–65) \times 3–3.8(–6.5) μ , smooth-walled. Penicilli mostly monoverticillate or fragmentary, sometimes as single phialides borne on the aerial hyphae. Phialides 10–15(–22.5) \times 2.5–6.5 μ , in verticils of 3–4(–6). Conidia elliptical, 3–6 \times 2.5–3.8(–4.5) μ , smooth-walled, pale yellowish brown in mass, not adher-

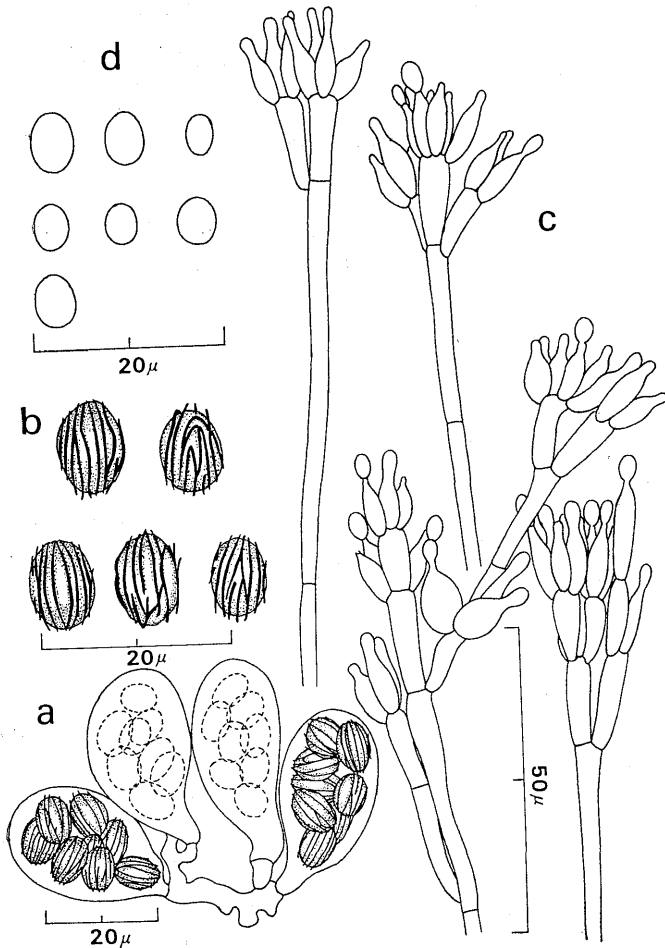


Fig. 3. *Hamigera striata*. a. Asci. b. Ascospores. c. Penicilli. d. Conidia.

ing long chains.

Colonies on oat-meal agar similar as on malt in rate of growth and general colony texture but somewhat thinner.

At 37°C, growth is very restricted, with no spore production.

Habitat : on soil of pine forest, Sinipsip near Baguio, Luzon Is., Republic of the Philippines, April 1968, NHL 6123.

The unique characteristic of this species is the ascospores, which are ornamented with graceful, longitudinal ridges (Fig. 10).

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Literature cited

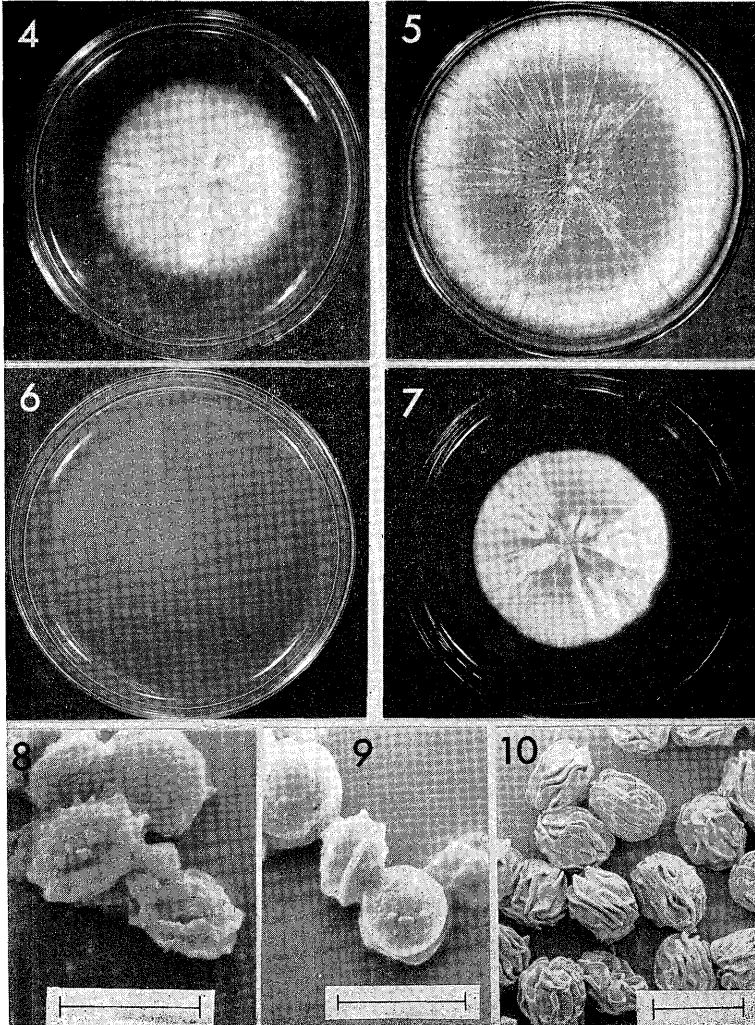
- 1) Raper, K. B. and Thom, C. : A manual of the Penicillia, p. 857 (1949). Williams and Wilkins Co., Baltimore. 2) Scott, De B. : Mycopathol. Mycol. Appl. 36 : 1-27 (1968). 3) Scott, De B. and Stolk, A. C. : Antonie van Leeuwenhoek 33 : 297-314 (1967).

Explanation of Plate VIII

4-5. *Eupenicillium luzoniacum*. Two-week-old colonies on Czapek's (left) and malt (right) agars, respectively. 6-7. *Eupenicillium philippinense*. Two-week-old colonies on Czapek's (left) and malt (right) agars, respectively. 8-10. Scanning electron micrographs of ascospores. 8. *Eupenicillium luzoniacum* (scale 5 μ), 9. *Eupenicillium philippinense* (scale 5 μ), and 10. *Hamigera striata* (scale 10 μ).

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フィリッピンから分離された次の4種の子のう菌類について記載した。不完全世代はいずれも *Penicillium* に属する。1) *Eupenicillium luzoniacum* Udagawa et Horie sp. nov. 本種はレンズ形の子のう胞子を形成し、胞子には2個の赤道隆起のあること、胞子表面は粗壁、分生子構造は不対称形、2重輪生となる特徴を示した。集落はにぶい橙色ないし淡褐色。2) *Eupenicillium philippinense* Udagawa et Horie sp. nov. 本種は同じくレンズ形の子のう胞子を形成するが、胞子表面はわずかに粗壁である。2個の赤道隆起は明確に分離して生じ、ときには2対となることもある。分生子構造は典型的な単輪生となる。集落は淡褐色。3) *Talaromyces rotundus*, *Hamigera striata* これらの2種は分布が稀れで、とくに後者の報告は原記載以後ないようである。



S. UDAGAWA & Y. HORIE: *Penicillia* from Philippines