

MORPHOLOGICAL STUDY OF *GONGRONELLA BUTLERI* (MUCORALES) FROM TAIWAN

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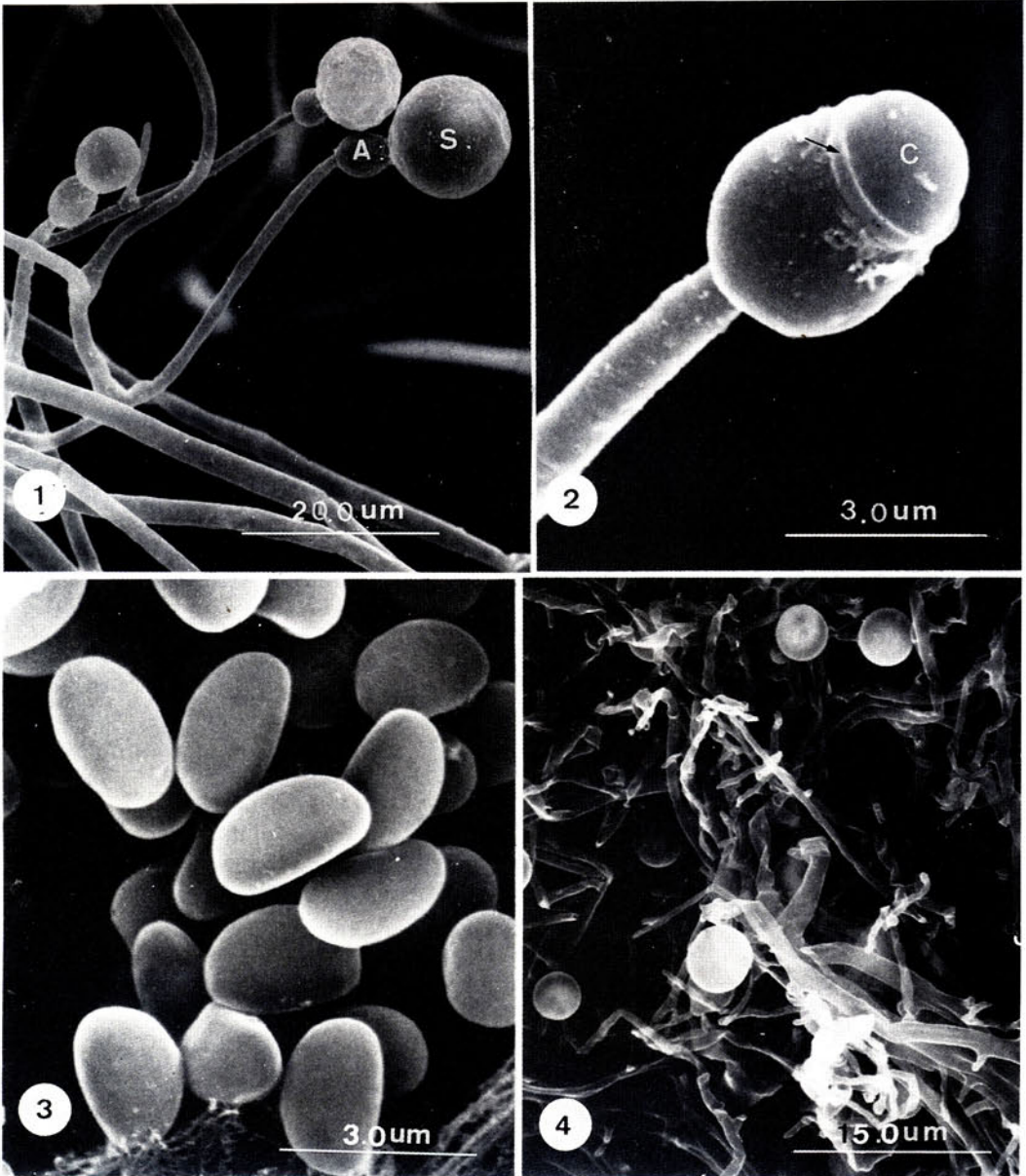
From a study of Mucoraceous fungi during 1988, *Gongronella butleri* (Lendner) Peyronel & Dal Vesco was isolated from many forest soil samples over this island. The genus *Gongronella* is closely related to *Absidia* because both possess an apophysis beneath the sporangium. However it differs from *Absidia* in having more distinct, swollen to oval-shaped apophysis and reduced columella (Zycha, 1969). According to Hesseltine C.W. & J.J. Ellis (1964), there are only two species in this genus: *Gongronella butleri* and *Gongronella lacrispora* Hesseltine & Ellis. The former species is different from the latter in having oval sporangiospores and sporangia borne erect. *G. butleri* has been isolated frequently during the course of study. Although this species is first reported from Taiwan, we thought it is widely distributed throughout this island. Pure culture was made and morphological characters were observed under light and scanning electron microscope.

For isolation, 1-1.5 g dry soil was put to 10 ml of cooled (Difco) Corn Meal Agar petri plates then incubated at 24°C for 24 hr and examined under a dissecting microscope. Single sporangium was cultivated on SMA (Synthetic Mucor Agar) for identification purpose. Zygosporic cultures were obtained by using mass hyphae transferred from cultures on which zygosporangia were examined. Technique for preparing the fungal material for the scanning electron microscopy was the same as previously described (Ho, 1988).

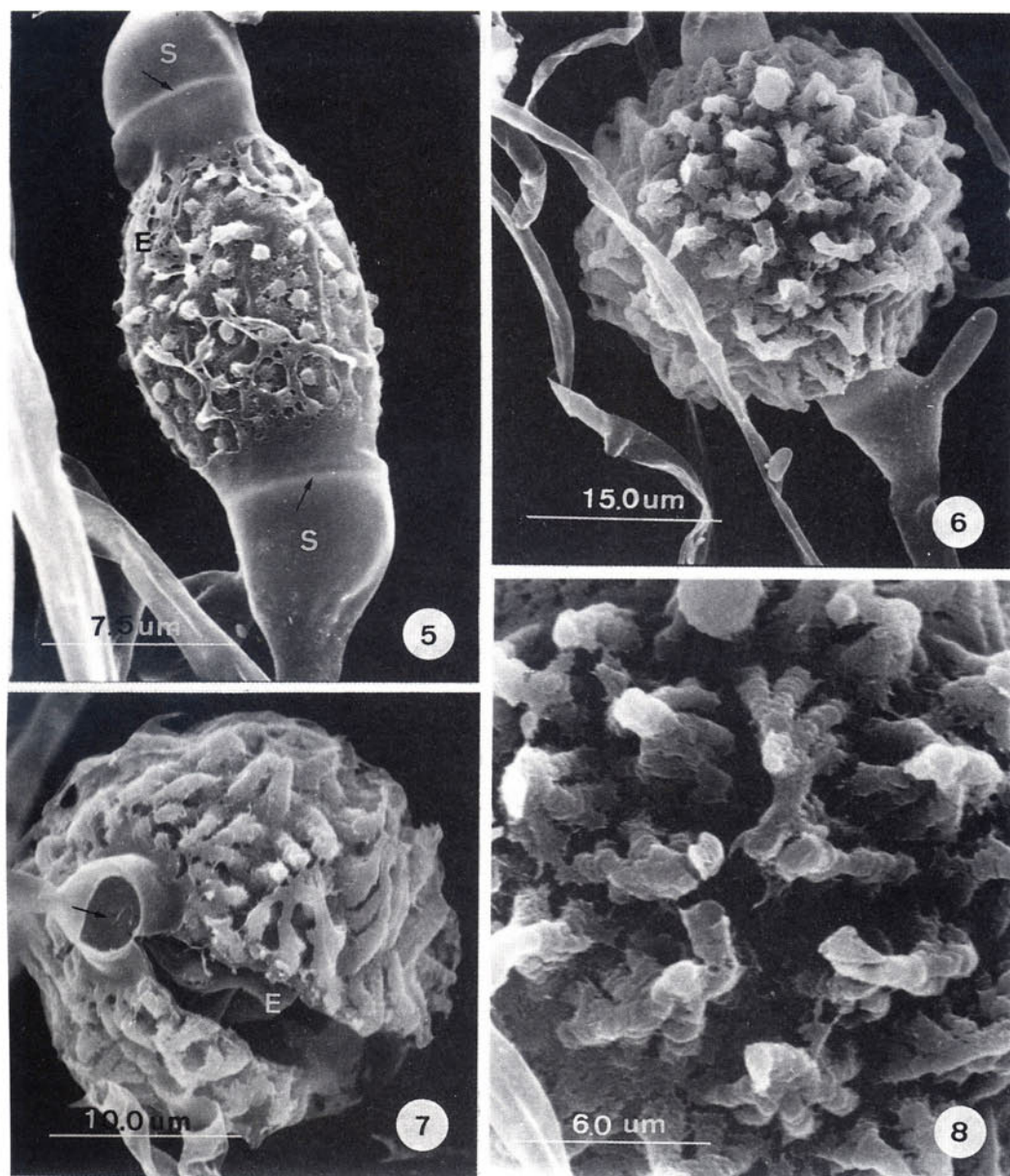
Formosan isolate of *Gongronella butleri* grows slowly on SMA, about 3-5 mm high with white turf (color names are from Ridgeway, 1912). Sporangioophores are 2.1-3.1 μm wide, hyaline, smooth to very faintly roughened, always with a septum under the apophysis, branching simply or irregularly (Fig. 1). Rhizoids present. Sporangia are globose, 16.5-22.7 μm in diameter, with thin, smooth and easily dissolved wall, many spored (Fig. 1). The most distinguished feature of this fungus is its swollen, oval-shaped apophysis beneath the sporangium. The apophyses are 7.0-10.3 μm in length and 8.0-8.7 μm in diameter with smooth surfaces (Fig. 1, 2). After the sporangial wall deliquesce, there leaves a sometimes recurved collar around the base of the original sporangium (Fig. 2), and a reduced columella is visible. Columellae are 3.1-6.6 μm in diameter, 2.1-4.2 μm in height, hemispherical to dome-shaped, smooth (Fig. 2). Sporangiospores are 2.5-7.2 \times 1.7-4.7 μm in size, smooth, oval to flattened on one side to reniform (Fig. 3). Chlamydospores were observed in substrate mycelium, 4.9-6.8 \times 4.6-10.7 μm in size, globose to ovoid with smooth surfaces (Fig. 4). Zygosporangia are formed between two nearly equal suspensors (Fig. 5). When mature, it is globose, about 16-36 μm in dia, and

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Figs. 1-4. Scanning electron micrographs of *Gongronella butleri*. 1. Apophysate (A) sporangiophores with terminal globose sporangia (S). 2. Apophysate sporangiophore with reduced columella (C) and collar (arrow). 3. Spores. 4. Globose chlamydozoospores.



Figs. 5-8. Scanning electron micrographs of *Gongronella butleri*. 5. Young zygospores with equal suspensors (S), episporium (E) just ruptured by outgrowing spines leaving fibrous to membranous remnants on the surface, arrows indicating gametangial septum. 6. Mature zygospores with conical spines. 7. A ruptured zygospore revealing smooth endospore (E), arrow indicating gametangial septum. 8. A magnified view from fig. 6. showing conical spines with some longitudinal depressions on the surface.

roughened with warts about $2\mu\text{m}$ in height. Zygosporangium is a general term which comprises the zygosporangium proper (endospore), the thick-walled zygosporangium (mesospore) and the evanescent outer wall derived from the original wall of the gametangium (epispore). Observed under scanning electron microscope, it reveals that the warted layer is first discernible as circular mounts in the young zygosporangium wall. The original gametangial wall is torn into membranous remnant adhering to the surface of the zygosporangium wall. As the zygosporangium comes to its final form, the warts become connate and having impressions running parallel to the long axis of the conical warts (Fig. 6, 7, 8). By rupturing the outer warted layer, the endospore surface reveals to be smooth (Fig. 7).

From scanning electron microscopic study on the zygosporangia of *G. butleri* (Fig. 5-8), it revealed that like many other mucoraceous fungi the whole wall structure of zygosporangia is composed with three layers: a ruptured epispore, a warted mesospore and a smooth endospore. The topography of endospores may be species specific. Preceding observation on *Mucor* revealed that there are two kinds of surface architecture of endospore: smooth and striated (O'Donnell, K.L., et al. 1978; Schipper, M. A. A., et al. 1975). In *Zygorhynchus* the endospores are all warted (O'Donnell, K.L., et al. 1978). The two species of *Rhizopus*, (i.e., *Rhizopus sexualis* and *Rhizopus stolonifer*) having been studied both possess endospores with projections (Hawker, L. E., et al. 1968; Ho, H.M. 1988). Although we prove the topography of *G. butleri* belongs the smooth-type, the similarity between two species of *Gongronella* needs further verification.

臺灣產卵孢球托黴(毛黴菌目)之形態觀察

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摘 要

1988年由臺灣北部與中部土壤中分離到一種毛黴菌目的卵孢球托黴 *Gongronella butleri* (Lendner) Peyronel & Dal Vesco, 以光學及掃描式電子顯微鏡觀察其形態特徵, 並證明本菌接合孢子內壁 (endospore) 是屬於光滑型。

LITERATURE CITED

- HESSELTINE, C. W. and J. J. ELLIS, 1964. The genus *Absidia*: *Gongronella* and cylindrical spored species of *Absidia*. *Mycologia* **56**: 568-601.
- HAWKER, L. E. and M. A. GOODAY, 1968. Development of the zygosporangium wall in *Rhizopus sexualis* (Smith) Callen. *J. gen. Microbiol.* **54**: 13-20.
- HO, H. M., 1988. The study of *Rhizopus stolonifer* isolated in Taiwan II. Morphological study of *Rhizopus stolonifer*: asexual apparatus and zygosporogenesis. *Trans. mycol. Soc. R.O.C.* **3**(1): 73-87.
- O'DONNELL, K. L., 1979. *Zygomycetes in culture*. Published and distributed by Department of Botany, University of Georgia, Athens, Georgia.
- _____, S. L. FLEGLER, J. J. ELLIS and C. W. HESSELTINE, 1978. The *Zygorhynchus* zygosporangium and zygosporangium. *Can. J. Bot.* **56**: 1061-1073.
- SCHIPPER, M. A. A., R. A. SAMSON and J. A. STALPERS, 1975. Zygosporangium ornamentation in the genera *Mucor* and *Zygorhynchus*. *Persoonia* **8**: 321-328.
- RIDGEWAY, R., 1912. *Color standards and color nomenclature*. Published by the author (Washington, D. C.). 43 pp.
- ZYCHA, H., R. SIEPMANN and G. LINNEMANN, 1969. *Mucorales*. Verlag von J. Cramer, Lehre, Germany. p. 87-89.