

Phialomyces fusiformis sp. nov. from soil in Singapore is identified and described

G. Delgado Rodriguez

Instituto de Ecología y Sistemática, Carretera de Varona Km 3.5, Capdevila, Boyeros, A.P. 8029, 10800 C. Habana, Cuba

Cony Decock¹

Mycothèque de l'Université catholique de Louvain (MBLA, MUCL²), Faculté des Sciences Agronomiques, Place Croix du Sud 3, 1348 Louvain-la-Neuve, Belgium

Abstract: *Phialomyces fusiformis* sp. nov., isolated from soil in Singapore, is described and illustrated. The species is similar to *P. macrosporus*-type species of the genus but differs in that it has longer, more ellipsoid-limoniform, fusiform and more coarsely ornamented conidia.

Key words: Hyphomycetes, *Penicillifer*, soil fungi, *Stachybotrys*, tropical Asia

INTRODUCTION

The genus *Phialomyces* was established by Misra and Talbot (1964) for a peculiar phialidic hyphomycete, *P. macrosporus* Misra & Talbot. The genus was characterized by large, sub-globose to broadly ellipsoid-fusoid, bi-apiculated, darkly pigmented and coarsely roughened conidia born in basipetal chains from ampulliform phialides arranged in a whorl of two or three at the apex of a long (up to 1 mm), hyaline conidiophore. Furthermore, the conidia in the chains are separated by a connective.

Two other species later were described in the genus: *Phialomyces taiwanensis* Matsush (Matsushima 1985) and *P. striatus* Castañeda & W. Gams (Castañeda and Gams 1991). Their placement in *Phialomyces* was justified by the verticillate disposition of the phialides and the pigmented, catenate conidia. However, they both differ from *P. macrosporus* in that they have much smaller conidia, striated in *P. striatus*, smooth and furthermore lacking connective in *P. taiwanensis*, a feature emphasized by Mercado et al (1998), who then excluded the latter species from

Phialomyces and transferred it to *Thysanophora* W.B. Kendr. (*T. taiwanensis* [Matsush.] Mercado et al).

During a study of leaf litter and soil mycobiota from Singapore, a typical *Phialomyces* species was isolated. It appeared to be similar to *P. macrosporus* in that it has identical phialides and the characteristic darkly pigmented, warted conidia forming long chains. However, after a closer comparison with the type of *P. macrosporus* (MUCL 9776), it was found to differ from the latter in conidial size, shape and ornamentation, and the roughness of the conidiophores. It therefore is described here as *Phialomyces fusiformis*.

MATERIAL AND METHODS

Cultures were grown on cornmeal agar (CMA) at 25 C, with a 12/12 h incident near ultra-violet light periodicity. Colors are described according to Kornerup & Wanscher (1981). Microscopic measurements were made in lacto-phenol cotton blue. In microscopic measurements, 5% of the ranges were excluded from each extreme and, when relevant, are given in parentheses. In the text, these abbreviations are used: \bar{x} = arithmetic mean; R = ratio of length/width of the conidia; \bar{x}_R = arithmetic mean of the ratio R. In preparation for scanning electron microscopy (SEM Phillips XL20), specimens were flash frozen (–212 C) in liquid nitrogen under vacuum for cryo-SEM (Oxford CT1500 cryo-system), transferred to the preparation chamber and then to the SEM chamber, where the frozen samples were sublimated (–80 C) to remove ice particles. Samples were sputter coated with gold in the preparation chamber for 75 s under 1.2 KV at –150 to –170 C. Specimens were viewed under 2–5 KV at –170 to –190 C.

DESCRIPTION

Phialomyces fusiformis Delgado et Decock, sp. nov.

FIGS. 1–15

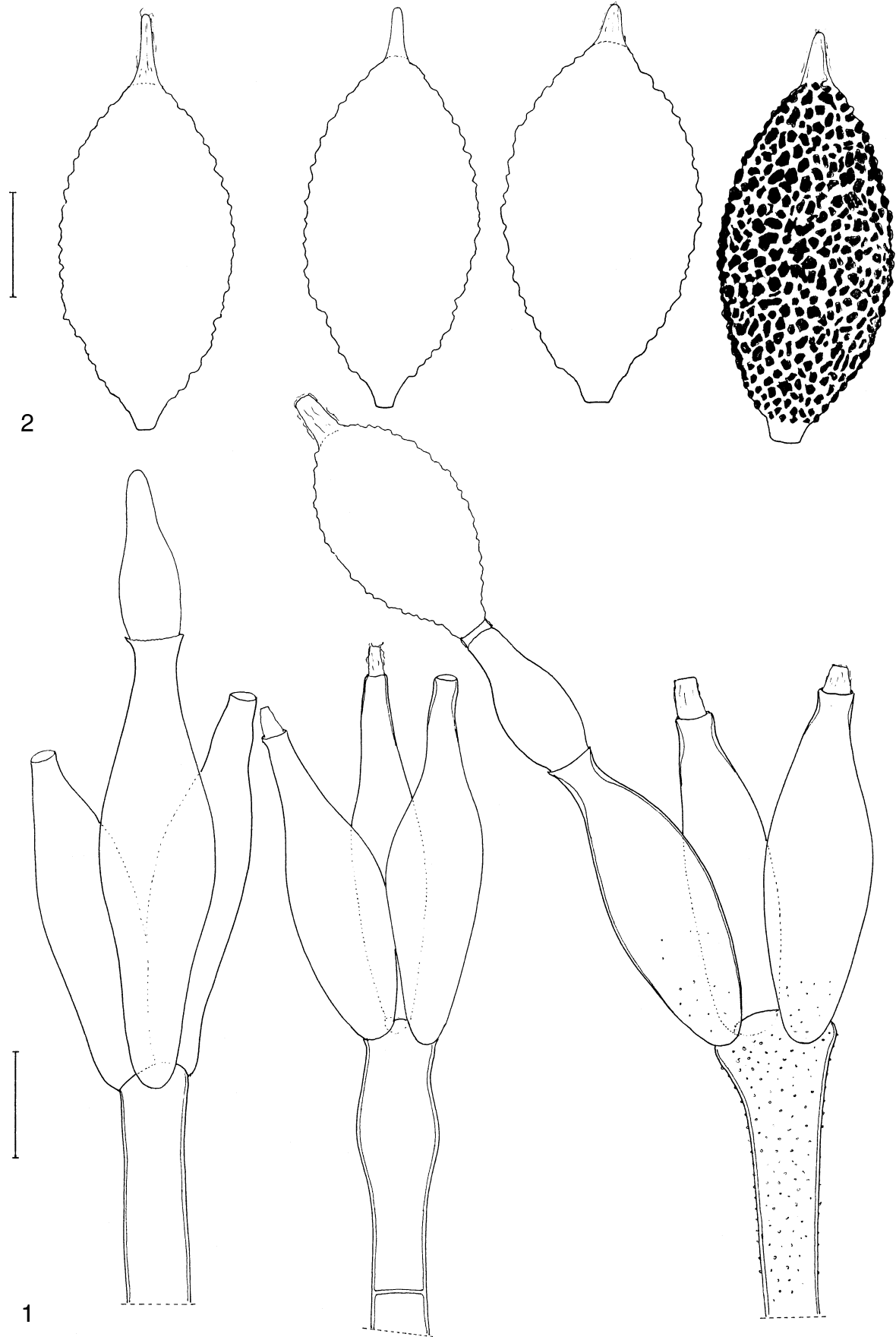
[Typo generis *Phialomyces macrosporus* Misra & Talbot affinis, sed conidiis ellipsoideis-limoniformibus, fusiformibus, magnis, ornamentioribus, (31–)33–44(–49) × (16–)17–21(–25) μm, \bar{x} = 37.5 × 19.0 μm, R = 1.6–2.2(–2.4), \bar{x}_R = 2.0, et conidiophoris verrucosis satis differt.]

Colonies on cornmeal agar reaching 30 mm diam in 7 d. *Mycelium* mainly immersed or superficial, hyaline. *Sporulation* starting from center after 3–4 d, then extending over colony, with abundant, erect conidiophores giving the colony a loose velutinous aspect, white at first changing progressively to grayish

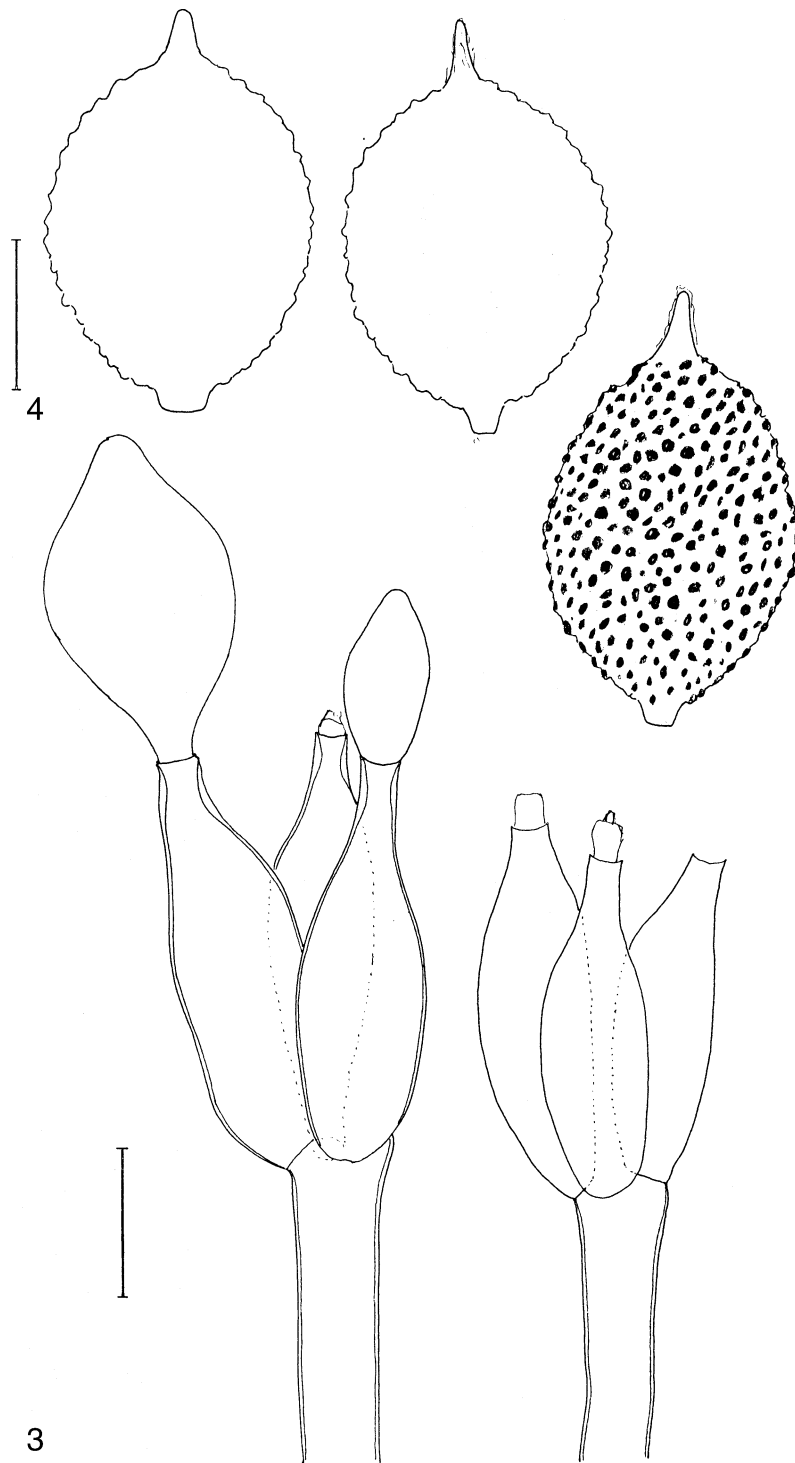
Accepted for publication November 20, 2002.

¹ Corresponding author. E-mail: decock@mbla.ucl.ac.be

² Part of the Belgian Coordinated Collections of Micro-organisms (BCCM).



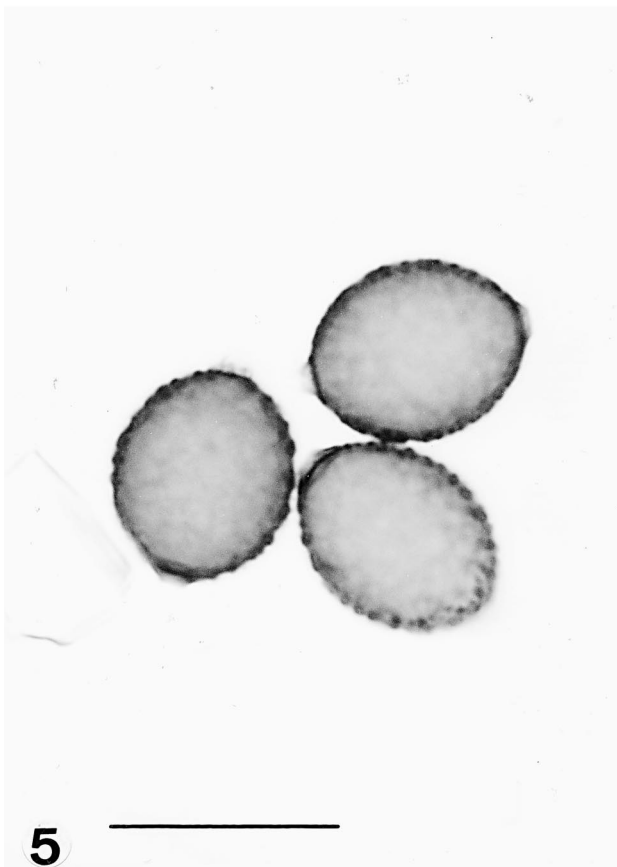
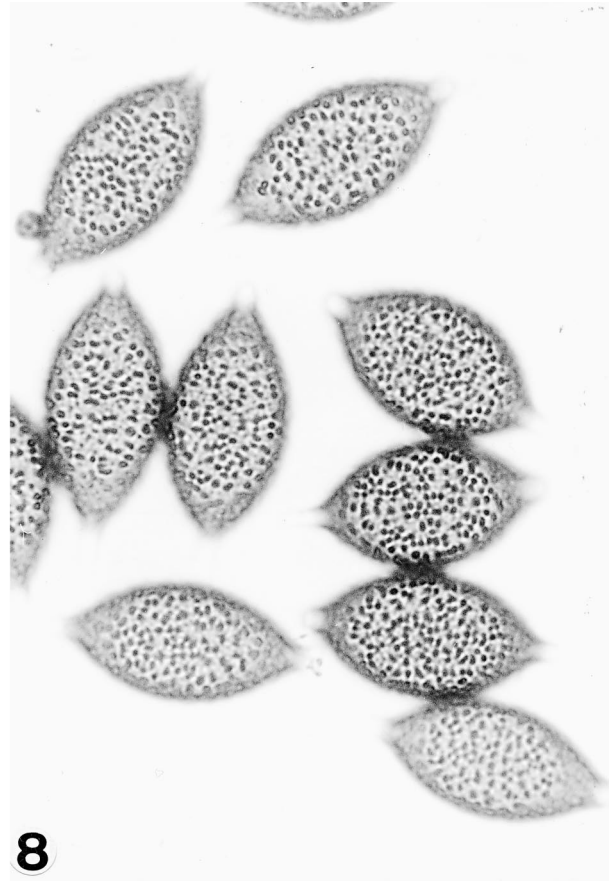
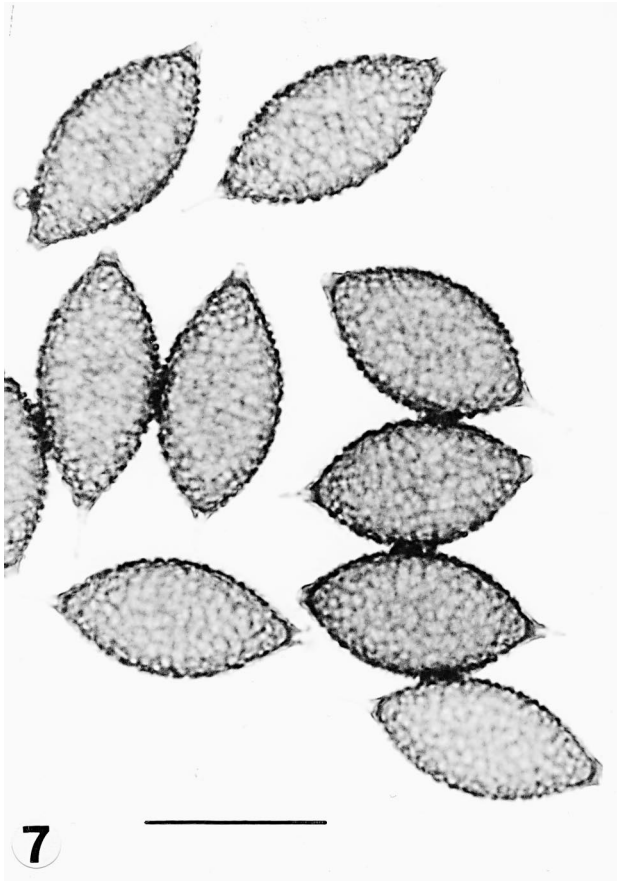
FIGS. 1-2. *Phialomyces fusiformis*. 1. Conidiophores and phialides. 2. Conidia (scale bar = 10 μ m).



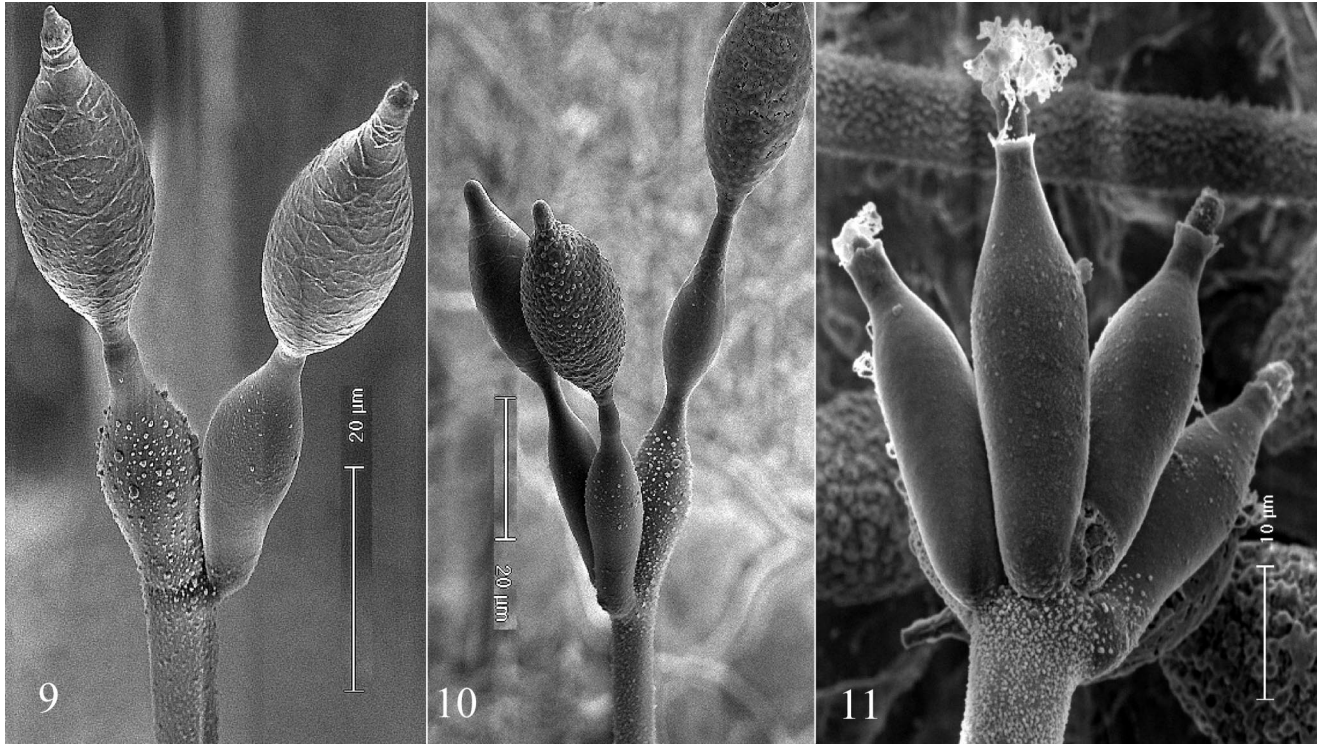
FIGS. 3–4. *Phialomyces macrosporus*, type (MUCL 9776). 3. Conidiophores and phialides. 4. Conidia (scale bar = 10 μm).

brown, then blackish (6(D–F)3) when conidia mature. *Conidiophores* macronematous, mononematous, erect, unbranched or rarely branched at the apex, thick-walled, septate, hyaline or faintly yellowish, smooth to verruculose, especially in upper third, up to 1.2 mm long, 4.0–6.0 μm wide, bearing commonly

a single apical cluster of 2–3(–5) verticillate conidiogenous cells, and occasionally a subapical cluster of 2–3 verticillate conidiogenous cells. *Conidiogenesis* enteroblastic. *Conidiogenous* cells monopialidic. *Phialides* discrete, determinate, lageniform-ampulliform, smooth to slightly verruculose at the basis, with a



FIGS. 5-8. 5. *Phialomyces macrosporus*, type (MUCL 9776) Conidia. 6-8. *Phialomyces fusiformis*. 6. Phialides and conidia. 7-8. Conidia. (scale bar = 25 μ m).



FIGS. 9–15. *Phialomyces fusiformis*. 9–11. Conidia and phialides. Scale bar on image. 12–15. Conidia at different stage of maturity. Scale bar on image. On FIG. 11, the white material at the top of the phialides represents remnants of cell wall mixed with ice that was not removed from sublimation.

short collar, thin- to slightly thick-walled, with a periclinal thickening at aperture resulting from successive conidial formation, hyaline to pale yellowish, $(28\text{--})30\text{--}40\text{--}(42) \times 8.00\text{--}10\text{--}(11.0) \mu\text{m}$, $\bar{x} = 35.4 \times 9.0 \mu\text{m}$, $2.5\text{--}4.0\text{--}(5.0) \mu\text{m}$ at the apex. *Conidia* ellipsoid to fusiform-limoniform, bi-apiculate, with a hyaline, truncate basis and a pointed apex, the latter often with a short, cylindrical remnant of connective, covered with remnant of cell wall, the wall smooth or faintly striated (under SEM) at first, covered with a thin (mucilaginous) membrane, then becoming progressively coarsely and densely verrucose when maturing, pale to dark olive brown to golden brown, nonseptate, $(31\text{--})33\text{--}44\text{--}(49) \times (16\text{--})17\text{--}21\text{--}(25) \mu\text{m}$, $\bar{x} = 37.5 \times 19.0 \mu\text{m}$, $R = 1.6\text{--}2.2\text{--}(2.4)$, $\bar{x}_R = 2.0$, in long (up to 40 conidia), dry chains, each conidia separated by a connective, as a short straight, narrow, short, cylindrical “rod” of unknown constitution, covered with remnant of cell wall.

HOLOTYPE. SINGAPORE: Mac Ritchie Reservoir, forest soil, collected by O. Laurence, isolated by G. Delgado Rodriguez, Feb 2002, MUCL 43747 (ISOTYPE SING).

Commentary. Two species so far are accepted in *Phialomyces*, *P. macrosporus* and *P. striatus*. *Phialomyces fusiformis* morphologically is close to *P. macrosporus*, from which it differs in having longer, ellipsoid-

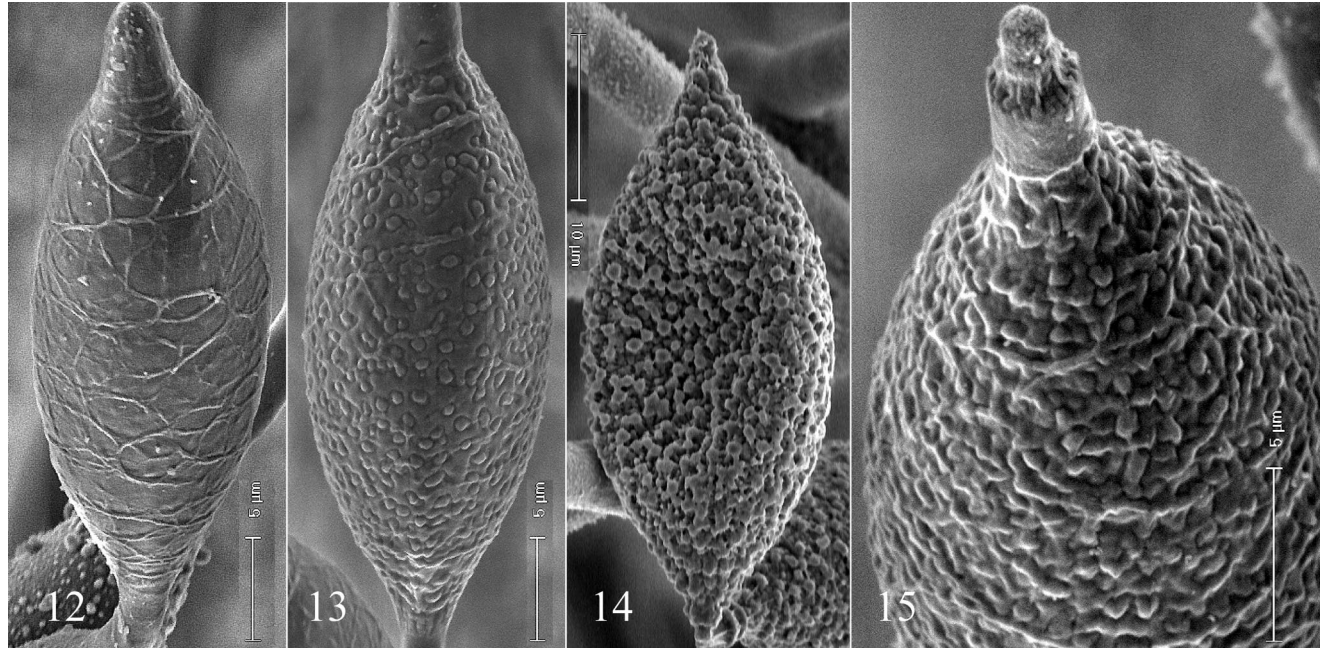
fusiform to limoniform, more coarsely ornamented conidia. Furthermore, the conidiophores and the bases of the phialides occasionally are slightly verrucose (FIGS. 9–11). In *P. macrosporus*, conidiophores and phialides are completely smooth.

The conidia in the type culture of *P. macrosporus* (MUCL 9776) are mainly subglobose to slightly ellipsoid, bi-apiculated (FIG. 4), $(18\text{--})20\text{--}25.3\text{--}(27) \times (14\text{--})15\text{--}19\text{--}(22) \mu\text{m}$ ($\bar{x} = 22.5 \times 16.0 \mu\text{m}$), with a ratio length/width (R) of 1.0–1.6 ($\bar{x}_R = 1.4$). Misra and Talbot (1964) and Ellis (1971) gave the measurements $20\text{--}26 \times 16\text{--}20 \mu\text{m}$ and $22\text{--}27 \times 16\text{--}20 \mu\text{m}$, respectively. The conidia in *P. fusiformis* are longer, mostly $33\text{--}44 \mu\text{m}$, averaging $37.5 \mu\text{m}$ long, with $R = 1.6\text{--}2.2\text{--}(2.4)$ ($\bar{x}_R = 2.0$).

Searching the literature for other reports of *P. macrosporus*, we found that Matsushima (1975) reported the species from soil in Japan. From his descriptions and illustrations, it appeared that his culture differs from *P. macrosporus* in that it has larger ($24\text{--}37 \times 18\text{--}22 \mu\text{m}$), more ellipsoid-limoniform, fusiform conidia and roughened conidiophores, which better would agree with *P. fusiformis*.

Phialomyces striatus differs from the two latter species in that it has more numerous and compacted phialides and smaller and striated conidia.

Within the other genera of Hyphomycetes, *Stachy-*



FIGS. 9–15. Continued

botrys theobromae Hansf. has somewhat similar, large (16–28 × 12–16 μm) and pigmented (dark green) conidia, occasionally verrucose, born from large phialides in a whorl of 3–5 (Jong and Davis 1976). *Penicillifer* van Emden, especially *P. japonicus* Matsush., also has large phialides with a conspicuous collarette born in clusters of 3–6, which resemble *Phialomyces* (Matsushima 1985). However, *S. theobromae* and *P. japonicus* differ in their conidial shape and the conidia mostly aggregating in a slimy drop. In the case of *P. japonicus*, conidia also may form chains but without connective (Matsushima 1985).

Key to the *Phialomyces* Species:

- 1a Conidia striated *P. striatus*
- 1b Conidia verruculose 2
- 2a Conidia mainly 20–26 μm long, always smaller than 30 μm, subglobose to slightly ellipsoid limoniform, bi-apiculated *P. macrosporus*
- 2b Conidia mainly longer or equal to 30 μm, up to 40 μm, ellipsoid-limoniform, fusiform, bi-apiculated *P. fusiformis*

ACKNOWLEDGMENTS

We wish to express our thanks to the National Parks Board of Singapore for having granted Mycosphere Ltd. research and collection permits for investigations of Singapore fungal diversity. Part of this work was done during a stay of G. Delgado Rodriguez at MUCL, financed by a grant from UNESCO-IUMS-MIRCEN-SGM. This work was partly financed by a sponsorship from Mycosphere Ltd., Singapore.

Prof. C. Evrard (BOTA, UCL) is sincerely thanked for his help with the Latin diagnosis. Cony Decock gratefully acknowledges the financial support received from the Belgian Federal Office for Scientific, Technical and Cultural Affairs (OSTC, Contract BCCM/MUCL C2/10/007) and thanks the directors of MUCL for the provision of facilities and continual encouragement. Gregorio Delgado Rodriguez also acknowledges the Cuban Ministry of Science, Technology and Environment for providing facilities and financial support.

LITERATURE CITED

Castañeda Ruiz RF, Gams W. 1991. A new species of *Phialomyces*. Mycotaxon 42:239–243.

Ellis MB. 1971. Dematiaceous hyphomycetes. Kew, Surrey, UK: Commonwealth Mycological Institute. 608 p.

Jong SC, Davis EE. 1976. Contribution to the knowledge of *Stachybotrys* and *Memnoniella* in culture. Mycotaxon 3: 409–485.

Kornerup A, Wanscher JH. 1981. Methuen handbook of color. 3rd ed. London: Methuen. 282 p.

Matsushima T. 1975. *Icones Microfungorum a Matsushima lectorum*, Kobe, Japan: 1–209, Plates 1–405.

———. 1985. *Matsushima Mycological Memoirs No. 4*. Matsushima Fungus Collect., Kobe, Japan: 1–68.

Mercado-Sierra A, Gené J, Figueras MJ, Rodriguez K, Guarro J. 1998. New or rare Hyphomycetes from Cuba. IX. Some species from Pinar del Rio. Mycotaxon 68:417–426.

Misra PC, Talbot PHB. 1964. *Phialomyces*, a new genus of the Hyphomycetes. Can J Bot 42:1287–1290.