Koichiro MIURA* & Mitsuyo Y. KUDO**: **Two new species of filamentous fungi from Japan**

三浦宏一郎*・工藤光代**: 日本産糸状菌類の2新種

The genus *Pyramidospora* was established by Nilsson (1962)[1], with *P. casuarinae* as the type species. This genus was characterized by the simple conidiophore with a single phialide and the multicellular phialoconidium "consisting of an aggregate of rounded or oblong cells more or less regularly arranged to form a ±pyramid-like structure". Another species, *P. densa*, was described by Alasoadura[2] in 1968. Both are aquatic fungi with aquatic conidia. Recently we found two undescribed fungi, apparently belonging to this genus, growing on submerged decaying leaves.

Pyramidospora fluminea Miura et Kudo, sp. nov. (Fig. 1)

Fungus aquaticus submersus, mycelio hyalino, septato, ramoso. Conidiophora singula, simplicia, hyalina, unam cellulam sporogenam cylindricam vel clavatam terminaliter efferentia. Conidia solitaria, terminalia, raro lateralia, ramosa, multicellulata, hyalina; axe centrale ellipsoideo, uniseptato, 16–23 μ longo, 7–13 μ lato in septo, 3–5 (plerumque 4) ramulos——1–3 (plerumque 2) per cellulam——oblique gerenti; ramulis hemisphaericis vel obtuso-conicis vel obtuso-cylindricis, continuis vel uniseptatis, 3.5–17 ($-20\ \mu$) longis, basi 5.7–13.0 μ latis.

Hab. in foliis putrescentibus decidurum dicotyledonearum plantarum in flumine submersis, Meguro, Tokyo (September 22, 1968, Miura no. 1054——type in TNS).

For a survey of aquatic Hyphomycetes, submerged decaying leaves of some deciduous plants were collected in a small stream in National Park for Nature Study, National Science Museum, Meguro, Tokyo in September 1968. The collected materials were brought into the laboratory and placed in Petri dishes partly filled with autoclaved tap water. Two days later, a fungus, obviously belonging to the genus *Pyramidospora*, was observed

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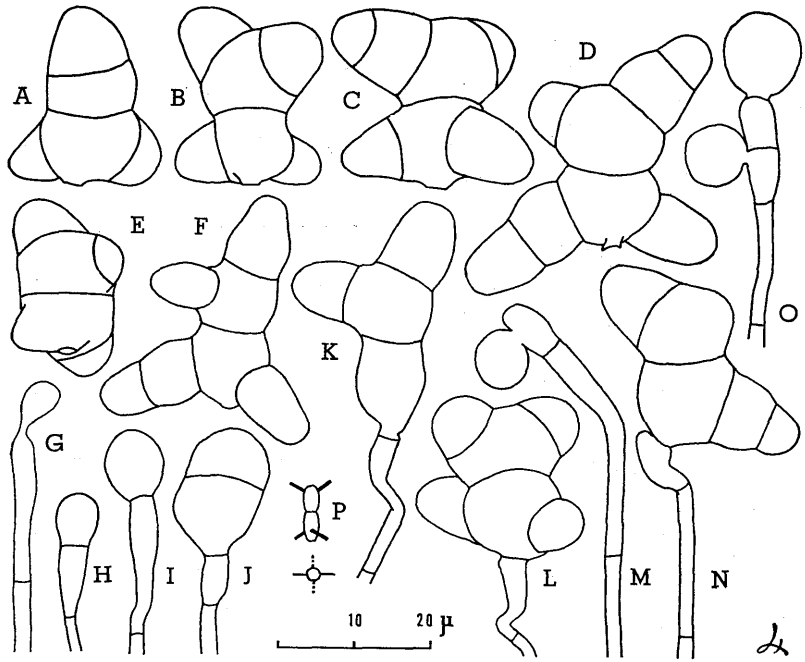

Fig. 1. *Pyramidospora fluminea*. A–F. Mature conidia. G. Spore-initial formed as a blown-out end of the sporogenous cell. H. Spore-initial formed as a swollen-up end of the sporogenous cell. I–L. Conidia at different stages of development. M–N. Laterally formed conidia. O. Conidiophore bearing two spore-initials. P. Schematic diagram of the conidium, side view (upper) and vertical view (lower).

growing and sporulating on marginal regions of the leaves, together with *Clavariopsis aquatica*, *Lunulospora curvula*, *Tetrachaetum elegans* and *Trisclephorus monosporus*. Many monospore-cultures were made by picking up single conidia with capillary pipettes and transferring them onto yeast extract-glucose agar (YGA) plates. This fungus grew slowly on YGA and on malt agar (MA), but on both solid media it failed to form conidia. Even when strips of these colonies were submerged in sterile water, conidium production did not occur. But, when the fungus was cultured on lignin-cellulose agar (LCA)[3] and a slice of the colony was placed in water, many conidiophores and conidia were produced.

The mycelial hyphae were hyaline, branched, septate and 1.4–3.5 μ wide.

The conidiophores were hyaline, usually simple with terminal solitary sporogenous cells, 20–100 μ long (including the sporogenous cells) and 1.4–2.2 μ wide. The sporogenous cells were cylindrical to clavate, 7–21 μ long and 2.8–4.5 μ broad at widest part, bearing single conidia. In development, the distal end of each sporogenous cell swelled up and this swelling, which was a spore-initial, was delimited from its parent sporogenous cell by a cross wall near the base. Less often, the sporogenous cell put out terminally or somewhat laterally a subspherical bud as a spore-initial; in this case, the swelling was clearly constricted at the base. Then, the spore-initial became ellipsoidal and was divided into two cells by a transverse septum, forming the central axis of the conidium. When the axis was fully grown, hemispherical processes appeared on both central cells successively; the processes on the upper central cell grew ascendingly and these on the lower one descendingly. The mature conidia were hyaline and multicellular, each consisting of a central axis and 3–5 (mostly 4) lateral outgrowths——1–3 (mostly 2) outgrowths per central cell. The central axis was two-celled, 16–23 μ long and 7–13 μ wide at the septum. The lateral outgrowths were unbranched, hemispherical or conical to cylindrical with bluntly rounded ends, 1- or 2-celled, 3.5–17 (−20) μ long and 5.7–13.0 μ wide at the base. In the vertical view of four-armed conidium, two outgrowths of the upper central cell and two of the lower one were arranged alternately around the central axis and were more or less at a right angle to each other (Fig. 1, P.). The detached conidia had single stump-like hila indicating the attachment points to their parent sporogenous cells. In our materials, the plurality of conidia was observed only once; the second conidium developed laterally and below the terminal one.

This fungus is clearly distinguished from the congeneric species in having four-armed conidia with wider central axes and lateral outgrowths.

Pyramidospora ramificata Miura, sp. nov. (Fig. 2)

Fungus aquaticus submersus, mycelio hyalino, septato, ramoso. Conidiophora singula, simplicia, hyalina, unam cellulam sporogenam terminaliter efferentia; cellula sporogena basibus cylindrica, apice aciculare. Conidia solitaria, terminalia, ramosa, multicellulata, 17–29 μ longa et lata, hyalina; axe centrale ellipsoideo, uniseptato, 13–18 μ longo, 5–8 μ lato, 6–7 ramulos——3–4 (plerumque 3) per cellulam——lateraliter vel oblique gerenti;

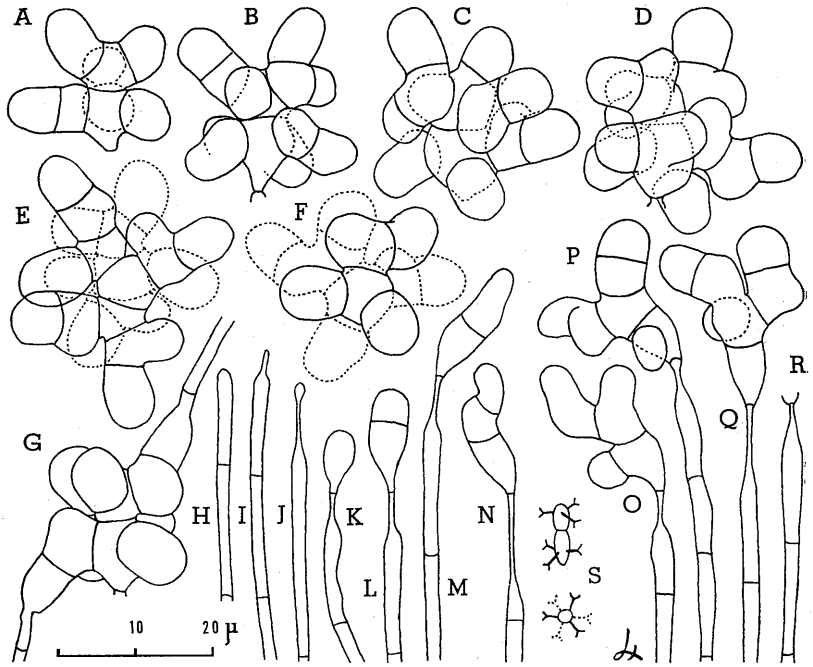

Fig. 2. *Pyramidospora ramificata*. A-F. Mature conidia; A-D, side view; E-F, vertical view. G. Germination of conidium. H-I. Young conidiophores. J-Q. Conidia at different stages of development. R. Conidiophore bearing a membranaceous collar. S. Schematic diagram of the conidium: side view (upper) and vertical view (lower).

ramulis simplice vel plus minusve sympodice ramificatis, continuis vel 1-2 (−4) septatis, basi 4.7-8.0 μ latis.

Hab. in foliis putrescentibus dicotyledonearum plantarum in flumine submersis prope Oki-kô, Haha-jima, Bonin Ins. (July 17, 1969, Miura no. 1086——type in TNS).

This fungus was found on submerged decaying leaves of some broad-leaved woody plants collected in a small stream near Oki-kô, Haha-jima Isl. and in the river Yatsuse-gawa, Chichi-jima Isl., the Bonin Islands, in July 1969. Pure cultures obtained from single spores were established on YGA and MA. This fungus grew slowly on both agar media, but spore formation failed to occur, even when strips of these colonies were transferred to water. But, when a strip of the colony grown on LCA was sub-

merged in water, many conidiophores and conidia developed.

The mycelial hyphae were hyaline, branched, septate and 1–3 μ wide. The conidiophores were hyaline, septate, usually simple with terminal solitary sporogenous cells, 40–130 (−180) μ long (including the sporogenous cells) and 1.4–2.2 μ wide. The sporogenous cells were cylindrical with terminal filamentous prolongations, 12–24 (−33) μ long (including the prolongations) and 2.0–3.0 μ broad at widest part. The apical prolongations were 2.3–8.3 (−11) × 0.5–0.7 μ in size. The conidium began its development at the end of the filamentous neck of the sporogenous cell as a minute swelling, which was delimited from the neck by a cross wall near the base. Then, the swelling became obovoid and was divided into two cells by a transverse septum, forming the central axis of the conidium. From both central cells, hemispherical processes arose laterally or obliquely, and successively, growing into lateral branches. The mature conidia were hyaline, pluriseptate and 17–29 μ in length and in width, each consisting of a central axis and 6–7 lateral branches——3–4 (mostly 3) per central cell. The central axis was ellipsoidal, two-celled, 13–18 μ long and 5–8 μ wide at the septum. The lateral branches were 1- -3-(-5-) celled, 0–2 (−3) times branched more or less sympodially and 4.7–8.0 μ wide at the base. In the vertical view of six-armed conidium, three branches of the upper central cell and three of the lower one were arranged more or less alternately around the circumference of the central axis (Fig. 2, S). The detached conidia had single stump-like hila indicating the attachment points to the sporogenous cells. Often a membranaceous collar was observed on the hilum. In some cases, a similar collar was seen at the end of the sporogenous cell which had liberated the conidium. The attachment point of the conidium to the sporogenous cell was so delicate that the origin of the collar and the mode of liberation of conidium were not ascertained even under the phase-contrast microscope.

This fungus is clearly distinguished from the congeneric species hitherto described in having branched lateral outgrowths on the conidia.

Discussion

As cited above, one of the main characteristics of *P. casuarinae* lies in its simple conidiophores with single phialides producing phialoconidia. On

the conidial apparatus of *P. densa*, Alasoadura described and figured similar structure. Our two fungi described here also produced unbranched conidiophores bearing single sporogenous cells. The sporogenous cells of our fungi, however, do not seem to be phialides, and the conidia seem to be other than phialoconidia. According to Hughes[4], the phialide is a cell "which develops one or more open ends from which a basipetal succession of conidia (phialospores) develops without an increase in length of the phialide itself". Nilsson made no mention of the plurality of conidia. Alasoadura, in spite of his interpretation of the conidia of *P. densa* as phialoconidia, stated in his Latin diagnosis, "Conidiophorum...., efferens *unam* sporam terminalem". As far as we observed, our fungi produced only one spore on each sporophore. The second conidium was observed in *P. fluminea* only once, but the second conidium was produced laterally and below the terminal one. We could not observe any conidia formed in basipetal succession in our materials. According to Alasoadura, "in spite of the shape of the cell which bears the conidium and notwithstanding Nilsson's description of the spore of the type species as a phialospore, Prof. C. T. Ingold had expressed doubts about the phialospore nature of the conidium". Although further studies are necessary for conclusion, *Pyramidospora* seems to us to be aleuriosporous.

For the recent taxonomy of imperfect fungi, especially of aquatic Hyphomycetes, the steps taken in conidium ontogeny is very meaningful. In *P. casuarinae*, the delimitation of conidium from the parent "phialide" is delayed until the maturation of conidium (Nilsson, 1962, Fig. 4). But, in *P. densa* and in both species described here, the conidium initials were delimited before the initials became two-celled. Excepting this point of difference, our fungi are very similar to *P. casuarinae* in the mode of conidium morphogenesis. Recently Marvanová & Marvan[5] collected *P. casuarinae* from Cuba. In their strain, they observed a distinct septum between the sporophore and the spore-primordium which was stil unicellular.

In the basic design of spore, our species agree well with the two species described earlier. Each conidium of these fungi consists of a two-celled central axis and several lateral outgrowths. Such a design of spore is reminiscent of that of *Stephanoma*[6] or *Arachnophora* (Fig. 3). Under the generic name *Stephanoma*, six species have been reported. Van Zinderen-

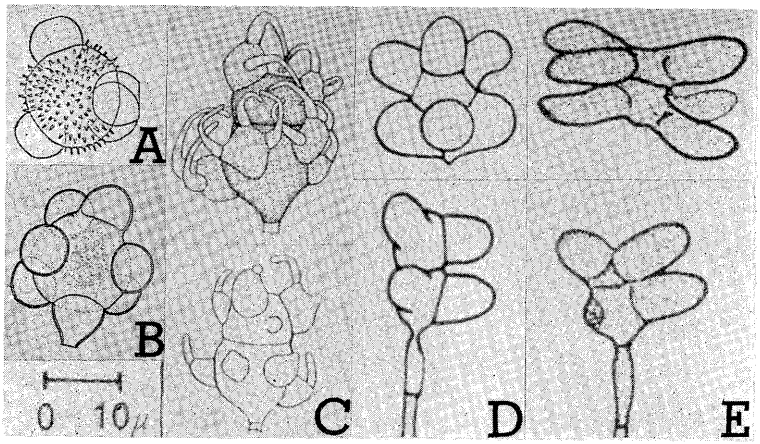

Fig. 3. Comparison of some fungi with resembling conidia. A. *Stephanoma tetracoccum* (van Zinderen-Bakker, 1934). B. *S. strigosum* (Tubaki, 1963, Fig. 6, A). C. *Arachnophora fagicola* (Hennebert, 1963, Fig. 1, C, D). D. *Pyramidospora casuarinae* (Nilsson, 1962, Fig. 4, a, b). E. *P. densa* (Alasoadura, Fig. 1, e, f).

Bakker[7], however, doubted whether *S. italicum*, *S. meliolae* and *S. negeri* were congeneric with *S. strigosum*[8], the type species of the genus. His opinion was supported by Butler & McCain[9]. Each conidium of the remaining three species consists of a single central cell with several satellite cells. *Arachnophora fagicola*[10] is more similar to *Pyramidospora* species in having the conidium consisting of a two-celled central axis and several lateral outgrowths. But, it is a dematiaceous fungus with annelloconidia, of which lateral outgrowths terminate in hook-like structures.

Although our fungi have conidia with septate lateral outgrowths, and though one of them forms more or less sympodially branched outgrowths, they may more preferably be placed in *Pyramidospora*, with some emendation of the genus.

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次の 2 種の菌類を新種として記載・報告すると共に，*Pyramidospora* 属について若干の検討を加えた。1) *Pyramidospora fluminea* Miura et Kudo (水生菌，不完全菌類)，2) *Pyramidospora ramificata* Miura (水生菌，不完全菌類)。

□Chow Cheng: **Formosan Native Rhododendrons** 17.5×9.5 cm, 26 頁，原色写真 16 図，1970。園芸業者のカタログであるが，台湾のツツジ・シャクナゲ類 17 種類の美事な原色写真に英語と日本語の解説がついている。現在，台湾からは 18 種類知られているので，殆んどの種類がのっている珍らしい出版物である。1 新種がのせてあるが，これは *R. transalpinum* Ohwi と思う。台中市立徳街 194，周鎮蘭園。(山崎　敬)

○植物シルエットの簡単な作製法 (渡辺邦秋)　Kuniaki Watanabe: A simple method of making plant silhouettes.

植物の葉や茎の形態を示す際に，黒い影絵，すなわちシルエットが，しばしば用いられている。この方法によると，複葉，多鋸歯葉の葉縁，托葉，分枝の様子などを適確に示すことができ，形態比較，形態変異を正しく表現することに利用できる。

Manton, I. (1950) は，シダ植物の種間および種内の葉形の相違をこの方法で示したが，その後，シダ植物に限らず，広く種分化の研究に，シルエットが用いられている。福田 (1968) は，ネガティブ写真から印画紙に焼付けしたものに墨入れし，これを減力することによって輪郭を表わす方法を報告している。この方法をシルエット作製に応用すると，縮尺または拡大を自由に調整できて便利であるが，少し煩雑なことはまぬがれえない。

筆者は，葉や茎の分枝の様子をシルエットによって，もっと簡単に正確に表現する方法として，複写用ネガポジ法を用いている。図は，この方法によって，ノヂギクの