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メタデータ	言語: English 出版者: 公開日: 2009-08-25 キーワード (Ja): キーワード (En): 作成者: ICHITANI, Takio, KINOSHITA, Tomio メールアドレス: 所属:
URL	https://doi.org/10.24729/00009278

Materials for Pythium Flora of Japan (III)
Pythium aristosporum* from rhizosphere soil of zoysia green

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(Received October 31, 1989)

Abstract

Several isolates of *Pythium aristosporum* Vanterpool were obtained from rhizosphere soil of a golf green. One of the isolates is described and illustrated, and its morphological peculiarities are discussed from a morphological point of view.

During the study on spring dead spot of manilagrass (*Zoysia matrella* Merr.), several isolates of *Pythium aristosporum* Vanterpool were obtained from rhizosphere soil of a golf green. The fungus was maintained on corn-meal agar (CMA) as described previously¹⁾ and in sterilized water.

P. aristosporum was found in Canada, being first isolated from diseased wheat roots but occurring only rarely since²⁾. In Japan, also, this species is not extensively encountered, but it was newly reported as a root rot pathogen from konnyaku (*Amorphophallus konjac* C. Koch)³⁾. Later, the fungus was detected in damped-off rice seedlings in nursery beds in Fukushima Prefecture in the north-eastern part of Japan (Ichitani, unpublished).

This paper deals with the description and illustration of the species, following the methods described previously^{1,4,5)}.

***Pythium aristosporum* (Plates I-V)**

A detailed description of this fungus is as follows.

Colonies on Bacto-CMA and -PDA submerged at the early stage of incubation, but dense mycelial mats with more aerial mycelium on the latter medium at the later stage (Plate I). Main hyphae up to 10.0 μ m wide. Mycelium soon becoming granular and septate. Sporangia consisting of inflated outgrowths, forming toruloid complexes of various sizes. Zoospores rarely formed; long, slender discharge tubes after successive transfer of infected grass blades into water at 23°C. Oogonia globose, mostly terminal on relatively long, but some short side branches, very rarely intercalary, 33–41 μ m, average 36 μ m diam., smooth, percentage abortion of oospores on CMA*** fairly high. Antheridia 2–6 per oogonium, originating at some distance from the oogonium, club-shaped, crook-necked, making apical contact with the oogonium, mostly declinous, rarely monoclinal,

* This work was partly supported by the Research Grant for fiscal 1989 of the Japan Plant Protection Association (Tokyo).

*** 20 g corn-meal sold in market as a chicken feed containing fish meal, 15 g agar, 1,000 ml distilled water.

born on one or several antheridial stalks. Oospores aplerotic or plerotic, 31–37 μ m, average 34 μ m diam., smaller after longer incubation periods. Wall up to 3.5 μ m thick, average 2.2 μ m. Thick wall frequently found in granulated oospores.

Cardinal temperatures: minimum 8°C, optimum 28°C, maximum 37°C. Daily mycelial growth on Bacto-CMA at 25°C 16 mm.

Description: based on UOP 379 (=IFO 32219)

Isolation: UOP 379 (= IFO 32219), on Bacto-CMA selectively⁶⁾, from rhizosphere soil of zoysia green, Ritto-cho, Shiga Prefecture, March 15, 1989, by Ichitani.

Host range: examined preliminarily with the isolate UOP 379 (= IFO 32219). This isolate was pathogenic on aerial parts of manilagrass and creeping bentgrass, but failed to infect seedlings of onion, carrot, radish and petsai. Extensive studies have been done on *P. aristosporum* causing root rot of konnyaku. The fungus can be isolated from threeseed mercury (*Acalypha virginica* L.) and common purslane (*Portulaca oleracea* L.) growing in naturally infested konnyaku fields as well as from cabbages left over in these fields. Following artificial inoculation of 29 crops in 13 families, root rot was noted in konnyaku and taro, and poor germination in cucumber and tomato. Post emergence damping-off was noted in cucumber, watermelon and tomato. Water-soaked decay of the rootlets was observed in 21 crops in 10 families, including cucumber, eggplant, etc.⁷⁾.

Rare peculiarities are the presence of a buldge in the oospore wall and two malformed oospores within one oogonium, one oospore usually very small and sometimes appearing as a disorganized lump of crushed protoplasm (Plate II-18, V-53 (arrow)). The collapsed oogonial wall with adhering antheridia persists for a considerable time after the oospore have matured. Hyphal swellings⁹⁾ up to 36 μ m are rarely present, germinating by one or more germ tubes (Plates II-19, 20; V-54, 55). Lobulations develop on grass blades in water, but are rare on CMA, and germinate by several tubes (Plates II-7, III-32 (arrow)).

P. aristosporum is similar to *P. pyriformis*, but differs in not producing pyriform sporangia and in having dark brown oospores. It also resembles *P. volutum*, but differs in having plerotic oospores (about 50%) and in the antheridial branches not wrapping the oogonial stalk. Though close to *P. arrhenomanes*, it has fewer antheridia. *P. aristosporum* also resembles *P. graminicola*, but has more and declinuous antheridia as well as larger oogonia. All these major key characters should be used to separate such a closely related species^{2,8,9)}.

Although differing slightly in such characters as mycelium creamy in color, a few monoclinal antheridia, plerotic oospores (about 50%), and predominant degeneration of oospores (more than 50%), the fungus may be identified as *P. aristosporum*, considering the similarity of the other main characters²⁾.

Since this isolate proved to be pathogenic (more than 30% disease severity at 15°C and 100% at 25°C) on Japanese lawngrass (*Zoysia japonica* Stud.) and creeping bentgrass (*Agrostis palustris* Huds.) (Tani, T., Tanpo, H. and Miyagawa, T., personal communication), this fungus may cause diseases in turf.

Acknowledgements— The authors are indebted to Prof. T. Inouye of the Univ. of Osaka Pref. and Dr. D.J. Stamps, formerly of the CAB International Mycological Inst., Kew, UK, for critical reading of the manuscript. The authors are also grateful to Prof. T. Tani and Mr. H. Tanpo of Kagawa Univ. for offering valuable information on the diseases of zoysia greens.

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Explanation of Plates

Plate I Growth habit of *P. aristosporum* UOP 379 on Bacto-CMA (left) and Bacto-PDA (right) incubated at 25°C for 3 weeks.

Plates II–V Morphology of *P. aristosporum* UOP 379.

21–26: Mycelia. 1, 27: Sporangium. 2, 28: Vesicle. 3, 29: Discharge tube. 4, 30: Empty zoosporangium. 5, 31, 56: Encysted zoospore. 6, 57: Germinating zoospores near the autoclaved leaf segments of turfgrass. 7, 32: Germinating (arrow) sporangia. 8, 33–35: Young oogonia and antheridia. 9, 36–39: Oogonia and antheridia. 10, 11, 40: Plerotic oospore. 12, 13, 41–43: Aplerotic oospores. 14–16, 44–51: Oospores with degenerated oospheres. 17, 52: Malformed oospore (or 2 oospores within 1 oogonium?). 18, 53: Two oospores within one oogonium, one oospore (arrow) very small. 19, 20, 54, 55: Germinating hyphal swellings. 58–61: Propagules in leaf tissues of turfgrass (58, 59: hyphae extending through cell membrane, 60: sporangia, 61: oospore). Bars (20µm) below fig. 19 and fig. 20 are applicable to figs. 1–7, 9, 18, 19 and 8, 10–17, 20, respectively. Bar (80µm) on fig. 21 is to fig. 22. Bar (40µm) on fig. 23 is to figs. 27–30, 32, 34, 36, 37, 53, 54, 56, 57 and 61. Bar (20µm) on fig. 24 is to the rest of figures on plates III–V.

Plate I

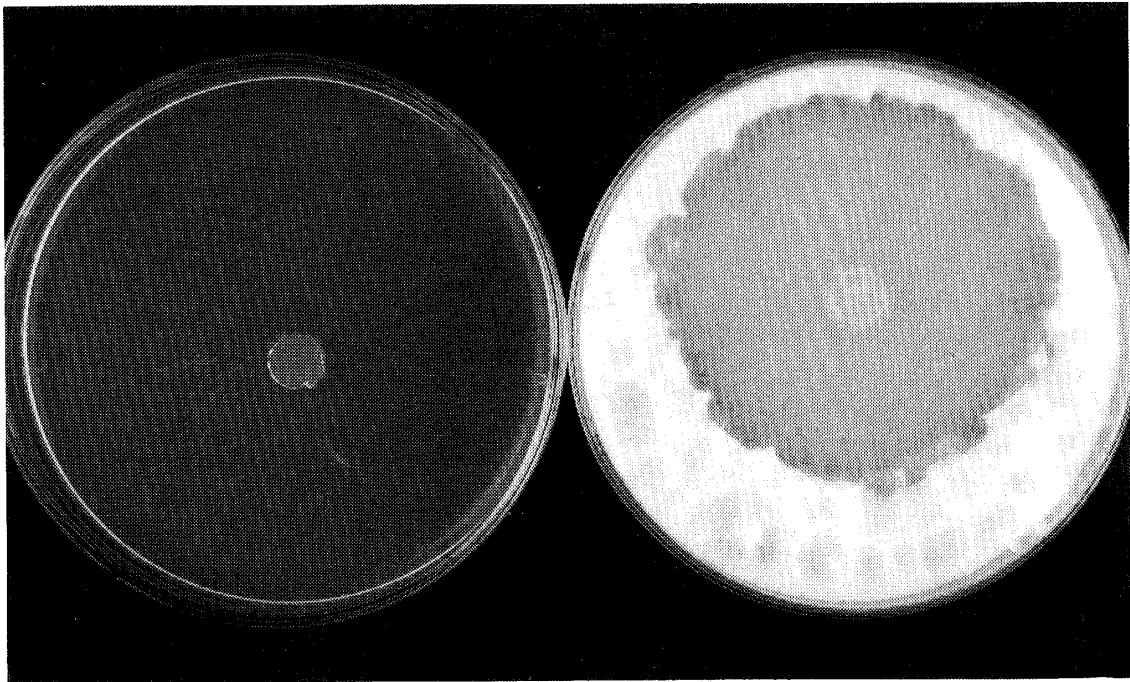


Plate II

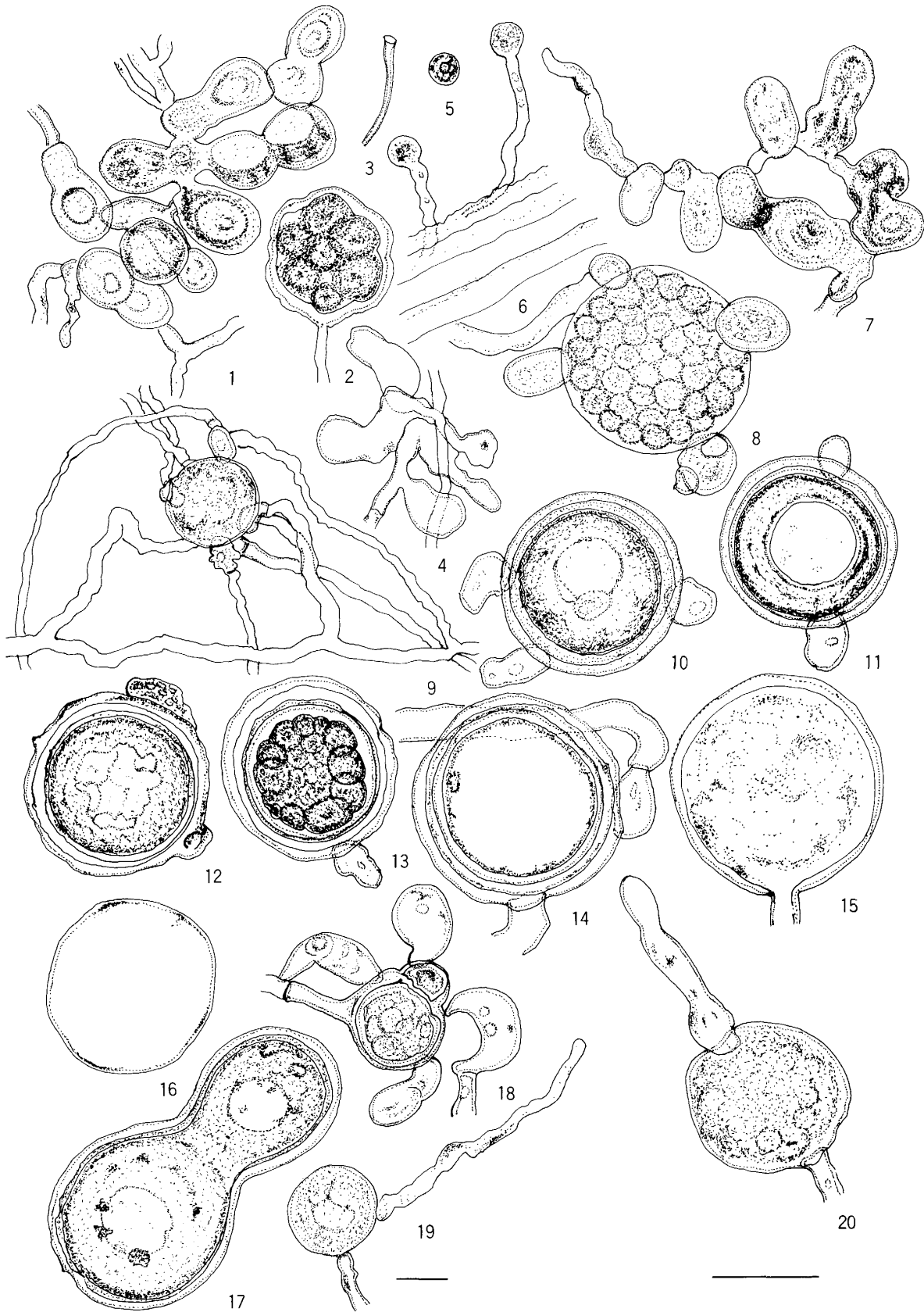


Plate III

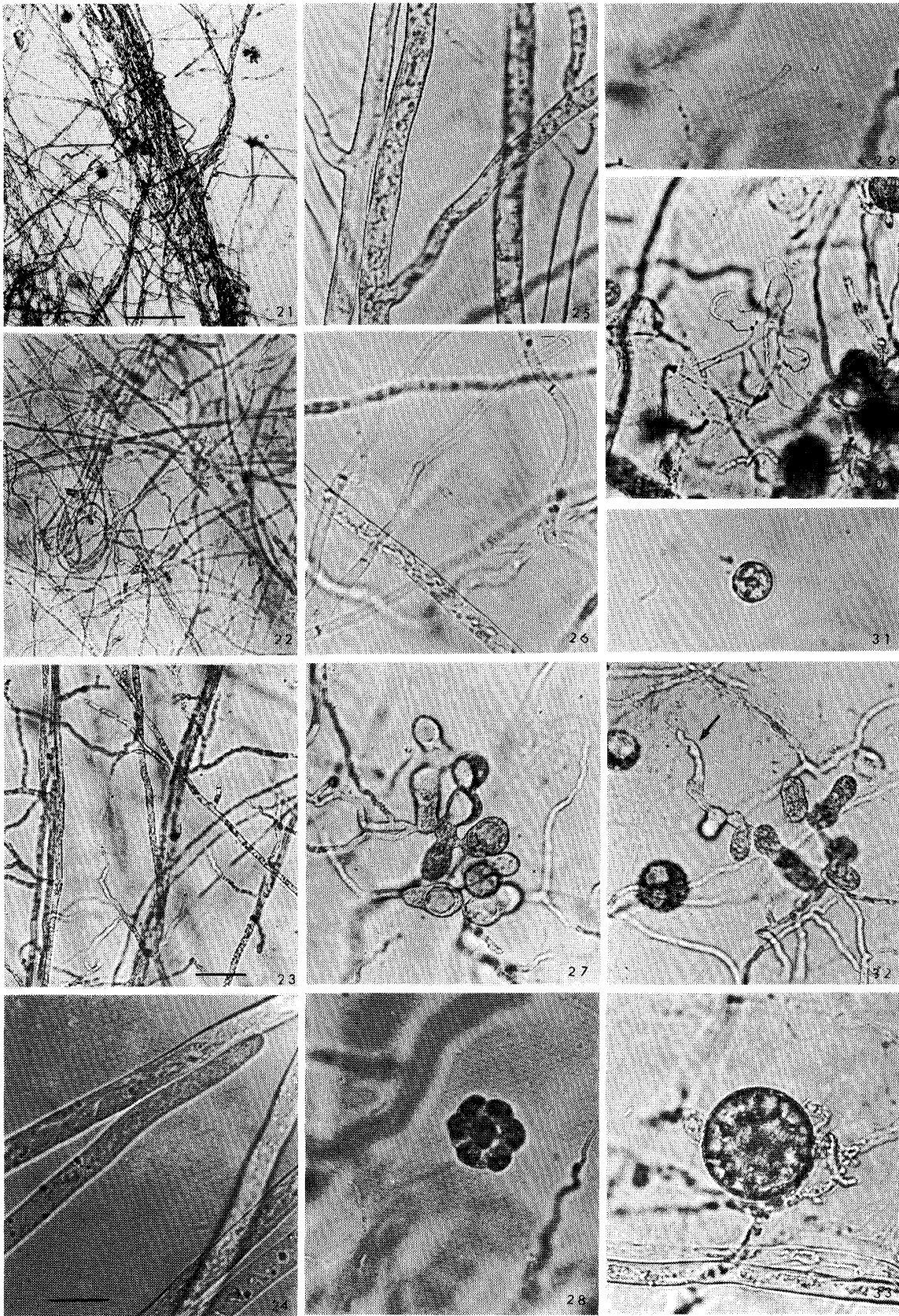


Plate IV

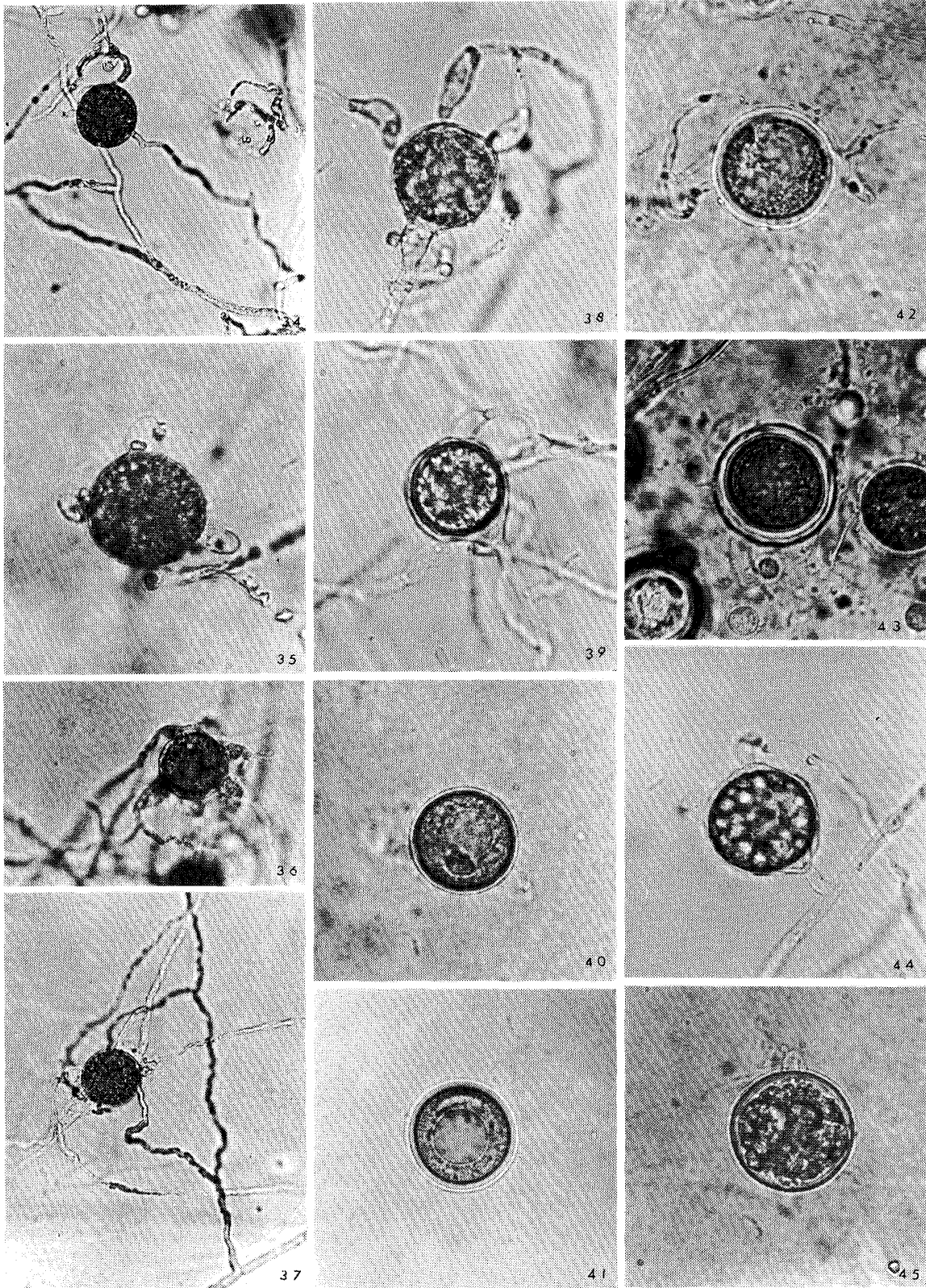


Plate V

