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Plant-pathogenic Py thium irregulare

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Materials for Pythium Flora of Japan (I)
Plant-pathogenic *Pythium irregulare*

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Abstract

Several isolates of *Pythium irregulare* Buisman obtained as a pathogen from diseased roots of edible burdock and stems of onion are described and illustrated.

The isolates of *Pythium irregulare* employed were identified and noted elsewhere as being newly recorded in Japan^{1, 2)}. Host range studies were performed using several isolates^{3, 4)}. The fungus was maintained at 15-22°C and subcultured every 12 months on CMA (20 g corn meal*, 15 g agar, 1,000 ml distilled water). This paper deals with a more detailed description and drawings of the representative two isolates, following the method reported previously⁵⁾.

Pythium irregulare causing root rot of edible burdock (Plates I-IV)

In the 1950s, root rot was found on edible burdock (*Arctium lappa* L.) in various parts of Japan. In 1961, Tomiku *et al.* identified the genus of the causal fungus and named this new disease as a root rot in 1964⁶⁾. Later, the identification of the species was made¹⁾. A detailed description of this fungus is as follows.

Main hyphae up to 7.5 µm wide. Sporangia globose, 8.8-25.0 µm, terminal and intercalary, easily producing zoospores, not proliferating internally. Hyphal swellings globose, obovate, limoniform or irregular in shape, terminal and intercalary, up to 25 µm, easily germinating by germ tube(s). Oogonia globose, frequently oval, intercalary, rarely terminal, 13.8-23.8 µm, average 18.4 µm, smooth, frequently with blunt projections varying in length and numbers (mostly 1-6). Antheridia 1-2, rarely 3 per oogonium, monoclinal, usually long stalked and originating at some distance from the oogonium, sometimes diclinal. Antheridial cells club shaped, making apical contact with the oogonium. Oospores spherical, commonly aplerotic, 11.3-18.8 µm, average 15.7 µm, wall thin.

Cardinal temperatures: minimum 5°C, optimum 28°C, maximum 34°C. Daily mycelial growth rate on Bacto-CMA at 25°C 25.0 mm.

Description: based on UOP 177 (=Py No.5, IFO 30346).

Isolation: on CMA, from diseased burdock (Akaguki-shirohada Sakigake Gobo) root tissues collected at Turuzaki, Oita City, Oita Prefecture, November 12, 1970, by T. Tomiku.

* Sold in market as a chicken feed containing fish meal.

Host range : examined using isolate (Py No.5)⁴⁾.

Three more isolates [UOP 176 (=Py No.1), UOP 324 (=Py No.12), UOP 326 (=Py No.11)] obtained from edible burdock roots are considered to be identical to *P. irregulare* (UOP 177). But the identification of the species of the former two isolates has so far been unsuccessful since they lost the ability to reproduce oospores after isolation⁷⁾.

Pythium irregulare causing damping-off of onion (Plates I, V)

In the early 1980s, damping-off of onion (*Allium cepa* L.) seedlings was commonly seen in onion-growing areas in Saga Prefecture and *Pythium* sp. (20.1 %), together with *Fusarium* spp. (56.9 %), *Rhizoctonia* sp. (6.9 %) and unidentified miscellaneous fungi (16.1 %), was isolated from the browned shoots³⁾. The *Pythium* sp. was tested for pathogenicity and identified as *P. irregulare*^{2, 3)}. Detailed morphology of this fungus is as follows.

Main hyphae up to 8.6 μm wide. Sporangia globose, 10.0 - 22.5 μm , intercalary and terminal, commonly not producing zoospores and not proliferating internally. Hyphal swellings oval, limoniform or irregular in shape, up to 23.0 μm in diam., not germinating by germ tubes. Oogonia globose, terminal, sometimes intercalary, 14.1 - 21.3 μm , average 17.6 μm , smooth, frequently with blunt, straight, sometimes curved-digitate single projections. Antheridia 1-2, rarely 3, monoclinal. Antheridial cells club shaped, making apical contact with the oogonium. Oospores spherical, commonly aplerotic, 11.7 - 18.8 μm , average 15.4 μm , wall thin.

Cardinal temperatures : minimum about 4°C, optimum 23-25°C, maximum above 35°C. Daily mycelial growth rate on Bacto-CMA at 25°C 46.5 mm.

Description: based on UOP 362 (=1-2, IFO 32073).

Isolation: on plain agar, from diseased onion (Satsuki) stem tissues collected at Fukudomi-cho, Saga Prefecture, November, 1983, by K. Tanaka.

Host range: examined using two isolates (F-3, K-2)³⁾.

One more isolate (4-1) obtained as a pathogen from diseased onion (Satsuki) stems was examined and considered to be identical to *P. irregulare* (UOP 362)²⁾. This disease suddenly declined in 1985 to unimportance and no serious damping-off has been found since then. In the United States, *P. irregulare* was isolated from seeds and seedlings previously sown in soil collected from commercial onion and lettuce fields, and was shown to be pathogenic to onion seedlings⁸⁾. However, Tanaka *et al.*²⁾ directly isolated the pathogen from diseased stems in the field.

Recently, we described *P. irregulare* UOP 359 (= No.861, IFO 32072) causing root rot of tulip [*Tulipa gesneriana* L. (Red Queen)] [Ichitani, T. *et al.* (1988). *Ann. Phytopath. Soc. Japan* 54 (3) (*Abstr. in Japanese*) *In press*] and this fungus was noted as being newly recorded in the world.

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Explanation of Plates

Plate I Growth habit of two isolates of *P. irregulare*

1 : UOP 177 (left) and UOP 362 (right) on Bacto-CMA. 2 : UOP 177 (left) and UOP 362 (right) on Bacto-PDA.

Plates II-V Morphology of two isolates of *P. irregulare*

Plates II-IV : Isolate (UOP 177). Plate V : Isolate (UOP 362). 3, 31, 32 : Discharge of zoospores. 4-6, 33, 52, 53 : Sporangia. 7-19, 34-43, 54-67 : Oogonia and antheridia. 20, 21, 44-46, 68 : Mature oospores. 22-26, 47-49, 69-78 : Hyphal swellings. 27, 50 : Germinating hyphal swellings. 51 : Oospores and hyphal swellings. 28-30 : Mycelia.

All bars represent about 20 μ m. Bars on the figs. 31 and 34 are applicable to the figs. 33, 37, 38, 45 and 35, 36, 39-44, 46-50, respectively.

Plate I

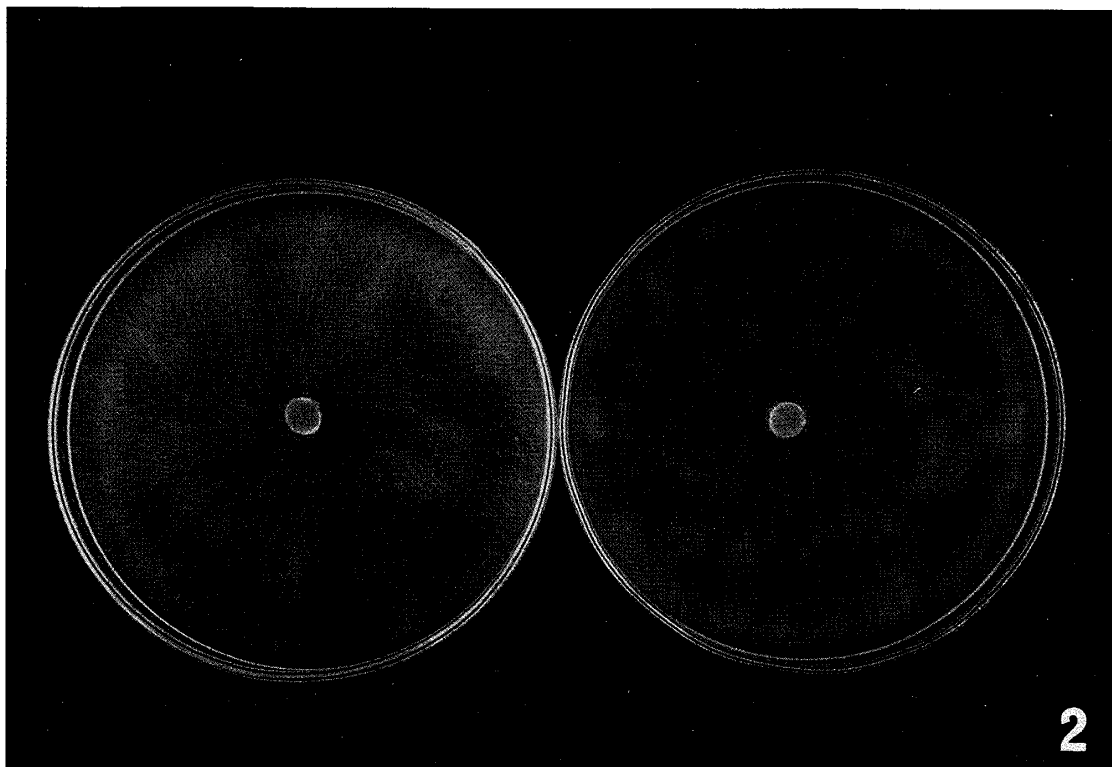
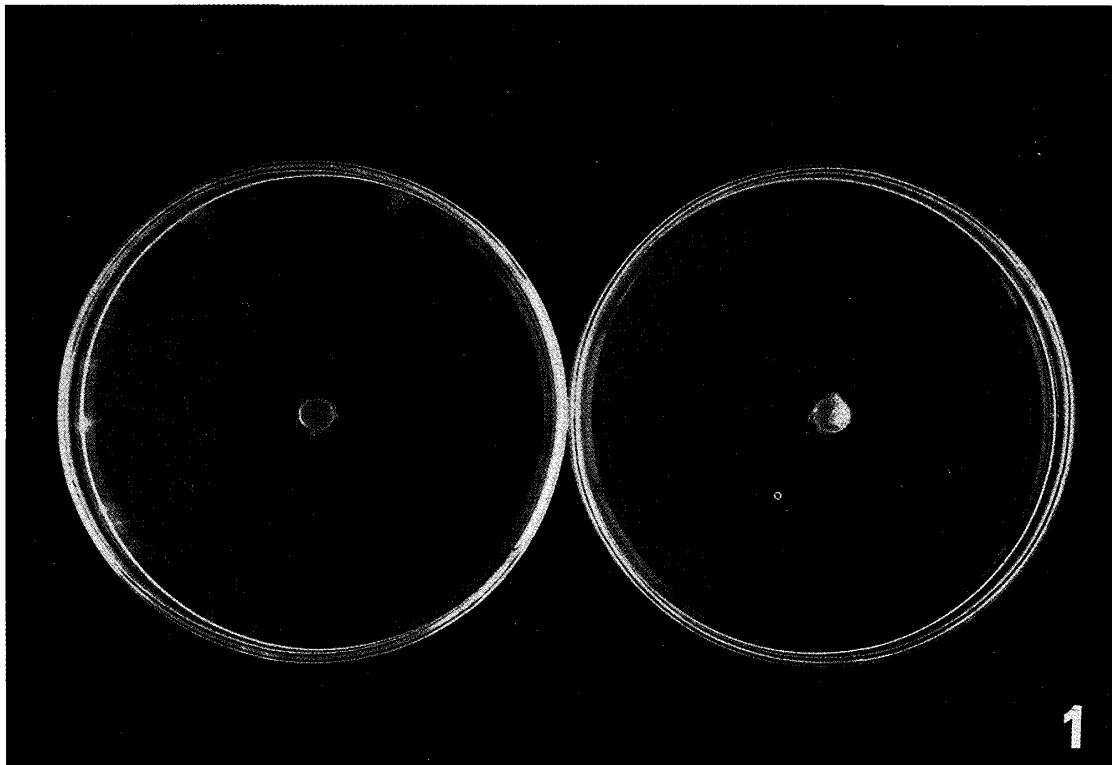


Plate II

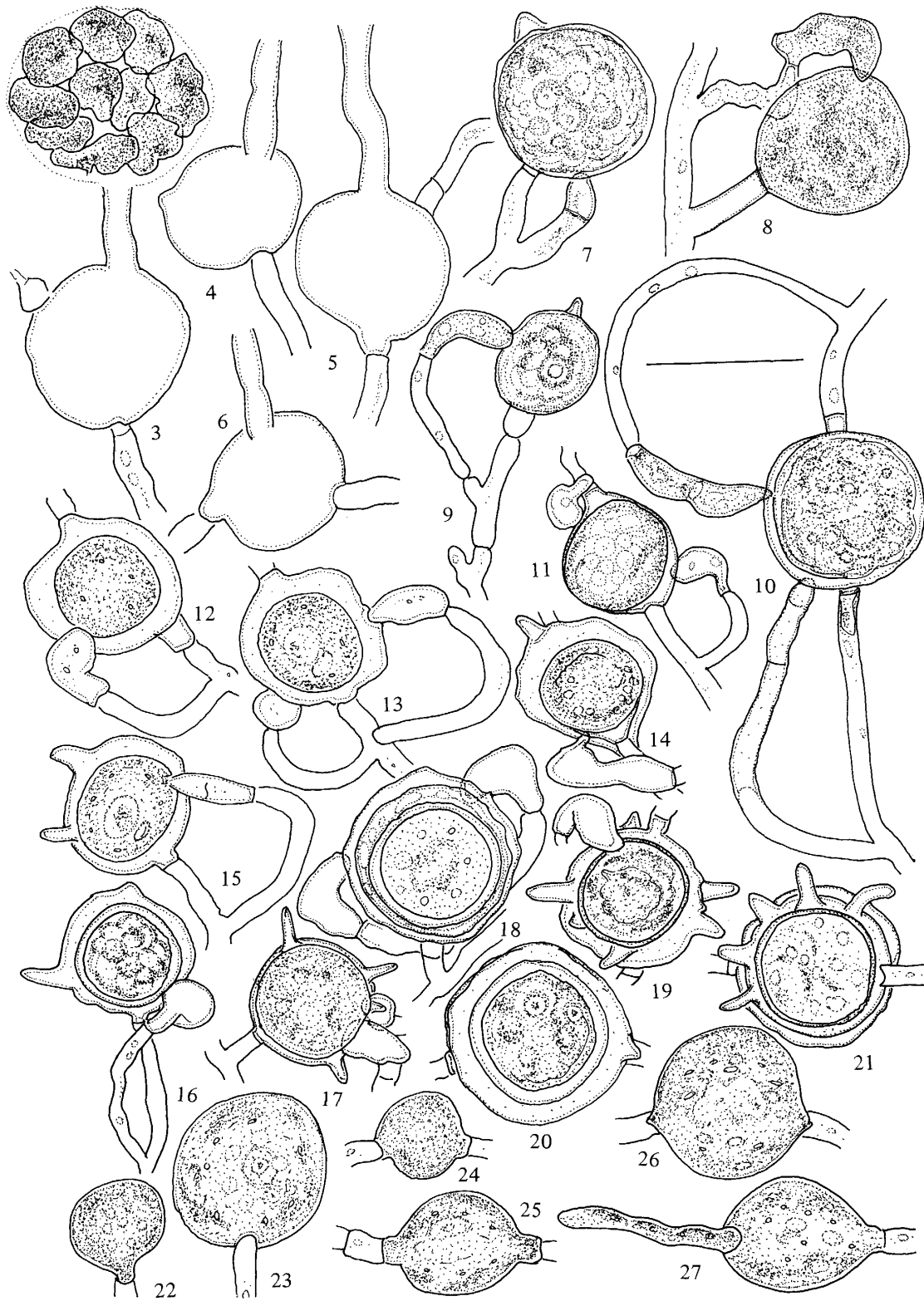


Plate III

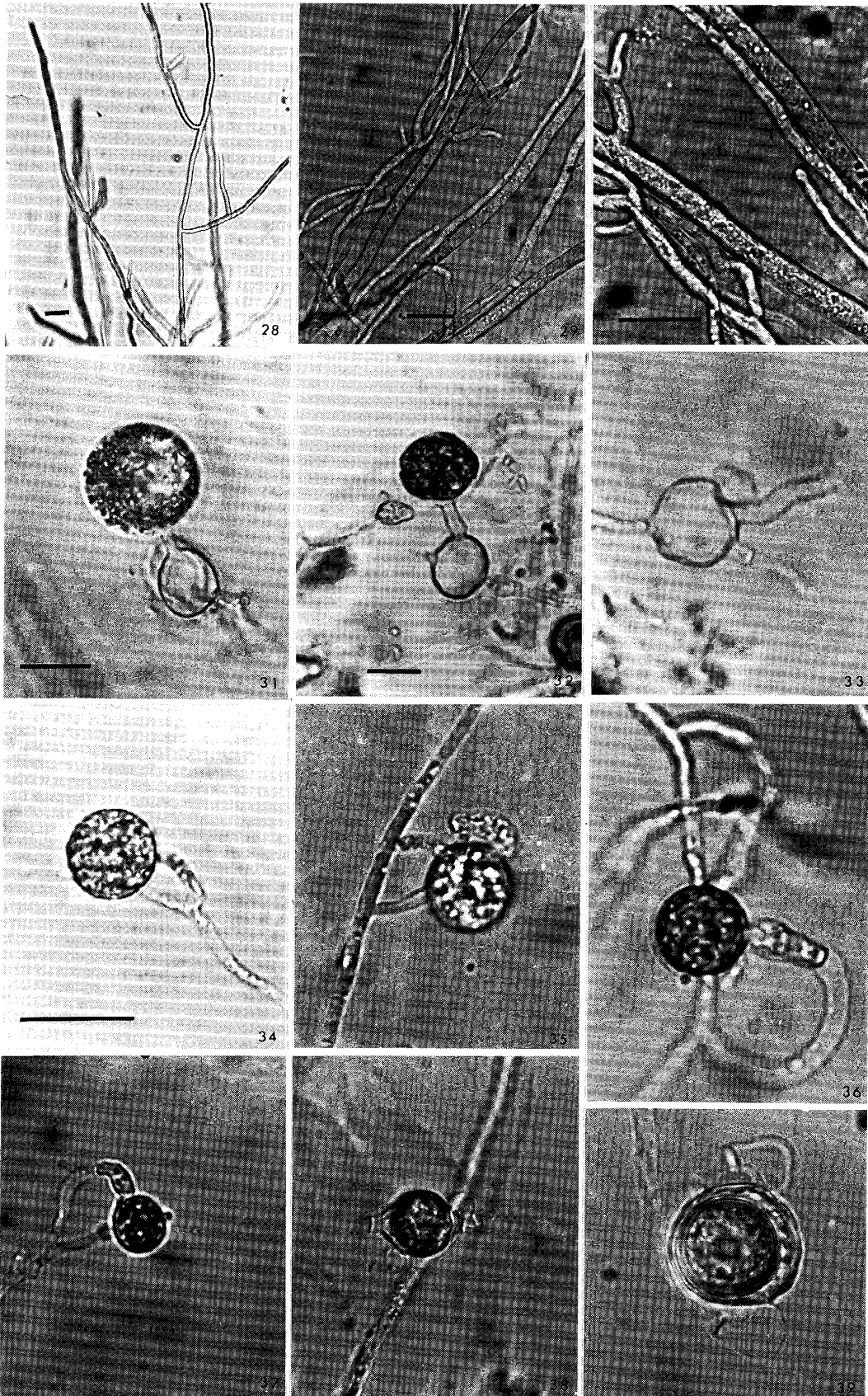


Plate IV

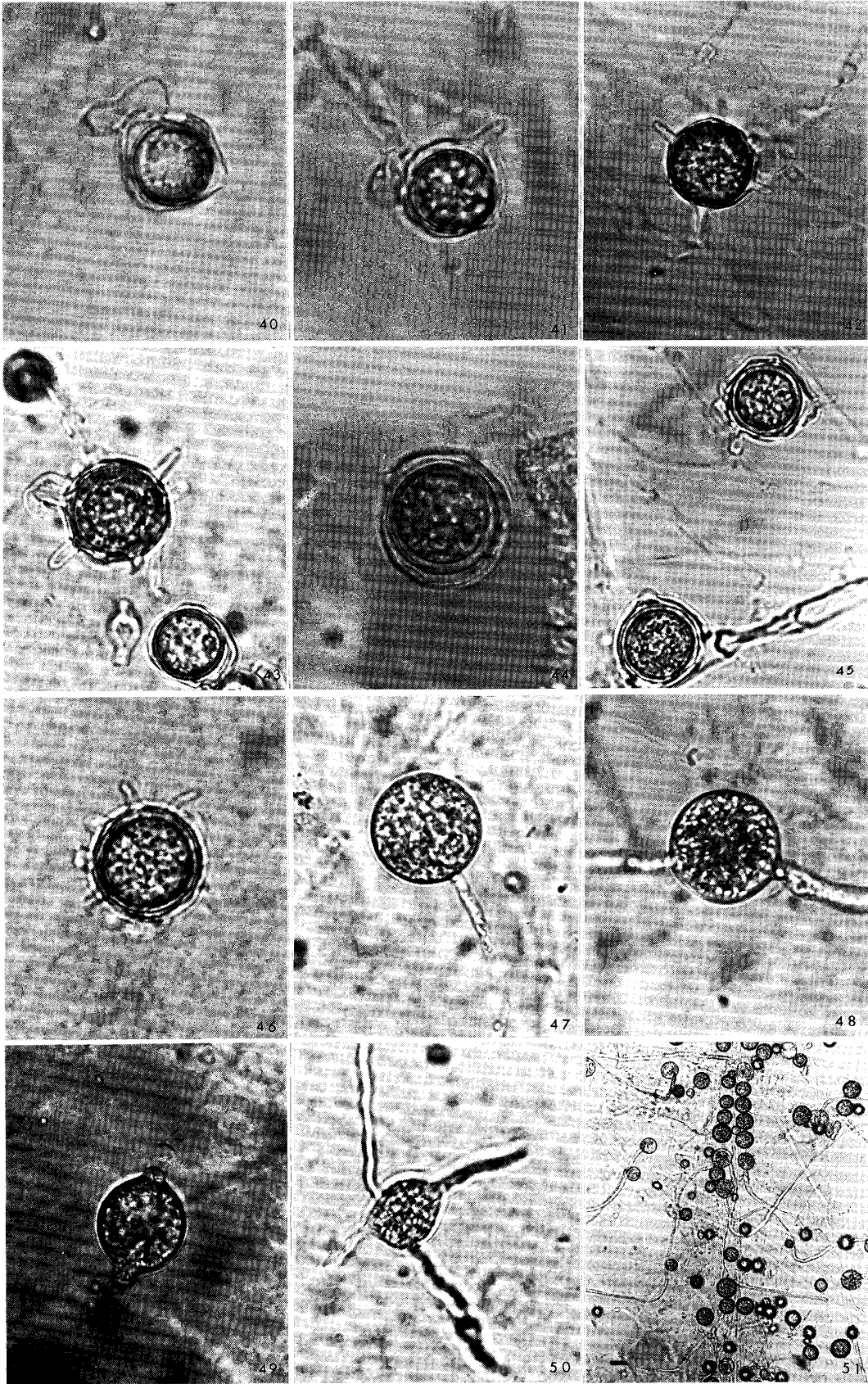


Plate V

