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# A new aquatic species of *Pythium* from Algeria with filamentous sporangia and thick walled oospores

BERNARD PAUL

## RÉSUMÉ

PAUL, B. (1990). Une nouvelle espèce aquatique de *Pythium* d'Algérie à sporanges filamenteux et oospores à paroi très épaisse. *Candollea* 45: 575-579. En anglais, résumés français et anglais.

Une nouvelle espèce de *Pythium* est signalée en Algérie. Il s'agit de *Pythium cryptogynum*, isolé à partir des eaux douces dans le nord-ouest algérien. Le champignon produit des sporanges filamenteux non-enflés, des oogones, et des oospores possédant une paroi très épaisse. Les structures sexuelles sont produites sur graines de chanvres dans l'eau ou sur des milieux gélosés additionnés de stérols.

## ABSTRACT

PAUL, B. (1990). A new aquatic species of *Pythium* from Algeria with filamentous sporangia and thick walled oospores. *Candollea* 45: 575-579. In English, French and English abstracts.

*Pythium cryptogynum* spec. nov. is described and illustrated from water samples collected in north-western Algeria. The essential characteristics of this fungus are the presence of catenulate oogonia which are usually surrounded and infested by antheridia, and its thick walled oospores. These are produced in water on hemp-seeds and on solid media that are supplemented by sterols.

## Introduction

*Pythium cryptogynum* was isolated thrice from fresh water reservoirs in Tlemçen in north-western Algeria.

This species belongs to the group of *Pythium* that produce a filamentous, non-inflated type of zoosporangia. In this group PLAATS-NITERINK (1981) has included 17 species; ALI-SHTAYEH & DICK (1985) included two new species that they described from England: *P. lutarium* and *P. pachycaule*; PAUL (1987, 1988) added two more: *P. capillosum* and *P. capillosum* var. *helicoides* from Algeria.

*P. cryptogynum* was isolated together with other members belonging to the same group. Most of these fungi were unable to produce sexual structures on solid media, while others produced them only on hemp-seeds in water. An attempt is being undertaken to induce the sexual reproduction by adding different kinds of sterols. *P. cryptogynum* was first to respond to  $\beta$ -sitosterol.

The species is characterized by its filamentous, non-inflated or slightly inflated type of sporangia, large catenulate oogonia which are completely surrounded and hidden by one to many antheridia before fertilization, its thick walled oospores and at times multisporeous oogonia.

*Derivation.* — The specific epithet refers to the oogonia completely hidden by antheridial branches.

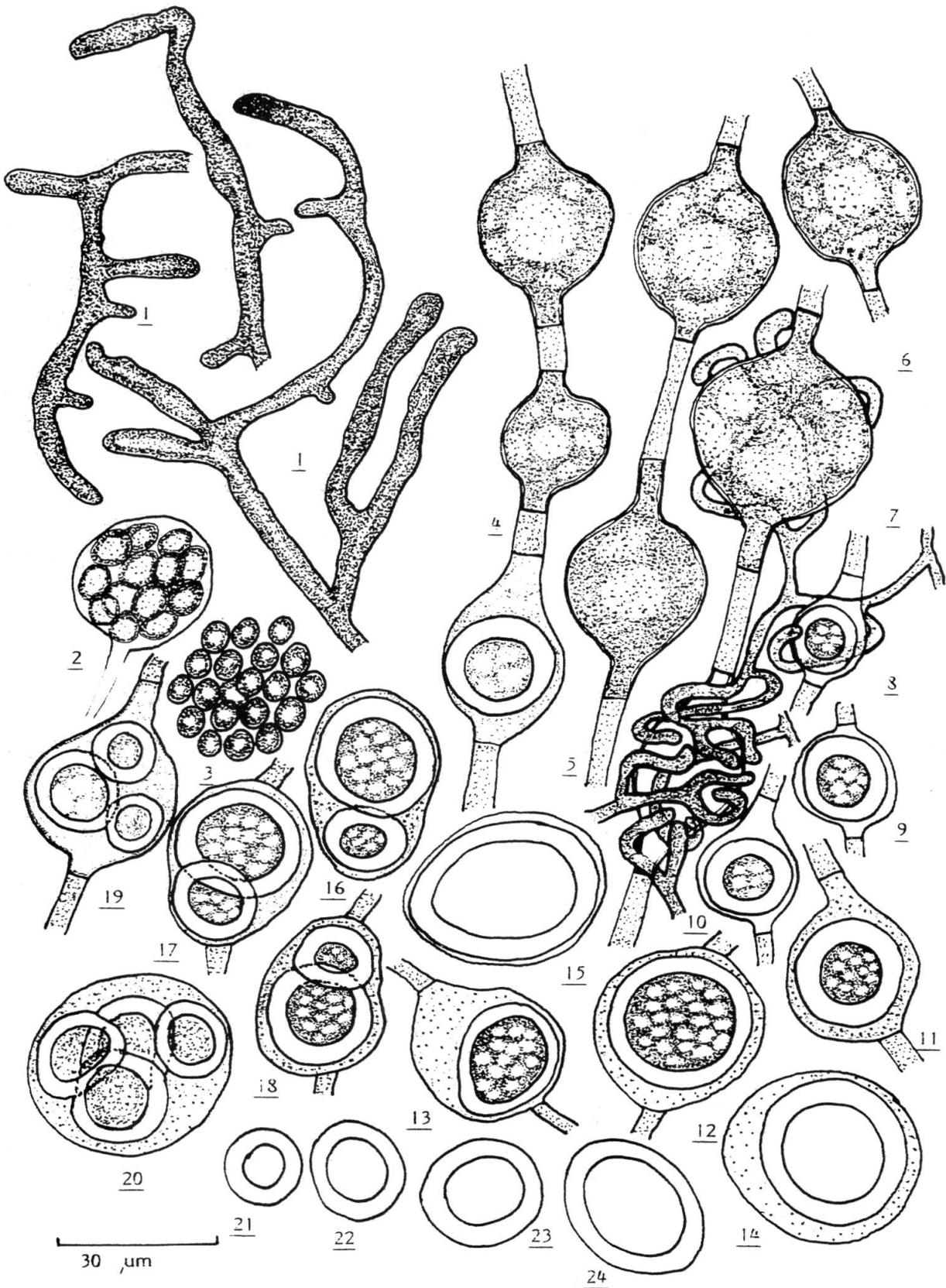


Plate 1. — 1, filamentous, non inflated sporangia; 2, sporangial vesicle, 3-encysted zoospores; 4-5, catenulate oogonia; 6, intercalary oogonia; 7-8, oogonia with antheridia; 9-15, oogonia with a single oospore; 16-18, oogonia with two oospores; 19-20, oogonia with multiple oospores; 21-24, thick walled oospores.

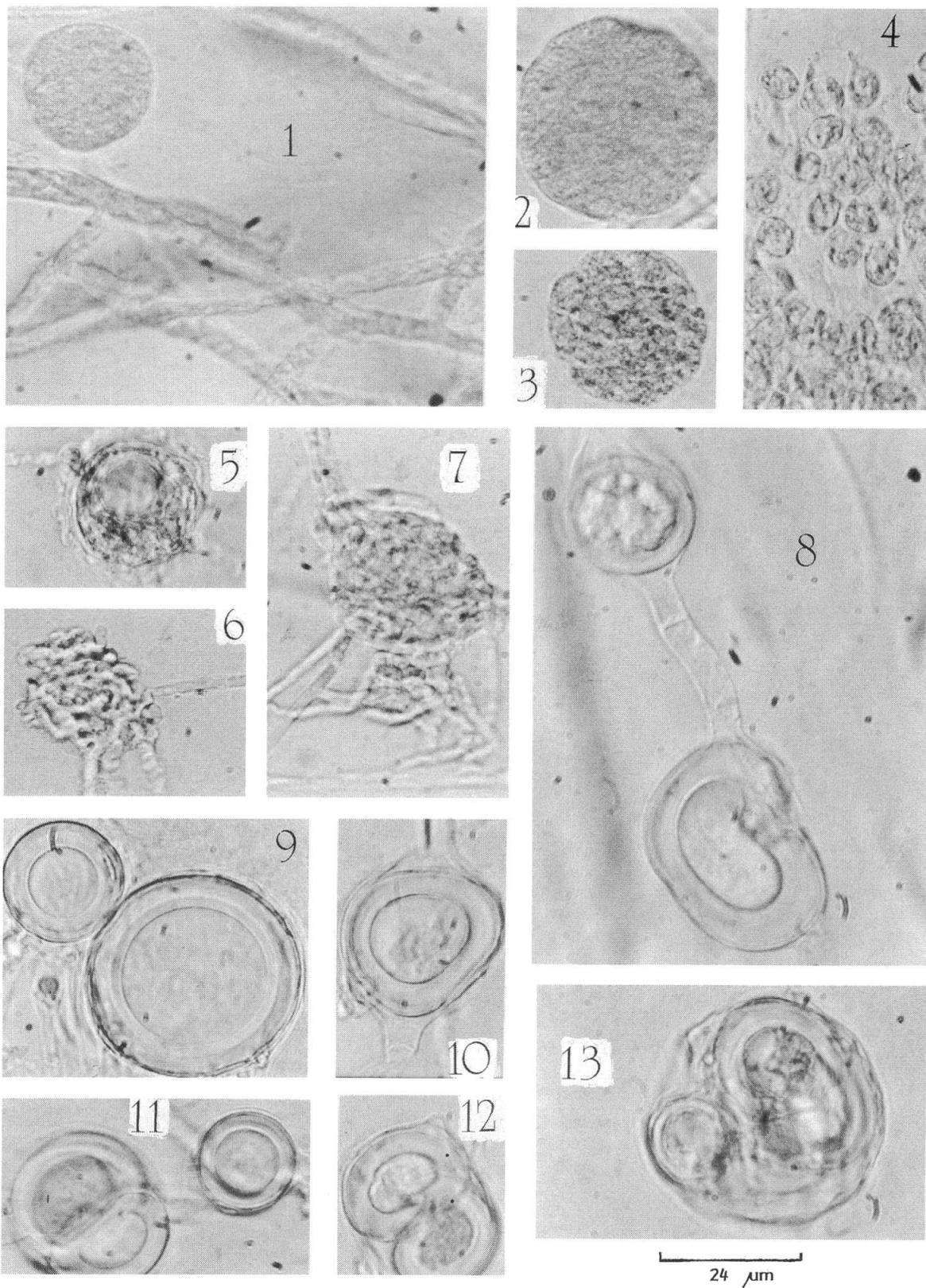


Plate 2. — 1, Filamentous non-inflated sporangia; 2-3, sporangial vesicles; 4, encysted zoospores; 5-7, oogonia with antheridia; 8, catenulate oogonia; 9-10, oogonia containing thick walled oospores; 11-13, oogonia containing multiple oospores.

### Materials and methods

Water samples were taken from small water reservoirs found in the Tlemçen region. Fungi were isolated from these by using the usual baiting technique described elsewhere (PAUL, 1986a, b). The cultures were purified by using simple techniques (PAUL, 1986b, c). Pure cultures were maintained on corn meal agar (CMA), potato carrot agar (PCA) and on boiled hemp-seed halves in water.

To induce sexual reproduction,  $\beta$  sitosterol was used. As this substance is insoluble in water, 20 mg of this sterol was dissolved in 10 ml of 95% ethanol by heating the solution gently. When a clear solution was obtained, it was poured into 1 litre PCA and autoclaved.

The identification of the fungus was done with the help of keys provided by MIDDLETON (1943), WATERHOUSE (1967) and PLAATSNITERINK (1981).

### Observations and results

*Pythium cryptogynum* grows well on PCA and CMA plates as well as on hemp-seed halves in water, but it produces sexual structures only on the latter. These structures are borne on the hyphae in close proximity to the hemp-seeds. The PCA and CMA plates were subjected to various temperatures, but no oogonia or oospores were produced. On the contrary, on PCA enriched with  $\beta$  sitosterol the fungus produced sexual structures plentifully from 3rd day onwards at 20°C, and within 15 days the plate was full of them.

#### ***Pythium cryptogynum* Paul, spec. nov. (Pl. 1, 11).**

Hyphae hyalinae ramificatae, 5-7  $\mu$ m diam. Sporangia filamentosa, non dilata, terminalia; zoosporae oriuntur inter 10-25°C, zoosporae incapsulatae usque ad 8  $\mu$ m diam. Oogonia globosa, subglobosa, interdum ovoidea, intercalaria, saepe catenata, 13.5-42  $\mu$ m diam., antheridia monoclina vel diclina, interdum intercalaria aut complectentia oogonium. Oogonia continentia unam, vel duas, vel plurimes oosporas pleroticas vel apleroticas, 12-39  $\mu$ m diam., globosas, interdum ovoideas, 2-6  $\mu$ m crassi tunicatas. Incrementum radiale quotidianum 9 mm 25°C in agaro Solani tuberosi et Dauci carotae.

Holotypus in herbario universitatis Oranensis conservatus (BF-26).

The mycelium of *P. cryptogynum* is well branched and hyaline. The fungus grows well on hemp-seeds in water and on the usual solid media. The average radial daily growth of the fungus on PCA at 25°C is 9 mm, producing a narrow chrysanthemum pattern. On both the solid media (PCA and CMA) the mycelium is submerged. The cardinal temperatures for growth are: minimum 2°, optimum 20-25°, maximum 35°C.

The main hyphae are up to 7  $\mu$ m in width. Sporangia are produced in abundance on hemp-seeds in water. These are of filamentous non-inflated or slightly inflated type. Zoospores are formed between 10-25°C. Most of the encysted zoospore are about 7.5-8  $\mu$ m in diameter.

Oogonia, antheridia, and oospores are formed on PCA supplemented with  $\beta$  sitosterol. Oogonia are mostly spherical, at times oval and rarely cylindrical to somewhat irregular. These are mostly catenulate, sometimes terminal; on PCA with sterol, quite a number of empty oogonia are also formed; the diameter of the spherical oogonia ranges from 13.5 to 42  $\mu$  (av. 30.2  $\mu$ m).

The antheridia of *P. cryptogynum* are mostly intercalary, sometimes terminal and branched. The antheridial branches wind around the oogonia, making it difficult to observe their number and nature, as well as the type of contact. There can be 1 to 8 antheridia per oogonium crowding around it. These are mostly of declinous origin but occasionally monoclinous antheridia are also present winding around in a similar fashion.

Oospores are both plerotic and aplerotic and are usually limited to one per oogonium, but at times there may be two, three, or four oospores present. These are usually spherical, at times oval and rarely cylindrical, measuring 12-39  $\mu$ m in diameter (av. 22.8  $\mu$ ) and having a very thick wall of 2.25-6  $\mu$ m in thickness (av. 4.7  $\mu$ m). Many abortive oospores are also present.

### Discussion

Among the slow growing *Pythium* having a filamentous, non-inflated type of sporangia, no other species has a similar combination of large catenulate oogonia (measuring upto 42  $\mu\text{m}$  in diameter and being at times multispore), intercalary winding antheridia and very thick walled oospores. PAUL (1988) described a new variety, *P. capillosum* var. *helicoides*, which also has catenulate oogonia and antheridia winding around them. In this respect it resembles *P. cryptogynum*. The following table nevertheless makes it clear that these are different organisms:

<i>Pythium cryptogynum</i>	<i>P. capillosum</i> var. <i>helicoides</i>
1. Growth on PCA 9 mm/day at 25°C	Growth on PCA 20 mm/day at 25°C
2. Sporangia plentiful	Sporangia rare
3. Encysted zoospores up to 8 $\mu\text{m}$ diam.	Encysted zoospores up to 11 $\mu\text{m}$ diam.
4. Oogonia smooth-walled, 13.5-42 $\mu\text{m}$ in diam. (av. 30.2)	Oogonia papillate, 11.2-27.2 $\mu\text{m}$ in diam. (av. 20.7)
5. Sessile or hypogynous antheridia unknown	Sessile and hypogynous antheridia present
6. Oospores 12-39 $\mu\text{m}$ diam. (av. 22.8) multiple oospores present, wall thick, 2.25-6 $\mu\text{m}$ (av. 4.7)	Oospores smaller 11-22.4 $\mu\text{m}$ diam. (av. 17.7) multiple oospores unknown, wall moderately thick, 1.6-3.2 $\mu\text{m}$ (av. 2.4).
7. Appressoria not present	Appressoria formed on solid media.

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