

**PENICILLIUM INFLATUM SP. NOV.**

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(With one Text-figure)

A description and drawings are presented of a new species of *Penicillium* which is assigned to the *P. nigricans* series.

During investigations of the fungus flora on the root surface of *Picea abies* carried out in the coniferous forests of Denmark an interesting species of *Penicillium* was encountered. It proved to be sufficiently different from all described species of *Penicillium* (Raper & Thom, 1949; Kulik, 1968) to warrant its description as a new species. This fungus along with many others was isolated from the surface of roots which had been dug out from a depth of about 20 cm and whose length and diameter ranged 30 to 75 mm and 2 to 10 mm, respectively. All root samples were taken from young healthy looking trees not older than ten years. A few strains of the same fungus were isolated from forest soil in the Netherlands.

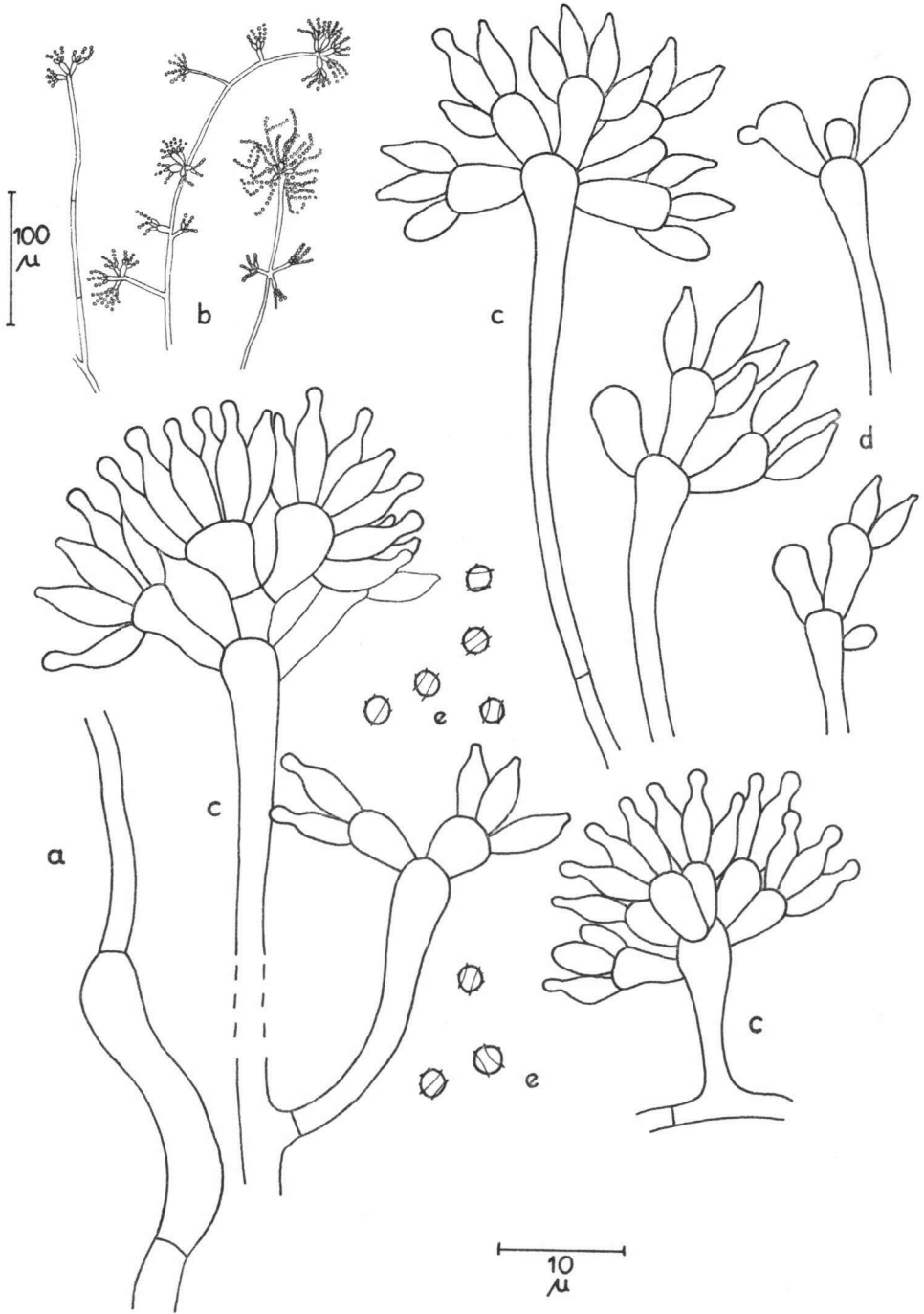
Cultures as well as dried type material of this species have been deposited at the "Centraalbureau voor Schimmelcultures", Baarn, The Netherlands.

***Penicillium inflatum* Stolk & Malla, sp. nov.—Fig. 1**

Coloniae in agaro Czapekii post 2 hebdomatas 25 °C 1 cm diametro, durae, dense coactae, parce sporulantes, pallide olivaceae, reverso roseolo vel aurantio-brunneo. Coloniae in agaro maltoso post 2 hebdomatas 25 °C 2.5 cm diametro, margine velutino, parte submarginali medioque laxiores, copiose sporulantes, griseolae vel olivaceae vel bubalinae.

Hyphae vegetativae hyalinae, 1.5-4 µ diametro, cellulae submersae vulgo inflatae. In agaro maltoso conidiophora margine coloniae e hyphis submersis oriuntur penicillis terminata, in dies longitudine augmentata procumbunt et numerosos ramulos laterales penicillis terminatos proferunt; parte submarginali et centrali conidiophora brevia lateralia e hyphis aeriis oriuntur. Conidiophora tenuitunicata, hyalina, levia, longitudine maxime variabilia, nonnumquam ad 500 µ vel longiora, 1.5-3 µ crassa, apice inflato vesiculoso, 3.5-6 µ diametro. Rami irregulariter in conidiophoris dispositi, 5-30 × 1.5-2.5 µ, apice ad 3-4.5 µ inflati. Penicilli biverticillati divaricati, e 2-10 metulis plerumque valde divergentibus et phialidibus constant, omnino hyalini et leves. Metulae deinceps ex apice conidiophori oriuntur, clavatae, 5-10 µ longae, e 1.5-2.2 µ sursum ad 3-6 µ incrassatae. Phialides 3 vel 8 in verticillis, modice divergentes, deorsum modice attenuatae, apice abrupte in tubulum 0.5-1 µ longum constricto, 5.5-7.5 × 2-3 µ. Conidia brunneola, globosa vel subglobosa, asperulata, plerumque duobus

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fere parallelis anulis tenuibus praedita, 1.7–2.5  $\mu$  diametro. Catenae conidiorum divergunt. modice intricatae, ad 60  $\mu$  longae.

Typus CBS 682.70, isolatus a D. S. Malla, Statens Forstlige Forsøgsvaesen, Springforbi, Dania, 1970, a superficie radicum *Piceae abietis* in silva Danica, prope Lövenholm, Jutland.

Colonies on Czapek agar growing very restrictedly, attaining a diameter of about 1 cm in two weeks at 25 °C; central areas generally raised, mostly somewhat wrinkled and buckled, consisting of a tough, close-textured felt of hyphae, lightly sporing. Surface of central areas almost white, the very narrow plane marginal areas showing pale olivaceous to buff shades near Deep Olive-Buff (Ridgway, 1912: pl. 40; Rayner, 1970, 21''b). Exudate lacking or in limited amount and then collecting in very small pale orange droplets. Margin abrupt. Reverse of the colonies pinkish to orange-brown from Light Pinkish Cinnamon to Cinnamon (Ridgway, pl. 29; Rayner 15''d to 15''), sometimes showing a small brown zone.

Colonies on malt agar growing slightly more rapidly than those on Czapek agar, attaining a diameter of 2.5 cm in two weeks at 25 °C; plane, slightly raised and furrowed in the centre of the colonies, velvety at the margin, becoming looser-textured in the submarginal and central areas, consisting of a thin network of trailing hyphae; slightly zonate in age; sporulating well. Surface showing greyish to olivaceous shades ranging from Light Grayish Olive to Grayish Olive (Ridgway, pl. 46; Rayner, 21''b to 21'''). Reverse of the colonies yellowish brown.

Vegetative hyphae hyaline, branched, 1.5–4  $\mu$  in diameter, the submerged hyphae often showing inflations up to 8  $\mu$  in diameter. On malt agar conidiophores arising at the margin from submerged hyphae, terminating in penicilli, ascending at first, but with increasing length becoming procumbent and developing many short, separate side-branches with penicilli; in submarginal and central areas conidiophores arising as short branches from aerial hyphae.

Conidiophores hyaline, smooth- and thin-walled, varying greatly in length, ranging from very short when arising from aerial hyphae to 500  $\mu$  or even longer, by 1.5–3  $\mu$  in diameter; enlarged at the apex to form a vesicula-like structure 3.5–6  $\mu$  in diameter. Branches irregularly arranged along the conidiophores, measuring 5–30  $\times$  1.5–2.5  $\mu$ , swollen at the apex to 3–4.5  $\mu$  in diameter. Penicilli biverticillate-divaricate, consisting of 2 to 10 mostly strongly diverging metulae bearing phialides; when many metulae are present they may be somewhat radiately arranged, giving the penicillus an *Aspergillus*-like appearance; also reduced forms consisting of only two metulae and monoverticillate penicilli occur; all elements of the penicillus are hyaline and smooth-walled. Metulae developing successively on the vesicula-like apex of the conidiophore, occasionally occurring also on its subterminal portion; club-shaped, rarely branched, 5–10  $\mu$  long, narrow at the base, 1.5–2.2  $\mu$  in diameter, broadening gradually to the swollen apex, 3–6  $\mu$  in diameter. Phialides developing successively on the swollen apex, occasionally also on the subterminal portion of the metula, occurring in small clusters of 3 to 8, slightly diverging, 5.5–7.5  $\times$  2–3  $\mu$ , less wide at the base, narrowing at the top abruptly to a small, but definite conidium-bearing tip (0.5–1  $\mu$  long). Conidia brownish, globose to subglobose, slightly roughen-

#### EXPLANATION OF FIGURE 1

Text-fig. 1. *Penicillium inflatum*, CBS 682.70 — a. Vegetative hypha with inflated part. — b. Habit sketches of conidiophores bearing penicilli and branches with penicilli. — c. Different types of penicilli. — d. Development of penicilli, showing successive development of metulae. — e. Conidia.

ed, provided with mostly two roughly parallel, very thin bands, 1.7–2.5  $\mu$  in diameter. Conidial chains diverging, somewhat tangled, short, up to 60  $\mu$  long.

Minimum temperature 5°, optimum temperature 20–25 °C, maximum temperature 30°.

TYPE STRAIN: CBS 682.70 (S 13–105) isolated from the root surface of *Picea abies*, Lövenholm district, Jutland, by D. S. Malla, Statens Forstlige Forsøgsvaesen, Springforbi, Denmark, 1970.

ADDITIONAL STRAINS: CBS 132.70 (S 8–25), CBS 133.70 (S 10–4), CBS 134.70 (S 10–6), CBS 135.70 (S 10–22), all isolated from root surfaces of *Picea abies* by D. S. Malla in the Hörsholm district in the northern part of Sjaelland, Denmark, 1969, and CBS 817.70 isolated from forest soil under *Quercus rubra*, Spaanderswoud near Hilversum, Netherlands, by R. A. Samson, C.B.S. Baarn, October 1970.

The additional strains agree very well with the type strain. The specific epithet refers to the inflated apices of conidiophores, branches, and metulae.

Because of the swollen apices of its conidiophores and its many strongly diverging metulae, which in large heads may be radiate, the habit of this new species suggests a species of *Aspergillus*. It differs, however, from this genus in some important characters. No definite foot-cells are present, the metulae do not develop simultaneously on the apex of the conidiophore as is known to be the case in true *Aspergillus*, but they develop successively. Moreover the conidiophore wall is thin, whereas most *Aspergilli* have thick walls. The species shows much closer affinities to the genus *Penicillium*, especially to the *P. nigricans* series. Its cultures are greyish to olivaceous-buff like in this series, the conidia are brownish coloured, while the structure of the colony agrees completely with *P. nigricans* Bainier ex Thom (Raper & Thom, 1949: 325). Besides in *P. nigricans* metulae are strongly diverging and the apices of the metulae of this species are commonly inflated. However, *P. inflatum* differs from *P. nigricans* in its much larger number of metulae and in the structure and size of its conidia. In *P. daleae* Zaleski (Raper & Thom, 1949: 296)—a species that could be placed much better in the *P. nigricans* series than in the *P. janthinellum* series—the conidia are coarsely roughened in winding bands, but they are much larger than those of *P. inflatum* and besides of quite different shape.

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