

Phytophthium sindhum



Fungal Planet 49 – 18 June 2010

***Phytophythium* Abad, de Cock, Bala, Robideau, Lodhi & Lévesque, gen. nov.**

Sporangia globosa ad ovoidea, cum papilla et tamen saepe interne proliferantia (phytophthoroida); emissioe zoosporarum pythioide. *Phytophythium* ex speciebus *Pythii* cladii K in Lévesque & de Cock (2004)¹ formatur.

Etymology. Phylogenetically between *Pythium* and *Phytophthora*.

Sporangia globose to ovoid, often with papilla and often proliferating internally (*Phytophthora*-like). Zoospore discharge is *Pythium*-like: the sporangium forms a discharge tube through which the contents moves out and forms a vesicle at the tip with an undifferentiated mass of protoplasm which then differentiates

into biflagellate zoospores. Most species have large, smooth oogonia, thick-walled oospores, and 1–2 elongate or lobate antheridia, laterally applied to the oogonium. *Phytophythium* comprises the *Pythium* species from clade K in Lévesque & de Cock¹, and is morphologically and phylogenetically between *Pythium* and *Phytophthora*.

Type species. *Phytophythium sindhum*.
Mycobank MB517068.

***Phytophythium sindhum* Lodhi, Shahzad & Lévesque, sp. nov.**

Sporangia subglobosa, terminalia, unilateraliter intercalaria vel intercalaria, proliferantia, 15 × 20–35 × 40 µm, saepe cum papilla. Tubi emittentes brevissimi, 5 × 8 µm diam. Zoosporae incystatae 10 µm diam. Oogonia globosa, laevia, terminalia et unilateraliter intercalaria, 30–39 (av. 34.5) µm diam. Oogonia plerumque monospora (99 %) raro bispora. Oosporae laeves, pleroticae vel apertoticae, 30–38 µm diam. Parietes oosporae 4–5 (av. 4.5) µm diam. Indice apertotico 91 %, indice parietis 59 %.

Etymology. Name refers to the province Sindh from where this species was frequently isolated.

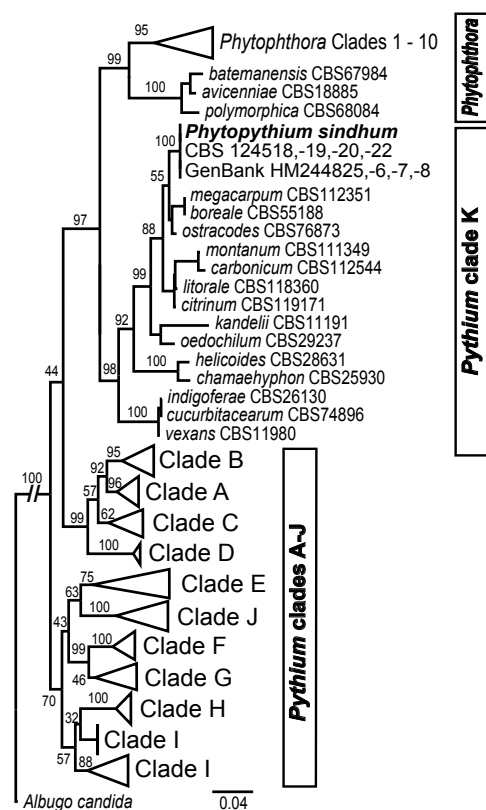
Sporangia subglobose, terminal, occasionally unilaterally intercalary or intercalary, proliferating and of variable size, ranging from 15 × 20–35 × 40 µm; under stress conditions they germinate directly via several germ tubes; a papilla is frequently associated with the sporangia; abundant zoospore discharge occurred at room temperature after washing, followed by half an hour cold shock; discharge tubes are very short, 5 × 8 µm; zoospores after encystment up to 10 µm diam. *Oogonia* globose, smooth, laterally on a short stalk, occasionally terminal and unilaterally intercalary; 30–39 (av. 34.5) µm diam; oogonia are mostly monosporous (> 99 %) but occasionally bisporous. *Antheridia* diclinous as well as monoclinal, elongate, more or less lengthwise applied but crook necked, making narrow apical contact with the oogonium. *Oospores* are smooth, mostly plerotic or nearly plerotic, occasionally apertotic, 30–38 (av. 34) µm. Oospore wall very thick, ranging from 4–5 (av. 4.5) µm.

Culture characteristics — *Phytophythium sindhum* produces thick, white, cottony growth on potato-dextrose agar (PDA), on potato-carrot agar (PCA) white aerial mycelium, on cornmeal agar (CMA) submerged mycelium and on cornmeal-dextrose agar (CMDA) a light rosette pattern. Colony diameter after one day at 25 °C on PDA 28.5 mm, PCA 28 mm, CMA 28.5 and CMDA 37.5 mm. The optimum growth temperature was 35 °C but it could not grow at 40 °C.

Holotypus. PAKISTAN, Sindh, District Sanghar, Shahpur Chakar, 25°55' N, 68°58' E, banana rhizosphere, 20 Nov. 2005, M. Lodhi, CBS 124518 (cryo-preserved). Ex-type culture also deposited as DAOM 238986 in the CCFC. GenBank HM244825 (ITS & LSU) and HM244822 (Cox1), MycoBank MB517069. Additional strains are listed in Table 1 (see MycoBank).

Colour illustrations. Collection site in Pakistan, banana field; Proliferating sporangium in water culture, swimming zoospores in a vesicle; Sporangium with 2 papilla; Oospore with monoclinal antheridium. Scale bars = 10 µm.

Notes — See MycoBank MB517069.



Maximum likelihood analysis using GTR model with PhyML² of the LSU (D1-D3, alignment length 1 384 bp) with close to 100 *Phytophthora* species, 150 *Pythium* species and *Phytophythium sindhum* showed a strong bootstrap support (1 000 replicates) for *Phytophythium sindhum* sp. nov. and for the *Pythium* clade structure proposed by Lévesque & de Cock¹ (for more detailed tree see MycoBank MB17069).

References. ¹Lévesque CA, Cock AWAM de. 2004. Molecular phylogeny and taxonomy of the genus *Pythium*. Mycological Research 108: 1363–1383. ²Guindon S, Gascuel O. 2003. A simple, fast, and accurate algorithm to estimate large phylogenies by maximum likelihood. Systematic Biology 52: 696–704.

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