

Penicillium coccotrypicola



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***Penicillium coccotrypicola* Holdom, Y.P. Tan & R.G. Shivas, sp. nov.**

Etymology. Derived from the generic name of the palm seed borer weevil (*Coccotrypes*) that formed the galleries from which the fungus was isolated.

Mycelium ramified in galleries of palm seed borer (*Coccotrypes carpophagus*) scolytine weevils that infest seeds of *Archontophoenix cunninghamiana*. **Synnemata** protrude from the fibrous seed husk, blue-grey, clavate, often furcated and slightly flattened, up to 1 cm high, solitary or clustered in small coralloid groups. **Conidiophores** in vivo borne on surface of synnemata; stipes 30–120 µm, verruculose or finely roughened to partly smooth, subhyaline to pale olivaceous; penicilli biverticillate or terverticillate, rarely monoverticillate; 2–5 metulae, one metula often larger than others, (9–)10.5–13.5(–16.5) × (2.5–)3.5 × 4.5(–5) µm, smooth or finely roughened, subhyaline to pale grey-olivaceous. **Conidiogenous cells** phialides, in verticils of 2–6, acerose, smooth, 9–15 × 2–3.5 µm, with a distinct neck, hyaline to subhyaline. **Conidia** globose to subglobose (2.5–)3 × 3.5(–4) µm, smooth, pale grey-olivaceous. Synnemata produced in vitro on Czapek yeast extract agar (CYA) after 14 d in the dark at 25 °C, with similar conidiophores borne from hyphae with stipes up to 200 µm; metulae (8.5–)9–11.5(–14.5) × 2.5–3.5(–4) µm and phialides (7–)8–10(–12) × 2–2.5(–3) µm.

Culture characteristics — (after 7 d in the dark at 25 °C). On CYA colonies 40–43 mm diam, velutinous, weakly sulcate, glaucous grey to greenish grey; tinged sienna at centre and white margins, apricot droplets exuded at centre and pale brown soluble pigment released into agar; cinnamon in reverse; no growth at 5 or 37 °C. Conidial mass becoming cinnamon on older cultures on most media; increasing Cu and Zn had no effect; rare (< 1 %) germination but no growth at 30 °C. On oatmeal agar (OA) and potato dextrose agar (PDA) colonies 40–42 mm diam, with irregular concentric rings of greenish grey sporulation, synnemata form in rings. On 25 % glycerol nitrate agar colonies 12–14 mm diam with no sporulation. On creatine sucrose agar colonies 27–31 mm diam with acid production. On Czapek agar (CzA) colonies 24–30 mm diam. On malt extract agar (Pitt 1979) colonies 29–30 mm, sporulation sparse, soluble pigment not released, and colour of culture not changing to cinnamon with age. On yeast extract sucrose agar colonies 43–47 mm diam, no sporulation, primrose around a darker centre. On CYA + 5 % NaCl colonies 26–28 mm diam. On nitrite-sucrose agar colonies 27–30 mm diam. No growth on CzA + propionic acid. On CzA + sorbic and benzoic acids colonies 5–11 mm diam.

Typus. AUSTRALIA, Queensland, Bli Bli, Maroochy Wetlands, on seeds of *Archontophoenix cunninghamiana* and in galleries infested by *Coccotrypes carpophagus*, 6 July 2013, D. Holdom & J. Hewett (holotype BRIP 59608; ITS sequence GenBank KM605436, LSU sequence GenBank KM605437, beta-tubulin sequence GenBank KM605438, MycoBank MB810327).

Colour illustrations. *Archontophoenix cunninghamiana* at Mapleton Falls National Park Queensland; seeds of *A. cunninghamia* with synnemata of *Penicillium coccotrypicola*; 7-d-old cultures on CYA (left) and OA (right); synnemata on OA; conidia and conidiophores on CYA after 14 d. Scale bars (from top to bottom) = 1 cm, 1 cm, 1 cm, 1 mm, 10 µm.

Notes — *Penicillium* s.str. has recently been redefined as a monophyletic genus by multilocus (RPB1, RPB2, Tsr1 and Cct8) phylogenetic analysis (Houbraken & Samson 2011). The formation of synnemata by species of *Penicillium* is uncommon (Pitt 1979, Seifert et al. 2004). *Penicillium coccotrypicola* is morphologically distinct from other species by having furcated synnemata. *Penicillium coccotrypicola* produced ramified mycelium in the galleries of palm seed borer weevils (*Coccotrypes carpophagus*: *Coleoptera*, *Curculionidae*, *Scolytinae*) in seeds of *Archontophoenix cunninghamiana* (*Arecaceae*). The palm seed borer weevils in the galleries were not colonised by *P. coccotrypicola*, which provides evidence that these ambrosia insects were farming the fungus. Possible mutualistic associations between *Penicillium* species and various scolytine weevil genera (*Crypturgus*, *Dendroctonus*, *Hypothenemus*, *Ips*, *Pityogenes* and *Tomicus*) have been noted before (Peterson et al. 2003, Giordano et al. 2013).

ITS. Based on a megablast search of the NCBI GenBank nucleotide database, the closest hits using the ITS sequence are *Penicillium mononematosum* (ex-type strain CBS 172.87; GenBank JX997082; Identities = 507/512 (99 %), Gaps = 0 (0 %)), *P. gladioli* (ex-type strain NRRL 939; GenBank DQ339568; Identities = 658/665 (99 %), Gaps = 1/665 (0 %)), *P. confertum* (ex-type strain CBS 171.87; GenBank JX997081; Identities = 506/512 (99 %), Gaps 0/512 (0 %)) and *P. flavigenum* (ex-type strain CBS 419.89; GenBank JX997105; Identities = 506/512 (99 %), Gaps = 0/512 (0 %)).

BT. Based on a megablast search of the NCBI GenBank nucleotide database, the closest hits using the BT sequence are *Penicillium expansum* (ex-type strain CBS 325.48; GenBank JQ965099; Identities = 585/634 (92 %), Gaps = 8/634 (1 %)) and *P. sclerotigenum* (ex-type strain CBS 101033; GenBank AY674393; Identities = 429/467 (92 %), Gaps = 6/467 (1 %)).