

*Cordyceps jakajanicola*



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***Cordyceps jakajanicola*** Luangsa-ard, Tasan., Noisrip. & Hywel-Jones, *sp. nov.*

**Etymology.** Named after the host, *jakajan*, cicada in Thai and *cola* - Latin suffix meaning 'inhabitant of, residing on'.

**Classification** — *Cordycipitaceae*, *Hypocreales*, *Sordariomycetes*.

**Stromata** pale yellow (blackish brown after drying), simple, fusiform, fleshy, erect, protruding from the ground with several stromata loosely connected emerging from between the head and the thorax of the cicada nymph, 32–45 mm long. Fertile part on the terminal end c. 1/3 of the stroma. Mycelia scarce, whitish, covering the host, slightly rhizoidal in the soil joining together to form a compact stipe upon emerging from the soil. **Perithecia** semi-immersed, ovoid, 400–650 × 300–400 µm. **Asci** cylindrical, 265–360 × 4–5 µm, ascus tip 2–3 µm. **Ascospores** whole, bola-shaped, 250–310 × 1 µm, terminal part fusiform 54–60 × 1 µm, central part filiform, < 1 µm diam. **Asexual morph** *Isaria*. **Synnemata** erect and simple with branching near the apex, often clavate, growing from a white to creamy mycelium which covers the host, powdery and floccose near the apex due to heavy conidiation. **Conidiophores** consisting of verticillate branches with whorls. **Phialides** 4–5.3(–6) × 2–3.5(–4) µm, consisting of a globose, oval or occasionally conical swollen basal portion tapering suddenly into a thin neck, 0.5 µm wide. **Conidia** ellipsoid or cylindrical, mostly symmetrical, rarely slightly curved, (4–)4.5–6(–7) × (1.5–)2–2.5(–3) µm.

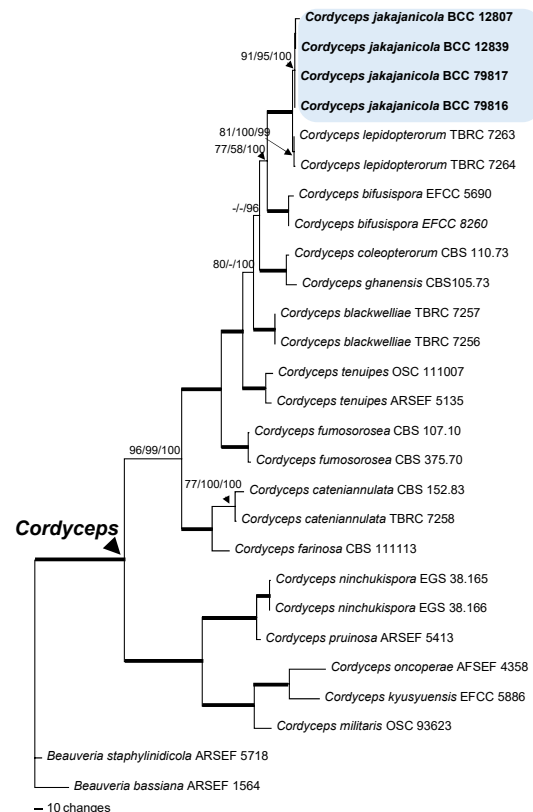
**Culture characteristics** — Discharged ascospores germinated within 24–36 h. Colonies had a white to cream funiculose appearance with a cream reverse. Cultures readily produced phialides and conidia after 2 wk on potato dextrose agar at room temperature showing a powdery appearance due to profuse conidiation. From the **sexual morph**: Colonies on PDA fast growing, attaining 15–20 mm diam within 14 d at 25 °C. Colonies floccose, at first white, turning into cream-brown and looking powdery with age. **Phialides** flask-shaped with long neck, (4–)5.5–8(–9) × (2–)2.5–3.5 µm. **Conidia** in long chains, cylindrical, (6–)7–9(–10) × 2–3 µm. **Chlamydospores** solitary, clavate, cylindrical, unicellular, (9–)10–15(–17) × (3–)4.5–6.5(–7) µm.

**Typus.** THAILAND, Nakhon Ratchasima Prov., Khao Yai National Park, on cicada nymph, buried in soil, 9 July 2015, *K. Tasanathai, W. Noisripoom & D. Thanakitpipattana* (holotype BBH40246, culture ex-type BCC79816, SSU, LSU, *TEF*, *RPB1* and *RPB2* sequences GenBank MN296394, MN275696, MN338479, MN338484 and MN338489, MycoBank MB832492).

**Additional materials examined.** THAILAND, Nakhon Ratchasima Prov., Khao Yai National Park, on cicada nymph, buried in soil, 9 July 2015, *K. Tasanathai, W. Noisripoom & D. Thanakitpipattana* (BBH 40247, BCC 79817, SSU, LSU, *TEF*, *RPB1* and *RPB2* sequences GenBank MN296395, MN275697, MN338480, MN338485 and MN338490); Kanchanaburi Prov., Thung Yai Naresuan Wildlife Sanctuary, on cicada nymph, buried in soil, 15 Sept. 2002, *R. Nasit, W. Thongsridam & B. Tongnuch* (BBH8628, BCC12807, SSU, LSU and *TEF* sequences GenBank MN296392, MN275694 and MN338477); *ibid.*, (BBH8629, BCC12839, SSU, LSU and *TEF* sequences GenBank MN296393, MN275695 and MN338478).

**Colour illustrations.** Type locality – a trail in Khao Yai National Park. Fungus on cicada nymph (sexual morph); perithecia on stroma; ovoid perithecium; asci; bola ascospore; fungus on cicada nymph (asexual morph); phialides; conidia. Scale bars =15 mm (stromata), 300 µm (perithecia on stroma), 120 µm (asci), 20 µm (perithecium), 15 µm (ascospore), 5 µm (phialides, conidia).

**Notes** — *Cordyceps jakajanicola* is parasitic on cicadas that can be found buried in the soil. The macromorphologies of the natural samples of *C. jakajanicola* closely resemble *Cordyceps bifusispora* (Eriksson 1982) by producing fusiform, pale yellow ascospores on the terminal part of the stroma. It differs significantly in the host, sizes of the perithecia, asci and ascospores. In *C. jakajanicola*, perithecia and asci are longer and wider than those reported for *C. bifusispora* (300 × 150–170 µm; 200–220 × 3–4.5 µm; 145–220 × 4 µm). It shares similarities with *C. lepidopterorum* (Mongkolsamrit et al. 2018) in phialide and conidial dimensions. In *C. lepidopterorum* the phialides and conidia are larger (5–8 × 4–5 µm; 6–10 × 3–4 µm) compared to *C. jakajanicola* and differs in their respective hosts. The results of our molecular phylogenetic study strongly support and separate *C. jakajanicola* from other species. *Cordyceps jakajanicola* is therefore proposed as a new species belonging to *Cordyceps*.



Phylogenetic tree with *C. jakajanicola* was constructed from a combined dataset comprising SSU, LSU, *TEF*, *RPB1* and *RPB2* sequences. The phylogenetic tree was analysed using Maximum parsimony (MP), Maximum likelihood (ML) and Bayesian inference. The MP analysis was conducted on the combined dataset using PAUP v. 4.0b10 (Swofford 2003), adopting random addition sequences (100 replications), with gaps being treated as missing data. A bootstrap (BP) analysis was performed using the maximum parsimony criterion in 1000 replications. The ML analysis was run with RAxML-VI-HPC2 v. 8.2.12 (Stamatakis 2014) under a GTR model, with 1000 bootstrap replicates. Bayesian phylogenetic inference was calculated with MrBayes v. 3.2.6 (Ronquist & Huelsenbeck 2003), with 5 M generations and under the same model. Numbers at the significant nodes represent MP bootstrap support values/RAxML bootstrap support values/Bayesian posterior probabilities (BPP) times 100. Thickened lines in the tree represent 99–100 % BP values and 99–100 BPP.

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