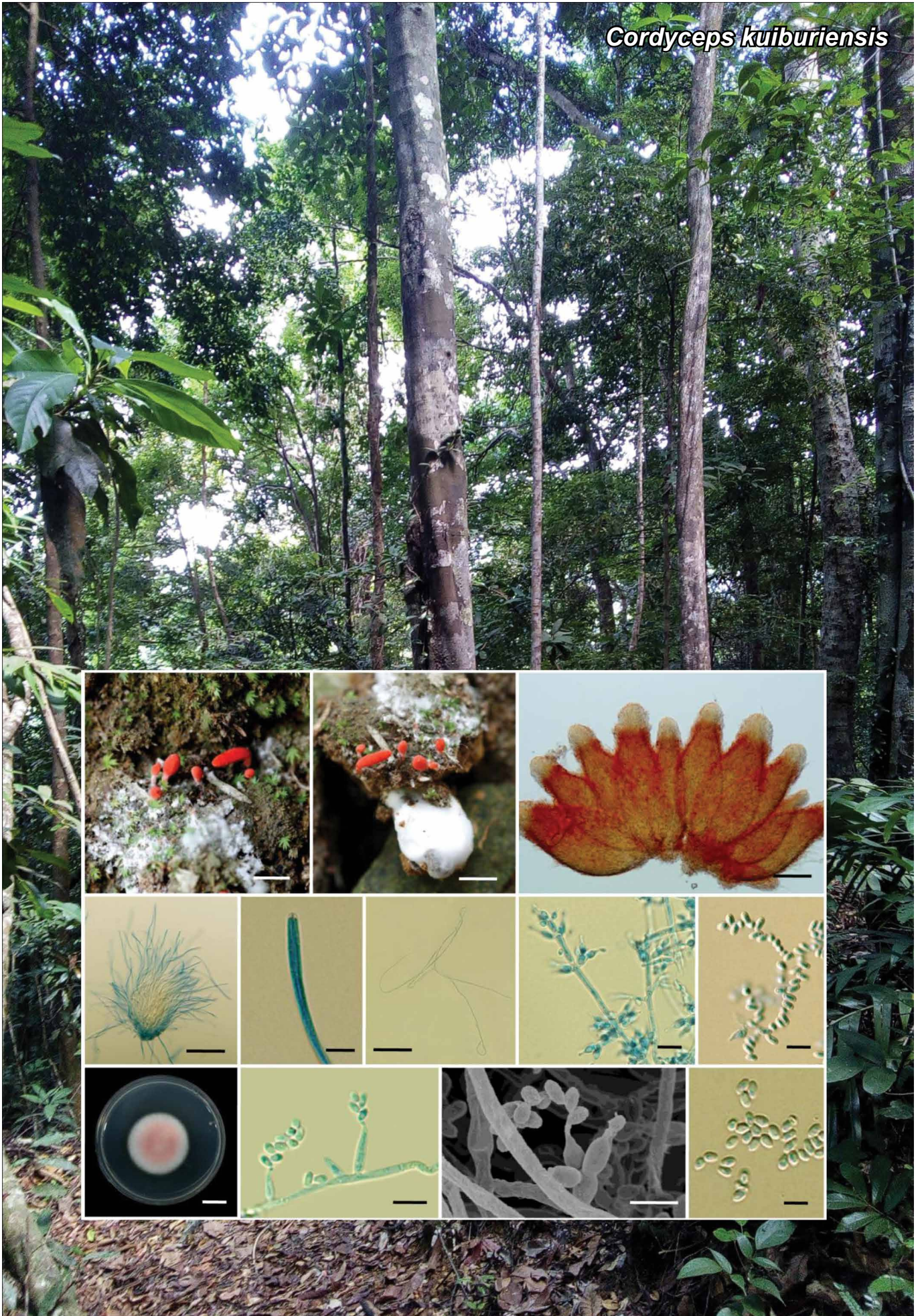


Cordyceps kuiburiensis



Fungal Planet 1010 – 18 December 2019

Cordyceps kuiburiensis Himaman, Mongkols., Noisrip. & Luangsa-ard, *sp. nov.*

Etymology. The name refers to the location where the species was collected – Kui Buri National Park, Thailand.

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

Stroma solitary, up to 8 mm long and 1–1.5 mm in width, cylindrical, pale red-orange. *Rhizoids* flexuous, arising from the body of spiders (*Araneidae*), c. 2–5 mm long, buried under the ground. Fertile part at apex. *Ascomata* clavate to subglobose, red-orange, 1.5–5 mm long, 1–2.5 mm in width. *Perithecia* pseudo-immersed, obpyriform, (350–)370–460(–550) × (120–)140–190(–240) µm. *Asci* cylindrical, up to 280 µm long, 3–5 µm in width. *Ascospores* hyaline, filiform with septations, up to 250 µm long, 1 µm in width. *Asexual morph*, evlachovaea-like, produced on base of the stroma and on the soil surface, powdery because of heavy sporulation, whitish, *synnemata* up to 1.5 mm long, *conidiophores* usually forming verticillate branches with phialides in whorls of 2–5. Entire phialides 5–10 × 2–3.5 µm, with swollen, ellipsoidal basal portion, tapering into a neck, 1–5 × 1 µm. *Conidia* hyaline, mostly ellipsoidal, fusiform, aseptate, 2–3.5 × 1–1.5 µm.

Culture characteristics — Colonies developed from germinating conidia. The conidia germinated within 24 h on PDA. Evlachovaea-like conidial morphs developing after c. 7 d. Colonies on PDA fast growing, c. 2.5 cm diam in 14 d at 25 °C. Colonies pale pink, becoming white when sporulating abundantly after 30 d, reverse deep pink. Conidial structures consisting of erect conidiophores borne or aerial hyphae, verticillate with phialides in whorls of two to four. Some phialides borne directly and singly on aerial hyphae. Phialides (3–)4–8(–10) × 1.5–2 µm, with swollen, ellipsoidal basal portion, necks present, 1–3 × 1 µm. Conidia hyaline, ellipsoidal, fusiform, aseptate, 3–4 × 1.5–2 µm.

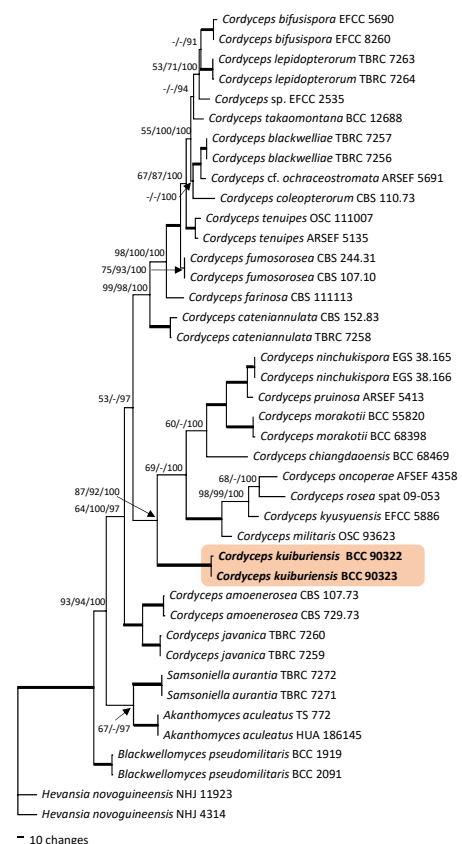
Typus. THAILAND, Prachuap Khiri Khan Prov., Kui Buri National Park, on spiders (*Araneidae*), buried in soil, 7 Jan. 2011, *W. Himaman* (holotype BBH45453, culture ex-type BCC90322, LSU, *TEF*, *RPB1* and ITS sequences GenBank MK968816, MK988030, MK988032 and MN099707, MycoBank MB831637).

Additional materials examined. THAILAND, Prachuap Khiri Khan Prov., Kui Buri National Park, on spider (*Araneidae*), buried in soil, 7 Jan. 2011, *W. Himaman*, BBH45454 (BCC90323), LSU, *TEF*, *RPB1* and ITS sequences GenBank MK968817, MK988031, MK988033 and MN099708; *ibid.*, BBH45452 (BCC90321).

Notes — Most of the species in *Cordyceps* have been reported as parasites of insects such as *Coleoptera*, *Hymenoptera*, *Lepidoptera*, and *Orthoptera*, producing brightly coloured, fleshy stromata. In this study, *Cordyceps kuiburiensis* is parasitic on spiders (*Araneidae*) that can be found buried in the soil. This species is only found in PraktaKhoo Waterfall, Kui Buri National Park, Prachuap Khiri Khan Province. The gross macromorphol-

Colour illustrations. Background photo of forest in Prachuap Khiri Khan Province. Fertile part with ascomata and asexual morph; perithecia; asci; ascus tip; ascospores; phialides; conidia; culture on PDA, evlachovaea-like asexual morph on PDA; conidia. Scale bars = 10 mm (plate culture), 5 mm (stromata), 120 µm (perithecia), 50 µm (asci), 10 µm (ascus), 50 µm (ascospores), 5 µm (phialides and conidia, evlachovaea-like morph on PDA with conidia), 3 µm (conidia).

ogy of the natural samples of *C. kuiburiensis* closely resembles *C. ninchukispora* (Sung et al. 2007) that can also be found in soil or in leaf litter (Luangsa-ard et al. 2008) by producing clavate to subglobose, orange to orangish red ascomata on the terminal part of the stroma. It differs significantly in the sizes of the perithecia and asci. In *C. kuiburiensis*, perithecia and asci are longer and wider than those reported for *C. ninchukispora* (95–145 × 50–60 µm; 75–100 × 2.1–3.1 µm) by Su & Wang (1986). Additionally, the ascospores in *C. kuiburiensis* are filiform, while ascospores in *C. ninchukispora* are whole, bola-shaped, with expanded fusoid end parts, and its hosts are lepidopteran pupae, not spiders. The results of our molecular phylogenetic study strongly support and separate *C. kuiburiensis* from other species. *Cordyceps kuiburiensis* is therefore proposed as a new species belonging to *Cordyceps*.



Phylogenetic tree with *C. kuiburiensis* was constructed from the combined dataset comprising LSU, *TEF* and *RPB1* 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. ML analysis was run with RAXML-VI-HPC2 v. 8.2.10 (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 3 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 % bootstrap support values and 99–100 BPP.

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