Ecology & Evolution | Nov 13, 2026 | 5 min read | By Bryan White

Three New Insect-Killing Ophiocordyceps Fungi Described From Yunnan Forests

Ecology & Evolution * Mycology * Entomopathogenic Fungi

Three species of Ophiocordyceps , the genus of insect -killing fungi best known for the zombie-ant fungus , have been described from forests in Yunnan Province, southwestern China. The study, published on 13 November 2026 in MycoKeys by Yi Wang, Ting-Chi Wen and colleagues, names Ophiocordyceps pseudoformicarum from an ant, O. yeyahuensis from beetle larvae buried in soil, and O. pseudovespulae from an adult wasp [1] . Each new species closely resembles a species already on record, and the authors argue that this pattern points to a large amount of diversity in the genus that morphology alone has missed.

What Was Found

All three fungi were collected by Yi Wang during fieldwork between 2022 and 2023 and are preserved at the Cryptogamic Herbarium of the Kunming Institute of Botany (HKAS), with living cultures held at Guizhou University (GACP) [1] . Like other members of the genus, each fungus kills its host and then grows a slender stalk, or stroma, from the corpse that carries the spore-producing structures.

Ophiocordyceps pseudoformicarum was found on an ant in Pu'er City on 25 November 2023. Its orange to yellow-orange stroma, 30-60 millimeters long, grows from the ant's abdomen. Its closest relative is O. formicarum , but the new species has larger perithecia (the flask-shaped chambers where spores form, averaging 561 x 200 micrometers against 260 x 170) and much shorter asci, the spore sacs, at 175-379 micrometers long against about 700 [1] .

Ophiocordyceps yeyahuensis was collected on 17 September 2022 at Ye Ya Hu Forest Park near Kunming, on beetle larvae parasitized while buried in soil. A thin stroma up to 58 millimeters long rises from the host's head. It is the sister species of O. guishanensis , another beetle-larva parasite, from which it differs in smaller, ovate perithecia, longer and wider asci, and the shape of the cap at the tip of each ascus [1] .

Ophiocordyceps pseudovespulae was found behind dead leaves in Pu'er City on 6 October 2023, growing from the head of an adult wasp. Its yellow to ginger stroma is about 78 millimeters long with a short ginger fertile tip. Compared with its sister species O. vespulae , first described from Jilin Province in 2021 [2] , it has shorter and narrower perithecia and asci [1] .

How the Species Were Separated

Because the new fungi look so much like their relatives, the authors relied on DNA as well as microscopy. They sequenced six genetic regions (ITS, nuclear SSU and LSU ribosomal DNA, tef-1alpha , rpb1 and rpb2) and built a phylogeny of 94 Ophiocordyceps taxa from a 4,873-character alignment, analyzed with both maximum likelihood and Bayesian inference [1] . Each new species formed its own

well-supported branch next to its nearest relative.

The genetic gaps are modest but consistent. O. pseudoformicarum differs from a reference specimen of O. formicarum at 3.19% of nuclear LSU positions and 1.82% of tef-1alpha positions. O. yeyahuensis differs from O. guishanensis at 7.08% of LSU positions, and O. pseudovespulae differs from O. vespulae at 11.24% of ITS positions [1] . The authors followed published guidelines that call for agreement between molecular and morphological evidence before a new fungal species is named [3] .

Cryptic Diversity in Three Lineages

Each species sits in a group where look-alike fungi are common, and the paper uses them to make a broader point about how Ophiocordyceps diversity is counted [1] .

In the ant-associated O. formicarum complex, several species overlap in the size of their perithecia and asci. Earlier work in Thailand showed that a single ant-infecting "species" can hide several genetically distinct lineages [4] . The Yunnan ant fungus adds to that picture: it is separated from its relatives by host, by the fusiform shape of its secondary spores, and by DNA rather than by any single obvious trait.

In the O. acicularis clade, the authors describe "strong morphological conservatism": species infecting beetle larvae in soil or rotten wood and others infecting caterpillars in leaf litter share similar fruiting bodies. Ecology helps separate them, since O. yeyahuensis and three of its relatives attack beetle larvae while two others attack lepidopteran larvae.

In the O. sphecocephala clade, which includes the new wasp fungus, closely related species have shifted between wasps, ants and froghoppers. The authors argue that diversification in this group has been driven mainly by repeated host specialization, so the identity of the host can be more informative than the shape of the fungus.

Why It Matters

Ophiocordyceps was reorganized in 2007, when a multigene study split the old genus Cordyceps and moved many insect-killing species into the family Ophiocordycipitaceae [5] . Later naming proposals for the family noted that unrelated species can converge on similar fruiting bodies, which makes identification by appearance unreliable [6] . The Yunnan study is a further example: three fungi that could have been filed under existing names turn out to be separate lineages once DNA, host and fine anatomy are examined together.

The authors describe southwestern China as an important center of diversification for these fungi, which they attribute to its complex topography, diverse forests and long-term geographic isolation [1] . They suggest that cryptic species are likely widespread in host-specific lineages and call for future work that combines phylogenomics, population genetics , host specificity and ecological niche modeling. The paper does not report behavioral data for the new species, so whether any of them alters host behavior in the way the zombie-ant fungus does is not known.

For field mycologists and anyone documenting insect diseases in Asian forests, the practical message is that a specimen matching a familiar description may still be an

undescribed species. Each of these fungi is known so far from a holotype and a paratype collected at a single locality, so their wider range, host breadth and population status remain open questions.

References & Primary Sources

* [1] Wang, Y., Peng, X.-C., Wei, D.-P., et al. (2026). Molecular phylogeny and morphology reveal three new species of Ophiocordyceps (Hypocreales, Ophiocordycipitaceae) from Yunnan, China. MycoKeys, 143, 111-133. -- https://doi.org/10.3897/mycokeys.143.210070

* [2] Long, F., et al. (2021). Multigene phylogeny and morphology reveal a new species, Ophiocordyceps vespulae, from Jilin Province, China. Phytotaxa, 478(1), 33-48. -- https://doi.org/10.11646/phytotaxa.478.1.2

* [3] Jeewon, R., & Hyde, K. D. (2016). Establishing species boundaries and new taxa among fungi: recommendations to resolve taxonomic ambiguities. Mycosphere, 7(11), 1669-1677. -- https://doi.org/10.5943/mycosphere/7/11/4

* [4] Khonsanit, A., et al. (2019). Cryptic species within Ophiocordyceps myrmecophila complex on formicine ants from Thailand. Mycological Progress, 18(1), 147-161. -- https://doi.org/10.1007/s11557-018-1412-7

* [5] Sung, G.-H., et al. (2007). Phylogenetic classification of Cordyceps and the clavicipitaceous fungi. Studies in Mycology, 57, 5-59. -- https://doi.org/10.3114/sim.2007.57.01

* [6] Quandt, C. A., et al. (2014). Phylogenetic-based nomenclatural proposals for Ophiocordycipitaceae (Hypocreales) with new combinations in Tolypocladium. IMA Fungus, 5(1), 121-134. -- https://doi.org/10.5598/imafungus.2014.05.01.12