

Outlineoffungi.org – Note 1549 *Cyathus*

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Cyathus Haller

The genus *Cyathus* was first introduced by Haller (Haller 1768) and later was adopted by Persoon (Persoon 1801), typified by *C. striatus* (Huds.) Willd (Duan et al. 2023). Due to their cup-like basidiomata resembling bird nests and lenticular peridioles resembling eggs, five genera viz. *Cyathus*, *Crucibulum* Tul. & C. Tul., *Mycocalia* J.T. Palmer, *Nidula* V.S. White, and *Nidularia* Fr., are commonly known as bird's nest fungi (Brodie 1975, Gómez and Pérez-Silva 1988, Zhao et al. 2008). This genus is characterized by having the deeper or cupped, inverted bell-shaped basidiomata covered with shaggy or tomentose hairs on the outside; peridium composed of three layers of tissues, filled with a number of dark-colored, small, hard lentil-shaped peridioles attached with funicular cords; and colorless, thin- or thick-walled, smooth basidiospores (Lloyd 1906, Brodie 1974, Brodie 1975, Brodie and Sharma 1980, Miller and Miller 1988, Das and Zhao 2012, 2013). The genus *Cyathus* is commonly found in temperate and tropical countries and that has an important role in nutrient cycling (Brodie 1975). The genus is characterized by having small-sized basidiomata with lenticular structures inside, named peridioles. Due to the arrangement of these structures, resembling small eggs inside a bird's nest, these organisms are known as 'bird's nest fungi'. The species of *Cyathus* are saprobic, usually growing on decaying wood, but it can also grow in manure, soil, leaves or seeds (Lloyd 1906, Brodie 1975, 1984). *Cyathus* is the most diverse genus of Nidulariaceae, with at least 60 described species until now (He et al. 2019, Boonmee et al. 2021, Duan et al. 2022), although this number may reach more than 80 species (Cruz 2017).

The comprehensive molecular systematic studies on *Cyathus* were started in the last two decades (Matheny et al. 2006, Zhao et al. 2007, Krausitdomsook et al. 2022). An overview of the phylogeny of Agaricales based on a multilocus analysis of a six-gene region supermatrix revealed that the family Nidulariaceae was close to Cystodermateae, in which *Cyathus striatus* and *Crucibulum laeve* (Huds.) Kambly grouped together within the family Nidulariaceae (Matheny et al. 2006). Phylogenetic relationships among *Cyathus* were investigated with ITS and nLSU ribosomal DNA sequences datasets inferred from the neighbor-joining, maximum likelihood, maximum parsimony, and MrBayes analyses, showing that morphological characteristics and molecular data were incompatible. These include, for example, the peridium plications, variations in peridium hair anatomy, peridiole structure, and fruit-body color. However, the ITS and nLSU datasets supported the recognition of three infrageneric groups, herein named the ollum, pallidum, and striatum groups (Zhao et al. 2007, Duan et al. 2023).

Recent phylogenetic studies with all genera the entire genus that composes Nidulariaceae (*Cyathus*, *Crucibulum*, *Nidula*, *Nidularia*, *Mycocalia* and the newly described *Retiperidiolia* Krausit., Cheoyklin, Boonprat & M.E.Sm.) shows that the family is a monophyletic group, forming a clade with *Squamantaceae* Jülich (Krausitdomsook et al. 2021, 2022). Zhao et al. (2008) had already shown that there are inconsistencies within the internal clades of *Cyathus*, requiring molecular data from type materials, as suggested by Krausitdomsook et al. (2021). To solve this problem, Cruz et al. (2023) performed phylogenetic analyses with sequences from type materials and confirmed the existence of the group's pallidum and ollum, proposed by Zhao et al. (2008). The striatum clade was re-nominated to striatum supergroup and was divided into four

new groups: aureum, badium, gigasporum and minimum; and three subgroups: discoideus, stercoreus and subglobisporus (Cruz et al. 2023, Góis et al. 2024).

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Entry by X. Yang College of Forestry, Southwest Forestry University, Kunming 650224, P.R. China, **C.L. Zhao** College of Forestry, Southwest Forestry University, Kunming 650224, P.R. China

(Edited by **Kevin D. Hyde & Alireza Armand**)

Published online 20 September 2024