



New species of *Phallus* from a subtropical forest in Xishuangbanna, China

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Abstract

Seven collections of *Phallus* species were made in surveys of a subtropical forest in Xishuangbanna in Yunnan Province, China, during the wet season of 2012. Macro and micro characters, together with nrITS sequence data, were used to separate the collections into three species. *Phallus mengsongensis* and *P. serrata* are introduced as species new to science, while a further *Phallus* species is described, but not formally introduced, due to paucity of material. Macro and micro descriptions, colour photographs, line drawings and nrITS phylogenetic data for all three species are provided, which are discussed in relation to similar species in these genera.

Key words: nrITS, Phallaceae, phylogeny, taxonomy

Introduction

Phallus (= *Dictyophora*) is a major genus within the order *Phallales*. The main characteristics of Phallaceae are development from an 'egg', unbranched, upright fruiting bodies and a foul smelling gleba (Arora 1986). The taxonomic relationship of *Phallus* and *Dictyophora* is confused. The presence of an indusium (or less technically a "skirt" that hangs down from the conical to bell-shaped cap) is a key taxonomic character distinguishing *Dictyophora* and *Phallus* (Cunningham 1944; Arora 1986). Cunningham (1944) and Arora (1986) treat *Phallus* and *Dictyophora* as two independent genera. However, Kreisel (1996) considered *Dictyophora* to be a subgenus of *Phallus sensu lato*. Kreisel (1996) considered that the presence of a pore at the cap (head) and indusium is not sufficient to distinguish the two genera. Recent molecular studies also indicate that the indusium cannot be used as a phylogenetically informative character for the generic level taxonomy of *Phallaceae* (Cabral *et al.* 2012).

Kirk *et al.* (2008) estimated that there are 18 species of *Phallus* worldwide, while Index Fungorum (2013) lists 29 species epithets for *Dictyophora*. Twenty-two species of Phallaceae, belonging to four genera, have been reported from China, 16 of which have been recorded from the Southwest of China (Li *et al.* 2004). Liu *et al.* 2005 listed 13 species of *Phallus* including four varieties of *Phallus costatus* (Penz.) Lloyd (1909: 10) and eight species of *Dictyophora* from China. Species of *Dictyophora* and *Phallus* have a long history of culinary and medical uses, because they are rich in nutrients and bioactive compounds (Lin *et al.* 2011). For example, *Dictyophora rubrovalvata* M. Zang, D.G. Ji & X.X. Liu (1976: 11), known in China as the flower of fungi (Huang 1993), is extremely valuable for its medicinal properties. *Phallus impudicus* L. (1753: 1178) is a prized edible mushroom said to stimulate circulation and have antitumor properties (Lu & Luo 2010). Six *Dictyophora* species and three *Phallus* species are included in the checklist of edible fungi in China (Dai *et al.* 2010).

Although the species of *Phallus* and *Dictyophora* have been used for a long time, scientific investigations regarding their diversity, taxonomy, and phylogeny are rare. The present study uses both molecular and

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