

Dissertation Title	Taxonomy and Phylogeny of Discomycetes with Emphasis on Lignocellulose Substrates and Establishment of Discomycetes.org Website
Author	Anis Sri Lestari
Degree	Doctoral of Philosophy (Biological Science)
Advisor	Thilini Chethana Kandawatte Wedaralalage, Ph. D.

ABSTRACT

Discomycetes, an artificial group in Ascomycota, comprises fungal species bearing saucer-, cup- or disc-like ascoma. While discomycetes are mostly found on lignocellulose substrates, they are also present in soil, on rocks, and dung. Most exploration studies collected discomycetes on lignocellulose substrates as saprobes, some as pathogens or parasites, and a few as endophytes. Among the eleven classes that accommodate discomycetes, Leotiomyces has proven to be the most challenging. This dissertation focuses on finding and redescribing discomycete specimens as saprobes in Leotiomyces families and reviews pathogenic and parasitic discomycetes on lignocellulose substrates.

Our exploration of discomycetes, particularly in northern Thailand, has yielded significant findings, particularly those found on lignocellulose substrates as saprobes. In this study, the exploration of discomycetes on lignocellulose substrates in Chiang Mai, Chiang Rai, and Tak provinces, northern Thailand, resulted in the identification of novel taxa, host and geographical records. The identification of these new species, based on a polyphasic approach consisting of morphology, phylogeny analyses and morphological observation of the herbarium material, has addressed taxonomic issues and deepened our understanding of discomycete classification. Notably, in the current

study, *C. montana* and *C. shangrila*, formerly under *Bisporella*, have been re-assigned in *Calycina* based on the morphology, chemical reactions and multi-gene phylogeny, and *C. papaeana* has been introduced as a new species, marking a significant contribution to the *Calycina* taxonomy.

Furthermore, this study not only led to the discovery of five novel species and two geographical records of *Lambertella* within Rutstroemiaceae, but also contributed to the expansion of available sequence data in public repositories. Our polyphasic approach, incorporating the morphology derived from loaned herbarium material and fresh *Lambertella* specimens, and phylogenetic analyses based on ITS, LSU, SSU and *RPB2*, has confirmed the introduction of *L. Chiangraiensis*, *L. fusioidea*, *L. sessilis*, *L. phanensis* and *L. takensis* as novel species, and *L. aurantiaca*, and *L. himalayensis* as geographical records to Thailand. Moreover, the morphology and phylogenetic analyses based on ITS and LSU also revealed a new species in Helotiaceae from Northern Thailand, as well as two novel species from Italy: *Dicephalospora irregularis* and *Cyathicula dioscorea*, with *C. rusci* being introduced in Helotiales. This polyphasic approach also determined a new geographical record, *Chlorencoelia torta*, belonging to Cenangiaceae.

This dissertation encompasses a literature review on discomycetes identified as pathogenic or parasitic on live lignocellulose substrates or designated as phytopathogenic discomycetes. It presents phytopathogenic, discomycetous fungal taxa and offers notes on representative species, their economic importance, and available management strategies. Phytopathogenic discomycetes span six classes of fungi: Dothideomycetes (distributed across three orders, two families and seven genera), Eurotiomycetes (across two orders, two families and two genera), Lecanoromycetes (across three orders, three families and four genera), Leotiomycetes (across nine orders, 23 families and 104 genera), and Pezizomycetes (across one order, seven families and 18 genera). These fungi are recognized as biotrophs, hemibiotrophs, and necrotrophs

in spermatophytes, pteridophytes, and bryophytes, showing varied disease symptoms. The study also highlights that most of the discomycetous phytopathogens reside in Leotiomycetes, comprising approximately 104 fungal genera, infecting economically important plant families such as Brassicaceae, Cupressaceae, Ericaceae, Fagaceae, Pinaceae, Poaceae, Rosaceae and Solanaceae. Additionally, it briefly reports on the economic significance and current phytopathogenic status of key species, including *Botrytis cinerea*, *Diplocarpon rosae*, *Diplocarpon brunnea*, *Gremmeniella abietina*, *Neofabraea perenans*, *Oculimacula yallundae*, *Pseudopeziza medicaginis*, and *Rhizina undulata*. The impact of phytopathogenic fungi on important agricultural and forestry commodities is massive, with *B. cinerea* alone causing substantial financial losses ranging from 10–100 billion USD. Furthermore, the financial losses of other phytopathogenic discomycetes in Leotiomycetes, such as *Ascocorticium anomalum*, *Ascosorus floridanus*, *Ascodichaena rugosa*, *Monilinia* sp., and *Sclerotinia sclerotiorum*, are noted to be significant, although exact numbers are not detailed as they are reported separately in certain regions. It is stated that chemical applications remain the most predominant solution for managing phytopathogenic discomycetes to reduce economic damage and yield loss in agricultural products, which are essential for food security.

The online platform <https://discomycetes.org>, established in this study, serves as a comprehensive resource for all discomycetes. It compiles disjointed published morphological and phylogeny information in one website, ensuring that all taxa in discomycetes are up to date. The author and other mycologists with expertise in discomycetes regularly update the classification of discomycetes on the online platform <https://discomycetes.org>, providing a reliable and constantly updated source of information for the academic and research community.

Lastly, a checklist of discomycetes from Thailand was provided in this dissertation. A total of 122 novel species out of 690 extant species were recorded from

Thailand, belonging to ten classes, 23 orders, and 57 families. Lecanoromycetes and Leotiomyces were the dominant groups, accounted for 81% (553 species) and 7% (50 species), respectively. Discomycetes, either novel or extant species collected from Thailand, are mostly growing on lignocellulose substrates (83%), with some found on soil, rock, dung other organisms. The number of newly discovered discomycetes peaked from 1992 to 2022, reaching 97 species.

Keywords: Cup fungi, Helotiales, Leotiomyces, Phylogenetic Analyses, Taxonomy

