

<b>Dissertation Title</b>	Taxonomy and Phylogeny of Selected Families of Sordariomycetes with Emphasis on Seeds and Fruits
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## **ABSTRACT**

Sordariomycetes is the largest class of Ascomycota after Dothideomycetes. The majority of the species of Sordariomycetes are terrestrial, while some are found in aquatic habitats. This research is on taxonomic and phylogenetic studies of selected families of Sordariomycetes with emphasis on seeds and fruits.

Hypocreales is an order in the phylum Ascomycota, class Sordariomycetes, subclass Hypocreomycetidae, and consists of fungi with highly diverse lifestyles. This study provides outlines for the Bionectriaceae, Calcarisporiaceae, Hypocreaceae, Nectriaceae, Tilachlidiaceae, Ijuhyaceae, Stromatonectriaceae, Xanthonectriaceae with taxonomic treatments. We provide up-to-date DNA sequence-based phylogenies, including combined gene analysis of ITS, LSU, RPB2, TEF1 and TUB2 for Hypocreales and accept 17 families. Three new families and 14 new species are introduced with descriptions and illustrations, while 14 new records and one new species combination are provided. Here we mainly detail the taxonomy of Bionectriaceae, Hypocreaceae, Nectriaceae and Tilachlidiaceae. The new families Ijuhyaceae, Stromatonectriaceae and Xanthonectriaceae are introduced in this study based on phenotypic and molecular analyses. For each family we provide a list of accepted genera, the taxonomic history, morphological descriptions, taxonomic placement based on DNA molecular data and

illustrate the type genus. Representatives of each family are illustrated based on type herbarium material or fresh specimens where available, or provide relevant references. Summaries on ecological and economic importance of the families are also given.

As a part of this study, taxonomic updates with molecular phylogeny of selected phytopathogenic genera in Hypocreales: *Calonectria*, *Dactylonectria*, *Ilyonectria*, *Fusarium* and *Neonectria* are provided. In addition, a summary of the classification, distribution, disease symptoms and possible hosts of these genera are included in this section. This work also discusses the morphology based and molecular based identification with recommended genetic markers at the genus level and species level of *Calonectria*, *Dactylonectria*, *Ilyonectria*, *Fusarium* and *Neonectria*.

This study also introduced a new order, Falcocladiales in the subclass Hypocreomycetidae to accommodate the family Falcocladiaceae. We review the taxonomic history, morphological characteristics and economic and ecological importance of ten families, Apiosporaceae, Chaetosphaeriaceae, Catabotrydaceae, Cylindriaceae, Delonicicolaceae, Flammocladiaceae, Phaeochoyceae, Pseudotruncatellaceae, Thyridiaceae and Obryzaceae. Illustrations of the type or representative taxa of each family, a list of accepted genera and a key to the accepted taxa are also provided.

We are studying fungi belonging to subclasses of Diaporthomycetidae, Sordariomycetidae and Xylariomycetidae in the class Sordariomycetes, and evaluate fungal species in terms of morphological characters and multi-gene phylogenies. As a result of the phylogenetic analyses *Pseudohalonestria suthensis* is excluded from *Pseudohalonestria* and a new genus, *Tropohalonestria* is introduced to accommodate the species. The current research introduces a new genus *Delonicicola*, to accommodate *D. siamense* sp. nov., which was found to be associated with *Delonix regia* seed pods, collected in Thailand. Phylogenetic and molecular clock analyses of combined LSU, SSU and RPB2 sequence data provide evidence for a new family Delonicicolaceae and a new

order Delonicolales in Xylariomycetidae. A new genus *Pseudotruncatella* is described here to accommodate a truncatella-like coelomycete species, which was isolated in Italy. *Neotruncatella* is synonymised under *Monochaetinula* based on morphology. Considering both molecular and morphological data we introduce *Eriocamporesia* as a new genus in Cryphonectriaceae. Furthermore, here we introduce seven new species, two new sexual morph records, one new host and two new geographical records and reference specimen of *Phragmoportha conformis*.

This research work reviewed and determined the fungi growing on seeds and fruits of wild plants in various habitats. Such fungi colonise a wide range of substrates with most reported from cones, cupules, and leguminous pods that are high in cellulose and lignin content. There are 1348 fungal species (belonging to 230 families and 609 genera) reported from wild seeds and fruits in 84 countries, listed in this paper. Of these, 300 fungi were described from wild seeds and fruit substrates. Members of the Fabaceae support the highest number of taxa, namely 19% of the novel wild fruit fungi. Twenty-eight genera, including five fossil fungal genera have been described from wild seeds and fruits: *Agarwalomyces*, *Amorocoelophoma*, *Anisogenispora*, *Archephoma*, *Centrolepidosporium*, *Cylindroaseptospora*, *Cylindromyces*, *Davidhawksworthia*, *Delonicicola*, *Discotubeufia*, *Glaxoa*, *Kionocephala*, *Leucaenicola*, *Naranus*, *Neolindgomyces*, *Pleohelicon*, *Quercicola*, *Remotididymella*, *Repetoblastiella*, *Restilago*, *Soloacrosporiella*, *Strobiloscypha* and *Tainosphaeria*. *Archephoma*, *Meniscoideisporites*, *Palaeodiplodites*, *Palaeopericonia* and *Xylohyphites* are the new fossil fungal genera. Fungal asexual morphs predominate on wild seeds and fruits rather than the sexual morphs. The dominant fungal genera on wild seeds and fruits include *Alternaria*, *Aspergillus*, *Candida*, *Chaetomium*, *Cladosporium*, *Colletotrichum*, *Curvularia*, *Diaporthe*, *Drechslera*, *Fusarium*, *Mucor*, *Penicillium*, *Pestalotiopsis*, *Restiosporium*, *Rhizopus*, *Talaromyces*, *Trichoderma* and *Xylaria*. Certain assemblages of fungi have specific and distinct relationships with their hosts, especially *Xylaria* species (e.g., *Xylaria magnoliae* on *Magnolia* fruits; *X. xanthinovelutina* (= *X. ianthino-*

*velutina*) on Fabaceae pods; *X. carpophila* on *Fagus cupules*; *X. persicaria* on liquidambar fruits). Whether these species occur as endophytes and become saprobes following fruit fall requires further investigation. In this study, we also made several sexual morph collections of sordariomycetous taxa from different seed and fruit substrates mainly from Thailand, with a few from the UK. These include one new order, one new family, one new genus, 22 new species, 16 new host records and one new geographical record. The new species are described and illustrated.

During the present study of investigating the microfungi in various substrates in Italy, Russia and Thailand, some taxa in class Dothideomycetes were investigated in terms of morphological characters and multi-gene phylogenies. The study resulted five new species, 1 new host and geographical record and a reference specimen of *Plenodomus agnitus*, in the orders Botryosphaeriales and Pleosporales. The new species describe here are *Alternariaster centaureae-diffusae*, *Camarosporium laburnicola*, *Diplodia arengae*, *Keissleriella cirsii* and *Neosetophoma rosarum*.

**Keywords:** Fungi, Fungal Diversity, Fungal Systematics, New Combinations, New Genera, New Families, New Orders, New Species