Dissertation Title	Endophytic and Saprobic Fungi of *Aquilaria* Spp and Their Bioactive Properties
Author	Tianye Du
Degree	Doctoral of Philosophy (Biological Science)
Advisor	Adjunct Professor Kevin David Hyde, Ph. D.
Co-Advisor	Saowaluck Tibpromma, Ph. D.

ABSTRACT

Aquilaria, known as a genus in the Thymelaeaceae family, is the primary source of agarwood and serves as a valuable resource in medicine and the fragrance industry. As a precious resin, agarwood has significant economic, cultural, and medicinal value. Given its medicinal and economic importance, understanding the fungal community associated with *Aquilaria* spp. is crucial. Currently, there are limited reports on saprobic fungi, whereas in the study of endophytic fungi, only some have been reported for their inducing potential or biological activities, and there are few reports on the fungal community of related fungi of *Aquilaria* spp.

In this study, we investigated the fungal communities associated with *Aquilaria sinensis* by collecting samples from four plantations in Guangdong and Yunnan provinces of China. Fungal isolation was conducted from different plant tissues, including agarwood resin, healthy branches, healthy leaves, and decaying branches, and separated into four parts in this study. First, 960 fungal strains were isolated and identified at the genus level, belonging to 64 genera within the Ascomycota, Basidiomycota, and Mucoromycota phyla. Those 64 genera are provided with detailed notes including information on their habitats, life strategies (e.g., endophytic, saprobic, pathogenic), distribution ranges, and known host associations. These comprehensive annotations serve as a reference for future taxonomic, ecological, and functional studies. In addition, five novel species were described, *viz.*, *Banksiophoma endophytica, Deniquelata aquilariae, Montagnula sinensis, M. yunnanensis,* and *Fomitiporia aquilariae* in this part. The second part, comprising 47 representative strains from part one, was tested for antagonistic activity against common plant pathogens (Bacterial pathogens: *Erwinia amylovora*, *Pseudomonas syringae*, and

Salmonella enterica; and fungal pathogens: *Alternaria alternata*, *Botrytis cinerea*, and *Penicillium digitatum*), and the results showed that 40 of 47 strains have biocontrol potential, with the most significant being *Lasiodiplodia* sp. (YNA-D3). The third part, 12 selected strains from part one, were used in artificial agarwood induction experiments. In this part, *Fusarium solani* (GDA-HC01) exhibited outstanding performance by successfully inducing the formation of key medicinal compounds, including agarotetrol, which met pharmacological standards as early as the sixth month. In the last part, we introduced one genus, 17 novel saprobic fungal species, and five new records, belonging to 14 genera in nine families, four orders, and two classes in Ascomycota.

This research fills critical gaps in the diversity and ecological roles of agarwood-associated fungi and saprobic fungi, and enriches the taxonomic foundation of the agarwood fungal ecosystem. Furthermore, several fungal strains with potential antagonistic activity against pathogens were identified. The study also provides important theoretical insights and practical support for elucidating the biological regulatory mechanisms underlying agarwood formation, developing effective biological induction techniques, and understanding the interactions between medicinal plants and fungi.

Keywords: 1 New Genus, 22 New Species, 6 New Records, Agarwood-saprobic Fungi, *Aquilaria*, Ascomycota, Basidiomycota, Biological Control, Biotechnology, Endophyte, Fungal Communities, Fungal Induction, *Fusarium solani*, Genera Notes, *Lasiodiplodia*, Mucoromycota