CHAPTER 1

GENERAL INTRODUCTION

Studies of fungal diversity, as well as discoveries of new fungal species are published on a regular basis (Hyde *et al.*, 1999a, b; Lu and Hyde, 2000; McKenzie *et al.*, 2002). This information helps us to estimate global fungal numbers. In this way we have some estimates to establish whether the current level of biodiversity is being maintained and also mankind can make use of natural products and novel compounds discovered from fungi. This may be especially true for undescribed species or missing fungi that may produce novel compounds (Zhang *et al.*, 1998; Boonphong *et al.*, 2001; Seephonkai *et al.*, 2001; Hawksworth, 2002). There have been several estimates of worldwide fungal numbers, but all are based on data from temperate regions (e.g. 1.5 million, Hawksworth, 1991; 9.9 million, Cannon, 1997). It is hard to conclude which estimate is the most realistic, especially if the estimations are based on incomplete data. The lack of information from the tropics, where fungi may be far more diverse than in temperate regions, is an important gap in our knowledge (Hyde, 2001).

Pandanus species (Pandanaceae) and *Dracaena lourieri* (Dracaenaceae) are monocotyledonous with structurally similar morphological leaves. In Thailand, there are several distinct species of *Pandanus* throughout the country (Gardner *et al.*, 2000). Members of both plant genera are often used as herbs and in mixtures of medicines, while a number of species are cultivated as ornamentals. The *Pandanus* green leaf fibre is sometimes used for plaiting into mats and baskets, as well as for house thatch.

There have been several taxonomic studies on monocotyledon-inhabiting fungi in the tropics including those on bamboo (Dalisay, 1998; Zhou, 2000; Hyde *et al.*, 2002a, b), banana (Photita *et al.*, 2001, 2003a; Photita, 2003), grasses (Wong, 2000), ginger (Bussaban *et al.* 2001a, b; Bussaban 2005) and palms (Techa, 2001; Yanna, 2001; Yanna *et al.*, 2001a. b). Several new species of fungi were found on Pandanaceae, collected from eleven tropical countries (Whitton, 1999; Whitton *et al.*, 1999a, b, 2000a, b) and Mauritius (Dulymamode *et al.*, 1998a, b, c, d, e, 2001a, b).

However, fungi on this host family have not been investigated ecologically. An investigation of the fungi occurring on different *Pandanus* species at the same sampling site, on the same species during different seasons and/or sites is important in terms of providing answers to questions on the diversity of fungi in the tropics and establishing whether the fungi on *Pandanus* spp. are unique or the same as on other monocotyledonous plants.

Phylogenetic analysis is widely used in the characterization and classification of fungi (Kong *et al.*, 2001; Rossman *et al.*, 2001a; Roux *et al.*, 2001; Zhou and Stanosz, 2001; Jeewon *et al.*, 2002; Bussaban *et al.*, 2005; Miller and Huhndorf, 2005). In this study, members of Magnaporthaceae including *Ophioceras* and *Pseudohalonectria* species were collected from *Dracaena lourieri* and *Pandanus penetrans* respectively. There is some confusion as to the genera that should be included in the Magnaporthaceae and of the importance of morphological characters currently used in delineating genera. The ordinal placement is also not clear. Molecular tools are used to help discover intergeneric relationships within the Magnaporthaceae and its phylogenetic placement based on rDNA sequence analyses.

The objective of the present study is to study the diversity and ecology of saprobic and pathogenic fungi on wild and cultivated *Pandanus* species and compare them to those on wild species of *Dracaena loureiri* in Thailand. Two cultivated species of *Pandanus* are *P. odoratissimus* and *P. amaryllifolius*, and a wild species *P. penetrans*. *Pandanus odoratissimus* is a woody plant with prop roots and grows on beaches in eastern and southern regions of Thailand. *Pandanus penetrans* is native plant in moist northern Thailand forests (Figure 1.1). The plant species and genera were examined to establish whether the pathogens and saprobes differ between *Pandanus* and *Dracaena*, and between the wild and cultivated species of *Pandanus*. Seasonal patterns of occurrence and the distribution of fungi on *Pandanus* and *Dracaena* at different sites were also investigated. Representative saprobes and pathogens were tested for pathogenicity in order to establish information on the mode of life. Changes in fungal communities during the decay process (succession) of *P. penetrans* leaves were also examined. Ribosomal DNA sequences of selected sexual and asexual taxa of Magnaporthaceae in present study were analyzed to establish phylogenetic relationships.

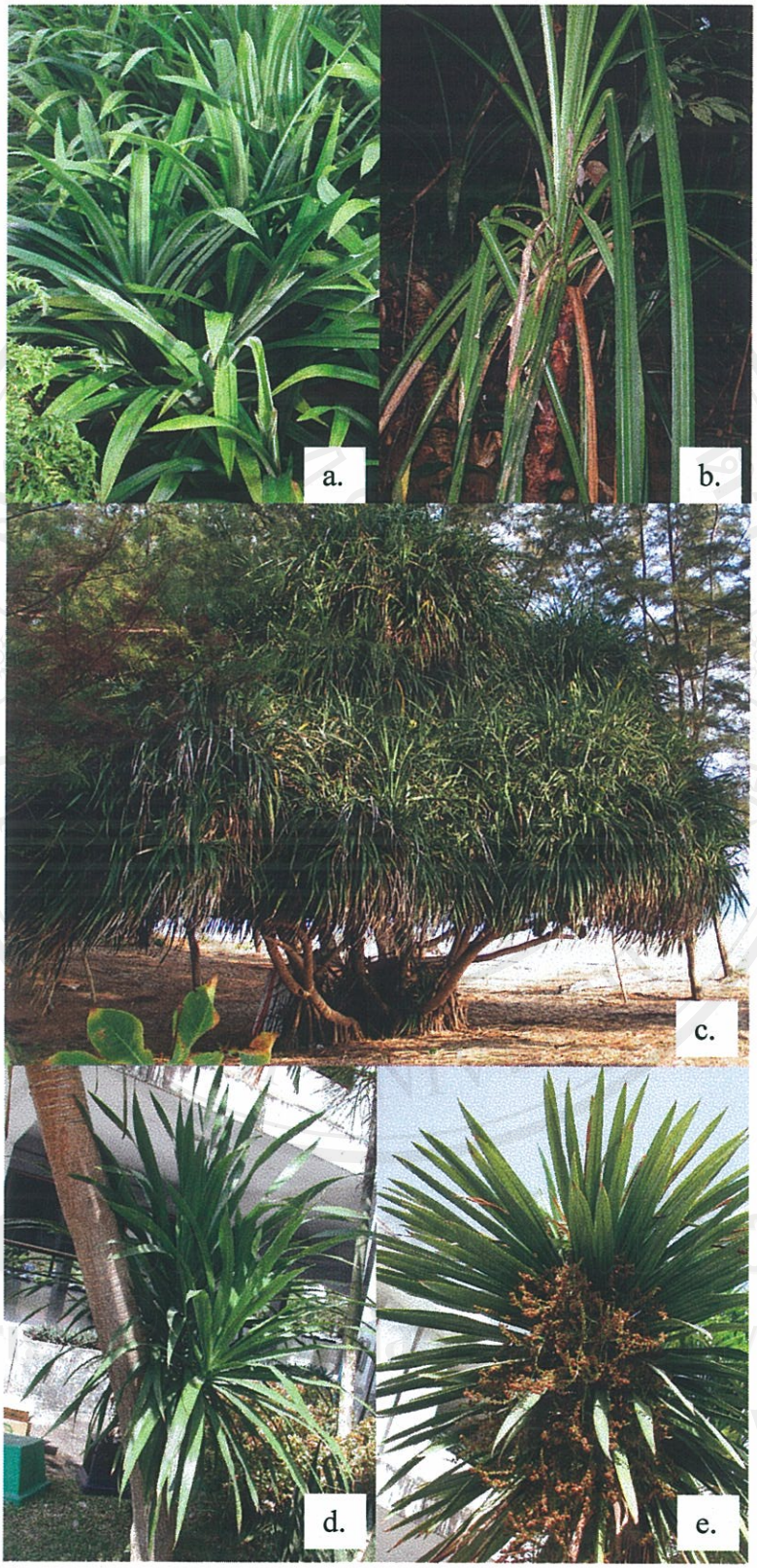

Figure 1.1 Plants selected for the present study. a. *Pandanus amaryllifolius*, b. *P. penetrans*, c. *P. odoratissimus*, d-e. *Dracaena lourieri*

This thesis (Figure 1.2) reviews knowledge of host plants including *Pandanus* and *Dracaena*, and the fungi and their phylogenetic relationships in Chapter 2. The biodiversity of saprobic and pathogenic taxa on some species of *Pandanus* and *Dracaena lourouri* in Thailand as well as the fungal succession on *P. penetrans* leaves from Doi Suthep Pui National Park are discussed (Chapter 3). Chapter 4 provides descriptions and illustrations of new and some interesting taxa identified in this study. Species in the Magnaporthaceae were sequenced and phylogenetic relationships of these group fungi analysised (Chapter 5). A general discussion and conclusion of the results of this study and their implications is presented in Chapter 6.

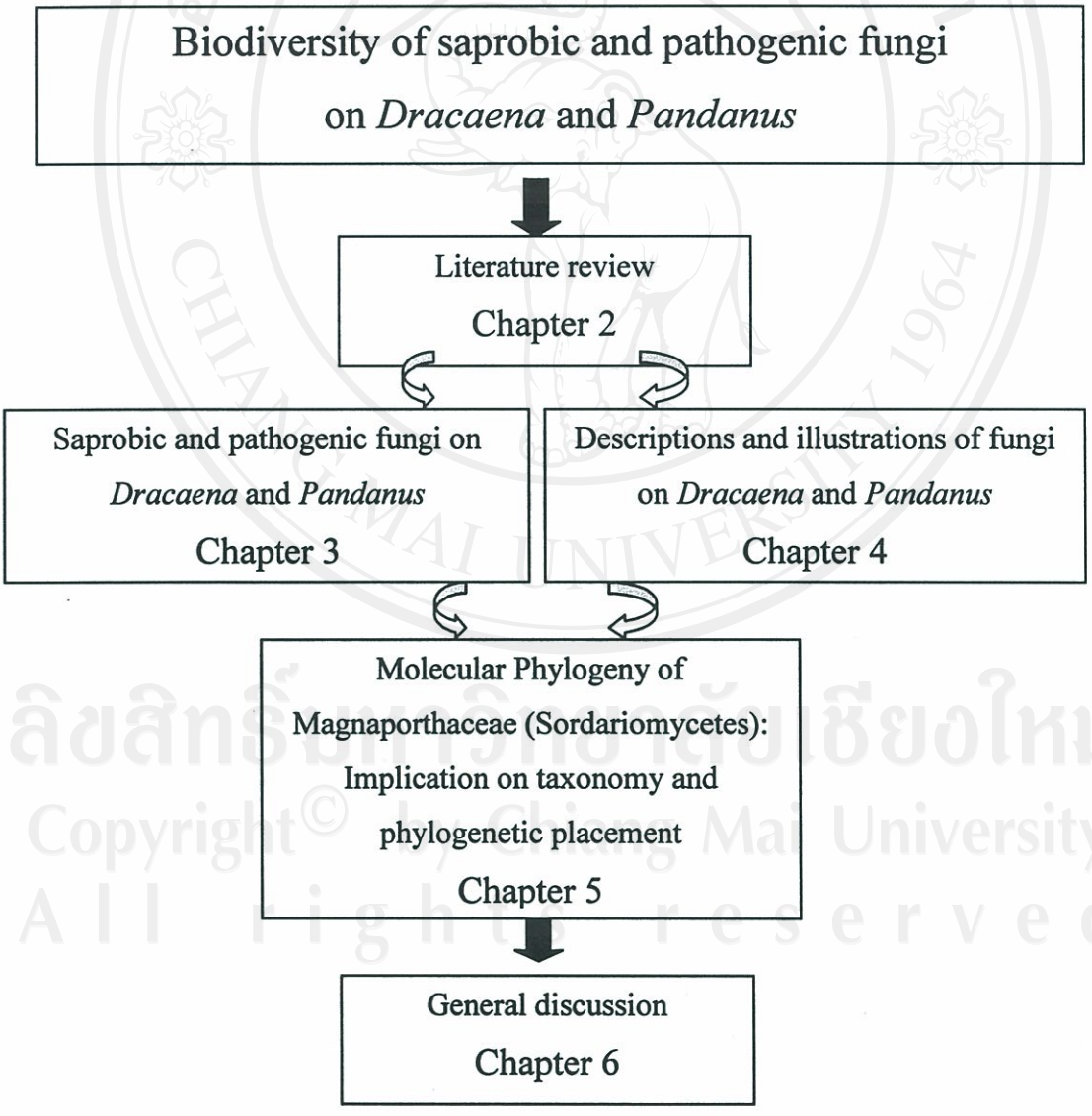

Figure 1.2 Schematic presentations of the relationships between chapters of the thesis.