CHAPTER 1

GENERAL INTRODUCTION AND THESIS OUTLINE

Orchids belong to the Family Orchidaceae, the largest family of flowering plants. In Thailand, 1,230 species from 170 genera of orchids were reported (Nanakorn and Indharamusika, 1998). Due to the high demand in horticultural market, many orchid species are said to be extinct in their natural habitats. Deforestation is another major cause for making orchids become endangered or extinct. Terrestrial orchids, in particular, are vulnerable due to habitat loss.

Orchids occur in a mutualistic symbiotic association with mycorrhizal fungi and their roots (Beyrle *et al.* 1995). The association of orchids with these endophytic fungi is essential in many cases for seed germination and subsequent plant development (Clements, 1988; McKendrick *et al.* 2000; Brundrett *et al.* 2001). The terrestrial orchids, in particular, depend on the fungal partners from seed germination to protocorm formation to flowering. By contrast, there are few reports on the association of mycorrhizal fungi with epiphytic orchids (Sangthong, 2002).

The orchid mycorrhizal fungi are not well known when compared to the ectomycorrhizal fungi that produce a mantle covering the fine roots of many woody hosts and the endomycorrhizal fungi that grow and penetrate into root

tissues of many wild and economical plants especially in Thailand the orchid mycorrhizal fungi have been poorly studied. However, studies on orchid mycorrhizal fungi in Thailand (Sangthong, 2002; Athipunyakom *et al.* 2004a) and in other countries (Moore, 1987; Anderson, 1991; Beyrle *et al.* 1995; Rasmussen *et al.* 1995; Weber and Webster, 2001; Chou and Chang, 2004; Ovando *et al.* 2005; Stewart and Kane, 2006; Smith and Read, 2008) indicate that the fungi associated with green (assimilating) orchids are Rhizoctonia-like fungi and have a potential to promote orchid's seeds germination and seedlings growth.

Key factors for ensuring orchid conservation include the knowledge of mycorrhizal fungi and methodology for culturing them to propagate orchid seedlings *in vitro* (Brundrett *et al.* 2001) and the requirement for stimulation of their growth when transferred from the laboratory to greenhouse cultivation or their natural environment. Hence, the objectives of this study are to identify mycorrhizal fungi associated with *Pecteilis susannae* and some Thai terrestrial orchids to develop the symbiotic culture methods for conservation and reintroduction purposes of the orchid species.

This thesis described a programme of research on orchid mycorrhizas of some terrestrial orchids in Thailand. Setting the background to this work, in Chapter 2 reviews our knowledge of orchids and their mycorrhizal fungi.

Chapter 3 describes the isolation and identification of orchid mycorrhizal fungi isolated from 6 terrestrial orchids.

Chapter 4 describes the effects of orchid mycorrhizal fungi on symbiotic seed germination of terrestrial orchids, *Pectelis susannae*.

Chapter 5 describes the screening of indole-3-acetic acid (IAA) and siderophoores production by orchid mycorrhizal fungi and fungi associated with orchid's root and studies on the optimization of IAA production by an active isolate.

Chapter 6 describes the optimization of growth condition of orchid mycorrhizal fungi on agar, grain and potting media.

Chapter 7 describes the using of mycorrhizal inoculums for cultivation orchid seedlings, mycorrhizal colonization and effects of mycorrhizal fungi on the growth of orchid seedlings of *Doritis pulcherrima*.

Chapter 8 describes the summarization and discussion of data in this thesis.

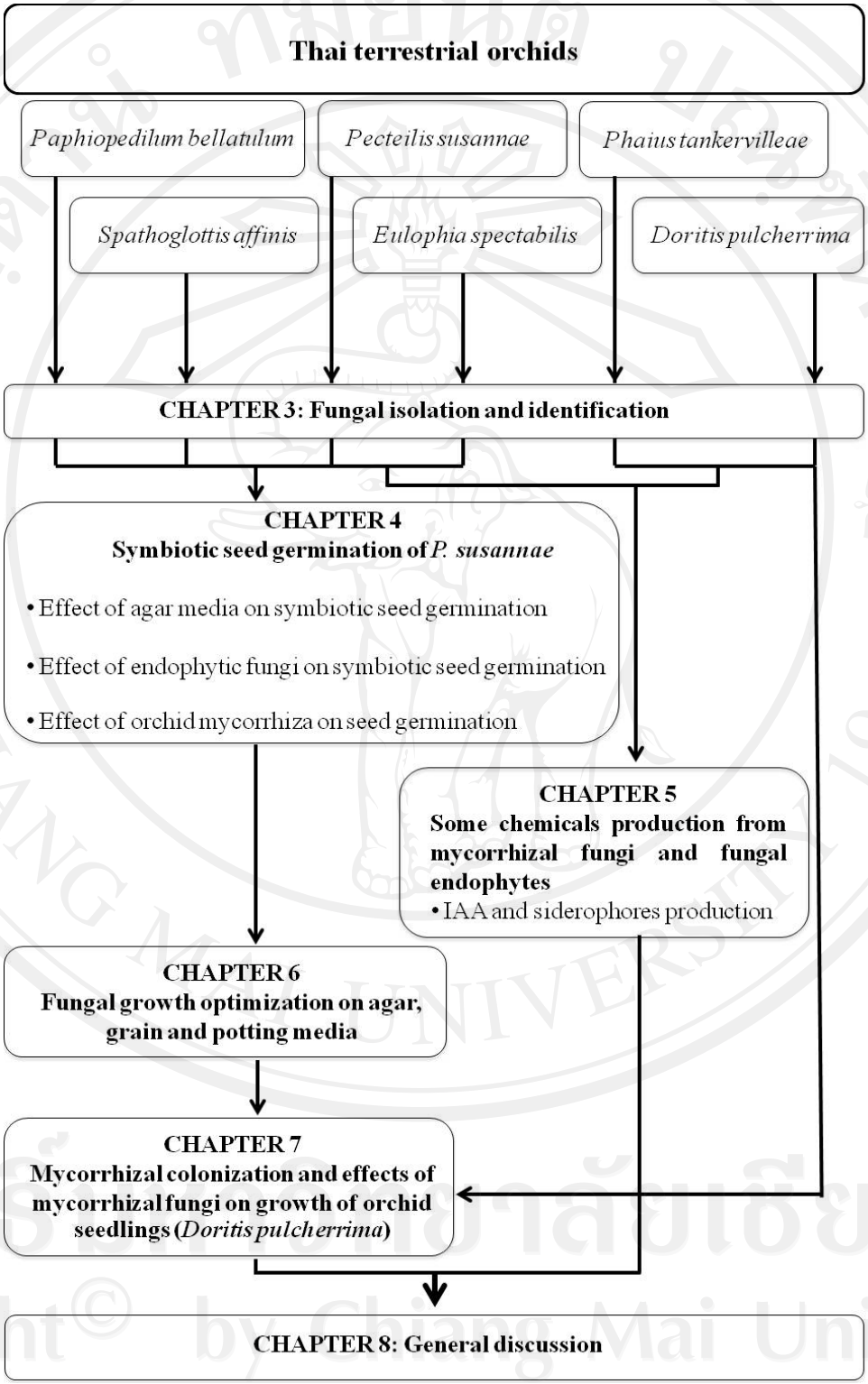

Figure 1.1 Structure of the thesis