CHAPTER II

REVIEW OF LITERATURE

1. Association of the endophytic fungi and plant

Endophytic fungi colonize living plant tissues by penetration of fungal hyphae between plants cells or may also grow intracellularly and must obtain nutrient materials through this intimate contact with the host. (Isaac, 1992). The association of fungi with plant ranges from mutualistic symbiosis, or commensalism to borderline latent pathogen (Strobel and Long, 1998). Results of their interaction are increase capacity of a plant to resist disease and increase survival of plant from natural environment by producing bioactive substance (plant growth promoting, antibacterial, antifungal and insecticidal) to enhance the plant growth.

2. Study of secondary metablites from the endophytic fungus

Before 1993, research on fungal endophyte was limited only for identification and classification, until in 1993 Strobel *et al* isolated paclitaxel (Taxol®, anticancer drug) from the endophytic fungus *Taxomyces andreanae* from Pacific yew *Taxus brevifolia.*

Nowaday, the fungal endophyte research has focused on screening of secondary metabolites that exhibited interesting bioactivities such as antifungal, insecticidal, antimicrobial, antimalarial, anticancer, immunosuppressive and antiviral activities. For examples, *Cryptosporiopsis* cf *quercina*, the fungal endophyte isolated from *Tripterygium wilfordii*, a chinese medicinal plant, produced cryptocandin, a cyclopeptide antifungal (Strobel *et al.*, 1999). Tricin, a bioactive flavonoid with insecticidal activities, is a secondary metabolite of *Neotyphodium typhnium* isolated from blue grass (*Poa ampla*) (Ju *et al.*, 1998). *Phomopsis longicolla*, the endophytic fungus of the endangered mint *Dicerandra frutescens*, was found to produce dicerandrol A, B, C, the xanthones with antimicrobial activities (Wagenaar and Clardy, 2001). Phomoxanthones A and B,

two novel xanthone dimers with antimalarial activities were isolated from the endophytic fungus *Phomopsis* sp BCC 1323 that isolated from *Tectona glandis* leaf (Isaka *et al.*, 2001). Taxol (paclitaxel), the anticancer drug from pacific yew bark, is a secondary metabolite of *Taxomyces andranae* isolated from *Taxus brevifolia* (Strobel *et al.*, 1993). Subglutinols A and B, two immunosuppressive compounds, were isolated from *Fusarium subglutinans*, an endophytic fungus of *Tripterygium wilfordii* (Lee *et al.*, 1995). Two novel *p*-tridepside antiviral compounds, cytonic acid A and B, were isolated from the endophytic fungus *Cytonaema* sp. obtained from *Quercus* sp. (Guo *et al.*, 2000). The biological activities, sources, chemical compounds of secondary metabolites from fungal endophyte were summarized in Table 1(in Appendix A).