

CHAPTER 5

GENERAL DISCUSSION

A study of powdery mildew fungi in the Erysipheae was conducted in Northern provinces of Thailand, e.g., Lampang, Chiang Mai, Chiang Rai, and Maehongsorn. Previously, there were some reports on powdery mildew in Thailand, in which 31 host plant species covering 22 families have been recorded. This study can describe and identify the fungi to Genera level of *Erysiphe* in 8 plant species and subgenera *Pseudoidium* in 59 plant species covering 34 families, the genus *Erysiphe* (*Brasiliomyces*) in 8 plant species describe and propose as two new species of *Erysiphe* species. Due to the phylogenetic position of the two new taxa within the *Erysiphe* clade, prefer to assign them to *Erysiphe* as described to *Erysiphe monoperiata* sp. nov. and *E.asiatica* sp. nov.

Oidium subgenus *Pseudoidium* are found on 59 host plant species covering 34 host plant families in this study, 7 host plant species are firstly reported in Thailand and 4 species are firstly recorded in the world. Within 59 host plant species, there is

only one species of powdery mildew producing both anamorphic and teleomorphic states on *Tectona grandis*. *Erysiphe (Uncinula) tectonae* occurred on *T. grandis* is characterized by having conidiophore arising from hyphae to bend upward at the base. Conidia are formed singly and cylindric without fibrosin bodies. Appendage has apex closely uncinately. Morphology of *U. tectonae* found in Thailand is similar to *U. tectonae* described by the previous reports (Salmon, 1907; Kothari *et al.*, 1965; Braun, 1987). Hirata (1968) divided powdery mildew into two groups based on the size of their host range. The genus *Uncinula* belongs to the group with wide host range as well as the genera *Erysiphe*, *Leveillula*, *Sphaerotheca*, *Podosphaera*, *Microsphaera*, and *Phyllactinia*. Twenty orders, 38 families, 18 genus and 395 host species were described as host plants of *Uncinula* from all over the world. In the present during a survey, only one species of the genus *Uncinula* was found. It is indicated that the genus *Uncinula* has only a few host plants in Thailand. Powdery mildew on *Tectona grandis* and *U. tectonae* on *T. grandis* were widely spread in Chiang Mai. Mostly white mycelia cover on the upper leaf surface. Later the fungus produced abundant chasmothecia. Braun and Takamatsu (2000) studied the phylogeny of *Erysiphe*, *Microsphaera*, and *Uncinula* by morphology and rDNA ITS sequences, and found a very close relationship between the genera *Erysiphe*, *Microsphaera*, and *Uncinula*. They transferred some species of the genus level of

Uncinula to *Erysiphe* emend. based on characteristic of anamorphic state (*Pseudoidium*) and ITS sequences. Thus, *U.tectonae* was transferred to *Erysiphe tectonae* (Salmon) Braun and Takamatsu (Braun and Takamatsu, 2000). In this study, the ITS sequence of *E.tectonae* differs from all isolates of *Erysiphe* species, suggesting that it is a unique species. The phylogenetic tree grouped *E.tectonae* with powdery mildew isolates from Betulaceae. In this clade, powdery mildew on Betulaceae has the largest sequence diversity and represents most members in this group. In this clade, *E.tectonae* is grouped with *E.sengokui* and *E.togashina*. But the morphological characteristics of chasmothecia of these fungi are different from each other. In conclusion, morphology and the ITS sequences supported that *Erysiphe (Uncinula) tectonae* is a unique species. **This is the first report of *Erysiphe (Uncinula) tectonae* on *Tectona grandis* in Thailand.**

Genus *Erysiphe (Brasiliomyces)*, both *Erysiphe monopendiata* and *E.asiatica*

have a single layer of chasmothecial peridium cells, which is a morphological characteristic of the genus *Brasiliomyces* (Zheng, 1984; Braun, 1987). However, unpublished results of our recent phylogenetic study clearly indicate that the genus *Brasiliomyces* is polyphyletic, consisting of at least two independent lineages. This result urgently requires revision of the generic concept of *Brasiliomyces*. Because the

current phylogenetic analysis indicates that both species belong to the *Erysiphe* clade with *Oidium* subgenus *Pseudoidium* anamorphs, together with *E.trinae* and *Typhulochaeta japonica*, we propose to assign these two new species to *Erysiphe*. A total of eight *Brasiliomyces* species have been reported in the world, especially from subtropical and tropical regions (Harkness, 1886; Viégas, 1944; Marasas, 1966; Boesewinkel, 1980; Hanlin & Tortolero, 1984; Hodges, 1985; Kuo *et al.*, 1992; Ahmad *et al.*, 1998; To-anun *et al.*, 2003). Three of the eight species occur on Fagaceae. Of these, *B.cyclobalanopsisidis* and *E.asiatica* by its much smaller ascospores. Epiphyllous mycelia of *B.kumanoensis* are shared by *E.monoperidiata*, but the former species differs from the latter one by its larger chasmothecia (80–90 µm). The phylogenetic analysis in this study indicates that *E.monoperidiata* and *E.asiatica* are closely related to *E.trinae* occurring on *Quercus agrifolia* in North America. However, they did not form a clade together in the phylogenetic tree (Fig. 23). In addition, *E.trinae* usually has 2-spored asci, which differs from *E.monoperidiata* and *E.asiatica* having 4–6-spored and 6–8-spored asci, respectively.

The present phylogenetic analysis indicates that *E.monoperidiata* and *E.asiatica* form a clade together with *T.japonica*, *E.trinae* and *E.gracilis* infecting Fagaceae. This clade belongs to a lineage consisting of fungi with uncinuloid appendages that formerly belonged to the genus *Uncinula*. Interestingly, *E.monoperidiata*, *E.asiatica*,

E.gracilis and *E.trinae* have mycelioid appendages, and *T.japonica* has unique club-shaped appendages, which indicates that none of the species belonging to this clade has uncinuloid appendages.

This result suggests that these different appendage shapes and a single layered peridium cells evolved on fagaceous hosts. Molecular phylogenetic analysis using more sequences from *B.cyclobalanopsisidis* and *B.kumanoensis* is required for further and deeper discussions. **Furthermore, two new species of *Erysiphe* from Thailand is the first report and record of powdery mildew genus *Erysiphe*.**