CHAPTER 1

INTRODUCTION

Principles and Rationale

The lotus (Nelumbonaceae) and the water lilies (Nymphaeaceae) are families of water plants that have been known by humans for thousands of years. Historical accounts reveal evidence of dried water lilies in the mausoleums of Egyptian kings who lived some 3,000-4,000 years ago. The excavation of ancient monuments and artifacts in the Sindhu River basin of India also brought to light ancient lotus and lotus petal designs. In addition, lotus seeds found in coal mines in Manchuria and China resulted in beautiful pink flowers 18 months after their discovery (Lakhakul, 1992). In China, lotus has been cultivated for nearly 5,000 years (Anonymous, 1987, cited in Shen-Miller *et al.*, 2002) and viable seeds were found in peat layers in Manchuria, where lotus apparently was cultivated 1,300 years ago (Ohga, 1923, 1927; Lakhakul, 1992). Lotus' association with Buddhism is intense. From religion, lotus images entered art, and a multitude of designs representing their flowers, leaves, and even the somewhat artistically shaped fruits. The floating leaves and colorful flowers of these plants are easily recognized in designs and systematic botanists have described them as retaining many of the ancestral characteristics of the first flowering plants (Burkill, 1996).

Several species of Nelumbonaceae and Nymphaeaceae are of economic importance because of their use as ornamental plants in water gardens and numerous horticultural varieties were developed over the last century. Species of *Nelumbo* and *Nymphaea* are edible and have a number of medicinal uses (Burkill, 1996; Keng, 1974). In Thailand, lotus is closely associated with Buddhism, which it symbolizes. Hence, an image of Buddha often sits on a giant lotus flower, and there are lotus flowers in the architecture of almost all Buddhist temples, pagodas, and worship places throughout the country. Lotus appears as capitals on columns in ancient Thai

temples, symbolizing the spiritual ideal. Thai people use flowers of *N. nucifera* in religious ceremonies. From religious practices, the tradition of using lotus and water lily decorations has entered non-religious art with many idioms and proverbs comparing the beauty of women with lotus and water lily. Furthermore their leaves, fruits, and colorful flowers are easily recognized in a multitude of designs in many ancient art works.

Lotus is also popular as a cut flower that generates income in rural areas. In addition to their ornamental value, they are extensively used for medicine and food in Thailand (Burkill, 1996). As is widely known, lotus and water lilies are among the oldest plant and they are highly significant to Thai cultures in their beliefs, lifestyles, and civilization. They are common wherever the landscapes are dotted with wetlands and ponds. Nevertheless, despite their economic and cultural importance, they have received little scientific attention in Thailand.

The knowledge about Thai lotus and water lilies is scattered in various sources such as articles, the internet and as unwritten knowledge of local people. There are only a few research reports regarding Thai Nelumbonaceae and Nymphaeaceae. Additionally, much confusion arose with the names of lotus and water lily species in published articles and reports. Consequently, Nelumbonaceae and Nymphaeaceae have so far received very little taxonomic attention and still require thorough systematic investigation. The majority of the species still await taxonomic revision and studies of their economic potential. So far, there has been no comprehensive study of the Nymphaeaceae and allied families in Thailand, and the geographical distribution, cytology, phytochemistry and their economic importance can only be guessed based on reports from the neighboring countries (i.e., Hooker, 1875; Humbert and Gagnepain, 1950; Backer and Bakhuizen, 1963; Ohwi, 1965; Ridley, 1967; Dassonayake, 1996). This situation clearly needs to be corrected through investigation in the systematic of Nelumbonaceae and Nymphaeaceae and related plant in Thailand. Nevertheless, Nelumbonaceae and Nymphaeaceae are common in breeding and species hybrids come in all colors, shapes and sizes. It is conceivable that escapes and naturalized hybrids will mix with the native species. This makes a study of the native Thai species so much more urgent.

Research Objectives

1. To make a taxonomic revision of Nelumbonaceae and Nymphaeaceae in Thailand, and to clarify any taxonomic problems.
2. To study the ethnobotany and assess the potentials of selected economically important species of Nelumbonaceae and Nymphaeaceae in Thailand.

Research Scope

1. Taxonomic revision of Nelumbonaceae and Nymphaeaceae in Thailand.

A taxonomic revision of Nelumbonaceae and Nymphaeaceae in Thailand was undertaken by carrying out a botanical inventory. This was conducted using standard taxonomical procedures with a generally conservative approach, including studies of morphology, anatomy, and ecology of the species. This revision was based on detailed field work in many parts of Thailand and the examination of herbarium material from the major herbaria both in Thailand and abroad. Descriptions and keys of the species, including vernacular names and an overview of the present knowledge of their uses and biogeographical distribution of each species, are provided based on surveyed data and literature, supplemented with living specimens collected in the field and subsequently grown at Queen Sirikit Botanic Garden, Chiang Mai, Thailand.

2. Ethnobotanical studies of Nelumbonaceae and Nymphaeaceae in Thailand

Ethnobotanical studies were carried out by interviewing local residents of the studied areas. A variety of information relating to past and present uses and resource management was collected. Answers were converted into a standardized form and then analyzed based on the interview data to detect differences between the species and differences between the informants' uses of the species.

3. Management information to the homepage

A homepage for displaying the information about water lilies and lotus in Thailand describing various aspects such as taxonomy, diversity, horticulture, ecology, biology and ethnobotany were designed.

Educational Application Advantages

The achievements gained through a taxonomic revision and ethnobotanical study of the Nelumbonaceae and Nymphaeaceae in Thailand are as follows.

1. The number of genera and native species with the correct botanical names of Nelumbonaceae and Nymphaeaceae in Thailand, including information on morphology, taxonomy, ecology and distribution range, are known.
2. Information preserved in a specimen-based database will contribute to the scientific knowledge base of water plants.
3. Fundamental knowledge for conservation and management will be strengthened and developed economical Thai lotus and water lilies in Thailand.
4. Ethnobotanically important data about Nelumbonaceae and Nymphaeaceae, and about their uses by local people, are provided.
5. A homepage of Thai water lilies and lotus (Nelumbonaceae and Nymphaeaceae) is made. This homepage will allow researchers and horticulturists to have connection with the editor.