Survey and Herbarium Study of Medicinal Vascular Flora of Doi Mae Soi

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ABSTRACT

The herbarium now includes over 10,037 specimens from 238 families (270 fam. in the world) kept in Medicinal Plants Herbarium, Faculty of Pharmacy, Chiang Mai University. From October 1991 until December 1993, a total of 740 species had been collected from Doi Mae Soi valley catchment, Chom Tong District, some of which are of considerable economic, medicinal and botanical interest. These plants which have been collected belong to 136 plant families. Doi Mae Soi valley, c.300–1,650 m. above MSL, compose of deciduous plants, mixed with evergreen plants and the area over c.1,000 m. are bedrock and granite. Plants found on the limestone differ from those species found on the granite area. So, vegetation collected from different level and habitat area will point to the development of natural forest in the future.

Key words: Doi Mae Soi, Herbarium specimens, Medicinal plants museum

INTRODUCTION

Mae Soi conservation area is situated about 65 km south of Chiang Mai City and includes an area of nearly 70 km^2. It is named after the Mae Soi stream which, along with its tributaries, originates in the uplands of the region, flows through a wide valley and eventually joins the Ping River at Mae Soi Village. The elevation of the area is 300 m at the base of the valley and rises to over 1,625 m at the top of the ridge. The bedrock is mostly granitic with limestone along the southern (c.400–c.1,100 m) and north-eastern (300–450 m) parts of the area. The main reference points are a Buddhist Meditation Centre in the centre of the valley and a Hmong (hilltribe) village, Ban Bah Gluay, on the ridge at c.1,400 m. Most of the area is officially under the auspices of the Watershed Management Division of the Royal Forest Department.

The lowlands of the area, continuously degraded for decades, are essentially clear-cut and abandoned by the early 1970. Because of this blatant ecological insult and the detrimental effects from this loss of habitat and resources, Pra Ajahn Pongsak, abbot of Pah Laht Temple on Doi Sutep in Chiang Mai, established a meditation centre in the Du Boo Cave area through which the Mae Soi stream passes. This meditation centre has prevented further forest destruction which, if continued, would have denuded and destroyed the cave area. Since Pra Ajahn

Pongsak is a "forest monk", that is one who is concerned about the permanence of forests, these provide him with proper meditation conditions. He has become an ardent conservationist in his efforts to not only protect this area from further degredation, but also to teach others how to respect and live with nature while finding ways to repair some of the damages. His efforts have received keen support from the villagers in the lowlands who have less water, decreased rainfall, increased heat and poorer soil fertility/crop yields because of forest deterioration in the area.

The Dhammanat Foundation for Conservation and Rural Development was established in July 1986 at Pah Laht Temple and the Mae Soi area became its first project area. The basic aims of the Dhammanat Foundation in the Mae Soi area are to :

1. Prevent further degradation of the forest and catchment/watershed areas,
2. Develop the devastated lowland valley area for agricultural use,
3. Establish a nature education centre at the Buddhist Meditation Centre, and
4. Replant upland forests.

It is the last of the above points which has made us involved directly in the project.

METHODOLOGY

Surveying and collecting the essential parts of medicinal plants of Mae Soi conservation area for taxonomic identification and collecting medicinal herbarium specimens to be authentic specimens in Pharmacy Herbarium, Faculty of Pharmacy, Chiang Mai University. The collection method and criteria are as follow :

- Collect plants that have leaves, flowers and fruits for identification
- Collect root and remove all dirt
- Collect the whole plant
- Choose about 5 blooming and just-budding flowers, with leaves and fruits if possible
- Choose about 5 young and ripen fruits with leaves
- If the specimens is not complete, collect more in other seasons with note attached
- Collect at least 5 duplicates, i.e.,
  2 duplicates for taxonomic identification
  3 duplicates for herbarium specimens

RESULTS AND DISCUSSION

There are three basic forest types in the Mae Soi conservation area, viz., lowland deciduous, or originally teak forest; mixed evergreen/deciduous forest at the middle elevations of c. 700–1,000 m; and the upland vegetation of pine and evergreen hardwood trees. The ground flora of each of the three basic forest types basically correspond to the type of tree cover, while those plants which actually grow on limestone differ from all others in the area. The vegetation of Doi Sutep-Pui, excluding limestone plants which are not found there, closely resembles that at Mae Soi and for more information, a report on this topic is relevant (Maxwell, 1988).

Lowland Vegetation

The original forest cover in the valley lowlands, in fact throughout most of the northern

part of Thailand, was a deciduous forest dominated by teak, (*Tectona grandis* L. f., fam. Verbenaceae), a very commercially-valuable timber species which was rendered almost locally extinct by logging exploiters. Much of the de-teaking operations occurred earlier this century and when this species was exhausted, less-profitable trees were removed, e.g., *Pterocarpus macrocarpus* Kurz and *Dalbergia dongnaiensis* Pierre (both Leguminosae, Papilionoideae), *Xylia xylocarpa* (Roxb.) Taub. var. *kerrii* (Craib & Hutch.) Niels. (Leguminosae, Mimosoideae), *Eriobotrya bengalensis* (Roxb.) Hk. f. forma *bengalensis* (Rosaceae), *Terminalia bellirica* (Gaertn.) Roxb. (Combretaceae), and *Chukrasia velutina* W. & A. ex Roem. (Meliaceae).

As a consequence of this destruction, a secondary type of deciduous vegetation has regenerated, viz., a deciduous dipterocarp-oak facies. More informations on these forest types are found in a report by the Center for Conservation Biology (1992). The deciduous dipterocarp-oak vegetation is basically a more open, shorter, single-storied and drier forest which covers much of the lowland and middle-elevation slopes. Apparently, the clear-cutting of the original deciduous (teak) forest and consequent loss of soil has prevented the teak forest from returning. Subsequent abuse, i.e., cutting and burning, of the deciduous dipterocarp-oak forest has resulted in retarded development of this secondary growth. Mae Soi valley has about 1 ha. remnant of the original forest ("Sacred Grove") next to Mae Soi stream which is in all ways, especially botanically and ecologically, different from the surrounding areas.

The deciduous dipterocarp-oak forest, often uncritically referred to as "dry dipterocarp" forest, is named in reference to the tree families Dipterocarpaceae (dipterocarps) and Fagaceae (oaks) which dominate it. Mae Soi valley presently has numerous *Dipterocarpus obtusifolius* Teijsm. ex Miq. var. *obtusifolius, D. tuberculatus* Roxb. var. *tuberculatus, Shorea obtusa* Wall. ex Bl. and *S. siamensis* Miq. var. *siamensis* (all Dipterocarpaceae) while oaks, e.g., *Quercus kerrii* Craib var. *kerrii* (Fagaceae) are generally infrequent. The soil, due to excessive erosion, is rocky and bamboos are scarce. The ground flora conform with that on Doi Sutep (Maxwell, 1988). Deciduous dipterocarp-oak areas that have been further degraded by logging, fire, cattle and soil/mineral removal have become scrub thickets and weed-lands.

Some areas that have shown signs of redevelopment into the original deciduous (teak) facies are now dominated by the bamboo *Thyrsostachys siamensis* (Kurz ex Mun.) Gamb. (Gramineae, Bambusoideae). These areas were only incompletely destroyed and have, therefore, retained most of the original species, albeit in very diminished numbers of individual trees. This is especially noticeable around the Meditation Centre where there has not been any cutting or burning in recent years in addition to being protected by a fence which has kept cows out of the area. The bamboo has thrived in response to the opening of the canopy and will disappear as the canopy begins to provide more shade. The stumps of teak and other hardwood giants in these areas indicate not only the kind of original forest and sizes of its trees, but also the shocking extent of devastation that the area has experienced.

Mixed Evergreen/Deciduous ("Mixed") Forest. c. 700–1,000 m.

The forest cover of the middle elevations and especially near streams is composed of both deciduous and evergreen tree species. The area, in contrast to the lowland area, has not been as severely ruined by logging and, therefore, has a more intact original facies. Some

deciduous trees are: *Schleichera trijuga* Willd. (Sapindaceae), *Semecarpus cochinchinensis* Engl. (Anacardiaceae), and *Diospyros coaetanea* Flet. (Ebenaceae). While some evergreen sympatriates are *Mangifera caloneura* Kurz (Anacardiaceae), *Turpinia pomifera* (Roxb.) Wall. ex DC. (Staphyleaceae), *Carallia brachiata* (Lour.) Merr. (Rhizophoraceae), and *Tarenna disperma* (Hk.) Pit. (Rubiaceae). The corresponding ground flora is more dense, but less diverse than in lowland deciduous areas. Mae Soi valley, because of varying degrees of destruction, well illustrates the fact that the regrowth of original forest cover is very gradual and often not clearly defined in extent. Those areas of lowland forest which have been most severely destroyed tend to have deciduous dipterocarp-oak components in the "mixed" zone, while less-severely damaged areas have more of the original forest species merging with the lower part of the upland evergreen hardwood and pine vegetation.

It should be noted that the forest cover along streams with year-round flow are mostly composed of evergreen trees and shrubs which differ from upland species. Some of these species are restricted to this habitat, e.g. *Eugenia grata* Wight var. *grata* (Myrtaceae) and *Ficus abelii* Miq. (Moraceae), while *Scleropyrum wallichianum* Arn. var. *siamensis* H. Lec. (Santalaceae), *Homalium grandiflorum* Bth. var. *grandiflorum* (Flacourtiaceae), and *Hopea odorata* Roxb. var. *odorata* (Dipterocarpaceae) are often found in or near these places. Judging by the species found in nearby forests, especially Doi Sutep-Pui, Doi Intanon, and the teak forest in Mae Yom National Park (Prae Province), several big tree species seem to be missing in the lowland and "mixed" forests in the Mae Soi valley. *Afzelia xylocarpa* (Kurz) Craib (Leguminosae, Caesalpinoideae), of lowland forests, and *Dipterocarpus costatus* Gaertn. f. (Dipterocarpaceae) in "mixed" areas, because of their commercial value, have, it seems, disappeared completely from the Mae Soi area. *Pinus merkusii* Jungh. & De Vriese (Pinaceae) should also be in the "mixed" and upland forests of Mae Soi. However, we have not seen it there. It is often sympatric with *Pinus kesiya* Roy. Ex Gard. (Pinaceae) in other nearby forests, thus its absence at Mae Soi seems to be anomalous.

Upland Evergreen Hardwood and Pine Forest

The pine *Pinus kesiya* Roy. ex Gard. (Pinaceae) and evergreen hardwood tree species, differing from those at lower elevations, begin to appear from c.900–1,000 m elevation in "mixed" forested areas. The upland evergreen hardwood and pine forest is well-developed above 1,000 m and continues to the top of the Mae Soi Ridge (1,625 m.) During the time that the lower forests were being destroyed, the upland areas were also being ravaged by hilltribe people for opium (*Papaver somniferum* L., Papaveraceae) cultivation. Presently, vast areas on the ridge, including most of the Mae Soi catchment valleys, have been either completely destroyed or severely degraded. Although most of the opium cultivation has now been suppressed, the cash crop substitues (mostly cabbage, *Brassica oleracea* L., Cruciferae) grown by the Hmong villagers of Ban Bah Gluay, have resulted in further destruction of the upland forest. This is due to the fact that since the soil in many of the former opium fields has been depleted of nutrients/soil, new plots have been cut from forested areas. In addition to this, the combination of uncontrolled population growth, primitive agricultural methods, lack of conservation awareness, poaching and unrestrained destruction of the upland forest and catchment valleys have led to the presently appalling conditions of the vegetation on the Mae Soi Ridge.

The evergreen hardwood tree species are dominated by the oaks (Fagaceae), e.g. *Castanopsis acuminatissima* (Bl.) DC., *C. armata* (Roxb.) Spach, *Lithocarpus elegans* (Bl.)

Hatus. ex Soep.; *Quercus lanata* Sm. and *Q.semiserrata* Roxb. Other tree species are commonly found, such as : *Schima wallichii* (DC.) Korth and *Ternstroemia gymanthera* (W. &A.) Bedd. (both Theaceae), *Spondias axillaris* Roxb. (Anacardiaceae), *Eugenia albiflora* Duth. ex Kurz (Myrtaceae), *Sarcosperma arboreum* Bth. (Sapotaceae), *Helicia nilagirica* Bedd. (Proteaceae), *Cinnamoumu camphora* (L.) Nees & Eberm. (Lauraceae), *Sapium baccatum* Roxb. (Euphorbiaceae), and *Engelhardia spicata* Lechen. ex Bl. var. *spicata* (Juglandaceae).

In recent years, because of the Hmong people in the area, fire has become a serious problem. Pine is the upland equivalent of teak as far as quantity, utility and profit are concerned. The Hmong villagers constantly hack out pieces of wood from living pine trees for tindling wood and are also very careless in using fire to extract pine resin. As more pines are demolished by abuse and oaks destroyed by fire, large areas with a distinct lowland deciduous dipterocarp-oak facies have developed in effect by following paths of fire in the upland areas. A basic result has been a decrease in evergreen hardwood trees and an increase in smaller, well-spaced, deciduous and more fire-resistant lowland tree species, e.g., *Aporusa villosa* (Lindl.) Baill. (Euphorbiaceae), *Tristania rufescens* Hance (Myrtaceae), and *Gluta usitaia* (Wall.) Hou (Anacardiaceae). *Mahonia nepalensis* DC. (Berberidaceae), a treelet-shrub of considerable medicinal use, and *Cycas pectinata* Griff. (Cycadaceae), found in fire-prone, degraded upland areas, are characteristic species and can be used to indicate viable, but degraded forest land. *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) C.E. Hubb. ex Hubb. & Vaugh. (Gramineae) and *Pteridium aquilinium* (L.) Kuhn ssp. *Aquilinium* var. *wightianum* (Ag.) Try. (Dennstaedtiaceae) are two increasingly common herbaceous species which indicate the ultimate in destroyed, fire-maintained and degraded upland forested areas. *Eupatorium adenophorum* Spreng. (Compositae), a very aggressive perennial herbaceous weed from tropical America, is rampant on Mae Soi Ridge and is not only dominating regrowth in many areas at the expense of native species, but is also a serious fire hazard in the dry season (February to May).

Catchment Areas

Due to the project goals of the Dhammanat Foundation, protection of the catchment areas on the Mae Soi Ridge is of paramount importance. Unfortunately, the Watershed Conservation unit on the ridge is only planting *Pinus keysia* in their "reforestation" effort and often in catchment valleys with seasonally high soil moisture and slow drainage where it cannot survive. Several water catchment valleys, to varying degrees, include a distinct shade and moisture-requiring ground flora which is extremely fragile ecologically. Most of these shaded, muddy to wet upper catchment areas are replete with many flowering plants, e.g., *Dichroa febrifug* Lour. (Saxifragaceae), *Pollia hasskarlii* R. Rao (Commelinaceae), and *Musa acuminata* Calla (Masaceae); and ferns, e.g. *Prenephrium nudatum* (Roxb.) Holtt. (Thelypteridaceae), *Didymochlaena truncata* (Sw.) J. Sm. and *Arachniodes speciosa* (D. Don) Ching (both Dryopteridaceae), and several epiphytic Polypodiaceae, e.g. *Neocheiropteris normalis* (D. Don) Tag., *Lepisorus nudus* (Hk.) Ching, and *Loxogramme chinensis* Ching.

Many of these species are either depleted in number or absent in places where the canopy trees have been cut and/or the moisture content of the soil has decreased. These plants have been replaced by upland secondary growth, e.g., *Maesa montana* A. DC. (Myrsinaceae), *Macaranga denticulata* (Bl.) M.-A. (Euphorbiaceae), *Pueraria stricta* Kurz (Leguminosae,

Papilionoideae); and herbaceous weeds, e.g., *Eupatorium adenophorum* Spreng. and *Bidens pilosa* L. (both Compositae), with the grasses *Setaria palmifolia* (Koen.) Stapf and *Thysanolaena latifolia* (Roxb. ex Horn.) Honda (Gramineae).

CONCLUSION

Mae Soi Conservation Area, Chom Tong District, Chiang Mai Province : The Mae Soi Conservation area is situated about 65 km south of Chiang Mai City, includes an area of nearly 70 km^2, and is presently in the bounds of Awp Luang National Park. The Conservation area is named after the Mae Soi stream and village, the stream originating in the uplands of the region and eventually joining the Ping (Bing) River at Mae Soi Village. The elevation of the area is 300 m at the base of the valley and rises to over 1,625 m at the top of the ridge. The bedrock is mostly granitic with limestone along the southern (c. 400–1,100 m) and north-eastern (300–450 m) parts of the area. There is a Hmong hilltribe village, Ban Bah Gluay, on the ridge at c.1400 m.

The lowlands of the area, continuously degraded for decades, was essentially clear-cut and abandoned by the early 1970's. Due to the efforts of local lowland villagers and dedicated Buddhist monks, the area has undergone ecological redevelopment under the auspices of a private Buddhist organization. The basic problems with the area were decreased rainfall, increased temperature, flash flooding, increasing erosion and lower crop yields. Much of the present problem also has to do with the uncontrolled destruction of the forest by the Hmong at Ban Bah Gluay. A reforestation programme has begun on the uplands using only native forest hardwood species where it has been found that pines will naturally colonize.

The lowland vegetation was formerly of a deciduous hardwood type, dominated by *Tectona grandis* L. f. (Verbenaceae), teak; various hardwooded legumes, e.g., *Pterocarpus macrocarpus* Kurz and *Dalbergia dongnainensis* Pierre (both Leguminosae, Papilionoideae); *Xylia xylocarpa* (Roxb.) Tuab. var. *kerrii* (Craib & Hutch.) Niels. (Leguminosae, Mimosoideae); *Eriobotrya bengalensis* (Roxb.) Hk. f. forma *bengalensis* (Rosaceae), *Terminalia bellirica* (Gaertn.) Roxb. (Combretaceae), *Chukrasia velutina* Wight & Arn. Ex Roem. (Meliaceae), etc. As a result of the removal of this forest cover, a secondary type of deciduous vegetation has regenerated, viz., a deciduous dipterocarp-oak facies, which is named in reference to the tree families Dipterocarpaceae (dipterocarps) and Fagaceae (oaks) that dominate it. *Dipterocarpus obtusifolius* Teijsm. Ex Miq. var. *obtusifolius, D. tuberculatus* Roxb. var. *tuberculatus, Shorea obtusa* Wall. Ex Bl. And *S. siamensis* M q. var. *siamensis* (all Dipterocarpaceae) along with various Fagaceae, e.g. *Quercus kerrii* Craib var. *kerrii* are common in the lowlands of the area.

The uplands have a different kind of forest cover which is best described as being a mixed evergreen hardwood and pine forest. This forest cover begins at about 900 m and continues to the summit. The hardwood trees are of various kinds, many Fagaceae, e.g., *Castanopsis acuminatissima* (Bl.) DC., *C. armata* (Roxb.) Spach, *Lithocarpus elegans* (Bl.) Hatus. Ex Soep., *Quercus lanata* Sm. and *Q. semiserrata* Roxb.; as well as others, viz., *Schima wallichii* (DC.) Korth. (Theaceae), *Spondias axillaris* (Roxb.) (Anacardiaceae), *Helicia nilagirica* Bedd. (Proteaceae), and many others. *Pinus kesiya* Roy. Ex Gard. (Pinaceae) is the only pine there and has suffered greatly because of the Hmong villagers with their primitive and selfish attitudes towards using the forest which, essentially, are damaging

to the entire forest ecosystem and also the future of the village. More problems have arisen because of fire in recent years since with the ecologically-unsuccessful implementation of cash crops, mainly cabbages in this area, there has been as increase in forest clearing along with environmentally-devastating amounts of pesticides and chemical (i.e., not organic or natural) fertilizers introduced into the environment and deadly amounts in the cabbages that are sold in the lowlands. The combined effect of "official" sanctioning of upland forest destruction plus environmental degredation has had serious effects on both the upland areas and all of the lowland area, indeed anywhere where the drainage from the area goes and also anyone who dares risk eating the poisonous cabbages.

RECOMMENDATIONS

The following native tree species are recommended for planting in :

Those species recommended for lowland and "mixed" forests, except for teak, should be planted in approximately equal numbers and equally distributed in the planting areas. Teak, since it is more common than the other species in natural forests, should include about 25% of the plantings. *Garcinia speciosa, Hopea odorata* var. *odorata*, and *Homalium grandiflorum* var. *grandiflorum* should be planted closer to streams or irrigation channels. Since there are essentially no diminant tree species in the "mixed" forest, it is suggested that those species recommended for planting in this area be planted in equal numbers and equally distributed throughout the planting areas.

The upland areas should be planted with about 1/3 dominance of *Pinus kesiya* on the ridges and upper slopes, but none in the valleys. All other species noted for this zone should be planted in equal numbers and in equal distributions. *Symplocos henschelii* var. *magnifica* has been recommended here since only one tree is known in the entire Mae Soi area (1,400 m) which, probably, may be the only place where it is known to exist in the world.

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Summary of Collection

	families	species, subspecies, varieties
ANGIOSPERMS		
Dicots	98	558
Monocots	15	136
GYMNOSPERMS	5	5
FERN ALLIES & FERNS	18	51
TOTAL :	136	740

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