

## The Cultural Significance of Sacred Forests: Species Diversity and Use of Zingiberaceae in Don Chao Poo Forest, Kalasin Province, Northeast Thailand

Piya Mokkal\*, Worachat Tokaew, Nukool Kudthalaeng and Tawin Saentrong  
Biology Program, Faculty of Science and Technology, Rajabhat Mahasarakham University, 44000, Thailand  
\*Corresponding Author, Tel. +6684-027-2960, e-mail: piyaatg@yahoo.com

### Abstract

This research aimed to study the species diversity and utilization of Zingiberaceae in Don Chao Poo Forest, Kanoon Village, Khainoon Sub-district, Huaiphueng District, Kalasin Province. Data collection were undertaken from April 2012 - February 2013. Field surveys were conducted in 2 seasons (wet season from June-October and dry season from November - February). Data were collected by conducting interviews with three local plant experts and collecting plant specimens from six forest trails. Results of the study included species identification, herbarium specimen collection, photographs and data on local utilization of plants. Ten species from five genera of Zingiberaceae were identified; *Alpinia* Roxb. (3 species), *Kaempferia* L. (3 species), *Curcuma* L. (2 species), *Amomum* Roxb (1 species). and *Globba* L. (1 species). These species were used by villagers as medicinal, food, spice, and decorative plants.

**Keywords:** biodiversity, traditional knowledge, Zingiberaceae, northeast Thailand

### 1. Introduction

Zingiberaceae is a family of monocotyledon plants. This family consists of about 57 genera and the family are distributed in the tropics and subtropics with centers of distribution in the Indo-Malayan region, that extend through tropical Africa, and Central and South America [1]. In the kingdom of Thailand Zingiberaceae is rich and diverse, with 26 genera and about 300 species distributed throughout the country [2]. Several species are well known for their economic importance as spices, ornamental plants, cosmetic materials and Thai traditional medicines. The chemical compounds of the plants are very useful for modern medicinal treatment [3].

The way of life of local people in northeastern Thailand (Isaan) closely relates to natural resources in the forest, especially community forests (forest whereby the local community plays a significant role in forest management and land use decision making by themselves in the facilitating support of government as well as change agents). Forests are a major source of foods, medicinal plants, firewood/charcoal, fiber, tools, building materials and forage for livestock. In addition to providing

products for survival, forests are a center of local people's emotion, belief and spiritual ceremonies [4]. Most Isaan villagers, who are predominantly Buddhist, are profoundly and spiritually respectful of the sacred significance of forest areas. It is common for communities throughout Isaan to have different legends or histories of dwelling guardian's spirits, which leads to community-based conservation of these forests. Through policy changes and shifts of a traditional agricultural society into an industrialized one, forest and wooded areas in Thailand have decreased significantly [5]. In contrast, forest maintenance has been very successful in cultural forest areas such as Don Chao Poo, because of spiritual perception regarding forest use. In order to understand the role of Don Chao Poo as a place to safeguard culturally important forest resource, this study was conducted to analyze species diversity and local use of Zingiberaceae in "Don Chao Poo", a cultural forest area of Khainoon Village, Huai Phueng District, Kalasin Province in northeast Thailand.

### 2. Case Study

Kalasin is a province in upper part of northeast, Thailand. It has a population of about one million inhabitants and almost all are Buddhists. Regarding their work status, 51.7% are unpaid family workers and 35.8% are engaged in self employment, usually in agriculture [6]. There are 7,576 km<sup>2</sup> total province land area of which 24% of the province (1,832 km<sup>2</sup>) is federally protected forest area.

Don Chao Poo or Don Poo Ta as it is called by local Isaan people is a cultural and not federally protected forest in northeastern Thailand. Its name refers to "the forest on the guardian spirit's hill". Don Chao Poo, a cultural forest area of Khainoon Village, Huai Phueng District, Kalasin Province is dry evergreen forest and 54 rai (864,000 m<sup>2</sup>) is its total land area. The forests are often the source of non-timber products such as medicinal plants, vegetables and mushrooms. These cultural forests still maintain their diversity at relatively high levels.

According to local beliefs, guardian spirits dwell at the different points in Don Cha Poo areas to look after and protect rural people from potential diseases, evil spirits and dangerous events in their daily lives. Guardian spirits also support and assist with increasing opportunities for good fortune and successful livelihood activities which are the

aspiration of most villagers. To please the guardian spirits, local people have built and maintained “spirit houses” where they also carry out worship ceremonies on Buddhist Sabbaths. To cut trees or remove plants from Don Chao Poo people must ask for permission from guardian spirits through a ceremony. As a result of this activity forest resources have been successfully maintained in Don Chao Poo.

In this paper, we reported species diversity and local use of family Zingiberaceae, a part of our main research topic; species diversity and traditional use of plants in Don Chao Poo Forest. Results data of other plant families are in analyzing process and we will report later.

### 3. Methods

#### *Period and site*

The field survey of species diversity of Zingiberaceae was conducted from June 2012 to February 2013 (rainy season and dry season) in Don Chao Poo Forest, which is located in Khainoon Village, Huai Phueng District, Kalasin Province, 70 km from Kalasin City (Figure 1). Don Chao Poo Forest (16° 62'50.66"N, 103° 95'12.48"E) has an area of 0.864 km<sup>2</sup> and elevation of 178 m from mean sea level (Figure 2).



**Fig. 1** Map of Kalasin Province showing the study site, Don Chao Poo Forest.

#### *Field Surveys and Collections*

Three native plant experts who are recognized as experts by the local community members, were interviewed during plant walk on six forest trails once time per month from June 2012 to February 2013. Six forest trails which are always

used by local people for finding livelihood survival material and goes to make ceremonies at the guardian spirit's houses area that located at the center of Don Chao Poo were conducted and distributed in different direction of the forest area (Fig. 2). During plant walk interviews, the plant experts were asked to identify plant species according to their plant using experience. In addition, thirty-seven villagers from three villages near Don Chao Poo were selected based on their reports of commonly collecting plants from Don Chao Poo Forest at least two times per month. Questionnaires were conducted with the sample group of villagers to collect data on common local names and utilization of plants. Local plant names were recorded using Thai script. Photographs were taken of each plant and their habitat. Plant specimens were deposited in the Biology Program Herbarium at Rajabhat Mahasarakham University. Scientific names for the plant were identified by the primary author in consultation with taxonomic literature by Larsen and Larsen [2], Sabu [1], Saensouk [7], Sirirugsa [8], Smitinand [9] and Triboun [10].



**Fig. 2** Main trails of plant surveying distributed in Don Chao Poo Forest area near Khainoon village (adapted from Google Earth 2006).

### 4. Results

Ten species in 5 genera of Zingiberaceae including *Alpinia* Roxb (3 species; *A. galanga* var. *pyramidata* (Blume) K. Schumann, *A. malaccensis* var. *malaccensis* (Burm.f.) Roscoe., and *A. samensis* K. chumann.), *Kaempferia* L. (3 species; *K. galanga* L., *K. pulchra* Ridl. and *K. siamensis* Sirirugsa), *Curcuma* L. (2 species; *C. parviflora* Wall. and *C. angustifolia* Roxb.), *Amomum* Roxb. (1 species; *A. villosum* Lour. var. *xanthioides* (Wall. ex Baker) Wu & Chen and *Globba* L. (1 species; *G. globulifera* Gagnep.) were identified along six forest trails in Don Chao Poo Forest (Table 1).

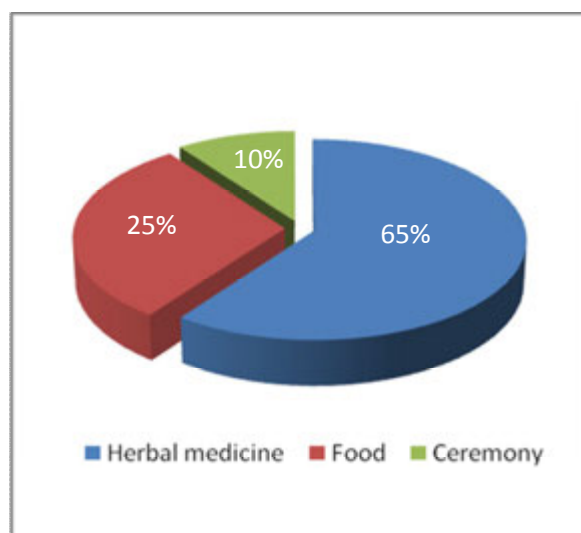
**Table 1** Species list of Zingiberaceae recorded in Don Chao Poo Forest

Genus	Species	English transliteration of local name with Thai script
1. <i>Alpinia</i> Roxb.	<i>A. galanga</i> var. <i>pyramidata</i> (Blume) K. Schumann	Khaa Yai
	<i>A. malaccensis</i> var. <i>malaccensis</i> (Burm.f.) Roscoe.	Khaa Khom Khaa Paa
	<i>A. samensis</i> K. chumann	
2. <i>Amomum</i> Roxb.	<i>A. villosum</i> Lour. var. <i>xanthioides</i> (Wall. ex Baker) Wu & Chen	Maak Neng
3. <i>Curcuma</i> L.	<i>C. parviflora</i> Wall.	Kra Chiao Khaw
	<i>C. angustifolia</i> Roxb.	Kra Chiao Daeng
4. <i>Kaempferia</i> L.	<i>K. galanga</i> L.	Waan Pro Hom
	<i>K. pulchra</i> Ridl.	Waan Toop Moop Waan Nok Khoom
	<i>K. siamensis</i> Sirirugsa	
5. <i>Globba</i> L.	<i>G. globulifera</i> Gagnep.	Dok Khao Phan Saa

**Table 2** Utilization of Zingiberaceae species reports by the communities villagers near Don Chao Poo

Species	Traditional use		
	Herbal Medicine	Food	Ceremony
<i>Alpinia galanga</i> var. <i>pyramidata</i>	-Rhizome: to relieve flatulent.	-Rhizome: curry ingredient. -Rhizome and young shoot: fresh or steamed vegetable.	
<i>A. malaccensis</i> var. <i>malaccensis</i>	-Rhizome: to relieve flatulent, extracted solution mix with ripe tamarind juice as a ingestible remedy to excrete excess blood from a woman postpartum. -Grinded fresh leaves: Ringworm and <i>Tinea versicolor</i> treatment.		
<i>A. samensis</i>	-Grinded leafy shoot: protecting insects	Rhizome: spice.	

<i>Amomum villosum</i> var. <i>xanthioides</i>	-Fruit, seed and leaf: to relieve flatulent. -Root: cough-remedy. -Flower: prickly heat and urticaria treatment.	-Seed powder: spice.	
<i>Curcuma parviflora</i>	-Rhizome and flower: to relieve flatulent.	-Flower: fresh or steamed vegetable.	
<i>C. angustifolia</i>	-Rhizome and flower: to relieve flatulent.	-Flower: fresh or steamed vegetable	
<i>Kaempferia galanga</i>	-Rhizome: excrete excess blood and purulent. -Flower: to improve eyesight.	-Rhizome and young leaves: fresh vegetable.	-Rhizome powder: used in combination with incantation to bless Buddha images.
<i>K. pulchra</i>	-Rhizome: reduce insects bite toxicity. -Leaf: sore throat treatment.	-Rhizome and young leaves: fresh vegetable.	
<i>K. siamensis</i>	-Rhizome: reduce insects bite toxicity.		
<i>Globba globulifera</i>			-Flower: used in combination with food when making alms offering to Buddhist monks.



**Fig. 3** Percentage chart of traditional uses of Zingiberaceae found in Don Chao Poo Forest follows villager’s wisdoms.

### Species Diversity

Table 1 presents a list of the plant names by genus according to local names in English transliteration, Thai script and Botanical names. Genera *Alpinia* Roxb. and *Kaempferia* L. had the highest species diversity of three species each. Most of the identified Zingiberaceae individuals were found along the surrounding trails of Don Chao Poo area and in open

or low crown cover areas, where sunlight intensity was higher than another trails, this environmental factor is typical for most Zingiberaceae species. In contrast, three species of *Kaempferia* L.; *K. galanga* L., *K. pulchra* Ridl. and *K. siamensis* Siriruga were found in shady ecological habitats. Table 2 describes the local use and useful parts of each plant as recorded from interviews with the local plant experts and sampled villagers at the research sites. As demonstrated in Figure 3, herbal medicine was the most frequency reported use for the Zingiberaceae plants that were recorded.

### Traditional uses

According to data collected from interviews with local plants experts and villagers (Table 2).

Almost all Zingiberaceae species are used as medicinal plants. Rhizomes, fruits and leaves of five species, *Alpinia galanga* var. *pyramidata*, *A. malaccensis* var. *malaccensis*, *A. villosum* var. *xanthioides* and *Curcuma angustifolia* were popularly used for relieve flatulence by ingesting fresh plant parts as crude drugs or vegetables. Some interviewees also boiled the rhizomes in water and drank the resulting tea, some interviewees used the plant parts as spices in local curries.

*Alpinia malaccensis* var. *malaccensis* rhizome is mixed with ripe tamarind juice as an ingestible remedy to use by the postpartum woman to excrete excess blood.

For foods, all species are edible as foods with exception of *Alpinia malaccensis* var. *malaccensis* and *Globba globulifera* have pungent smell, according to the interviewees. Local people usually eat ginger rhizomes and inflorescences as fresh vegetables, although sometimes the plant parts are steamed and used as spices in local curries.

The genus *Kaempferia* L. was known in the local taxonomy as *waan*, *K. galanga* and a species of *Globba* L., *G. globulifera* were used in spiritual ceremonies. All plant parts of *K. galanga* are fragrant, which make it valuable as material used in spiritual ceremonies because spirits are believed to favor fragrant plants. The crude powder of its grinded rhizome was used as a part of a mixture of other minerals to make small Buddha images, which are made by using a mold. Before making the small Buddha images, from the monks use *K. galangal* grinded rhizome powder as part of an incantation ceremony. Inflorescences of *G. globulifera* were often collected by the local people and as an alms offering to monks on Buddhist Lent.

## 5. Conclusion and Discussion

Don Chao Poo Forest provided community members with access a diverse range of culturally important Zingiberaceae species. In total, ten species in five genera of the family Zingiberaceae were found to be useful for local people in Don Chao Poo Forest.

Five of the species, *Alpinia galangal* var. *pyramidata*, *A. siamensis*, *Curcuma paviflora*, *Kaempferia galanga* and *K. pulchra*, are distributed in wide range across Thailand. Four species, *Alpinia malaccensis* var. *malaccensis*, *Amomum villosum* var. *xanthioides*, *Curcuma angustifolia* and *Globba globulifera*, are distributed across only the northern region of Thailand. One species, *Kaempferia siamensis*, is distributed only in north-eastern part of Northeast Thailand and is endemic species to this distributed area. Two species, *Alpinia galanga* var. *pyramidata* and *A. siamensis*, are popularly cultivated in Thai home gardens.

The number of Zingiberaceae species reported in this study represented about 3% of the total ginger species in Thailand, as reported by Larsen and Larsen [2]. This low diversity is due to geographical location and small size of the forest.

The study site is low altitude dry evergreen forest in Northeast Thailand, which is far from the equatorial's tropical rain forest or hill moist evergreen forest that is the center of species diversity for the ginger family [2]. Moreover, several environment factors such as sunlight intensity, moist and soil compounds in this area might not be suitable for Zingiberaceae species. Almost all ginger species found in upper part range of Thailand, especially in the northeast region, are found in deciduous dry

dipterocarp forest and mixed deciduous forest, which have many open gaps and high sunlight intensity. In Don Chao Poo Forest, species diversity was mostly distributed along the surrounding trail of this forest or open gap areas. Only few species in genus, *Kaempferia* L. were found in the shady interior part of the forest, although they were sparsely distributed.

Don Chao Poo Forest of Khainoon Village is a small cultural forest (54 Rai) that contained only a terrestrial ecosystem, which is affecting on number of species among a plant group. Low ecosystem diversity causes low species diversity.

However, cultural forests in northeast of Thailand are play an important role as conservation areas of natural resources. Many cultural forests provide rare sinks of abundant forest resources because most of the surrounding land is used for agricultural activities, such as rice fields. Most cultural forest are established and maintained as cooperation units by communities to protect their remaining forest. This forest provides local people with important resources that can be used to meet their subsistence needs and contribute to their livelihood stability. This study shows that cultural forests help maintain natural resources based on the religious and spiritual belief of local people.

The success interaction between cultural forest, local people, and natural resources conservation has important implications for policies that seek to improve livelihood stability and cultural preservation in rural areas of Thailand.

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## 7. References

- [1]. Sabu M. *Zingiberaceae and Costaceae of South India*. Printarts Offset, Kerala. 2006.
- [2]. Larsen K, Larsen S.S.. *Gingers of Thailand*. Queen Sirikit Botanic Garden, the Botanical Garden Organization, Ministry of Natural Resources and Environment, Chiang Mai. 2006.
- [3]. Chaveerach, A., Sudmoon, R., Tanee, T., Mokkamul, P., Sattayasai, N. and Sattayasai, J. Two new species of *Curcuma* (Zingiberaceae) used as cobra-bite antidotes. *Act. Phyto. Sinica*. 2008, 45 (6): 1-10.

- [4]. Khumkratok, S., Boongtiang, K., Chutichudet, P. and Pramual, P. 2012. Geographic Distribution and Ecology of Ornamental *Curcuma* (Zingiberaceae) in Northeastern Thailand. *Pakistan Journal of Biological Sciences*. 2012, 15 (19): 929-935
- [5]. Acharya, P.K. and Acharya, R. Eating From the Wild: Indigenous Knowledge on Wild Edible Plants in Parroha VDC of Rupandehi District, Central Nepal. *International Journal of Social Forestry*. 2010, 3(1):28-48.
- [6]. Cruz-Garcia, G.S. and Price, L. L. Ethnobotanical investigation of ‘wild’ food plants used by rice farmers in Kalasin, Northeast Thailand. *Journal of Ethnobiology and Ethnomedicine*. 2011, vol. 8 (1): 7-33.
- [7]. Saensouk, S. Taxonomy and Biology of the genus *Alpinia* Roxb. (Zingiberaceae) in Thailand. A thesis for the degree of doctor of philosophy, Khon Kaen University, Khon Kaen, Thailand. 2006.
- [8]. Sirirugsa, P. *The genus Curcuma (Zingiberaceae) in Thailand*. Songkla: Department of Biology, Faculty of Science, Prince of Songkla University. Thailand. 1966.
- [9]. Smitinand, T. **Thai Plant Names: Revised Edition**. The Forest Herbarium. Royal Forest Department. Bangkok. Inhabitants Co. Ltd. 2001.
- [10]. Triboun, P. Biogeography and Biodiversity of the Genus *Zingiber* in Thailand. Doctor of Philosophy Thesis in Biology, Khon Kaen University, Khon Kaen. 2006.



**Fig. 4** Species Diversity of Zingiberaceae in Don Chao Poo Forest; (A) Guardian's spirit Houses at the center of study site, (B) *Alpinia galanga* var. *pyramidata*, (C) *Alpinia malaccensis* var. *malaccensis*, (D) *Alpinia samensis*, (E) *Curcuma angustifolia*, (F) *Curcuma parviflora*, (G) *Amomum villosum* var. *xanthioides*, (H) *Kaempferia galangal*, (I) *Kaempferia pulchra*, (J) *Kaempferia siamensis* and (K) *Globba globulifera*