

Diversity of Medicinal Plants at Khao Lommuak in Prachuap Khiri Khan Province, Thailand

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Abstract

Khao Lommuak is a small and steep isolated limestone hill located on the eastern coast of peninsula Thailand. The primary natural habitat of the hill is forest over limestone hill, with some scrub and cultivated gardens at the base. As 90% of the hill's perimeter adjoins the sea, there are also some sea cliff vegetation, bare rocks and sandy beach. An 18-month study on the ecology and behavior of dusky langur (*Trachypithecus obscurus*), a type of monkey, was carried out at the site. Five botanical plots, each measuring 750 m², were established so as to describe the vegetation of the langurs' habitats, and to obtain an ecological understanding of the langurs' behavior. Using a minimum of 20 cm girth measured at 120 cm vertically from the tree's base, a total of 304 sample trees, including medicinal plants, were obtained from these plots. Simpson's index for diversity of plant at the site was 0.72. This paper describes some currently known medicinal plants observed at this site, both within and outside the vegetation plots, and the use of these plants by humans and the langurs.

INTRODUCTION

Khao Lommuak (N11°47'/E99°49') is a small and steep isolated rocky limestone hill located within a Royal Thai Air Force Base (Wing 53) on the eastern coast of Thailand peninsula. The hill reaches to a height of about 245 meters and covers an area of about 110 ha. The primary natural habitat of the hill is secondary mixed evergreen and deciduous forest with some scrub and cultivated gardens at its base. As 90% of the hill's perimeter adjoins the sea, there is also some sea cliff vegetation, bare rock and sandy beach. Thus, various plant species can be found on the hill and its immediate vicinity.

The dusky langur (*Trachypithecus obscurus*) belongs to the subfamily Colobinae, which is comprised species commonly known as leaf monkeys. All colobines are characterized with a large sacculated stomach containing a diverse array of microflora with cellulolytic properties that converts cellulose into volatile fatty acid, the energy source for colobines (Ohwaki et al., 1974; Bauchop, 1978). These bacteria deactivate toxins in the food, allowing colobines to consume a variety of plant items that are poisonous to humans (Chivers and Hladik, 1980). Many of the plant food items consumed by colobines have known medicinal properties that are exploited by humans. The population of langurs at Khao Lommuak comprised about 80 individuals from five groups.

MATERIALS AND METHODS

An 18-month study on the ecology and behavior of dusky langurs was carried out at the site from May 2001 to December 2002. To achieve this, five botanical plots, each measuring 750 m², were established to describe the vegetation of the habitats. Using a minimum of 20 cm girth measured at 120 cm vertically from the tree's base, a total of 304 sample trees, including medicinal plants, were obtained from these plots. Simpson's index of diversity was used to assess plant diversity (Begon et al., 1996).

RESULTS AND DISCUSSION

The 304 trees sampled from the five botanical plots comprised 26 species (Table 1). Plot I contained the lowest sample size, at only 10 trees, whereas plot V contained the highest sample size, at 129 trees. However, there were similarities in number of species richness within each plot, at 8, 7, 6, 8, and 10 respectively.

Simpson's index for diversity of plants found at the site, calculated from the total number of trees sampled ($n=304$) was 0.72. This index showed that the diversity of plants at Khao Lommuak was relatively high. However, variation of diversity within each plot was similarly high when calculated separately (Plot I = c. 0.96; Plot II = c. 0.70; Plot III = c. 0.71; Plot VI = c. 0.65; and Plot V = c. 0.30). Plot V had least species diversity, although it contained the highest number of trees. Whereas Plot I had the highest species diversity, even when it contained only 10 trees. This, however, might be possibly due to a low total sample size. Thus, several botanical plots were likely needed to overcome the bias.

The relative abundance (π) of the 26 tree species found within the plots was given in Table 1. *Drypetes hoagensis* Gagnep was species that had highest π value at c. 0.5, whereas *Streblus ilicifolius* (Vidal) Corn. ranked 2nd, with a π value at c. 0.2. A list of medicinal plants that was observed to be eaten by the langurs, both within and outside the botanical plots at Khao Lommuak, is presented in Table 2. Some common medicinal plants that were found at this site and were being used by Thais and other Asians are given below.

Local people in Prachuap Khiri Khan Province have known *Azadiracta indica* A. Juss. "neem" because of its medicinal property. The bitter taste of the parts of this plant species did not deter the langurs from consuming them throughout the year. Plant parts eaten included young leaves, mature leaves, flowers, and seeds. Misra and Sahu (1977) reported *Azadiracta indica* as having a fungicidal activity against dermatophytes.

Combretum quadrangulare Kurz was commonly used throughout the country as a vermifuge. The langurs were frequently observed consuming large quantities of young leaves and tiny seeds of this plant species. *Streblus asper* Lour. was one of the most common medicinal plants used as an antiseptic in Asia, especially in India. Parveen et al., (1989) examined potential antifilarial activity of this plant against *Seteria cervi* (Nematoda: Filarioidea). Taweechaisupamong et al. (2000) reported effect of this plant part's extract to the root canal bacteria. The langurs fed on its young leaves, flowers, with particularly preference for the young and ripe fruits.

Tamarindus indica L. was another medicinal plant that is very widely used in Thai and Asian recipes. It was also known as a laxative and a vermifuge for humans and domestic animals especially domestic elephants in Thailand. Fabiyi et al. (1993) investigated the use of tamarind for the traditional therapy of dracunculiasis caused by guinea worm in Nigeria, and found that it was effective to a certain extent. The langurs at Khao Lommuak were observed to consume almost every part of the plant species, and these included young leaves, flowers, young pods and seeds, mature pods and seeds and old seeds from rotten pods that had dropped to the ground. Tamarind seeds were similarly observed being eaten by baboons (*Papio cynocephalus*) in Tanzania (Rhine and Westlund, 1978).

Leucaena leucocephala (Lam.) de Wit is used as an anti-diabetic in humans. The langurs were similarly observed to consume large quantities of leaves belonging to this species, and the langurs' urine produced a very distinctive odor after consuming leaves of this species.

CONCLUSIONS

A number of medicinal plants that were being used by humans and the dusky langurs could be found at Khao Lommuak. The diversity of trees sampled within the five botanical plots was assessed using Simpson's species diversity index (Ds), giving a value of 0.72. Since variation of Ds between plots was high, therefore several botanical plots most likely needed to achieve more accuracy of the index. Relative abundance (π) showed

that *Drypetes hoaensis* was the most abundant species found within the plots, followed by *Streblus ilicifolius*.

It was observed that humans and dusky langurs shared many similarities in food selection for particular plant species. Studies on the ecology and behavior of the dusky langurs might not only allow a better understanding on relationship between plants and animals, but might also provide information on the diversity of plants and shed some light on the uses of medicinal plants that might be useful for human welfare.

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Tables

Table 1. Tree species and their proportions in five botanical plots at Khao Lommuak.

Scientific name	I	II	III	IV	V	Total	π
<i>Aganope thyrsoflora</i> (Bth.) Pohl. (Papilionoideae)	0	0	1	0	0	1	0.003
<i>Azadirachta indica</i> A. Juss. (Meliaceae)	1	1	0	0	0	2	0.006
<i>Bauhinia curtisii</i> Prain (Caesalpinioideae)	0	0	0	0	2	2	0.006
<i>Blachia siamensis</i> Gagnep. (Euphorbiaceae)	0	0	0	1	3	4	0.013
<i>Bridelia ovata</i> Decne. (Euphorbiaceae)	2	1	1	1	0	5	0.016
<i>Ceiba pentandra</i> (L.) Gaertn. (Bombacaceae)	0	1	0	0	0	1	0.003
<i>Citrus hystrix</i> DC. (Rutaceae)	1	0	0	0	0	1	0.003
<i>Drypetes hoensis</i> Gagnep. (Euphorbiaceae)	0	0	30	7	108	145	0.476
<i>Ficus curtipes</i> Corn. (Moraceae)	0	0	0	0	6	6	0.019
<i>Ficus geniculata</i> Kurz (Moraceae)	0	0	0	1	0	1	0.003
<i>Ficus microcarpa</i> L. (Moraceae)	0	0	1	0	0	1	0.003
<i>Ficus rumphii</i> Bl. (Moraceae)	0	0	0	0	1	1	0.003
<i>Gardenia collinsae</i> Craib (Rubiaceae)	0	0	0	0	1	1	0.003
<i>Grewia eriocarpa</i> Juss. (Tiliaceae)	0	2	8	3	1	14	0.046
<i>Guioa diplopetala</i> (Hassk.) Radlk. (Sapindaceae)	0	0	0	6	0	6	0.019
<i>Lagerstroemia floribunda</i> Jack var. <i>floribunda</i> (Lythraceae)	2	0	0	1	4	7	0.023
<i>Maerua siamensis</i> (Kurz) Pax (Capparaceae)	0	0	0	0	1	1	0.003
<i>Mangifera indica</i> L. (Anacardiaceae)	1	0	0	0	0	1	0.003
<i>Pithecellobium dulce</i> (Roxb.) Bth. (Caesalpinioideae)	0	2	0	0	0	2	0.006
<i>Pongamia pinnata</i> (L.) Pierre (Papilionoideae)	0	0	9	14	0	23	0.075
<i>Sindora siamensis</i> Teysm. ex Miq. var. <i>siamensis</i> (Caesalpinioideae)	1	0	0	0	0	1	0.003
<i>Streblus asper</i> Lour. (Moraceae)	1	12	0	0	0	13	0.042
<i>Streblus ilicifolius</i> (Vidal) Corn. (Moraceae)	0	0	17	42	0	59	0.194
<i>Syzygium jambos</i> (L.) Alston (Myrtaceae)	1	0	0	0	0	1	0.003
<i>Tamarindus indica</i> L. (Caesalpinioideae)	0	3	0	0	0	3	0.010
<i>Terminalia triptera</i> Stapf. (Combretaceae)	0	0	0	0	2	2	0.006
Total	10	22	67	76	129	304	0.990
Simpson's species diversity index	0.95	0.69	0.71	0.65	0.30	0.72	

π = relative abundance

Table 2. List of identified medicinal plants observed being eaten by langurs at Khao Lommuak, both within and outside the vegetation plots.

Botanical name	Parts used by humans	by langurs
<i>Amaranthus viridis</i> L. (Amaranthaceae)	Edible: yl	yl, fl
<i>Anacardium occidentale</i> L. (Anacardiaceae)	Edible: s, yl, fr; resin: corns & warts	yl
<i>Asystasia gangetica</i> (L.) T. And. ssp. <i>gangetica</i> (Acanthaceae)	Edible: yl	yl, fl
<i>Azadirachta indica</i> A. Juss. (Meliaceae)	Edible: yl, fl-mild laxative Leaf extract: insect repellent	yl, ml, fl, ys, ms
<i>Bridelia ovata</i> Decne. var. <i>ovata</i> (Euphorbiaceae)	Edible: fr, yl-mild laxative	yl, fr
<i>Ceiba pentandra</i> (L.) Gaertn. (Bombaceae)	Edible: yl, p, b: antifever, induce vomitting; roots: aphrodisiac	yl, fl, yp, ys
<i>Cleome viscosa</i> L. (Capparidaceae)	Edible: yl, fl	yl, fl
<i>Cocos nucifera</i> L. (Palmae)	Chacoal from shell: anti-diarrhea, Oil: anti-inflammation	yfl, flesh & juice
<i>Combretum quadrangulare</i> Kurz (Combretaceae)	Seed: vermifuge	ms, yl
<i>Ipomoea pes-caprae</i> (L.) Sweet ssp. <i>pes-caprae</i> (Convolvulaceae)	Leaves: anti-inflammation	yl, fl
<i>Leucaena leucocephala</i> (Lam.) de Wit (Mimosoidae)	Edible: yl, fl, yp, ms	yl, fl, p, s
<i>Litsea glutinosa</i> (Lour.) C.B. Rob. var. <i>glutinosa</i> (Lauraceae)	Edible: fr; Root: astringent. Stem: aphrodisiac. Leaves: astringent.	yl, fr
<i>Pithecellobium dulce</i> (Roxb.) Bth. (Mimosoidae)	Edible: p	yl, fl, p, ms
<i>Ruellia tuberosa</i> L. (Acanthaceae)	Leaves: anti-inflammation	yl, fl
<i>Senna (Cassia) siamea</i> (Lmk.) Irwin & Barnn. (Caesalpinioideae)	Edible: L, fl; ease sleepness.	yl, fl
<i>Streblus asper</i> Lour. var. <i>asper</i> (Moraceae)	Leaf extract: antiseptic, mouth wash, toothache	yl, fl, fr,
<i>Talinum triangulare</i> (Jacq.) Willd. (Portulacaceae)	Edible: yl, fl; anti-aging, mild laxative	yl, fl
<i>Tamarindus indica</i> L. (Caesalpinioideae)	Edible: yl, fl, yp, rp, s, sprout	yl, fl, yp, rp, ys, ms

(y=young, m=mature, r=ripe, l=leaf, fl=flower, fr=fruit, p=pod, s=seed, b=bark)