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Ethnobotanical study and utilization of plants in Khok Nhong Phok forest, Kosum Phisai District, Northeastern Thailand

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Abstract. *Saisor N, Prathepha P, Saensouk S. 2021. Ethnobotanical study and utilization of plants in Khok Nhong Phok forest, Kosum Phisai District, Northeastern Thailand. Biodiversitas 22: 4336-4348.* The present study was conducted in Khok Nhong Phok forest, Kosum Phisai District, Maha Sarakham Province, Northeastern Thailand. The forest was surrounded by communities where traditional knowledge has been inherited in the utilization of plants which may disappear over time due to the development of medicinal science and technology. The primary is to study the traditional knowledge in ethnobotanical, collect information about the utilization of plants, and provide the scientific name as the basis for future studies. Data were collected through open-ends interviewing with 30 villagers living in villages around the forest area about their local name, utilization of plants in all 3 aspects, including plants used as food, medicine, and plants used to build houses including parts of plants used. Plant materials and photographs were collected from January to December 2019. Altogether 101 plant species were recorded belonging to 52 families, divided into 3 groups of utilization according to traditional knowledge including 50 species of food plants, 69 species of medicinal plants, and 42 species used for housing, appliances, and fuel. In this study, some plants with more than one type of utilization showed that they were valuable to local people in terms of their uses, and such information can be used as a guideline for the conservation of plant resources in the area to show the importance of cherishing, and maintain valuable resources in the area to remain for future generations.

Keywords: Ethnobotanical, Maha Sarakham, Thailand, utilization

INTRODUCTION

From the past to the present, human life has relied on natural resources for survival, food, medicine, clothing, and housing. Learning to use plants for their benefits comes from real-world experience in using various plants and gaining benefits that inheritance for many generations until becoming a culture of each tribe. There may be some modifications or trajectories of each generation in response to their use. Currently, there is still ongoing exploitation of plants, especially in medicine (Pholhiamhan et al. 2018). Traditional or folk knowledge is often passed on from one generation to the next by verbal revelation and no written record, thus some things may differ from the old body of knowledge over time, because people in modern times have changed their lifestyle by relying on technology and imitating more foreign cultures. As a result, indigenous wisdom has been neglected until it tends to be lost along with the older generation (Anderson 1993).

In Thailand, the importance of plants in the community and the awareness of the value and benefits of local plants have been increasing attention due to people in different regions are increasingly making use of native plants from the naturally available. As reported in many studies, e.g. Chamratpan and Homchuen 2003, Inta et al. 2008, Panyadee et al. 2016, Saensouk et al. 2016, Pholhiamhan et al. 2018, Phumthum et al. 2018, Junsongduang et al. 2020, and Saensouk and Saensouk 2021.

In several studies from many parts of the world, i.e. Umair et al. 2017, Supiadi et al. 2019, Jadid et al. 2020, Rahman and Asha 2021, and Mutaqin et al. 2020.

Maha Sarakham is the province in Northeastern Thailand with the least forest area compared to the size of the province. "Khok Nhong Phok forest" is one of the deciduous dipterocarp forests located in Kosum Phisai District, the upper part of Maha Sarakham Province with a total area of about 1.792 km^2 (Isan people usually call the deciduous dipterocarp forest as Pa-Khok). Khok Nhong Phok forest is an important forest to the lives of the nearby villagers from the past to the present. It is a forest with an abundant diversity of plants, which is a source of food, herbs, and a place for livestock. In each season, villagers have gathered produce from the forest for use in food, herbs, firewood, etc. It is regarded as an important source of the utilization of plants for people in communities around the Khok Nong Phok forest until it becomes an inherited traditional knowledge from ancestors for a long time.

Due to the development of scientific technology, the new generation has reduced the utilization of plants less than in the past, especially the use of herbs which also results in the existing traditional wisdom may disappear over time along with the change from the rural society to urban society. Therefore, this study aims to study the traditional knowledge in ethnobotanical in Khok Nhong Phok forest, Kosum Phisai District, Maha Sarakham Province, northeastern Thailand, to collect information

about the utilization of plants, provided the scientific name as the basis for future studies, and including a guideline for the conservation of plant resources in the area to show the importance of cherishing, and maintain valuable resources in the area to remain for future generations.

MATERIALS AND METHODS

Study area

This study was carried out in Khok Nhong Phok forest (Figure 1), the public area which is one of the deciduous dipterocarp forests located in Hua Kwang Sub-district, Kosum Phisai District, Maha Sarakham Province, Northeastern Thailand (Isan people usually call the deciduous dipterocarp forest as Pa-Khok). Khok Nhong Phok forest is situated at an altitude of about 166-185 meters above sea level. The total area of the study comprised 1.792 km^2 with six villages around the forest area. The number of inhabitants around about 3,500 people, mostly agriculture such as rice fields, cassava fields, rubber crops, and traditional vegetable fields, including livestock e.g., chickens, ducks, cows, and buffaloes, while in some of the adult's working in the nearby companies. Moreover, living nearby Khok Nhong Phok forest is also a chance to find natural products to sell as a supplementary income, use some plants as food and spice for family meals, including uses the area for animal husbandry. It can be considered that this forest is an important part of the livelihood of the villagers around and nearby this forest. Like other regions in Thailand, the Khok Nhong Phok forest has three seasons; summer spans the months of March to May, the rainy season spans June to October, whereas winter spans November to February. The present study was conducted from January to December 2019.

Data collections

Data were collected through open-ends interviewing with 30 villagers living in 6 villages around the forest area about their local name, utilization of plants in all three aspects, including plants used as food, medicine, and plants used to build houses including parts of plants used. Plant materials and photographs were collected from January to December 2019.

Plant collections

Plant specimens were collected from Khok Nhong Phok forest, Maha Sarakham Province, the complete samples containing leaves, flowers, and fruits, along with taking photographs and recording the details of the plant, such as botanical data, morphological such as the color of flowers and fruits, etc. Study plant morphology under a stereomicroscope to identify the scientific name by using the key to species and various botanical documents e.g., Phengkhlai 1972; Chayamarit 1994; Middleton 2009; Inthachub et al. 2010; Chantaranothai 2011; Poopath et al. 2012; Boonma et al. 2020, 2021; Saensouk and Saensouk 2019; Saensouk et al. 2021a, 2021b. Dried specimens [Thailand, Maha Sarakham Province, *Narin 1 to 101* (MSU)] were preserved at Mahasarakham University Herbarium.

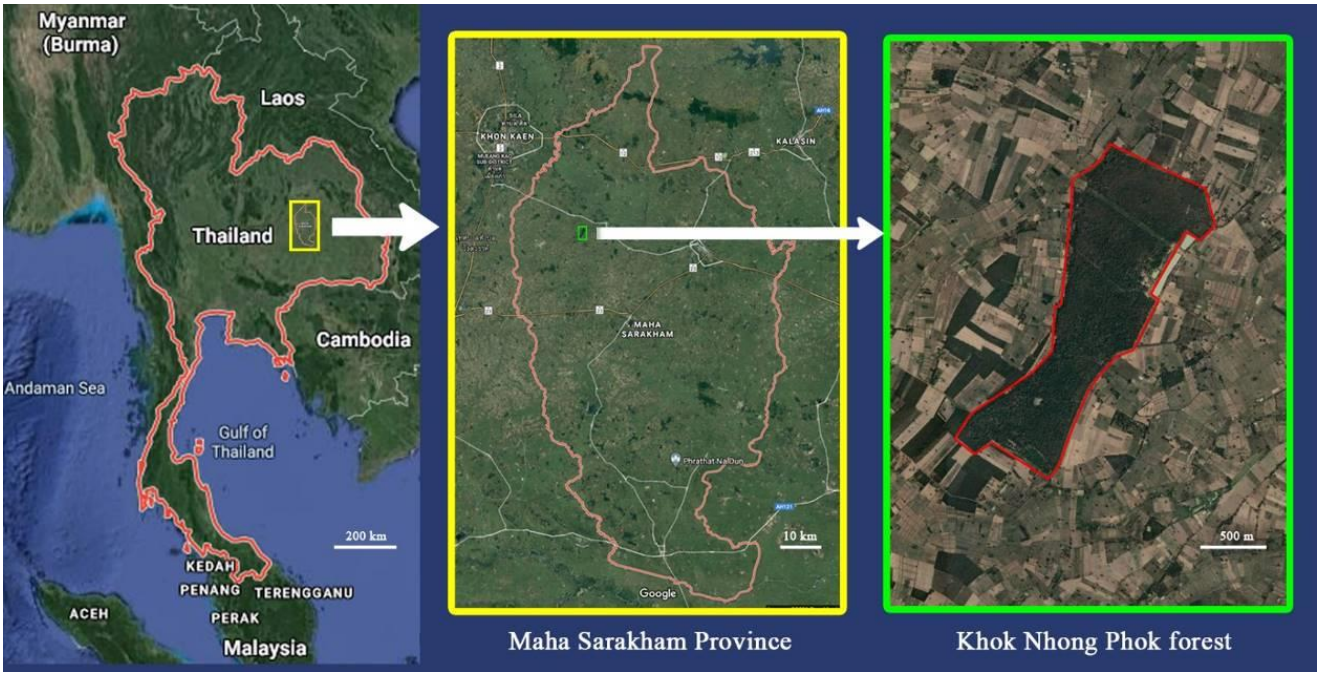

Figure 1. Map of Khok Nhong Phok forest, Maha Sarakham Province, Northeastern Thailand. (https://www.google.com/maps/place/Maha+Sarakham/@15.9787937,103.3353341,189884m/data=!3m1!1e3!4m5!3m4!1s0x3122a6ecd410be59:0xbbad95e486cb239e!8m2!3d16.0132015!4d103.1615169?hl=en)

Data analysis

Analysis of the data using basic statistics, frequency, percentage, the average of *Use Value (UV)*, *Agreement Ratio (IAR)*, and *Fidelity Level (%FL)* as shown below:

Use Value (UV)

$$UV = \frac{\sum Ui}{N}$$

Where: *Ui* is the number of utilization reports for each species of plant, based on each interviewee, and *N* is the Number of interviewees.

Informant agreement Ratio (IAR)

$$IAR = \frac{(Nur - Nt)}{(Nur - 1)}$$

Where: *Nur* is the number of reports of the specific use of the plant species in each symptom of the disease obtained from all data inquiries, and *Nt* is the number of plant species used in each syndrome.

Fidelity Level (%FL)

$$\%FL = \frac{Np}{N} \times 100$$

Where: *Np* is the number of reported uses of that plant in that syndrome, and *Nt* is the total number of reported utilization of that plant in all syndromes.

RESULTS AND DISCUSSION

Utilization of Khok Nong Phok Forest (Public forest)

A study of the utilization of the Khok Nong Phok forest which is located in Hua Khwang Sub-district, Kosum Phisai District, Maha Sarakham Province by interview 30 local philosophers and healers in 6 communities living around the forest. The results show that the plant of the study area is rich in useful species, which includes a total of 101 species, classified in 52 families (Table 1).

Plant Utilization Index (Use Value, UV) in Khok Nhong Phok Forest

When considering the utilization index (Use value, UV) as shown in Table 2, it was found that the plants that were most used in the Khok Nhong Phok forest area were *Azadirachta indica* (Meliaceae), *Senna siamea* (Fabaceae-Caesalpinioideae), *Phyllanthus emblica* (Phyllanthaceae), *Bambusa bambos* (Poaceae), *Amphineurion marginatum* (Apocynaceae), *Schleichera oleosa* (Sapindaceae), *Leucaena leucocephala* (Fabaceae-Mimosoideae), *Pterocarpus macrocarpus* (Fabaceae-Papilionoideae), *Cratoxylum formosum* (Hypericaceae), and *Canarium subulatum* (Burseraceae). A higher *Use Value (UV)* number indicates that the plant is being utilized more than any other species. For example, *Azadirachta indica* (Meliaceae) has a *UV* number of 2.17. Based on utilization data, it is used as food, medicine, and fuel. Due to the high utilization, it's also causing the risk of extinction of such plants from the forest area studied. On the other hand, the low *Use Value (UV)* may indicate that people are less interested in that species of plants which makes it less at risk of extinction.

Classified by utilization

When considering the use of plants in the community. And herbal healers in the area found that each type has different uses, which can be divided according to the three groups of use as follows: (i) Used as food, (ii) Used as medicinal plants, (iii) Used to build housing or fuel.

Khok Nhong Phok forest is an important source of food for the community. Fifty species of plants surveyed were used as food. The most commonly used family is the Fabaceae family, which has considerable species diversity and is common in the study area. There are six parts used for food: the rhizomes or tubers, the stems (pith, bark, vine, and shoot), leaves, young offshoots, flowers, and fruits (seeds). Most of the plants used for cooking or fresh vegetables use the young shoots and flowers, such as the young shoot of *Smilax luzonensis*, the young shoot, and the flower of *Cratoxylum formosum*, and the bamboo shoot. While fruit is the most eaten part, followed by the young leaves and shoots, seeds, sprouts, tubers, and heartwood respectively, they are mostly eaten fresh (Table 3).

Khok Nhong Phok forest is also a collection of herbs which 69 species are used by the community. The seven parts used are tubers, roots, stems (all stems, piths, barks, and rhizomes), leaves, fruits, and latex. These herbs were used by local herbal healers who are like a small hospital in the community. When the villagers are sick, they may first come to the local herbal healers to inquire about symptoms. Each healer has a method for treating and administering medication according to specific symptoms and their expertise. Most of the medicinal formulas are used to treat the postpartum female gastrointestinal syndrome, to nourish the blood, to treat infantile croup, tonic, and to treat fever. Methods for use include boiling and drinking, make it thoroughly by rubbing against a stone tool and pour into drinking, eating fresh, or make it thoroughly by rubbing against a stone tool and applied to the area to be treated depends on the type of plant and symptoms to be treated (Table 4).

Informant Agreement Ratio (IAR)

Physical abnormalities or diseases (Table 4) were categorized into 13 groups such as defined symptoms, injuries, respiratory system, endocrine system, genitourinary system, nutritional disorders, skin disorders, gastroenterology, poisonings, infection, pregnancy/ birth/puerperium, muscular-skeletal system and other. 69 plants were used to treat ailments consists of *Lannea coromandelica*, *Uvaria ferruginea* var. *cherrevensis*, *Polyalthia debilis*, *Polyalthia evecta*, *Amphineurion marginatum*, *Streptocaulon juventas*, *Urceola polymorpha*, *Urceola minutiflora*, *Asparagus racemosus*, *Chromolaena odorata*, *Elephantopus scaber*, *Millingtonia hortensis*, *Ehretia aspera*, *Canarium subulatum*, *Trema orientale*, *Salacia chinensis*, *Ellipanthus tomentosus*, *Argyreia*

breviscapa, *Cyperus rotundus*, *Shorea obtusa*, *Diospyros oblonga*, *Diospyros mollis*, *Diospyros ehretioides*, *Erythroxylum cuneatum*, *Aporosa villosa*., *Croton persimilis*, *Trigonostemon reidioides*, *Croton crassifolius*, *Senna siamea*, *Bauhinia saccocalyx*, *Xylia xylocarpa*, *Pueraria candollei*, *Pterocarpus macrocarpus*, *Flacourtia indica*, *Nephelium hypoleucum*, *Hymenopyramis parvifolia*, *Vitex glabrata*, *Mesosphaerum suaveolens*, *Litsea glutinosa*, *Careya arborea*, *Strychnos nux-blanda*, *Lagerstroemia calyculata*, *Grewia abutilifolia*, *Helicteres angustifolia*, *Memecylon scutellatum*, *Azadirachta indica*, *Diploclisia glaucescens*, *Tinospora crispa*, *Artocarpus lacucha*, *Ochna integerrima*, *Phyllanthus emblica*, *Vietnamosasa pusilla*, *Ziziphus oenopolia*, *Ridsdalea wittii*, *Catunaregam tomentosa*, *Morinda coreia*, *Ixora finlaysoniana*, *Canthium berberidifolium*, *Discospermum parvifolium*, *Clausena wallichii*, *Micromelum minutum*, *Schleichera oleosa*, *Sisyrolepis muricata*, *Xantolis cambodiana*, *Eurycoma longifolia*, *Stemona collinsiae*, *Cissus repanda*, and *Kaempferia marginata*.

Twenty eight (28) species are used to treat gastroenterology-related symptoms such as stomach ache, carminative, and flatulence, i.e. 1. *Uvaria ferruginea* var. *cherrevensis*, 2. *Polyalthia debilis*, 3. *Amphineurion marginatum*, 4. *Asparagus racemosus*, 5. *Trema orientale*, 6. *Salacia chinensis*, 7. *Ellipanthus tomentosus*, 8. *Shorea obtusa*, 9. *Senna siamea*, 10. *Pterocarpus macrocarpus*, 11. *Flacourtia indica*, 12. *Hymenopyramis parvifolia*, 13. *Careya arborea*, 14. *Strychnosnux-blanda*, 15. *Helicteres angustifolia*, 16. *Azadirachta indica*, 17. *Ochna integerrima*, 18. *Phyllanthus emblica*., 19. *Catunaregam tomentosa*, 20. *Morinda coreia*, 21. *Discospermum parvifolium*, 22. *Clausena wallichii*, 23. *Micromelum minutum*, 24. *Schleichera oleosa*, 25. *Sisyrolepis muricata*, 26. *Eurycoma longifolia*, 27. *Cissus repanda*, and 28. *Kaempferia marginata.*

Table 1. List of plants that are used in the Khok Nong Phok forest area, Kosum Phisai District, Maha Sarakham Province, Northeastern Thailand

Family	Scientific name	Thai name	Coll. number
Anacardiaceae	*Buchanania cochinchinensis* (Lour.) M.R.Almeida	มะม่วงหัวแมงวัน	*Narin 1*
Anacardiaceae	*Mangifera caloneura* Kurz	มะม่วงป่า	*Narin2*
Anacardiaceae	*Lannea coromandelica* (Houtt.) Merr.	กอกกัน	*Narin3*
Annonaceae	*Polyalthia debilis* (Pierre) Finet & Gagnep.	กล้วยเต่า	*Narin5*
Annonaceae	*Polyalthia evecta* (Pierre) Finet & Gagnep.	นมน้อย	*Narin6*
Annonaceae	*Uvaria ferruginea* var. *cherrevensis* (Pierre ex Finet & Gagnep.) Meade & J. Parn.	นมแมวป่า	*Narin4*
Annonaceae	*Uvaria rufa* (Dunal) Blume	ฟีพวนน้อย	*Narin7*
Apocynaceae	*Amphineurion marginatum* (Roxb.) D.J. Middleton	ไส้ตัน	*Narin8*
Apocynaceae	*Streptocaulon juventas* (Lour.) Merr.	เครือประสงค์	*Narin9*
Apocynaceae	*Urceola polymorpha* (Pierre ex Spire) D.J. Middleton & Livsh.	เครือส้มลม	*Narin10*
Apocynaceae	*Urceola minutiflora* (Pierre) D.J. Middleton	เถามวกแดง	*Narin11*
Araceae	*Amorphophallus brevispathus* Gagnep.	อีลอก	*Narin12*
Arecaceae	*Cocos nucifera* L.	มะพร้าว	*Narin13*
Asparagaceae	*Asparagus racemosus* Willd.	รากสามสิบ	*Narin14*
Asteraceae	*Chromolaena odorata* (L.) R.M.King & H.Rob.	สาบเสือ	*Narin15*
Asteraceae	*Elephantopus scaber* L.	โด่ไม่รู้ล้ม	*Narin16*
Bignoniaceae	*Millingtonia hortensis* L.f.	ปีป	*Narin17*
Boraginaceae	*Ehretia aspera* Willd.	ตังบี้	*Narin18*
Burseraceae	*Canarium subulatum* Guillaumin	มะกอกเกลื้อน	*Narin19*
Cannabaceae	*Trema orientale* (L.) Blume	พังแหร	*Narin20*
Celastraceae	*Salacia chinensis* L.	กำแพงเจ็ดชั้น	*Narin21*
Connaraceae	*Ellipanthus tomentosus* Kurz	ตานกกด	*Narin22*
Convolvulaceae	*Argyreia breviscapa* (Kerr) Ooststr.	เถาฟ้าระงับ	*Narin23*
Cyperaceae	*Cyperus rotundus* L.	แห้วหมู	*Narin24*
Dilleniaceae	*Dillenia ovata* Wall. ex Hook.f. & Thomson	ส้าน	*Narin25*
Dioscoreaceae	*Dioscorea birmanica* Prain & Burkill	เครือมันนก	*Narin26*
Dipterocarpaceae	*Shorea obtusa* Wall. ex Blume	เต็ง	*Narin27*
Dipterocarpaceae	*Dipterocarpus tuberculatus* Roxb.	กุง	*Narin28*
Dipterocarpaceae	*Dipterocarpus obtusifolius*Teijsm. ex Miq.	ซาด	*Narin29*
Ebenaceae	*Diospyros oblonga* Wall. ex G.Don	ตะโกพนม	*Narin30*
Ebenaceae	*Diospyros mollis* Griff.	มะเกลือ	*Narin31*
Ebenaceae	*Diospyros ehretioides* Wall. ex G. Don	ตับเต่าต้น	*Narin32*
Erythroxylaceae	*Erythroxylum cuneatum* (Miq.) Kurz	ไกรทอง	*Narin33*
Euphorbiaceae	*Aporosa villosa* (Lindl.) Baill.	เหมียดโลด	*Narin34*
Euphorbiaceae	*Croton persimilis* Müll.Arg.	เปล้าใหญ่	*Narin35*
Euphorbiaceae	*Trigonostemon reidioides* (Kurz) Craib	โลดทะนงแดง	*Narin36*
Euphorbiaceae	*Croton crassifolius* Geiseler	พังคี	*Narin37*
Fabaceae-Caesalpinioideae	*Senna siamea* (Lam.) H.S.Irwin & Barneby	ขี้เหล็ก	*Narin38*

Fabaceae-Caesalpinioideae	*Cassia fistula* L.	ราชพฤกษ์	*Narin39*
Fabaceae-Caesalpinioideae	*Bauhinia saccocalyx* Pierre	เสี้ยวป่า	*Narin40*
Fabaceae-Caesalpinioideae	*Erythrophleum succirubrum* Gagnep.	พันชาด	*Narin41*
Fabaceae-Caesalpinioideae	*Sindora siamensis* Miq.	มะค่าแต้	*Narin42*
Fabaceae-Mimosoideae	*Xylia xylocarpa* (Roxb.) Taub.	แดง	*Narin43*
Fabaceae-Mimosoideae	*Leucaena leucocephala* (Lam.) de Wit	กระถินไทย	*Narin44*
Fabaceae-Papilionoideae	*Pueraria candollei* Wall. ex Benth.	กวาวเครือขาว	*Narin45*
Fabaceae-Papilionoideae	*Pterocarpus macrocarpus* Kurz	ประดู่	*Narin46*
Fabaceae-Papilionoideae	*Dalbergia cochinchinensis* Pierre	พะยูง	*Narin47*
Fabaceae-Papilionoideae	*Dalbergia oliveri* Gamble ex Prain	ชิงชัน	*Narin48*
Hypericaceae	*Cratoxylum formosum* (Jack) Benth. &Hook.f. ex Dyer	ติ้วขาว	*Narin51*
Irvingiaceae	*Irvingia malayana* Oliv. ex A.W.Benn.	กระบก	*Narin52*
Lamiaceae	*Hymenopyramis parvifolia* Moldenke	ขาเปีย	*Narin53*
Lamiaceae	*Vitex glabrata* R.Br.	ไข่เน่า	*Narin54*
Lamiaceae	*Mesosphaerum suaveolens* (L.) Kuntze	อีตู่ต้น	*Narin55*
Lauraceae	*Litsea glutinosa* (Lour.) C.B.Rob.	หมี่	*Narin56*
Lecythidaceae	*Careya arborea* Roxb.	กระโดน	*Narin57*
Loganiaceae	*Strychnos nux-blanda* A.W. Hill	ตูมกา	*Narin58*
Lythraceae	*Lagerstroemia calyculata* Kurz	ตะแบก	*Narin59*
Malvaceae	*Grewia eriocarpa* Juss.	ปอแก่นเทา	*Narin60*
Malvaceae	*Grewia abutilifolia* Vent. ex Juss.	ข้าวสี่	*Narin61*
Malvaceae	*Helicteres angustifolia* L.	ปอขี้ตุ่น	*Narin62*
Malvaceae	*Microcos tomentosa* Sm.	พลับพลา	*Narin63*
Melastomataceae	*Memecylon scutellatum* (Lour.) Hook. &Arn.	พลองเหมือด	*Narin64*
Meliaceae	*Walsura trichostemon* Miq.	ข่าลิ่น	*Narin65*
Meliaceae	*Azadirachta indica* A.Juss.	สะเดา	*Narin66*
Menispermaceae	*Tiliacora triandra* (Colebr.) Diels	เครือยานาง	*Narin67*
Menispermaceae	*Diploclisia glaucescens* (Blume) Diels	เครือไส้ไก่	*Narin68*
Menispermaceae	*Tinospora crispa* (L.) Hook.f. & Thomson	บอระเพ็ด	*Narin69*
Moraceae	*Artocarpus lacucha* Buch.-Ham.	มะหาด	*Narin70*
Myrtaceae	*Syzygium antisepticum* (Blume) Merr. & L.M. Perry	สเม็ดชุน	*Narin71*
Myrtaceae	*Syzygium cumini* (L.) Skeels	หว้า	*Narin72*
Ochnaceae	*Ochna integerrima* (Lour.) Merr.	ช้างน้าว	*Narin73*
Passifloraceae	*Adenia viridiflora* Craib	ผักสาบ	*Narin74*
Phyllanthaceae	*Phyllanthus emblica* L.	มะขามป้อม	*Narin75*
Phyllanthaceae	*Antidesma acidum* Retz.	มะเม่า	*Narin76*
Phyllanthaceae	*Hymenocardia punctata* Wall. ex Lindl.	แฟบน้ำ	*Narin77*
Poaceae	*Vietnamosasa pusilla* (A. Chev. & A.Camus) T.Q.Nguyen	ไผ่เพ็ก	*Narin78*
Poaceae	*Bambusa bambos* (L.) Voss	ไผ่ป่า	*Narin79*
Primulaceae	*Embelia ribes* Burm.f.	ส้มกุ้ง	*Narin80*
Rhamnaceae	*Ziziphus oenopolia* (L.) Mill.	เล็บแมว	*Narin81*
Rubiaceae	*Ridsdalea wittii* (Craib) J.T. Pereira	หมักม่อ	*Narin82*
Rubiaceae	*Catunaregam tomentosa* (Blume ex DC.) Tirveng.	หนามแท่ง	*Narin83*
Rubiaceae	*Morinda coreia* Buch.-Ham.	ยอป่า	*Narin84*
Rubiaceae	*Ixora finlaysoniana* Wall. ex G.Don	เข็มขาว	*Narin85*
Rubiaceae	*Canthium berberidifolium* E.T. Geddes	เงี่ยงดุก	*Narin86*
Rubiaceae	*Discospermum parvifolium* Kuntze	ครอบจักรวาล	*Narin87*
Rubiaceae	*Mitragyna diversifolia* (Wall. ex G.Don) Havil.	กระทุ่มนา	*Narin88*
Rutaceae	*Clausena wallichii* Oliv.	ส่องฟ้า	*Narin89*
Rutaceae	*Micromelum minutum* (G. Forst.) Wight &Arn.	สมัดน้อย	*Narin90*
Salicaceae	*Flacourtia indica* (Burm.f.) Merr.	ตะขบป่า	*Narin49*
Sapindaceae	*Nephelium hypoleucum* Kurz	คอแลน	*Narin50*
Sapindaceae	*Schleichera oleosa* (Lour.) Oken	ตะคร้อ	*Narin91*
Sapindaceae	*Sisyrolepis muricata* (Pierre) Leenh.	ตะคร้อหนาม	*Narin92*
Sapindaceae	*Lepisanthes rubiginosa* (Roxb.) Leenh.	หวดคา	*Narin93*
Sapotaceae	*Xantolis cambodiana* (Pierre ex Dubard) P.Royen	นมสาว	*Narin94*
Simaroubaceae	*Eurycoma longifolia* Jack	ปลาไหลเผือก	*Narin95*
Smilacaceae	*Smilax luzonensis* C.Presl	เครือเขียง	*Narin96*
Stemonaceae	*Stemona collinsiae* Craib	หนอนตายอยาก	*Narin97*
Thymelaeaceae	*Enkleia malaccensis* Griff.	ปอเต่าไห้	*Narin98*
Vitaceae	*Cissus repanda* (Wight &Arn.) Vahl	เถาวัลย์ปูน	*Narin99*
Zingiberaceae	*Kaempferia marginata* Carey ex Roscoe	เปราะป่า	*Narin100*
Zingiberaceae	*Curcuma singularis* Gagnep.	กระเจียวขาว	*Narin101*

Table 2. Utilization Index (Use Value, UV) of plants in Khok Nhong Phok Forest, Northeastern Thailand (sorted from highest to lowest)

Scientific name	Family	Use value (UV)
Azadirachta indica	Meliaceae	2.17
Senna siamea	Fabaceae-Caesalpinioideae	2.13
Phyllanthus emblica	Phyllanthaceae	2.07
Bambusa bambos	Poaceae	2.00
Amphineurion marginatum	Apocynaceae	1.47
Schleichera oleosa	Sapindaceae	1.40
Leucaena leucocephala	Fabaceae-Mimosoideae	1.33
Pterocarpus macrocarpus	Fabaceae-Papilionoideae	1.30
Cratoxylum formosum	Hypericaceae	1.27
Canarium subulatum	Burseraceae	1.20
Cassia fistula	Fabaceae-Caesalpinioideae	1.20
Careya arborea	Lecythidaceae	1.17
Polyalthia debilis	Annonaceae	1.10
Xylia xylocarpa	Fabaceae-Mimosoideae	1.07
Cocos nucifera	Arecaceae	1.00
Dipterocarpus tuberculatus	Dipterocarpaceae	1.00
Dipterocarpus obtusifolius	Dipterocarpaceae	1.00
Tiliacora triandra	Menispermaceae	1.00
Antidesma acidum	Phyllanthaceae	1.00
Irvingia malayana	Irvingiaceae	0.97
Curcuma singularis	Zingiberaceae	0.97
Dalbergia cochinchinensis	Fabaceae-Papilionoideae	0.90
Adenia viridiflora	Passifloraceae	0.90
Kaempferia marginata	Zingiberaceae	0.90
Litsea glutinosa	Lauraceae	0.87
Artocarpus lacucha	Moraceae	0.87
Syzygium cumini	Myrtaceae	0.87
Shorea obtusa	Dipterocarpaceae	0.80
Sindora siamensis	Fabaceae-Caesalpinioideae	0.77
Flacourtia indica	Salicaceae	0.77
Bauhinia saccocalyx	Fabaceae-Caesalpinioideae	0.73
Ziziphus oenopolia	Rhamnaceae	0.70
Mangifera caloneura	Anacardiaceae	0.67
Polyalthia evecta	Annonaceae	0.67
Diospyros oblonga	Ebenaceae	0.67
Amorphophallus brevispathus	Araceae	0.63
Ridsdalea wittii	Rubiaceae	0.63
Chromolaena odorata	Asteraceae	0.60
Ellipanthus tomentosus	Connaraceae	0.60
Strychnos nux-blanda	Loganiaceae	0.60
Vietnamosasa pusilla	Poaceae	0.60
Clausena wallichii	Rutaceae	0.60
Smilax luzonensis	Smilacaceae	0.60
Aporosa villosa	Euphorbiaceae	0.57
Mitragyna diversifolia	Rubiaceae	0.57
Hymenopyramis parvifolia	Lamiaceae	0.53
Asparagus racemosus	Asparagaceae	0.50
Erythrophleum succirubrum	Fabaceae-Caesalpinioideae	0.50
Dillenia ovata	Dilleniaceae	0.47
Streptocaulon juventas	Apocynaceae	0.43
Buchanania cochinchinensis	Anacardiaceae	0.40
Diospyros mollis	Ebenaceae	0.40
Croton persimilis	Euphorbiaceae	0.40
Tinospora crispa	Menispermaceae	0.40
Catunaregam tomentosa	Rubiaceae	0.40
Enkleia malaccensis	Thymelaeaceae	0.40
Nephelium hypoleucum	Sapindaceae	0.37
Lepisanthes rubiginosa	Sapindaceae	0.37
Eurycoma longifolia	Simaroubaceae	0.37
Uvaria ferruginea var. *cherrevensis*	Annonaceae	0.33
Uvaria rufa	Annonaceae	0.33
Walsura trichostemon	Meliaceae	0.33
Grewia eriocarpa	Malvaceae	0.30
Grewia abutilifolia	Malvaceae	0.30
Micromelum minutum	Rutaceae	0.30
Lannea coromandelica	Anacardiaceae	0.27
Urceola polymorpha	Apocynaceae	0.27
Salacia chinensis	Celastraceae	0.27
Syzygium antisepticum	Myrtaceae	0.27
Ochna integerrima	Ochanaceae	0.27
Morinda coreia	Rubiaceae	0.27
Dioscorea birmanica	Dioscoreaceae	0.23
Elephantopus scaber	Asteraceae	0.20
Ehretia aspera	Boraginaceae	0.20
Erythroxylum cuneatum	Erythroxylaceae	0.20
Trigonostemon reidioides	Euphorbiaceae	0.20
Dalbergia oliveri	Fabaceae-Papilionoideae	0.20
Helicteres angustifolia	Malvaceae	0.20
Sisyrolepis muricata	Sapindaceae	0.20
Embelia ribes	Primulaceae	0.17
Millingtonia hortensis	Bignoniaceae	0.13
Vitex glabrata	Lamiaceae	0.13
Microcos tomentosa	Malvaceae	0.13
Hymenocardia punctata	Phyllanthaceae	0.13
Ixora finlaysoniana	Rubiaceae	0.13
Xantolis cambodiana	Sapotaceae	0.13
Stemona collinsiae	Stemonaceae	0.13
Diospyros ehretioides	Ebenaceae	0.10
Pueraria candollei	Fabaceae-Papilionoideae	0.10
Canthium berberidifolium	Rubiaceae	0.10
Cyperus rotundus	Cyperaceae	0.07
Lagerstroemia calyculata	Lythraceae	0.07
Memecylon scutellatum	Melastomataceae	0.07
Urceola minutiflora	Apocynaceae	0.03
Trema orientale	Cannabaceae	0.03
Argyreia breviscapa	Convolvulaceae	0.03
Croton crassifolius	Euphorbiaceae	0.03
Mesosphaerum suaveolens	Lamiaceae	0.03
Diploclisia glaucescens	Menispermaceae	0.03
Discospermum parvifolium	Rubiaceae	0.03
Cissus repanda	Vitaceae	0.03

Table 3. List of plants used as food in Khok Nhong Phok forest, Northeastern Thailand

Family	Scientific name	Used part	Instruction
Anacardiaceae	*Buchanania cochinchinensis*	Raw or ripe fruit	Eaten fresh as fruit
Anacardiaceae	*Mangifera caloneura*	Raw or ripe fruit	Eaten fresh asfruit
Annonaceae	*Uvaria ferruginea* var. *cherrevensis*	Ripe fruit	Eaten fresh as fruit,sweet
Annonaceae	*Polyalthia debilis*	Ripe fruit	Eaten fresh as fruit, sweet
Annonaceae	*Polyalthia evecta*	Ripe fruit	Eaten fresh as fruit, sweet
Annonaceae	*Uvaria rufa*	Ripe fruit	Eaten fresh as fruit, sweet and sour
Apocynaceae	*Amphineurion marginatum*	Young leaves and young shoots	Eat as fresh vegetables
Apocynaceae	*Urceola polymorpha*	Young leaves and young shoots	Eat as fresh vegetables, sour
Araceae	*Amorphophallus brevispathus*	Stems	Boil and pour out the boiled water, then use the boiled stem to cook with *Tiliacora triandra* and tamarind juice
Arecaceae	*Cocos nucifera*	Fruits	Dring coconut juice and eat coconut meat or used coconut meat to make coconut mile
Asparagaceae	*Asparagus racemosus*	Young shoots	Blanched
Boraginaceae	*Ehretia aspera*	Raw fruit	Eaten by pounding mix with weaver ant (*Oecophylla smaragdina*)
Burseraceae	*Canarium subulatum*	Raw fruit	Pickled, then cut and eat the white part of the fruit
Dioscoreaceae	*Dioscorea birmanica*	Tuber	Boil or make them into desserts
Ebenaceae	*Diospyros oblonga*	Ripe fruit	Eaten fresh as a fruit
Fabaceae-Caesalpiniaceae	*Senna siamea*	Young shoots	Boil and pour out the boiled water, then cook with *Tiliacora triandra* juiceand curry paste
Fabaceae-Caesalpiniaceae	*Cassia fistula*	Stem (pith)	Chop into small pieces and mix with betel leaves and red lime
Fabaceae-Caesalpinioideae	*Bauhinia saccocalyx*	Young shoots	Put it in fish curry for a sour taste
Fabaceae-Caesalpinioideae	*Sindora siamensis*	Seeds	Eaten young seeds
Fabaceae-Mimosoideae	*Xylia xylocarpa*	Seeds	Eaten young seeds
Fabaceae-Mimosoideae	*Leucaena leucocephal*	Seeds	Eaten young seeds
Salicaceae	*Flacourtia indica*	Ripe fruit	Eaten fresh as fruit, sweet and sour
Hypericaceae	*Cratoxylum formosum*	Young leaves and young shoots	Eat as fresh vegetablesor add in fish curry
Irvingiaceae	*Irvingia malayana*	Seeds	Roasted and eaten as a snack
Lecythidaceae	*Careya arborea*	Young leaves and young shoots	Eat as fresh vegetables
Malvaceae	*Grewia eriocarpa*	Ripe fruit	Eaten fresh as fruit, sweet and sour
Malvaceae	*Grewia abutilifolia*	Ripe fruit	Eaten fresh as fruit, sweet and sour
Malvaceae	*Microcos tomentosa*	Ripe fruit	Eaten fresh as fruit, sweet and sour
Meliaceae	*Walsura trichostemon*	Ripe fruit	Eaten fresh
Meliaceae	*Azadirachta indica*	Young shoots and flowers	Eaten as a blanched vegetable
Menispermaceae	*Tiliacora triandra*	Leaves	Crush to juice and used to cooking e.g. in bamboo shoot curry, Cassia curry
Moraceae	*Artocarpus lacucha*	Ripe fruit	Eaten fresh as fruit, sweet and sour
Myrtaceae	*Syzygium antisepticum*	Young leaves and young shoots	Eat as fresh vegetables or add in fish curry
Myrtaceae	*Syzygium cumini*	Ripe fruit	Eaten fresh as a fruit
Passifloraceae	*Adenia viridiflora*	Young shoots	Eaten as a blanched vegetable
Phyllanthaceae	*Phyllanthus emblica*	Fruit	Eaten fresh as a fruit
Phyllanthaceae	*Antidesma acidum*	Fruit	Eaten fresh as a fruit
Phyllanthaceae	*Hymenocardia punctata*	Young fruit	Eaten fresh as a fruit
Poaceae	*Vietnamosasa pusilla*	Young offshoots	Eaten as a blanched vegetable
Poaceae	*Bambusa bambos*	Young offshoots	Eaten as a blanched vegetable or cooking curry with *Tiliacora triandra* juice
Primulaceae	*Embelia ribes*	Young shoots	Eat as fresh vegetables, sour
Rhamnaceae	*Ziziphus oenopolia*	Ripe fruit	Eaten fresh as a fruit
Rubiaceae	*Ridsdalea wittii*	Ripe fruit	Eaten fresh as a fruit
Rutaceae	*Clausena wallichii*	Young leaves	Eat as fresh vegetables
Sapindaceae	*Schleichera oleosa*	Ripe fruit	Eaten fresh as a fruit
Sapindaceae	*Sisyrolepis muricata*	Ripe fruit	Eaten fresh as a fruit
Sapindaceae	*Lepisanthes rubiginosa*	Ripe fruit	Eaten fresh as a fruit
Smilacaceae	*Smilax luzonensis*	Young leaves andyoung shoots	Eat as fresh vegetables or add in fish curry
Zingiberaceae	*Kaempferia marginata*	Young leaves	Eaten as a blanched vegetable or cut into small pieces and stir-fry with chameleons
Zingiberaceae	*Curcuma singularis*	Young inflorescence	Eaten as a blanched vegetable

Table 4. List of plants used as medicinal plants in Khok Nhong Phok forest, Northeastern Thailand

Family	Plants name and scientific name	Used part	Instruction
Anacardiaceae	*Lannea coromandelica*	Stems (barks)	Bitter, boiled to treat diarrhea
Annonaceae	*Uvaria ferruginea* var. *cherrevensis*	Roots	Make it thoroughly by rubbing against a stone tool, to treat hemorrhoids, or boiled roots treat stomach pain or treat fever
Annonaceae	*Polyalthia debilis*	Roots	Make it thoroughly by rubbing against a stone tool, and put it in drinking water to treat fever, chickenpox, or boil and eat to treat stomachache
Annonaceae	*Polyalthia evecta*	Roots	Make it thoroughly by rubbing against a stone tool, and put it in drinking water to treat fever, or boil and eat to treat gallstones
Apocynaceae	*Amphineurion marginatum*	Roots, stems and leaves	Make the roots thoroughly by rubbing against a stone tool, then put it in drinking water to nourish breast milk after giving birth; boiled stems and eat to treat hemorrhoids; crushed the leaves and applied to treat hemorrhoids
Apocynaceae	*Streptocaulon juventas*	Latex	Use latex to treat stomatitis
Apocynaceae	*Urceola polymorpha*	Leaves	Eat fresh to reduce dizziness
Apocynaceae	*Urceola minutiflora*	All parts	Soak all parts of the plant in water and bath to treat belly disease
Asparagaceae	*Asparagus racemosus*	Roots	Boil and drink to nourish the body, heal the uterus, or crush it and apply it to the abscess area
Asteraceae	*Chromolaena odorata*	Leaves	Crush and applied it to heal fresh wounds, help to stop bleeding
Asteraceae	*Elephantopus scaber*	All parts	Boil and eat as a tonic
Bignoniaceae	*Millingtonia hortensis*	Stem (barks)	Helps relieve cough
Boraginaceae	*Ehretia aspera*	Fruits	Eat fresh to reduce dizziness
Burseraceae	*Canarium subulatum*	Fruits and stems (barks and piths)	Pickle fruits, or crush the core of the stem with water, eat to treat children with croup, or soaked in water to treat conjunctivitis, wet eyes disease
Cannabaceae	*Trema orientale*	Roots	Boil and eat to treat stomach pain
Celastraceae	*Salacia chinensis*	Roots and stems	Boil to help cure gastritis. Used as a laxative, dried and then boiled or Make it thoroughly by rubbing against a stone tool and eat to detox the kidneys
Connaraceae	*Ellipanthus tomentosus*	Stem (barks)	Boiled barks and drink to treat gastritis, or boiled stems and bath to treat the rash
Convolvulaceae	*Argyreia breviscapa*	Roots	Boil and eat to cure cough
Cyperaceae	*Cyperus rotundus*	Roots	Boil and drink to cure gonorrhea, cure abscesses
Dipterocarpaceae	*Shorea obtusa*	Young leaves	Boil and drink to cure stomachache
Ebenaceae	*Diospyros oblonga*	Stem (barks)	Boil and drink to help expel parasites
Ebenaceae	*Diospyros mollis*	Stem (piths)	Make it thoroughly by rubbing against a stone tool, and drink to help expel parasites
Ebenaceae	*Diospyros ehretioides*	Stems	Boil and eat to treat the cough and vaginal discharge
Erythroxylaceae	*Erythroxylum cuneatum*	Roots	Boil and eat to nourish milk
Euphorbiaceae	*Aporosa villosa*	Stems	Boil and eat, or soak in bath water to treat croup
Euphorbiaceae	*Croton persimilis*	Leaves	Make it dried and wrapped in a thin white cloth, steamed it, and applied to the bruised or painful area
Euphorbiaceae	*Trigonostemon reidioides*	Roots and leaves	Make it thoroughly by rubbing against a stone tool, apply to cure abscesses, or mix with lemon juice to anti-snake venom. Boiled leaves and eat to relieve pain
Euphorbiaceae	*Croton crassifolius*	Roots	Boil and eat to nourish the blood
Fabaceae-Caesalpinioideae	*Senna siamea*	Leaves	Made it curry and eaten it as a laxative
Fabaceae-Caesalpinioideae	*Bauhinia saccocalyx*	Roots and young leaves	Use the leaves or young shoots to chew thoroughly to treat mouth sores or mouth ulcers. The root is used to lozenge in the mouth or boil and eat to help heal mouth ulcers
Fabaceae-Mimosoideae	*Xylia xylocarpa*	Stem (barks)	Boil it with *Irvingia malayana* Oliv. ex A.W.Benn., and eat it for pain relief
Fabaceae-Papilionoideae	*Pueraria candollei*	Roots	Apply or eat to help treat female internal symptoms, nourish the body
Fabaceae-Papilionoideae	*Pterocarpus macrocarpus*	Stems	Boiled and eaten as an anthelmintic, can cure flatulence and indigestion
Salicaceae	*Flacourtia indica*	Roots	Boil and eat to cure flatulence, nourish the body
Sapindaceae	*Nephelium hypoleucum*	Stem (barks)	Bring to boil and drink for women after giving birth to help heal wounds
Lamiaceae	*Hymenopyramis parvifolia*	Stems	Boil to treat gastritis

Lamiaceae	*Vitex glabrata*	Stems and fruits	Boil to cure diabetes
Lamiaceae	*Mesosphaerum suaveolens*	Root	Boil with *Ochna integerrima*, and eat it to cure food poisoning
Lauraceae	*Litsea glutinosa*	Leaves and root	The fermented leaves are used as a shampoo, and finely ground roots are applied to treat purulent abscesses
Lecythidaceae	*Careya arborea*	Stem (barks)	Boil to treat gastritis
Loganiaceae	*Strychnos nux-blanda*	Root and stems	Chew bark and blow on snakebite wounds; boiled the piths and eat to cure stomach problems; roots soaked in water for cows or buffalo to eat it as a laxative
Lythraceae	*Lagerstroemia calyculata*	Stems	Boil and eat to treat muscle weakness
Malvaceae	*Grewia abutilifolia*	Roots	Boil and drink to cure urinary incontinence
Malvaceae	*Helicteres angustifolia*	Roots	Boil to cure flatulence
Melastomataceae	*Memecylon scutellatum*	Roots and stem	Make it thoroughly by rubbing against a stone tool, eat as herbal medicine to nourish milk; soak the stems, and bath to cure the children's croup
Meliaceae	*Azadirachta indica*	Leaves and stem (piths and barks)	Boiled leaves and eaten as an aphrodisiac to relieve flatulence; leaves or stem bark used for fermentation to kill insects; Boiled cores to treat diabetes
Menispermaceae	*Diploclisia glaucescens*	Stems	Boiled and eaten help nourish milk, used as a herbal remedy for wound healing for women after giving birth
Menispermaceae	*Tinospora crispa*	Stems	Boil and drink to cure fever
Moraceae	*Artocarpus lacucha*	Stems	Boil and eat as an anthelmintic drug or boil and bathe in rash fever
Ochnaceae	*Ochna integerrima*	Stems	The peel is applied to the face to make the face white. Boil and eat to help cure stomach problems
Phyllanthaceae	*Phyllanthus emblica*	Piths and fruits	The core is boiled and eaten to cure cough; fruitsare eaten fresh to moisten the throat and reduce coughingor eat fresh as a laxative
Poaceae	*Vietnamosasa pusilla*	Roots	Boil and eat to cure fever
Rhamnaceae	*Ziziphus oenopolia*	Roots	Boil to treat purulent abscesses
Rubiaceae	*Ridsdalea wittii*	Stems, roots, and fruits	Boiled stems and eaten to treat tendon diseases or to be soaked in water to cure children's croup, boiled roots to relieve fever. Boiled fruit and eaten to nourish the body, or dried and boiled to treat diabetes
Rubiaceae	*Catunaregam tomentosa*	Stems and old fruits	Boiled stems and eat to treat painkillers, diarrhea, and hemorrhoids; The mature fruit is used to beat with water and used as a shampoo
Rubiaceae	*Morinda coreia*	Fruits	Eat fresh fruit as a laxative to cure flatulence and indigestion
Rubiaceae	*Ixora finlaysoniana*	Roots and stems	Make it thoroughly by rubbing against a stone tool, eat to treat a suffer from food poisonous
Rubiaceae	*Canthium berberidifolium*	Stems	Make it thoroughly by rubbing against a stone tool, and applied to the pain area to reduce the pain
Rubiaceae	*Discospermum parvifolium*	Roots	Boil and eat to cure stomachache
Rutaceae	*Clausena wallichii*	Roots or all stem	Thoroughly the roots by rubbing against a stone tool, eat to treat the suffer from food poisonous for female after giving birth, the whole plant is eaten to carminative and treat beriberi
Rutaceae	*Micromelum minutum*	Leaves	Boil and eat as carminative and reduce flatulence and distension
Sapindaceae	*Schleichera oleosa*	Fruits	Eat it as a laxative, but should not take too much as it can cause diarrhea
Sapindaceae	*Sisyrolepis muricata*	Fruits	Eat it as a laxative, but should not take too much as it can cause diarrhea, or crushed into the water and eat to nourish the blood
Sapotaceae	*Xantolis cambodiana*	Stem (barks)	Boil and drink to nourish the milk
Simaroubaceae	*Eurycoma longifolia*	Roots	Make it thoroughly by rubbing against a stone tool, or boil and drink to cure hemorrhoids, or use fillings on tooth decay to relieve toothache; boiled and eat to treat food poisoning of women after childbirth
Stemonaceae	*Stemona collinsiae*	Roots	Eat to cure skin diseases, rashes, lymphatic drainage. Or crush and apply to cure scorpion bites, snake bites
Vitaceae	*Cissus repanda*	Leaves	Grind with *Zingiber ottensii* rhizomes and dry, eat to cure stomachache
Zingiberaceae	*Kaempferia marginata*	Rhizomes	Boil and eat as carminative

Fiveteen (15) species are used to treat infections related to infections such as fever, abscess, and pus, i.e. 1. *Lannea coromandelica*, 2. *Uvaria ferruginea* var. *cherrevensis*, 3. *Polyalthia debilis*, 4. *Polyalthia evecta*, 5. *Salacia chinensis*, 6. *Ellipanthus tomentosus*, 7. *Cyperus rotundus*, 8. *Trigonostemon reidioides*, 9. *Litsea glutinosa*, 10. *Tinospora crispa*, 11. *Artocarpus lacucha*, 12. *Vietnamosasa pusilla*, 13. *Ziziphus oenopolia*, 14. *Ridsdalea wittii*, and 15. *Catunaregam tomentosa*.

Fourteen (14) species are used to treat nutritional disorders such as antihistamines and tonics, i.e. 1. *Polyalthia debilis*, 2. *Urceola minutiflora*, 3. *Asparagus racemosus*, 4. *Elephantopus scaber*, 5. *Canarium subulatum*, 6. *Aporosa villosa*, 7. *Croton crassifolius*, 8. *Flacourtia indica*, 9. *Mesosphaerum suaveolens*, 10. *Memecylon scutellatum*, 11. *Azadirachta indica*, 12. *Ridsdalea wittii*, 13. *Ixora finlaysoniana*, 14. *Sisyrolepis muricata*.

Eleven (11) species are used for women during pregnancy, birth, or puerperium, i.e. 1. *Amphineurion marginatum*, 2. *Asparagus racemosus*, 3. *Diospyros ehretioides*, 4. *Erythroxylum cuneatum*, 5. *Pueraria candollei*, 6. *Nephelium hypoleucum*, 7. *Memecylon scutellatum*, 8. *Diploclisia glaucescens*, 9. *Clausena wallichii*, 10. *Xantolis cambodiana*, and 11. *Eurycoma longifolia*.

Nine (9) species are used to treat poisonings, i.e. 1. *Diospyros oblonga*, 2. *Diospyros mollis*, 3. *Trigonostemon reidioides*, 4. *Pterocarpus macrocarpus*, 5. *Strychnos nux-blanda*, 6. *Azadirachta indica*, 7. *Artocarpus lacucha*, 8. *Canthium berberidifolium*, and 9. *Stemona collinsiae*.

Five (5) species are used to treat the muscular-skeletal system, i.e. 1. *Croton persimilis*, 2. *Trigonostemon reidioides*, 3. *Xylia xylocarpa*, 4. *Lagerstroemia calyculata*, and 5. *Catunaregam tomentosa*.

Four (4) species are used to treat the respiratory system, i.e. 1. *Millingtonia hortensis*, 2. *Argyreia breviscapa*, 3. *Diospyros ehretioides*, and 4. *Phyllanthus emblica*.

Three (3) species are used to treat the genitourinary system, i.e. 1. *Polyalthia evecta*, 2. *Salacia chinensis*, and 3. *Grewia abutilifolia*.

Three (3) species are used to treat the endocrine system, i.e. 1. *Vitex glabrata*, 2. *Azadirachta indica*, and 3. *Ridsdalea wittii*.

Three (3) species are used to treat injuries, i.e. 1. *Streptocaulon juventas*, 2. *Chromolaena odorata*, and 3. *Bauhinia saccocalyx*.

Two (2) species are used for skin disorders, i.e. 1. *Ochna integerrima*, and 2. *Stemona collinsiae*.

Two (2) species are used to treat defined symptoms such as dizziness, i.e. 1. *Urceola polymorpha*, and 2. *Ehretia aspera*.

Two (2) species are used for other disorders treated, such as champoo, i.e. 1. *Litsea glutinosa*, and 2. *Catunaregam tomentosa*.

Analysis of the IAR index (Table 5), the vertigo syndrome group has an ICF of 0.958 which indicates that medicinal plants for the treatment of the syndrome are accepted by many informants. This conformity shows a high degree of acceptance. While muscle-related syndromes group (Muscular-skeletal system) had an ICF of 0.692, indicating that medicinal plants used in the treatment of this syndrome were less acceptable by all informants. This may be due to the low use of plants in this syndrome and the use of different plants for each respondent.

Fidelity Level (%FL)

Fidelity Level by analyzing the plants which are the most interesting in the treatment of each syndrome. This is because, in each syndrome, multiple plant species may be treated using the ratio of the number of reported plant utilization in that symptom group to the total reported number of plant use of that plant across all symptom clusters. It was shown that if a plant had a high *%FL*, it meant that the plant was used in the same direction or that each informant was using the same plant to treat the syndrome. The highest value was 100, while the plant *%FL* was low. This indicates that the plant is used for multiple purposes or multiple syndromes (Table 6).

Comparing to the result of Suksri et al. (2005) which although we are studying in the same region in northeastern Thailand but differ in the characteristics area and provinces. Our study area, Khok Nhong Phok forest, is the deciduous dipterocarp forest located in Maha Sarakham Province, whereas the study of Suksri et al. studied in the Bung Khong Long area where is a wetland located in Bueng Kan Province. Due to the different conditions of the area, the vegetation found in the area is different and results in different utilization as well.

Khok Nhong Phok forest is an important source of food for the community; 50 plants surveyed are used as food. The proportion is less than the result of the study Ethnobotany of Phu Thai Ethnic Group in Nakhon Phanom Province, Thailand by Pholhiamhan et al. (2018). While in this study, 101 plant species were found. Six utilization parts of plants used for food were rhizomes or tubers, the stems (pith, bark, vine, and shoot), leaves, young offshoots, flowers, and fruits (seeds). According to a study by Pholhiamhan et al. (2018), most of the edible plants used young shoots and flowers, such as *Senna siamea*. The shoots and flowers of *Cratoxylum formosum* were used. Seasonal wild fruits such as *Uvariarufa* and *Grewia abutilifolia*. While the study of Cruz-Garcia & Price (2011) about wild plants used as food found 87 species belong to 47 families. 17 species of food plants, which found distributed in Kalasin province are also found in our study area and used as food too, i.e. 1. *Mangifera caloneura*, 2. *Polyalthia debilis*, 3. *Polyalthia evecta*, 4. *Amorphophallus brevispathus*, 5. *Canarium subulatum*, 6. *Careya arborea*, 7. *Azadirachta indica*, 8. *Tilia coratriandra*, 9. *Artocarpus lacucha*, 10. *Syzygium cumini*, 11. *Adenia viridiflora*, 12. *Bambusa bambos*, 13. *Ziziphus oenopolia*, 14. *Ridsdalea wittii*, 15. *Schleichera oleosa*, 16. *Lepisanthe srubiginosa*, and 17. *Curcuma singularis*. However, more than 70 percent are different.

Table 5. Disease symptom clusters and Informant Agreement Ratio (IAR) index of the therapeutic use of plants in Khok Nhong Phok forest, Northeastern Thailand

Use-categories	Disorders treated	Number of use report	Number of taxa	IAR
Defined symptoms	Dizziness	25	2	0.958
Injuries	Wound, aphthous ulcers	36	3	0.943
Respiratory system	Cough	49	4	0.938
Endocrine system	Diabetes	27	3	0.923
Genitourinary system	Diuretic, renal failure	18	3	0.882
Nutritional disorders	Nutrients supplement	109	14	0.880
Skin disorders	Skin nourishment, rashes	9	2	0.875
Gastroenterology	Hemorrhoid, stomachache, gastritis, constipation, carminative	208	28	0.870
Poisonings	Sting, parasite, insect repellent	51	9	0.840
Infection	Fever, diarrhea, abscess, gonorrhea	85	15	0.833
Other	Shampoo	7	2	0.833
Pregnancy/ Birth/Puerperium	Lactation stimulant, recovery (female after giving birth)	58	11	0.825
Muscular-skeletal system	Muscle pain, sprain	14	5	0.692

Table 6. The %FL values of each plant from Khok Nhong Phok forest, Northeastern Thailand in the treatment of disease syndrome

Family	Plant name and scientific name	Medical category	Np	N	%FL
Anacardiaceae	*Lannea coromandelica*	Infection	6	6	100.00
Annonaceae	*Uvaria ferruginea* var. *cherrevensis*	Gastroenterology	5	8	62.50
		Infection	3	8	37.50
Annonaceae	*Polyalthia debilis*	Infection	7	20	35.00
		Nutritional disorders	5	20	25.00
		Gastroenterology	8	20	40.00
Annonaceae	*Polyalthia evecta*	Infection	1	3	33.33
		Genitourinary system	2	3	66.67
Apocynaceae	*Amphineurion*	Gastroenterology	7	12	58.33
		Pregnancy/birth/puerperium	5	12	41.67
Apocynaceae	*Streptocaulon juventas*	Injuries	13	13	100.00
Apocynaceae	*Urceola polymorpha*	Defined symptoms	14	14	100.00
Apocynaceae	*Urceola minutiflora*	Nutritional disorders	23	23	100.00
Asparagaceae	*Asparagus racemosus*	Nutritional disorders	1	10	10.00
		Gastroenterology	2	10	20.00
		Pregnancy/birth/puerperium	7	10	70.00
Asteraceae	*Chromolaena odorata*	Injuries	15	15	100.00
Asteraceae	*Elephantopus scaber*	Nutritional disorders	20	20	100.00
Bignoniaceae	*Millingtonia hortensis*	Respiratory system	14	14	100.00
Boraginaceae	*Ehretia aspera*	Defined symptoms	11	11	100.00
Burseraceae	*Canarium subulatum*	Nutritional disorders	6	6	100.00
Cannabaceae	*Trema orientale*	Gastroenterology	31	31	100.00
Celastraceae	*Salacia chinensis*	Gastroenterology	6	18	33.33
		Genitourinary system	5	18	27.78
		Infection	7	18	38.89
Connaraceae	*Ellipanthus tomentosus*	Gastroenterology	5	14	35.71
		Infection	9	14	64.29
Convolvulaceae	*Argyreia breviscapa*	Respiratory system	12	12	100.00
Cyperaceae	*Cyperus rotundus*	Infection	4	4	100.00
Dipterocarpaceae	*Shorea obtusa*	Gastroenterology	8	8	100.00
Ebenaceae	*Diospyros oblonga*	Poisonings	2	2	100.00
Ebenaceae	*Diospyros mollis*	Poisonings	2	2	100.00
Ebenaceae	*Diospyros ehretioides*	Respiratory system	11	16	68.75
		Pregnancy/birth/puerperium	5	16	31.25
Erythroxylaceae	*Erythroxylum cuneatum*	Pregnancy/birth/puerperium	5	5	100.00
Euphorbiaceae	*Aporosa villosa*	Nutritional disorders	7	7	100.00
Euphorbiaceae	*Croton persimilis*	Muscular-skeletal system	3	3	100.00
Euphorbiaceae	*Trigonostemon reidioides*	Infection	12	21	57.14
		Poisonings	5	21	23.81

		Muscular-skeletal system	4	21	19.05
Euphorbiaceae	*Croton crassifolius*	Nutritional disorders	2	2	100.00
Fabaceae-Caesalpinioideae	*Senna siamea*	Gastroenterology	23	23	100.00
Fabaceae-Caesalpinioideae	*Bauhinia saccocalyx*	Injuries	8	8	100.00
Fabaceae-Mimosoideae	*Xylia xylocarpa*	Muscular-skeletal system	2	2	100.00
Fabaceae-Papilionoideae	*Pueraria candollei*	Pregnancy/birth/puerperium	4	4	100.00
Fabaceae-Papilionoideae	*Pterocarpus macrocarpus*	Poisonings	8	21	38.10
		Gastroenterology	13	21	61.90
Salicaceae	*Flacourtia indica*	Gastroenterology	3	10	30.00
		Nutritional disorders	7	10	70.00
Sapindaceae	*Nephelium hypoleucum*	Pregnancy/birth/puerperium	4	4	100.00
Lamiaceae	*Hymenopyramis parvifolia*	Gastroenterology	7	7	100.00
Lamiaceae	*Vitex glabrata*	Endocrine system	12	12	100.00
Lamiaceae	*Mesosphaerum suaveolens*	Nutritional disorders	8	8	100.00
Lauraceae	*Litsea glutinosa*	Infection	12	15	80.00
		Other	3	15	20.00
Lecythidaceae	*Careya arborea*	Gastroenterology	8	8	100.00
Loganiaceae	*Strychnos nux-blanda*	Poisonings	5	11	45.45
		Gastroenterology	6	11	54.55
Lythraceae	*Lagerstroemia calyculata*	Muscular-skeletal system	3	3	100.00
Malvaceae	*Grewia abutilifolia*	Genitourinary system	11	11	100.00
Malvaceae	*Helicteres angustifolia*	Gastroenterology	6	6	100.00
Melastomataceae	*Memecylon scutellatum*	Pregnancy/birth/puerperium	8	14	57.14
		Nutritional disorders	6	14	42.86
Meliaceae	*Azadirachta indica*	Nutritional disorders	5	22	22.73
		Gastroenterology	2	22	9.09
		Poisonings	9	22	40.91
		Endocrine system	6	22	27.27
Menispermaceae	*Diploclisia glaucescens*	Pregnancy/birth/puerperium	2	2	100.00
Menispermaceae	*Tinospora crispa*	Infection	4	4	100.00
Moraceae	*Artocarpus lacucha*	Infection	5	11	45.45
		Poisonings	6	11	54.55
Ochnaceae	*Ochna integerrima*	Skin disorders	2	6	33.33
		Gastroenterology	4	6	66.67
Phyllanthaceae	*Phyllanthus emblica*	Gastroenterology	7	19	36.84
		Respiratory system	12	19	63.16
Poaceae	*Vietnamosasa pusilla*	Infection	3	3	100.00
Rhamnaceae	*Ziziphus oenopolia*	Infection	4	4	100.00
Rubiaceae	*Ridsdalea wittii*	Nutritional disorders	5	18	27.78
		Infection	4	18	22.22
		Endocrine system	9	18	50.00
Rubiaceae	*Catunaregam tomentosa*	Muscular-skeletal system	2	18	11.11
		Infection	4	18	22.22
		Gastroenterology	8	18	44.44
		Other	4	18	22.22
Rubiaceae	*Morinda coreia*	Gastroenterology	4	4	100.00
Rubiaceae	*Ixora finlaysoniana*	Nutritional disorders	5	5	100.00
Rubiaceae	*Canthium berberidifolium*	Poisonings	9	9	100.00
Rubiaceae	*Discospermum parvifolium*	Gastroenterology	6	6	100.00
Rutaceae	*Clausena wallichii*	Pregnancy/birth/puerperium	5	13	38.46
		Gastroenterology	8	13	61.54
Rutaceae	*Micromelum minutum*	Gastroenterology	2	2	100.00
Sapindaceae	*Schleichera oleosa*	Gastroenterology	4	4	100.00
Sapindaceae	*Sisyrolepis muricata*	Gastroenterology	5	14	35.71
		Nutritional disorders	9	14	64.29
Sapotaceae	*Xantolis cambodiana*	Pregnancy/birth/puerperium	5	5	100.00
Simaroubaceae	*Eurycoma longifolia*	Gastroenterology	8	16	50.00
		Pregnancy/birth/puerperium	8	16	50.00
Stemonaceae	*Stemona collinsiae*	Skin disorders	7	12	58.33
		Poisonings	5	12	41.67
Vitaceae	*Cissus repanda*	Gastroenterology	4	4	100.00
Zingiberaceae	*Kaempferia marginata*	Gastroenterology	8	8	100.00

This forest is a collection of plants of which 69 species have been used by the community for medicinal purposes. The majority of plants were used for the treatment of gastrointestinal diseases such as abdominal pain and gastritis, similar to the results of studies by Pholhiamhan et al. (2018) and Junsongduang et al. (2020), where most plants were used for medicinal purposes to treat the gastrointestinal.

In addition, plants in the Khok Nong Phok forest are used as building materials, appliances and fuel. Here, it is considered an important source of material in which 42 species of plants are used in this area, mainly stems and leaves, similar to the results of a study by Panyadee et al. (2016), who studied Woody Plant Diversity. in Urban Homegardens in Northern Thailand where plant stems are used to build homes, appliances, and fuel. But at present, it is found that the use of plants in this field has decreased due to the use of synthetic materials that can be substituted. And in the present, in the aforementioned areas, there is a resolution forbidding the use of trees in Khok Nhong Phok forest for long-term forest conservation.

In summary, there are 101 species of plants that are used according to traditional knowledge, which classified in 52 families, categorized into three groups based on traditional used: 50 species of food plants, 69 species of medicinal plants, and 42 species used to build homes, appliances, and fuel. In this study, some plants with more than one type of utilization showed that they were valuable to local people in terms of various uses. Such information can be used as a guideline for the conservation of plant resources in the area to show the importance of cherishing and maintain valuable resources remain for future generations forward.

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