# Medicinal plants used by Tai Lao healers in Roi Et, Thailand

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## Research

## Abstract

*Background*: Local knowledge of herbal medicine in rural communities is rich. This part of culture plays an important role in societies where knowledge of indigenous medicine and folk healing has been passed down from generation to generation. Most of the knowledge was never written down, and much of it has disappeared over time, as it was presented orally and through memorization. The objective of this study was to compile knowledge related to medicinal plants used by Tai Lao traditional healers in Roi et province and identify their explicit use in order to preserve the useful wisdom for the people.

*Methods*: In this study, we identify and document medicinal plants and associated ethnobotanical knowledge held by 14 traditional Tai Lao healers. They were selected by snowball and purposive sampling and questioned using semi-structured interviews. Interviews about their knowledge, covered their training, the ailments they treated, the techniques they used, their methods of preparation and, in addition, several healing sessions were observed. During walks in the fields, we searched for the medicinal plant with the help of the healers to review and document their availability at each locality and in different habitats around the villages. Use Values (UV) were calculated to estimate the importance of each medicinal plant, and Informant Agreement Ratios (IAR) were calculated to understand how widely known the uses were among the healers.

*Results*: We found 146 species of medicinal plants in 127 genera and 60 plant families that were used for medicinal purposes by the 14 traditional healers interviewed. The family with the most medicinal plants was Fabaceae (12 spp., 8%), followed by Poaceae (10 spp., 6%) and Zigiberaceae and Lamiaceae (8 spp., 5%). The most important and widely used medicinal plants were the sedge *Cyperus rotundus* (UV=0.71) followed by the dicot tree *Salacia dongnaiensis* (UV=0.64) and the palm Borassus flabellifer (UV=0.42). The most common preparation method was decoction, used for 99 species (68%), followed by grinding with water to produce a drink for 29 species (20%). The 14 healers together used medicinal plants to treat 53 specific conditions. Itching had the highest informant agreement ratio (IAR) among the specific conditions, at 0.33 (4 use-reports, 3 spp.). The general category of digestive system disorders had an informant agreement ratio (IAR) value of 0.35 (57 use-reports, 37 spp.), and this category of treatments also had the highest degree of consensus. The most common life form among the medicinal plants was trees (56 spp., 38%), followed by herbs (41 spp., 28%). The medicinal plants were mostly collected in homegardens (60 spp., 41%). The most commonly used plant parts for medicine were the stem, which was used for almost half of the species (69 spp., 48%), followed by the roots (54 spp., 37%). The age of the Tai Lao healers varied from

26 to 87 years. All of them were male. Their age and education were not correlated with the number of known medicinal plants. The highest number of known medicinal plants was held by a 70-year-old healer (55 spp.).

*Conclusions*: Considering the richness of the healers' pharmacopeia and the fact that their profession is not being perpetuated, this study points to the urgent need to document the traditional knowledge from the old herbalists before it disappears with the last practitioners in the rural communities.

*Keywords*: *ethnobotany; herbalist; northeastern Thailand; Roi Et; traditional knowledge*

## Background

Thai people began using medicinal plants for the treatment of various health symptoms and diseases and for maintaining good health, before the Sukhothai period, which started in 1238 A.D. The Kingdom of Thailand, as a consequence, has a system of traditional medicine called "Thai traditional medicine" (TTM) (He 2015). The Thai traditional medicinal (TTM) system is deeply rooted and has played a key role in Thai culture. It has been the means of health care for the Thai people up until the early 20th century (He 2015). The diverse way of life and culture in each region of Thailand has led to a parallel diversity of local health care systems with a variety of local folk remedies and traditional medicines that are used to meet people's needs and to treat different diseases (Maneenoon *et al.* 2015). Local herbal medicine is therefore the standard primary health care and health promotion among Thai people in rural areas, and it is consistent with their culture (Suwankhong *et al.* 2011). Presently, however, modern westernized medicine is becoming dominant in the mainstream healthcare system, and Thai traditional medicine (TTM) has attained a status of nonconventional or alternative medicine (Chokevivat *et al.* 2005). It has, nevertheless, been recognized that modern medicine is probably not the answer to all aspects of good health for Thai people. This attitude has been influenced by the realization that a large proportion of the country's healthcare budget is being spent on the treatment of diseases using high-priced, sophisticated equipment and imported new drugs, rather than on disease prevention and health promotion (Jesho *et al.* 2015). In addition, despite all the advancements of medical technologies and the pharmaceutical industry, modern medicine cannot successfully cure many of the chronic lifestyle-related diseases, which are major health problems of today's world, including diabetes, hypertension, cardiovascular diseases, and various types of cancer (Chokevivat *et al.* 2005). It is now accepted that the current medical plan alone does not solve all health problems. The high-cost medical system, as a side effect, relies on medical supplies and medical equipment from abroad, which is a major limitation that prevents modern medicine from serving the public thoroughly and equally (Jesho *et al.* 2015; Onchomchan 2005). However, traditional medicinal knowledge and practice have not been adequately studied, exploited, or documented (Amiri & Joharchi 2013; Dahlberg & Trygger 2009). Turning to the wisdom of indigenous medicine in all dimensions, we can recover additional knowledge that is still valid in the time we live in and make the most of it. Thai traditional medicine in different parts of the country has its heritage that differs according to its origin, ecosystem, and culture. The long abandonment of the wisdom of folk medicine due to the lack of research and continuous development has hampered the development of this knowledge. In many developing countries, the traditional knowledge of indigenous people is being widely threatened by current trends of economic globalization. Many researchers have reported that traditional knowledge systems, which were either lost or transmitted orally from one generation to the next among traditional health practitioners, are in danger due to poor relations between the older and younger generations (Al-Douri & Al-Essa 2010; Ghasemi *et al.* 2012; Junsongduang *et al.* 2020; Pandikumar *et al.* 2011; Shah *et al.* 2013). Therefore, it is urgently needed to study, research, and develop our knowledge of traditional medicinal systems. Traditional healers still play an important role in the health care of villagers in many parts of Thailand (Inta *et al.* 2008; Junsongduang *et al.* 2020; Maneenoon *et al.* 2015; Neamsuvan *et al.* 2015; Neamsuvan & Ruangrit 2017; Suwankhong *et al.* 2011). Their knowledge is more vulnerable than the documented traditional knowledge. In the past, ethnobotanical studies among traditional societies indicated that the level of idiosyncratic knowledge is very high (Thomas *et al.* 2009). To uncover the cultural truth or generalized knowledge, quantitative ethnobotany may provide the answers (Kılıç *et al.* 2020; Tareau *et al.* 2022; Vandebroek 2010). Quantitative approaches have been used in ethnobotanical studies to measure the degree of consensus concerning the use of a particular medicinal plant. The consensus analyses have been used to test falsifiable hypotheses on the use of plants and also as a tool for selecting medicinal plants for further research (Canales *et al.* 2005; Case *et al.* 2006) thus, such quantitative approaches are helpful for the extraction of higher-level conclusions from the data available in ethnobotanical surveys (Etkin & Elisabetsky 2005). When studying traditional knowledge of ethnomedicinal uses to improve health in the concerned communities, it is useful to look at both the specific conditions and diseases and also at broader categories (Cook 1995). The specific conditions could be diseases such as cancer and diabetes, and it could also be problems with lactation and similar situations, which may be an inconvenience or abnormality. To be able to make meaningful comparisons with other studies, the specific conditions must be classified in a system of broader categories, such as digestive system disorders, blood system disorders, and endocrine system disorders. The northeastern part of Thailand, corresponding to the Isan

region, is by far the poorest part of the country. Approximately 30% of the Thai population lives in the region (Keyes 1967). The Isan people are an ethno-regional group native to northeastern Thailand with an estimated population of about 22 million (Lawler 1996), and they are ethnically of Tai Lao origin, constituting one of the largest minorities in the country. The main languages spoken are Thai, Lao, and some ethnic languages (Hattaway 2004). Most northeastern Thais speak a dialect of Lao mixed with some influences from Thai (Grabowsky 1995). In the last few decades, ethnobotanical studies have received more attention. However, many uses and practices linked to plants from all over the world remain unknown, not documented, or evaluated. According to the uniqueness of Thai traditional medicine with its heritage in each ethnic group (Chokevivat *et al.* 2005; Jesho *et al.* 2015; Junsongduang *et al.* 2020; Onchomchan 2005; Suwankhong *et al.* 2011) and the traditional knowledge of many ethnic communities, it depends on natural resources, which are being widely threatened by current trends of economic globalization (Sulaiman *et al.* 2020). Such relevant and specific knowledge is facing different threats and may disappear from many countries all over the world. It is urgently needed to document the traditional knowledge possessed by the old herbalists before it disappears from the rural communities in Thailand (Junsongduang *et al.* 2025). This study focuses on the plants used by a group of Tai Lao traditional healers as part of an ongoing study on herbal therapies for primary health care in their communities. In this context, we aim to answer the following general question: What is the traditional knowledge used by healers for curing their patients? Specifically, we asked: (1) How many medicinal plants do they know and use for treating patients in their community, and what are the vernacular names of the species? (2) Which species are most used? (3) How many and which ailments are treated with traditional medicinal plants? (4) Which plant parts are commonly used for medicine? (5) Which life-forms of plants are represented among the medicinal plants? (6) Which preparation methods are available? (7) What are the habitats from which the healers derive their medicinal plants?

## Materials and Methods

**Study area and the traditional healers**

Roi Et is one of the 17 provinces in northeastern Thailand with a geographical extension of 8299 km2, located at 16°03 N latitude and 103°39 E longitude (Fig. 1). We selected 14 traditional Tai Lao healers who still practice traditional healing. They were all male and 26-87 years in 5 districts: Phon Thong (16.3019° N, 103.9608° E), Changhan (16.1637° N, 103.6131° E), Phanom Phrai (15.7445° N, 104.0537° E), Suwannaphum (15.5790° N, 103.7753° E), and Kaset Wisai (16°03′ N 103°39′ E) (Fig. 1). All of the healers were Buddhist. Four of them were not uneducated; one of them was educated by a monk in the temple. There were only two healers who attended secondary school. and the other had attended primary school. Furthermore, all of them were farmers and practiced healing secondary to their main occupation (Table 1). Agriculture, the largest sector of the economy, accounts for 22% of gross regional product, compared to 8.5% for Thailand as a whole. Rice is the main crop occupying 60% of the cultivated land. However, farmers are increasingly diversifying into cash crops such as sugarcane and cassava, which are cultivated on vast scales, and to a lesser extent, rubber. However, agricultural production per area remains low due to the relatively dry climate and the often saline soils. The data were collected in five districts in Roi Et province (Fig. 1).

**Ethnobotanical survey and data collection**

Data and plant specimens were collected from April 2015 to April 2016. Purposive sampling was used to choose the respondents who met the study criteria and could provide rich data relevant to the study (Bernard 2013). A snowball sampling technique was used to expand the number of respondents (Biernacki & Waldorf 1981). Finally, we had only fourteen traditional Tai Lao healers. Each healer was visited and interviewed in their house, and informal meetings were held in Isan or Lao languages. With permission from the participants, semi-structured interviews were performed to collect quantitative and qualitative data on the traditional knowledge of medicinal plants used by them. All respondents were interviewed about their training knowledge, ailments, treatment techniques, and method of preparation. In addition to structured interviews, informal conversations and observations were recorded to capture the socio-cultural and ritual dimensions of healing practices. These qualitative notes were used to contextualize quantitative findings. Field-walk surveys searching for medicinal plants were made to review and document the availability of medicinal plants in different habitats. We recorded information about vernacular names of the plants, purposes of utilization, plant parts used for treatments, health conditions treated, method of preparation, administration, and the habitats of medicinal plants.

**Identification of plants species**

Voucher specimens were collected to support the identification of plant species recorded in this study and to document their botanical identity. Preliminary identification of medicinal plants was carried out in the field by Tai Lao healers using vernacular names. Initial scientific names based on these common names were determined using Thai Plant Names by Tem Smitinand (Pooma & Suddee 2014). Subsequently, plant identification and taxonomic confirmation were conducted at the herbarium of the Queen Sirikit Botanical Garden (QBG) using Flora of Thailand treatments and by comparison with

authenticated herbarium specimens, with assistance from a plant taxonomist at QBG (W.T.). The taxonomic status and native or exotic origin of medicinal plant species were further verified using Plants of the World Online (POWO; https://powo.science.kew.org/).

Voucher specimens were collected from the study sites, including community forests, rice fields, village surroundings, and home gardens. All voucher specimens are deposited and stored at the Department of Science and Technology, Roi Et Rajabhat University, Roi Et Province, Thailand, where they are available for future reference.

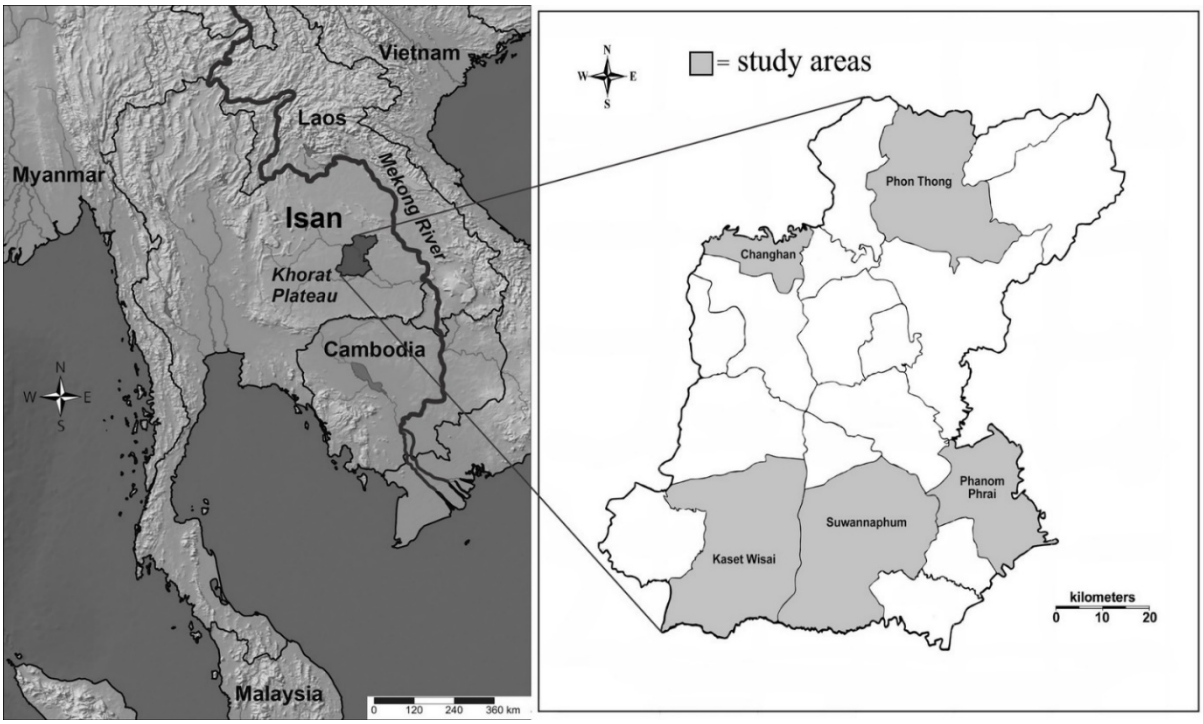


Figure 1. Location of Roi Et province in Thailand, where ethnobotanical data concerning medicinal plants were collected in five districts.

**Data analysis**

***Medicinal disorder terminology***

The use of medicinal plant species within each category follows standardized descriptors and terms from the Economic Botany Data Collection Standard (Cook 1995).

***Quantitative analysis of ethnomedicinal data***

The ethnobotanical data were tested for homogeneity using the Informant Agreement Ratio (IAR), which was performed for each category of disease, and calculated as (Trotter & Logan 1986)

$$IAR = Nur - Nt / Nur - 1$$

Where Nur is the number of use citations from informants for a particular plant-use category, and Nt refers to the number of taxa or species used by all informants for that specific plant use category. IAR values range between 0 and 1, where 1 indicates the highest level of informant consensus and 0 the lowest.

Use value (UV), which is a quantitative measure that demonstrates the relative importance of plant species known locally, was calculated as (Phillips 1994).

$$UV = \sum Ui/N$$

Where UV is the use value of a species, Ui is the number of citations for each plant species, and N is the number of informants. A high use value indicates the potential importance of the plant species reported.

## Results

**The traditional healers**

The 14 Tai Lao healers together knew 146 species of medicinal plants belonging to 127 genera in 60 families. Each Tai Lao healer knew 12-55 medicinal plant species. The average number of medicinal plants known by the healers was 24 species. All of them were men; the ages of the healers varied from 26 to 87 years. The age and their education were not correlated with the number of medicinal plants that they knew. The highest number of known medicinal plants was by a 70-year-old healer from Kaset Wisai, followed by an 87-year-old healer from the same district. The lowest number of medicinal plants known was by a 76-year-old healer also in Kaset Wisai (Table 1).

Table 1. Profiles of 14 Tai Lao healers interviewed in Roi Et province, Thailand, the number of medicinal plants and the location of each village.

| Healer | Occupation | Education | Age (years) | Village | District | Known and used medicinal species | Location |
|---|---|---|---|---|---|---|---|
| 1 | Farmer | None | 64 | Ban Tag dad | Suwannaphum | 15 | 15.6809 N, 103.8179 E |
| 2 | Farmer | Primary school | 65 | Ban Tag dad | Suwannaphum | 12 | 15.6809 N, 103.8179 E |
| 3 | Farmer | Secondary school | 70 | Ban Tag dad | Suwannaphum | 55 | 15.6809 N, 103.8179E |
| 4 | Farmer | Primary school | 60 | Ban Kum thung | Kaset Wisai | 16 | 15.8845 N, 103.8016 E |
| 5 | Farmer | Primary school | 76 | Ban Don yang | Kaset Wisai | 10 | 15.6099 N, 103.5634 E |
| 6 | Farmer | None | 76 | Ban Nong Muang San | Kaset Wisai | 17 | 15.5988 N, 103.6478 E |
| 7 | Farmer | None | 77 | Ban Ku Ka Sing | Kaset Wisai | 25 | 15.5856 N, 103.6704 E |
| 8 | Farmer | By temple | 87 | Tong Ton | Kaset Wisai | 53 | 15.5986 N, 103.6478 E |
| 9 | Farmer | Primary school | 66 | Ban Hnong Aor | Changhan | 36 | 16.19468 N, 103.57218 E |
| 10 | Farmer | Primary school | 68 | Ban Hnong Aor | Changhan | 12 | 16.19468 N, 103.57218 E |
| 11 | Farmer | Primary school | 26 | Ban Na Tum | Phon Thong | 29 | 16.2846 N, 103.9136 E |
| 12 | Farmer | None | 74 | Ban Ba Care | Phon Thong | 13 | 15.9121 N, 102.4610 E |
| 13 | Farmer | Secondary school | 76 | Ban Nhong Tub Tai | Phanom Phrai | 17 | 15.6935 N, 103.9784 E |
| 14 | Farmer | Primary | 76 | Ban Thung muen | Phanom Phrai | 27 | 15.7189 N, 103.9703 E |
| **Average** | | | **68.6** | | | **24 spp.** | |

**Number of medicinal plants used**

A total of 146 species in 127 genera and 60 families of medicinal plants were used for medicinal purposes by 14 traditional healers in this study. The best represented plant families were Fabaceae, which had 12 spp. of medicinal plants (8%), Poaceae (10 spp., 6%), Zigiberaceae and Lamiaceae (8 spp., 5% each), Solanaceae (6 spp., 4%), Acanthaceae, Amaranthaceae, Annonaceae, Rubiaceae and Euphorbiaceae (5 spp., 3% each), Apocynaceae, Asteraceae, Rutaceae and Menispermaceae (4 spp., 2.7% each). The remaining families had three (2%) or fewer species. The vernacular names are given for each species in Table 2.

**Most used medicinal plants (UV index)**

**T**he most important and widely used medicinal plant was *Cyperus rotundus* L. (Cyperaceae) (Fig. 2A), with a use value (UV) of 0.71. The healers used the roots and stems of *Cyperus rotundus* to cure digestive system disorders such as gallstones and flatulence. Furthermore, they used these plants for genitourinary system disorders, such as diuretic and venereal disease. The second most important species was *Salacia dongnaiensis* Pierre (Celastraceae) (Fig. 2C) (UV 0.64). They prepared medicine from this plant by decoction of the stem to treat digestive system disorders, such as gastritis and diarrhea, and as a laxative. Additionally, it was used to treat flatulence and muscular skeletal system disorders, for example, as a muscular relaxant. The third most important medicinal species was the palm tree *Borassus flabellifer* L. (Arecaceae) (UV 0.42) (Fig 2B). They decocted the petiole and inflorescence to treat genitourinary system disorders, such as female infertility, or they ground the fruit with water to prepare a drink to treat pregnancy/birth/puerperium disorders and as a lactation stimulant (Table 2).

**A** **B** **C**

Figure. 2. The three widely used medicinal plants among Tai Lao healers in Roi Et province
A; *Cyperus rotundus* L.; Cyperaceae), B; *Borassus flabellifer* L.; Arecaceae C; *Salacia dongnaiensis* Pierre; Celastracea

Table 2. Medicinal plants used by 14 Tai Lao healers in Roi Et province, Thailand.

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Acacia* sp. (AJL-142)/ FABACEAE | Hun dang | Community forest (T) | Stems | Decoction | Pain | Pain | 0.07 |
| *Acalypha indica* L. (AJL-002) /EUPHORBIACEAE | Tum yae maew | Home garden (H) | Stems/ Roots | Decoction/Eaten fresh | Asthma | Respiratory System Disorders | 0.07 |
| *Aegle marmelos* (L.) Corrêa (AJL-003)/ RUTACEAE | Ma toom | Community forest (T/NT) | Fruits | Decoction | Malaria | Infections/Infestations | 0.28 |
| | | | Fruits | Decoction | Nasal polyp | Respiratory System Disorders | |
| | | | Fruits | Decoction | Sinusitis | Respiratory System Disorders | |
| *Allium ascalonicum* L. (AJL-004)/ AMARYLLIDACEAE | Hom dang | Home garden (ExH) | Storage Leaves | Decoction/Inhalation | Fever | Infections/Infestations | 0.07 |
| *Allium cepa* L. (AJL-145)/ AMARYLLIDACEAE | Hom yai | Home garden (H) | Roots | Inhalation | Nasal polyp | Circulatory System Disorders | 0.07 |
| *Allium sativum* L. (AJL-008)/ AMARYLLIDACEAE | Kra tium | Home garden (H) | Roots | Decoction | Epilepsy | Nervous System Disorders | 0.14 |
| | | | Roots | Inhalation | Nasal polyp | Circulatory System Disorders | |
| *Alocasia cucullata* (Lour.) G. Don (AJL-006)/ ARACEAE | Wan tor ra hud | Home garden (H) | Roots | Decoction | Female infertility (uterus) | Genitourinary System Disorders | 0.07 |
| *Aloe vera* (L.) Burm. f. (AJL-009)/ XANTHORRHOEACEAE | Wan hang jorakae | Home garden (H) | Leaves | Jelly cover wound/Eaten fresh | Wounds | Inflammation | 0.14 |
| *Alpinia galanga* (L.) Willd. (AJL-007)/ ZINGIBERACEAE | Kha | Home garden (H) | Roots | Decoction/ Eaten fresh | Kidney diseases | Genitourinary System Disorders | 0.21 |
| | | | Roots | Decoction/ Eaten fresh | Carminative | Digestive System Disorders | |
| | | | Roots | Decoction/ Eaten fresh | Flatulence | Digestive System Disorders | |
| *Ampelocissus martini* Planch. (AJL-054)/ VITACEAE | Som kung | Community forest (V) | Roots | Decoction | Coughs | Respiratory System Disorders | 0.14 |
| | | | Roots | Decoction | Fever | Infections/Infestations | |
| *Ananas comosus* (L.) Merr. (AJL-099)/ BROMELIACEAE | Sub pra rod | Home garden (H) | Stems/Roots | Decoction | Gallstones | Digestive System Disorders | 0.21 |
| | | | Stems | Decoction | Urination difficulty | Genitourinary System Disorders | |
| | | | Roots | Decoction | Intoxication | Poisonings | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Andrographis paniculata* (Burm. f.) Wall. ex Nees (AJL-055)/ ACANTHACEAE | Pha ta lai jone | Home garden (H) | Roots | Decoction | Fever | Infections/Infestations | 0.14 |
| | | | Roots | Decoction | Cough | Respiratory System Disorders | |
| *Annona squamosa* L. (AJL-053)/ ANNONACEAE | Noi na | Home garden (T) | Bark | Hair Wash | Lice infestations | Insect Infestations | 0.07 |
| *Aphanamixis polystachya* (Wall.) R.Parker (AJL-010)/ MELIACEAE | Jume jung | Community forest (T) | Stems/Roots | Grinding with water | Intoxication | Postpartum Women Disorders | 0.14 |
| | | | Stems | Decoction | Pain | Pain | |
| *Arcangelisia flava* (L.) Merr. (AJL-098)/ MENISPERMACEAE | Ka mint krue | Home garden (H) | Stems | Decoction | Gallstones | Digestive System Disorders | 0.14 |
| *Artocarpus lacucha* Buch. -Ham. (AJL-052)/ MORACEAE | Ma had | Community forest (T) | Roots | Pounded with coconut juice and drunk | Helminth Infections | Infections/Infestations | 0.07 |
| *Asparagus racemosus* Willd. (AJL-101)/ ASPARAGACEAE | Rang samsipt | Rice field (H) | Roots | Decoction | Female infertility (uterus) | Genitourinary System Disorders | 0.07 |
| *Asystasia gangetica* (L.) T. Anderson. (AJL-140)/ ACANTHACEAE | Omm sa | Home garden (H) | Whole | Soaked to produce a bath or a drink | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | 0.07 |
| *Averrhoa carambola* L. (AJL-011)/ OXALIDACEAE | Ma phung | Home garden (T) | Roots | Decoction | Intoxication | Poisonings | 0.14 |
| | | Around the village (T) | Stems | Decoction | Venereal disease | Genitourinary System Disorders | |
| *Baccaurea ramiflora* Lour. (AJL-102)/ PHYLLANTHACEAE | Ma phai | Home garden (T) | Stems/Roots | Decoction | Cancer | Neoplasm | 0.21 |
| | | | Stems/Roots | Decoction | Eyes diseases | Sensory System Disorders | |
| | | | Stems/Roots | Decoction | Flatulence | Digestive System Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Baeckea frutescens* L. (AJL-093)/ MYRTACEAE | Saew noi | Community forest (S) | Whole | Decoction | Nasal polyp | Respiratory System Disorders | 0.07 |
| *Bambusa bambos* (L.) Voss (AJL-097)/ POACEAE | Phai pa | Rice field (G) | Stems/Leaves | Decoction | Jaundice | Skin/Subcutaneous Cellular Tissue Disorders | 0.07 |
| *Bambusa vulgaris* Schrad. ex J.C.Wendl. (AJL-012)/ POACEAE | Phai luang | Rice field (G) | Stems/Leaves | Decoction | Jaundice | Skin/Subcutaneous Cellular Tissue Disorders | 0.07 |
| | | | Stems/Leaves | Decoction | Kidney diseases | Genitourinary System Disorders | |
| *Bidens biternata* (lour.) Merr. & Sherffex Sherff (AJL-096)/ ASTERACEAE | Kun jume | Rice field (H) | Roots | Decoction | Gallstones | Digestive System Disorders | 0.07 |
| *Blumea balsamifera* (L.) DC. (AJL-013)/ ASTERACEAE | Nhad | Home garden (H) | Leaves | Boiled (bath/steaming) | Itching | Skin/Subcutaneous Cellular Tissue Disorders | 0.28 |
| | | | Leaves | Boiled (bath/steaming) | Hemolytic anemia | Blood System Disorders | |
| | | | Leaves | Boiled (bath/steaming) | Itching | Skin/Subcutaneous Cellular Tissue Disorders | |
| | | | Leaves | Compress | Pain | Pain | |
| | | | Roots | Boiled (bath/steaming) | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | 0.07 |
| *Boesenbergia rotunda* (L.) Mansf. (AJL-093)/ ZINGIBERACEAE | Kra sai | Home garden (H) | Rhizome | Fermented to drink | Tonic | Nutritional Disorders | 0.07 |
| *Borassus flabellifer* L. (AJL-050)/ ARECACEAE | Tan | Rice field (PT) | Petiole | Decoction | Female infertility (uterus) | Genitourinary System Disorders | 0.42 |
| | | | Inflorescense | Decoction | Female infertility (uterus) | Genitourinary System Disorders | |
| | | | Inflorescense | Decoction | Gallstones | Digestive System Disorders | |
| | | | Fruits | Crushed with water as a drink | Female infertility (uterus) | Genitourinary System Disorders | |
| | | | Fruits | Crushed with water as a drink | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Breynia androgyna* (L.) Chakrab. & N.P.Balakr. (AJL-035)/ PHYLLANTHACEAE | Pak wan ban | Community forest (S) | Roots/Stems | Crushed with water as a drink | Intoxication | Poisons | 0.07 |
| *Butea superba* Roxb. ex Willd. (AJL-094)/ FABACEAE | Jan kure | Rice field (T) | Stems | Dried and decocted | Hemorrhoids | Circulatory System Disorders | 0.07 |
| *Biancaea sappan* L. (AJL-092)/ FABACEAE | Phang | Community forest/Rice field (T) | Stems | Crushed with water as a drink | Fever | Infections/Infestations | 0.14 |
| | | Around the village (T) | Stems | Decoction | Hemorrhoids | Circulatory System Disorders | |
| *Canna indica* L. (AJL-103)/ CANNACEAE | Putha ruksa | Home garden (H) | Roots | Decoction | Nasal polyp | Respiratory System Disorders | 0.14 |
| | | | Roots | Inhalation | Nasal polyp | Respiratory System Disorders | |
| *Capparis micracantha* DC. (AJL-095)/ CAPPARACEAE | Chai sue | Community forest (S) | Stems | Decoction | Hemorrhoids | Circulatory System Disorders | 0.07 |
| *Carica papaya* L. (AJL-049)/ CARICACEAE | Mak hung | Home garden (H) | Roots | Decoction | Kidney diseases | Genitourinary System Disorders | 0.35 |
| | | | Roots/Stems | Decoction | Hepatitis | Infections/Infestations | |
| | | | Roots/Stems | Decoction | Eyes diseases | Sensory System Disorders | |
| | | | Roots/Stems | Decoction | Flatulence | Digestive System Disorders | |
| | | | Roots/Stems | Decoction | Cancer | Neoplasm | |
| *Cassia fistula* L. (AJL-014)/ FABACEAE | Koon | Around the village (T) | Stems, Fruits | Decoction | Laxative | Digestive System Disorders | 0.14 |
| | | | Stems, Fruits | Decoction | Microbial Infections | Infections/Infestations | |
| *Celastrus paniculatus* Willd. (AJL-091)/ CELASTRACEAE | Mak tak | Community forest (V) | Stems | Decoction | Pain | Pain | 0.14 |
| | | | Stems | Decoction | Pain | Pain | |
| | | | Stems | Decoction | Pain | Pain | |
| *Centella asiatica* (L.) Urb. (AJL-048)/ APIACEAE | Bue buk | Home garden | Stems | Crushed with water to drink | Mouth ulcer | Skin/Subcutaneous Cellular Tissue Disorders | 0.07 |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Chromolaena odorata* (L.) R. M. King. & H. Rob. (AJL-104)/ ASTERACEAE | Sab sue | Rice field/ Around the village (S) | Roots | Decoction | Cancer | Neoplasm | 0.07 |
| *Chrysopogon zizanioides* (L.) Roberty (AJL-139)₰ POACEAE | Ya fak hom | Rice field (G) | Whole | Decoction | Diabetes | Endocrine System Disorders | 0.07 |
| *Cinnamomum ilicioides* A.Chev. (AJL-105)/ LAURACEAE | Ta krai ton | Community forest (T) | Stems | Grinding with water | Fever | Infections/Infestations | 0.21 |
| | | | Stems | Grinding with water | Flatulence | Digestive System Disorders | |
| | | | Whole | Grinding with water | Fever | Infections/Infestations | |
| *Cissampelos pareira* L. (AJL-015)/MENISPERMACEAE | Khue ma noi | Community forest (V) | Roots | Grinding with water | Fever | Infections/Infestations | 0.35 |
| | | | Leaves | Eaten fresh | Tonic | Nutritional Disorders | |
| | | | Leaves | Eaten fresh | Tonic | Nutritional Disorders | |
| | | | Stems | Decoction | Hemorrhoids | Circulatory System Disorders | |
| | | | Stems | Decoction | Nasal polyp | Respiratory System Disorders | |
| *Citrus hystrix* DC. (AJL-047)/ RUTACEAE | Ma krude | Home garden (T) | Leaves | Grinding with water | Tonic | Nutritional Disorders | 0.21 |
| | | | Leaves | Decoction | Constipation | Digestive System Disorders | |
| | | | Fruits | Decoction | Hemolytic anemia | Blood System Disorders | |
| *Citrus lucida* (Scheff.) Mabb. (AJL-087)/ RUTACEAE | Ma saang | Community forest (T) | Whole | Decoction | Kidney diseases | Genitourinary System Disorders | 0.07 |
| *Clausena wallichii* Oliv. (AJL-016)/ RUTACEAE | Song fa | Community forest (S) | Roots | Grinding with lemon juice as a drink | Stomach | Digestive System Disorders | 0.21 |
| | | | Roots | Ground in water to drink | Fever | Infections/Infestations | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Clausena wallichii* Oliv. (AJL-016)/ RUTACEAE | Song fa | Community forest (S) | Whole | Decoction | Wound | Infections/Infestations | |
| *Clinacanthus nutans* (Burm. F.) Lindau. (AJL-056)/ ACANTHACEAE | Sa lad pang pon | Home garden (HC) | Stems/Leaves/Roots | Pounded and applied to skin/wound | Snake bites | Injuries | 0.07 |
| *Coccinia grandis* (L.) Voigt (AJL-138)/ CUCURBITACEAE | Tum lung | Home garden (H) | Leaves | Pounded and applied to skin/wound | Mouth ulcer | Skin/Subcutaneous Cellular Tissue Disorders | 0.07 |
| *Cocos nucifera* L. (AJL-135)/ ARECACEAE | Ma praw | Around the village (PT) | Roots | Decoction | Kidney diseases | Genitourinary System Disorders | 0.14 |
| | | | Fruits | Decoction | Helminth Infections | Infections/Infestations | |
| *Crinum asiaticum* L. (AJL-134)/ AMARYLLIDACEAE | Plub plung | Around the village (H) | Leaves | Compress | Pain | Pain | 0.07 |
| *Croton crassifolius* Geisel. (AJL-057)/ EUPHORBIACEAE | Pang kee | Community forest (H) | Stems | Grinding with water | Flatulence | Digestive System Disorders | 0.21 |
| | | | Roots | Eaten fresh/ Grinding with water | Stomach | Digestive System Disorders | |
| | | | Roots | Pounded and applied to skin/wound | Flatulence | Digestive System Disorders | |
| *Croton persimilis* Müll.Arg.. (AJL-46)/ EUPHORBIACEAE | Pao | Community forest (T) | Bark | Boiled (bath/steaming) | Itching | Skin/Subcutaneous Cellular Tissue Disorders | 0.35 |
| | | | Leaves | Compress | Pain | Pain | |
| | | | Leaves | Boiled (bath/steaming) | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | |
| | | | Stems | Decoction | Hemorrhoids | Circulatory System Disorders | |
| | | | Stems | Decoction | Nasal polyp | Respiratory System Disorders | |
| *Curcuma longa* L. (AJL-017)/ ZINGIBERACEAE | Ka mint shan | Homegarden (H) | Rhizome | Pounded and applied to skin/wound | Itching | Skin/Subcutaneous Cellular Tissue Disorders | 0.28 |
| | | | Rhizome | Pounded and applied to skin/wound | Wounds | Skin/Subcutaneous Cellular Tissue Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Curcuma longa* L. (AJL-017)/ ZINGIBERACEAE | Ka mint shan | Homegarden (H) | Rhizome | Decoction | Urination difficulty | Genitourinary System Disorders | 0.28 |
| | | | Rhizome | Decoction | Flatulence | Digestive System Disorders | |
| *Curcuma zanthorrhiza* Roxb. (AJL-058)/ ZINGIBERACEAE | Wan sak mod look | Homegarden (H) | Roots | Decoction | Female infertility | Genitourinary System Disorders | 0.35 |
| | | | Leaves | Decoction | Hemolytic anemia | Blood System Disorders | |
| *Cyathula prostrata* (L.) Blume (AJL-090)/ AMARANTHACEAE | Ya pun ngoo | Around the village (H) | Roots/Stems | Decoction | Kidney diseases | Genitourinary System Disorders | 0.35 |
| | | | Roots | Decoction | Gallstones | Digestive System Disorders | |
| | | | Roots | Decoction | Female infertility | Genitourinary System Disorders | |
| | | | Roots/Stems/Leaves | Decoction | Cancer | Neoplasm | |
| *Cymbopogon citratus* (DC.) Stapf. (AJL-059)/ POACEAE | Ta krai | Homegarden (ExG) | Stems/Leaves | Boiled (bath/steaming) | Hemolytic anemia | Blood System Disorders | 0.21 |
| | | | Roots | Ground to powder | Tonic | Nutritional Disorders | |
| | | | Leaves | Decoction | Constipation | Digestive System Disorders | |
| *Cymbopogon flexuosus* (Nees ex Steud.) Will. Watson (AJL-045)/POACEAE | Ta krai hom | Homegarden (ExG) | Stems/Leaves | Boiled (bath/steaming) | Hemolytic anemia | Blood System Disorders | 0.07 |
| *Cyperus rotundus* L. (AJL-060)/ CYPERACEAE | Ya hae moo | Around the village (G) | Roots | Decoction | Gallstones | Digestive System Disorders | 0.71 |
| | | | Roots/Stems | Decoction | Hepatitis | Infections/Infestations | |
| | | | Roots/Stems | Decoction | Eyes diseases | Sensory System Disorders | |
| | | | Roots/Stems | Decoction | Cancer | Neoplasm | |
| | | | Roots/Stems | Decoction | Flatulence | Digestive System Disorders | |
| | | | Roots | Decoction | Venereal disease | Genitourinary System Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Cyperus rotundus* L. (AJL-060)/ CYPERACEAE | Ya hae moo | Around the village (G) | Stems/Roots | Decoction | Urination difficulty | Genitourinary System Disorders | 0.71 |
| | | | Roots | Decoction | Gallstones | Digestive System Disorders | |
| | | | Roots | Decoction | Kidney diseases | Genitourinary System Disorders | |
| *Dalbergia lakhonensis* Gagnep. (AJL-089)/ FABACEAE | Par dong ruang | Community forest (T) | Stems | Grinding with water | Fever | Infections/Infestations | 0.07 |
| *Derris scandens* (Roxb.) Benth (AJL-044)/ FABACEAE | Taw wan priang | Community forest (CT) | Stems | Decoction | Pain | Pain | 0.28 |
| | | | Stems | Decoction | Jaundice | Skin/Subcutaneous Cellular Tissue Disorders | |
| | | | Stems | Decoction | Pain | Pain | |
| | | | Stems | Decoction | Pain | Pain | |
| *Derris thorelii* (Gagnep.) Craib (AJL-088)/ FABACEAE | Krue ta pla | Community forest (CT) | Roots/Stems | Decoction | Pain | Pain | 0.21 |
| | | | Whole | Decoction | Kidney diseases | Genitourinary System Disorders | |
| | | | Whole | Decoction | Urination difficulty | Genitourinary System Disorders | |
| *Dimocarpus longan* Lour. (AJL-106)/ SAPINDACEAE | Lum yai | Around the village/ Homegarden (T) | Fruit | Boiled with sugar, fermented and drunk | Goiter | Endocrine System Disorders | 0.14 |
| | | | Fruit | Boiled with sugar, fermented and drunk | Mumps | Infections/Infestations | |
| *Dioscorea bulbifera* L. (AJL-018)/ DIOSCOREACEAE | Sam pan trung | Around the village/Community forest (H) | Whole | Decoction | Tonic | Nutritional Disorders | 0.28 |
| | | | Whole | Decoction | Vomiting | Digestive System Disorders | |
| | | | Whole | Decoction | Dizziness | III-Defined Symptoms | |
| | | | Leaves | Decoction | Diabetes | Endocrine System Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Diospyros mollis* Griff. (AJL-060)/ EBENACEAE | Ma krue | Community forest (T) | Fruits/Roots | Pounded with coconut juice and drunk | Anthelmintics | Infections/Infestations | 0.07 |
| *Dracaena cochinchinensis* (Lour.) S. C. Chen (AJL-043)/ ASPARAGACEAE | Jan dang | Around the village (T) | Roots | Grinding with water | Fever | Infections/Infestations | 0.28 |
| | | | Stems | Grinding with water | Fever | Infections/Infestations | |
| | | | Stems | Grinding with water | Fever | Infections/Infestations | |
| | | | Stems | Grinding with water | Intoxication | Postpartum Women Disorders | |
| *Ehretia laevis* Roxb. (AJL-107)/ BORAGINACEAE | Kom | Community forest (T) | Roots/ Stems | Grinding with water | Intoxication | Postpartum Women Disorders | 0.07 |
| *Enkleia thorelii* (Lecomte) Nervling (AJL-061)/ THYMELAEACEAE | Pra du tung | Community forest (S) | Stems | Ground with lemon juice to drink | Intoxication | Poisonings | 0.07 |
| *Entada rheedii* Spreng. (AJL-019)/ FABACEAE | Sa ba | Community forest (T) | Fruit | Grinding with water | Cancer | Neoplasm | 0.14 |
| | | | Fruit | Grinding with water | Tonic | Nutritional Disorders | |
| *Euphorbia hirta* L. (AJL-062)/ EUPHORBIACEAE | Nam num racha see | Around the village (H) | Roots/ Stems | Grinding with water/Decoction | Intoxication | Poisonings | 0.28 |
| | | | Roots/ Stems | Grinding with water/Decoction | Cancer | Neoplasm | |
| | | | Roots/ Stems | Grinding with water/Decoction | Gonorrhea | Infections/Infestations | |
| | | | Roots/ Stems | Grinding with water/Decoction | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | |
| *Ficus pubigera* Blume (AJL-108)/ MORACEAE | Ma kra trub rong | Community forest (CT) | Stems | Grinding with water | Diabetes | Endocrine System Disorders | 0.21 |
| | | | Stems | Grinding with water | Kidney diseases | Genitourinary System Disorders | |
| | | | Stems | Grinding with water | Liver diseases | Digestive System Disorders | |
| *Flacourtia indica* (Burm.f.) Merr. (AJL-042)/ SALICACEAE | Mak ben | Community forest (T) | Bark | Decoction | Flatulence | Digestive System Disorders | 0.21 |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Flacourtia indica* (Burm.f.) Merr. (AJL-042)/ SALICACEAE | Mak ben | Community forest (T) | Bark | Soaked to produce a bath or a drink | Diarrhea | Digestive System Disorders | 0.21 |
| | | | Bark | Soaked to produce a bath or a drink | Constipation | Digestive System Disorders | |
| *Garcinia mangostana* L. (AJL-133) / CLUSIACEAE | Mang kod | Market (T) | Fruits | Pounded and applied to skin/wound | Wound | Injuries | 0.071 |
| *Gmelina elliptica* Sm. (AJL-109)/ LAMIACEAE | Song maew | Around the village (S) | Roots/Stems | Decoction | Cancer | Neoplasm | 0.28 |
| | | | Roots/Stems | Decoction | Hepatitis | Infections/Infestations | |
| | | | Roots/Stems | Decoction | Eyes diseases | Sensory System Disorders | |
| | | | Roots/Stems | Decoction | Flatulence | Digestive System Disorders | |
| *Hedychium coronarium* J.G. Koenig (AJL-063)/ ZINGIBERACEAE | Sa la te | Around the village/Homegarden (H) | Stems | Decoction | Intoxication | Poisonings | 0.07 |
| *Huberantha cerasoides* (Roxb.) Chaowasku (AJL-080)/ ANNONACEAE | Sai den | Community forest (S) | Stems | Decoction | Scurvy | Nutritional Disorders | 0.07 |
| *Hymenodictyon orixense* (Roxb.) Mabb. (AJL-020)/ RUBIACEAE | Sum kob | Community forest (T) | Stems | Pounded and applied to skin/wound | Shingles | Infections/Infestations | 0.28 |
| | | | Stems | Pounded and applied to skin/wound | Hemorrhoids | Circulatory System Disorders | |
| | | | Stems | Pounded and applied to skin/wound | Hemorrhoids | Circulatory System Disorders | |
| | | | Stems | Pounded and applied to skin/wound | Sinusitis | Respiratory System Disorders | |
| *Ichnocarpus frutescens* (L.) W. T. Aiton (AJL-086)/ APOCYNACEAE | Krue sude dang | Community forest (V) | Leaves | Decoction | Diabetes | Endocrine System Disorders | 0.07 |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Imperata cylindrica* (L.) Raeusch. (AJL-041)/ POACEAE | Ya kha | Community forest (G) | Stems | Decoction | Tonic | Nutritional Disorders | 0.21 |
| | | | Stems | Decoction | Diarrhea | Digestive System Disorders | |
| | | | Stems | Decoction | Constipation | Digestive System Disorders | |
| *Irvingia malayana* Oliv. ex A. W. Benn. (AJL-040)/ IRVINGIACEAE | Kar buk | Community forest/Rice field (T) | Bark/Stems | Decoction | Tonic | Nutritional Disorders | 0.07 |
| *Ischaemum barbatum* Retz. (AJL-085)/ POACEAE | Ya wai | Around the village (G) | Stems | Decoction | Urination difficulty | Genitourinary System Disorders | 0.07 |
| *Kaempferia rotunda* L. (AJL-064)/ ZINGIBERACEAE | Wan tub mob | Community forest (H) | Roots/Leaves | Decoction | Postpartum women | Pregnancy/Birth/Puerperium Disorders | 0.07 |
| *Lawsonia inermis* L. (AJL-110)/ LYTHRACEAE | Kaw | Community forest (S) | Roots/Stems | Decoction | Cancer | Neoplasm | 0.21 |
| | | | Roots/Stems | Decoction | Flatulence | Digestive System Disorders | |
| | | | Roots/Stems | Decoction | Eyes diseases | Sensory System Disorders | |
| *Litchi chinensis* Sonn. (AJL-021)/ SAPINDACEAE | Lin Chee | Around the village/Home garden (T) | Roots/Stems | Boiled with sugar, fermented and drunk | Goitre | Endocrine System Disorders | 0.14 |
| | | | Roots/Stems | Boiled with sugar, fermented and drunk | Mumps | Infections/Infestations | |
| *Lysiphyllum strychnifolium* (Craib) A.Schmitz (AJL-051)/ FABACEAE | Ya nang dang | Home garden (V) | Leaves | Decoction | Intoxication | Poisonings | 0.21 |
| | | | Leaves | Crushed with water as a drink | Eyes diseases | Sensory System Disorders | |
| | | | Roots | Decoction | Fever | Infections/Infestations | |
| *Mangifera indica* L. (AJL-111)/ ANACARDIACEAE | Ma muang | Around the village/Home garden (T) | Roots/Stems | Decoction (fresh/dry parts) | Hypertension | Circulatory System Disorders | 0.07 |
| *Mentha × villosa Huds.* (AJL-132)/ LAMIACEAE | Sa la nae | Home garden (H) | Whole | Grinding with water | Tonic | Nutritional Disorders | 0.07 |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Millingtonia hortensis* L.f. (AJL-131)/BIGNONIACEAE | Peep | Around the village (T) | Flower | Inhalation | Nasal polyp | Respiratory System Disorders | 0.14 |
| | | | Stems | Soaked to produce a bath or a drink | Coughs | Respiratory System Disorders | |
| *Molineria latifolia* (Dryand. ex W. T. Aiton) Herb. ex Kurz (AJL-084)/ HYPOXIDACEAE | Wan sak lek | Community forest (H) | Roots | Decoction | Female infertility (uterus) | Genitourinary System Disorders | 0.07 |
| *Moringa oleifera* Lam. (AJL-039) / MORINGACEAE | Pak e hum | Around the village /Home garden (T) | Seeds | Decoction (fresh/dry parts) | Flatulence | Digestive System Disorders | 0.14 |
| | | | Seeds | Decoction | Hypertension | Circulatory System Disorders | |
| *Nauclea orientalis* L. (AJL-112) / RUBIACEAE | Kan luang | Around the village (T) | Stems | Decoction | Jaundice | Skin/Subcutaneous Cellular Tissue Disorders | 0.07 |
| *Nicotiana tabacum* L. (AJL-146) / SOLANACEAE | Ya sub | Home garden (H) | Leaves | Inhalation | Nasal polyp | Circulatory System Disorders | 0.07 |
| *Ocimum africanum* Lour. (AJL-065) / LAMIACEAE | Mang luk | Home garden (H) | Leaves | Grinding with water | Tonic | Nutritional Disorders | 0.07 |
| *Ocimum basilicum* L. (AJL-147) / LAMIACEAE | Ho ra pa | Home garden (H) | Whole | Grinding with water | Tonic | Nutritional Disorders | 0.07 |
| *Ocimum tenuiflorum* L. (AJL-022)/ LAMIACEAE | Kra praw kaw, Kra praw dum | Home garden (H) | Whole | Grinding with water | Tonic | Nutritional Disorders | 0.07 |
| *Oroxylum indicum* (L.) Benth. ex Kurz. (AJL-113)/ BIGNONIACEAE | Lin fa | Around the village/Home garden (T) | Fruits | Crushed with water as a drink | Thalassemia | Blood System Disorders | 0.07 |
| *Orthosiphon aristatus* (Blume) Miq. (AJL-148)/ LAMIACEAE | Ya nuade maew | Home garden (H) | Whole | Decoction | Kidney diseases | Genitourinary System Disorders | 0.14 |
| | | | Whole | Decoction | Urination difficulty | Genitourinary System Disorders | |
| *Osbeckia stellata* Buch.-Ham. ex Ker Gawl. (AJL-083)/ MELASTOMATACEAE | En ar kun | Community forest (S) | Stems | Decoction | Pain | Pain | 0.07 |
| *Oxyceros horridus* Lour. (AJL-038) / RUBIACEAE | Krue kud kaw | Community forest (CS) | Roots | Decoction | Kidney diseases | Genitourinary System Disorders | 0.14 |
| | | | Roots | Decoction | Urination difficulty | Genitourinary System Disorders | 0.07 |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Pandanus amaryllifolius* Roxb. ex Lindl. (AJL-134)/ PANDANACEAE | Bai tauy | Home garden (ExS) | Leaves | Decoction | Flatulence | Digestive System Disorders | 0.07 |
| *Parinari anamensis* Hance (AJL-114)/ CHRYSOBALANACEAE | Ja buk | Community forest (T) | Stems | Grinding with water | Fever | Infections/Infestations | 0.07 |
| *Phyllanthus emblica* L. (AJL-066)/ PHYLLANTHACEAE | Ma kam pom | Around the village/ Homegarden (T) | Fruits | Eaten fresh | Coughs | Respiratory System Disorders | 0.28 |
| | | | Fruits | Decoction | Coughs | Respiratory System Disorders | |
| | | | Fruits | Fermented as a drink | Goiter | Endocrine System Disorders | |
| | | | Fruits | Fermented as a drink | Mumps | Infections/Infestations | |
| *Piper betle* L. (AJL-082)/ PIPERACEAE | Plu | Homegarden (V) | Leaves | Decoction | Intoxication | Postpartum Women Disorders | 0.07 |
| *Piper retrofractum* Vahl. (AJL-023)/ PIPERACEAE | De pree | Homegarden (V) | Fruits | Decoction | Female infertility (uterus) | Genitourinary System Disorders/ | 0.28 |
| | | | Fruits | Decoction | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | |
| | | | Stems | Decoction | Pain | Pain | |
| *Piper sarmentosum* Roxb. (AJL-115)/ PIPERACEAE | Cha plu | Homegarden (H) | Roots | Decoction | Coughs | Respiratory System Disorders | 0.07 |
| *Plumbago indica* L. (AJL-037)/ PLUMBAGINACEAE | Jed ta moon prung | Homegarden (ExS) | Whole | Grinding with water | Female infertility (uterus) | Genitourinary System Disorders/ | 0.21 |
| | | | Whole | Grinding with water and drink | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | |
| | | | Roots | Decoction | Coughs | Respiratory System Disorders | |
| *Plumeria rubra* L. (AJL-081)/ APOCYNACEAE | Lee la wa dee | Around the village (T) | Stems | Decoction | Cancer | Neoplasm | 0.07 |
| *Pogonatherum paniceum* (Lam.) Hack. (AJL-067)/ POACEAE | Ya pai | Around the village (G) | Stems | Pounded and applied to skin/wound | Wound | Injuries | 0.07 |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Polyalthia evecta* (Pierre) Finet & Gagnep. (AJL-036)/ ANNONACEAE | Tong lang | Community forest (T) | Roots | Boiled (bath/steaming) | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | 0.28 |
| | | | Roots | Decoction | Kidney diseases | Genitourinary System Disorders/ | |
| | | | Roots | Decoction | Fever | Infections/Infestations | |
| *Polygala chinensis* L. (AJL-068)/ POLYGALACEAE | Maa mae kum | Rice field/Around the village (H) | Stems | Decoction | Diabetes | Endocrine System Disorders | 0.07 |
| *Psidium guajava* L. (AJL-024)/ MYRTACEAE | Fa lang | Homegarden (T) | Bark | Soaked to produce a bath or a drink/ Decoction | Diarrhea | Digestive System Disorders | 0.21 |
| | | | Bark | Soaked to produce a bath or a drink/ Decoction | Flatulence | Digestive System Disorders | |
| | | | Bark | Soaked to produce a bath or a drink/ Decoction | Constipation | Digestive System Disorders | |
| *Punica granatum* L. (AJL-116)/ LYTHRACEAE | Tum tim | Homegarden (T) | Bark | Decoction | Diabetes | Endocrine System Disorders | 0.07 |
| *Rauvolfia serpentina* (L.) Benth. ex Kurz (AJL-130)/ APOCYNACEAE | Tum kran | Community forest (S) | Stems | Decoction | Fever | Infections/Infestations | 0.07 |
| *Rhinacanthus nasutus* L. kurz (AJL-079)/ ACANTHACEAE | Tong pan chang | Homegarden (S) | Roots/ Stems | Decoction | Diarrhea | Digestive System Disorders | 0.21 |
| | | | Whole | Decoction | Cancer (uterus) | Neoplasm | |
| | | | Whole | Pounded and applied to skin/wound | Ringworm | Infections/Infestations | |
| *Salacia chinensis* L. (AJL-026)/ CELASTRACEAE | Kam pang jed chun | Community forest (T) | Leaves | Decoction | Diabetes | Endocrine System Disorders | 0.14 |
| | | | Stems | Decoction | Diarrhea | Digestive System Disorders | |
| *Salacia dongnaiensis* Pierre (AJL-025)/ CELASTRACEAE | Ta kwang | Community forest (T) | Stems | Decoction | Jaundice | Skin/Subcutaneous Cellular Tissue Disorders | 0.64 |
| | | | Stems | Decoction | Gastritis | Digestive System Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Salacia dongnaiensis* Pierre (AJL-025)/ CELASTRACEAE | Ta kwang | Community forest (T) | Stems | Decoction | Diarrhea | Digestive System Disorders | 0.64 |
| | | | Stems | Decoction | Laxative | Digestive System Disorders | |
| | | | Whole | Decoction | Pain | Pain | |
| | | | Whole | Decoction | Vomiting | Digestive System Disorders | |
| | | | Whole | Decoction | Dizziness | III-Defined symptoms | |
| | | | Stems | Decoction | Flatulence | Digestive System Disorders | |
| | | | Stems | Decoction | Constipation | Digestive System Disorders | |
| *Scleria tonkinensis* C. B. Clarke (AJL-069)**/** CYPERACEAE | Ya kom paw | Community forest/ Around the village (H) | Roots/Stems | Decoction | Gallstones | Digestive System Disorders | 0.21 |
| *Senna siamea* (Lam.) H. S. Irwin & Barneby (AJL-078)/ FABACEAE | Kee Lak | Around the village (T) | Stems | Decoction | Paralysis | Nervous System Disorders | 0.14 |
| | | | Leaves | Decoction | Insomnia | Mental Disorders | |
| *Sesamum indicum* L. (AJL-117)/ PEDALIACEAE | Nga kaw | Homegarden (H) | Stems | Pounded and applied to skin/wound | Fractures | Muscular Skeletal System Disorders | 0.07 |
| *Sida acuta* Burm. f. (AJL-128)/ MALVACEAE | Ya kut mon | Rice field/ Around the village (S) | Roots | Decoction | Tonic | Nutritional Disorders | 0.07 |
| *Smilax corbularia* Kunth. (AJL-129)/ SMILACACEAE | Kaw yen nuea | Community forest (V) | Roots | Decoction | Cancer | Neoplasm | 0.07 |
| *Smilax glabra* Roxb. (AJL-118)/ SMILACACEAE | Kaw yen tai | Community forest (V) | Roots | Decoction | Cancer | Neoplasm | 0.07 |
| *Solanum anguivi* Lam. (AJL-034) SOLANACEAE | Ma wang | Home garden (S) | Roots | Decoction | Diabetes | Endocrine System Disorders | 0.21 |
| | | | Roots | Decoction | Coughs | Respiratory System Disorders | |
| | | | Fruits | Eaten fresh | Coughs | Respiratory System Disorders | |
| *Solanum capsicoides* All. (AJL-077)/ SOLANACEAE | Ma krue kune | Home garden (S) | Fruits | Decoction | Fever | Infections/Infestations | 0.14 |
| | | | Fruits | Eaten fresh | Coughs | Respiratory System Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Solanum sanitwongsei* Craib (AJL-070)/ SOLANACEAE | Ma wang ton | Home garden (S) | Roots | Decoction | Fever | Infections/Infestations | 0.14 |
| | | | Roots | Grinding with water | Coughs | Respiratory System Disorders | |
| *Solanum stramoniifolium* Jacq. (AJL-127)/ SOLANACEAE | Ma euk | Home garden (S) | Roots | Grinding with water | Pain | Pain | 0.07 |
| *Solanum trilobatum* L. (AJL-033)/ SOLANACEAE | Ma wang krue | Home garden (S) | Roots | Decoction | Fever | Infections/Infestations | 0.14 |
| *Strychnos nux-vomica* L. (AJL-150)/ LOGANIACEAE | Sang bue | Community forest (T) | Roots | Grinding with water | Intoxications | Poisoning | 0.07 |
| *Suregada multiflorum* (A. juss.) Baill. (AJL-125)/ EUPHORBIACEAE | Dong sai | Community forest (T) | Roots/Stems | Decoction | Pain | Pain | 0.14 |
| | | | Roots/Stems | Decoction | Pain | Pain | |
| *Syzygium aromaticum* (L.) Merr. & L. M. Perry (AJL-126)/ MYRTACEAE | Kan plue | Community forest (T) | Stems | Grinding with water | Female infertility (uterus) | Genitourinary System Disorders/ | 0.14 |
| *Tamarindus indica* L. (AJL-076)/ FABACEAE | Ma kam | Around the village/Homegarden (T) | Fruits | Soaked to produce a bath or a drink | Constipation | Digestive System Disorders | 0.14 |
| | | | Bark | Decoction | Flatulence | Digestive System Disorders | |
| *Tamilnadia uliginosa* (Retz.) Tirveng. & Sastre (AJL-119)/ RUBIACEAE | Lum puk | Community forest (T) | Bark | Decoction | Flatulence | Digestive System Disorders | 0.21 |
| | | | Bark | Decoction | Constipation | Digestive System Disorders | |
| *Terminalia catappa* L. (AJL-071)/ COMBRETACEAE | Hue kwang | Community forest (T) | Roots/Stems | Decoction | Fever | Infections/Infestations | 0.07 |
| *Terminalia chebula* Retz. (AJL-124)/ COMBRETACEAE | Sa mor | Community forest (T) | Fruits | Eaten fresh | Coughs | Respiratory System Disorders | 0.14 |
| | | | Fruits | Decoction | Coughs | Respiratory System Disorders | |
| *Thunbergia laurifolia* Lindl. (AJL-032)/ ACANTHACEAE | Rang jude | Homegarden/Around the village (V) | Roots/Leaves/Flower | Decoction | Intoxications | Poisoning | 0.28 |
| | | | | Crushed to cover skin or wound | Insect stings | Poisoning | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Thunbergia laurifolia* Lindl. (AJL-032)/ ACANTHACEAE | Rang jude | Homegarden/Around the village (V) | Roots/Leaves/Flower | Decoction | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | |
| *Tiliacora triandra* (Colebr.) Diels (AJL-120)/ MENISPERMACEAE | Ya nang | Homegarden (V) | Stems/Leaves | Ground with water and mixed with cuttlebone and decocted | Fever | Infections/Infestations | 0.07 |
| *Tinospora crispa* (L.) Hook. f. & Thomson (AJL-072)/ MENISPERMACEAE | Bor ra pet | Homegarden/Around the village (V) | Stems | Boiled (bath/steaming) | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | 0.21 |
| | | | Stems | Fermented as a drink | Liver diseases | Digestive System Disorders | |
| | | | Stems | Decoction | Fever | Infections/Infestations | |
| *Uvaria rufa* Blume (AJL-027)/ ANNONACEAE | Pee puan | Community forest (CT) | Stems | Decoction | Hemorrhoids | Circulatory System Disorders | 0.21 |
| | | | Roots | Grinding with lemon juice as a drink | Intoxications | Poisoning | |
| | | | Fruit | Eaten fresh | Dizziness | III-Defined symptoms | |
| *Vietnamosa pusilla* (Chevalier & A. Camus) Nguyen (AJL-031)/ POACEAE | Pai pek | Community forest (G) | Roots | Grinding with water | Intoxications | Poisoning | 0.07 |
| *Vitex glabrata* R. Br. (AJL-121)/ LAMIACEAE | Kai noew | Homegarden (S) | Stems | Decoction | Flatulence | Digestive System Disorders | 0.21 |
| | | | Stems | Decoction | Flatulence | Digestive System Disorders | |
| | | | Stems | Decoction | Constipation | Digestive System Disorders | |
| *Wrightia religiosa* (Teijsm. & Binn.) Benth. ex Kurz (AJL-073)/ APOCYNACEAE | Mok dok kaw | Homegarden (S) | Bark | Grinding with lemon juice as a drink | Intoxications | Poisoning | 0.07 |
| *Xantonnea parvifolia* (Kuntze) Craib (AJL-029)/ RUBIACEAE | Kaeng pune | Community forest (T) | Whole | Decoction | Kidney diseases | Genitourinary System Disorders | 0.21 |
| | | | | Decoction | Urination difficulty | Genitourinary System Disorders | |
| | | | | Boiled (bath/steaming) | Lactation stimulant | Pregnancy/Birth/Puerperium Disorders | |

| Species (Voucher no.)/ Family | Local Name | Habitat (Life form) | Part used | Preparation | Disorder treated/Medicines-Category | | UV |
|---|---|---|---|---|---|---|---|
| | | | | | Disorder treated | Medicines-Category | |
| *Xylia xylocarpa* (Roxb.) W. Theob. (AJL-028)/ FABACEAE | Dang | Community forest (T) | Stems | Decoction | Pain | Pain | 0.28 |
| *Zea mays* L. (AJL-122)/ POACEAE | Kaw pode | Homegarden (H) | Stems | Decoction | Gallstones | Digestive System Disorders | 0.07 |
| *Zingiber officinale* Roscoe (AJL-074)/ ZINGIBERACEAE | King | Homegarden (H) | Rhizome | Ground to powder | Flatulence | Digestive System Disorders | 0.42 |
| | | | Rhizome | Decoction | Kidney diseases | Genitourinary System Disorders | |
| | | | Rhizome | Decoction | Tonic | Nutritional Disorders | |
| | | | Rhizome | Decoction | Pain | Pain | |
| *Zingiber zerumbet* (L.) Smith. (AJL-123)/ ZINGIBERACEAE | Aue tue | Homegarden (H) | Roots | Decoction | Flatulence | Digestive System Disorders | 0.07 |
| *Ziziphus cambodiana* Pierre (AJL-075)/ RHAMNACEAE | Nham kom | Community forest (S) | Roots | Grinding with water | Intoxications | Poisoning | 0.07 |
| *Ziziphus oenopolia* (L.) Mill. (AJL-030)/ RHAMNACEAE | Laeb Maew | Community forest (S) | Roots/Stems | Grinding with water | Intoxications | Poisoning | 0.35 |
| | | | Roots/Stems | Decoction | Liver diseases | Digestive System Disorders | |
| | | | Roots/Stems | Decoction | Eyes diseases | Sensory System Disorders | |
| | | | Roots/Stems | Decoction | Flatulence | Digestive System Disorders | |

Life forms: G= Grass, ExG= Exotic Grass, H=Herb, S=Shrub, ExS= Exotic Shrub, T=Tree, CT= Climbing Tree, PT= Palm Tree, V=Vine

**Medicinal categories of ailments and informant agreement ratio (IAR)**

The 14 Tai Lao healers reported the use of medicinal plants for 22 categories of ailments (Table 3). The informant agreement ratio (IAR) varied among these categories, showing differences in how widely healing knowledge is shared among practitioners. The digestive system disorders category exhibited the highest IAR value (0.35), based on 57 use-reports involving 37 species, indicating strong consensus among healers regarding treatments for digestive ailments. The pain category ranked second (IAR = 0.30; 21 use-reports, 15 species), followed by genitourinary system disorders (IAR = 0.28; 36 use-reports, 26 species). Moderate consensus levels were recorded for respiratory system disorders (IAR = 0.26; 23 use-reports, 17 species), skin and subcutaneous tissue disorders (IAR = 0.18; 12 use-reports, 10 species), and infections or infestations (IAR = 0.16; 37 use-reports, 31 species). In contrast, several other categories, such as circulatory, endocrine, nervous, and reproductive system disorders, along with neoplasms and inflammations, had IAR values of 0.00, showing that plant use for these conditions is highly individualized among healers. Overall, the highest healer agreement was found for treatments related to digestive, pain-related, and genitourinary disorders, suggesting that these are both common and culturally significant health concerns in Tai Lao communities. Conversely, low IAR values for certain complex or chronic diseases reflect the presence of personalized healing traditions and healer-specific expertise.

Table 3. Medicines- categories and Informant Agreement Ration (IAR) among the 14 Tai Lao healers in Thailand.

| Medicines- categories | $U_i$ | Number of medicinal plants (Ut) | IAR |
|---|---|---|---|
| Digestive System Disorders | 57 | 37 | 0.35 |
| Pain | 21 | 15 | 0.30 |
| Genitourinary System Disorders | 36 | 26 | 0.28 |
| Respiratory System Disorders | 23 | 17 | 0.26 |
| Skin/Subcutaneous Cellular Tissue Disorders | 12 | 10 | 0.18 |
| Infections/Infestations | 37 | 31 | 0.16 |
| Nutritional Disorders | 16 | 15 | 0.07 |
| Circulatory System Disorders | 16 | 15 | 0.07 |
| Poisoning | 16 | 15 | 0.06 |
| Blood System Disorders | 6 | 6 | 0.00 |
| Endocrine System Disorders | 12 | 12 | 0.00 |
| III-Defined Symptoms | 3 | 3 | 0.00 |
| Inflammations | 1 | 1 | 0.00 |
| Injuries | 3 | 3 | 0.00 |
| Insect Infestations | 1 | 1 | 0.00 |
| Mental Disorders | 1 | 1 | 0.00 |
| Muscular Skeletal System Disorders | 3 | 3 | 0.00 |
| Neoplasm | 15 | 15 | 0.00 |
| Nervous System Disorders | 2 | 2 | 0.00 |
| Postpartum Women Disorders | 3 | 3 | 0.00 |
| Pregnancy/Birth/Puerperium Disorders | 13 | 13 | 0.00 |
| Sensory System Disorders | 7 | 7 | 0.00 |

**Specific disorders treated and informant agreement ratio (IAR)**

Across all categories, the healers reported the use of medicinal plants to treat 51 specific disorders (Table 4). The level of agreement, expressed by the IAR, varied substantially between conditions. Among all specific ailments, itching showed the highest IAR value (0.33), with 4 use-reports and 3 species, followed by Nasal polyp (IAR = 0.20; 6 use-reports, 5 species) and female infertility (IAR = 0.18; 12 use-reports, 10 species). Other conditions with moderate consensus included cough (IAR = 0.16; 13 use-reports, 11 species), fever (IAR = 0.14; 22 use-reports, 19 species), flatulence (IAR = 0.13; 23 use-reports, 20 species) and tonic fever (IAR = 0.07; 15 use-reports, 14 species). In contrast, numerous other ailments such as cancer, diabetes, hemorrhoids, kidney diseases, jaundice, and wounds showed IAR values of 0.00, indicating that their treatments were highly individualized and not shared among multiple healers. These findings indicate that ailments related to skin irritation, pain, and reproductive health are both frequent and culturally important, leading to higher healer consensus.

Meanwhile, treatments for chronic or rare conditions tend to reflect specialized personal knowledge or lineage-based medical traditions.

Table 4. Disorder treated and Informant agreement Ratio (IAR) for various specific symptoms/disorders treated by 14 Tai Lao healers in Thailand.

| Specific Disorder treated | $U_i$ | Number of medicinal plants (Ut) | IAR |
|---|---|---|---|
| Itching | 4 | 3 | 0.33 |
| Nasal polyp | 6 | 5 | 0.20 |
| Female infertility | 12 | 10 | 0.18 |
| Cough | 13 | 11 | 0.16 |
| Fever | 22 | 19 | 0.14 |
| Flatulence | 23 | 20 | 0.13 |
| Tonic | 15 | 14 | 0.07 |
| Sinusitis | 2 | 2 | 0.00 |
| Gallstones | 9 | 9 | 0.00 |
| Jaundice | 5 | 5 | 0.00 |
| Mouth ulcer | 2 | 2 | 0.00 |
| Helminth Infections | 2 | 2 | 0.00 |
| Microbial Infections | 1 | 1 | 0.00 |
| Asthma | 1 | 1 | 0.00 |
| Cancer | 15 | 15 | 0.00 |
| Constipation | 8 | 8 | 0.00 |
| Intoxication | 19 | 19 | 0.00 |
| Diabetes | 9 | 9 | 0.00 |
| Diarrhea | 6 | 6 | 0.00 |
| Urination difficulty | 8 | 8 | 0.00 |
| Dizziness | 3 | 3 | 0.00 |
| Epilepsy | 1 | 1 | 0.00 |
| Eyes disease | 7 | 7 | 0.00 |
| Fractures | 1 | 1 | 0.00 |
| Gastritis | 1 | 1 | 0.00 |
| Goiter | 3 | 3 | 0.00 |
| Gonorrhea | 1 | 1 | 0.00 |
| Hemorrhoids | 13 | 13 | 0.00 |
| Hemolytic anemia | 5 | 5 | 0.00 |
| Insect stings | 1 | 1 | 0.00 |
| Insomnia | 1 | 1 | 0.00 |
| Hepatitis | 3 | 3 | 0.00 |
| Hypertension | 2 | 2 | 0.00 |
| Kidney diseases | 15 | 15 | 0.00 |
| Lactation stimulant | 13 | 13 | 0.00 |
| Laxative | 2 | 2 | 0.00 |
| Lice infestations | 1 | 1 | 0.00 |
| Liver diseases | 3 | 3 | 0.00 |
| Mumps | 3 | 3 | 0.00 |
| Malaria | 1 | 1 | 0.00 |
| Paralysis | 1 | 1 | 0.00 |
| Postpartum women | 1 | 1 | 0.00 |
| Ringworm | 1 | 1 | 0.00 |
| Scurvy | 1 | 1 | 0.00 |
| Shingles | 1 | 1 | 0.00 |
| Sneak bites | 1 | 1 | 0.00 |
| Stomach | 2 | 2 | 0.00 |
| Thalassemia | 1 | 1 | 0.00 |
| Venereal disease | 2 | 2 | 0.00 |
| Vomiting | 2 | 2 | 0.00 |
| Wound | 5 | 5 | 0.00 |

**Plant parts used**

The most commonly used plant part was the stem, which was used for almost half of the species (69 spp., 48%), followed by the roots (54 spp.,37%), leaves (23 spp.,16%), fruits and whole plants in equal numbers (14 spp., 10%), bark (9 spp., 6%), rhizome (4 spp., 3%), and flowers (3 spp., 2%). Petioles, branches and seeds were used from only 1 species each (<1%) (Table 2).

**Life-forms of medicinal plants**

Medicinal plants used by the 14 healers represented five different life-forms, the most common one being trees (including a palm tree and a climbing tree) that were represented by 64 spp. (44%) followed by herbs including exotic herbs (42 spp., 28%), shrubs including some exotic shrubs (20 spp., 14%), vines (18 spp., 9%), grass including a few exotics (7 spp., 5%) (Table 2).

**Preparation of medicinal plants**

The healers described 19 different methods that they used to prepare plant medicines. The most common preparation method was decoction of fresh or dried plants (99 spp., 68%), followed by grinding with water (29 spp., 10%), and inhalation (6 spp., 4%) (Table 5).

Table 5. Preparation of medicinal plants used by 14 healers in Roi Et, Thailand.

| Preparation methods | Number of species | % |
|---|---|---|
| Decoction (fresh/dry parts) | 99 | 68 |
| Grinding with water | 29 | 20 |
| Inhalation | 7 | 5 |
| Eaten fresh incl. dry seed | 6 | 4 |
| Pounded and applied to skin/wound | 5 | 3 |
| Soaked to produce a bath or a drink | 5 | 3 |
| Grinding with water and applied to skin | 5 | 3 |
| Compressed | 4 | 3 |
| Boiled (bath/steaming) | 4 | 3 |
| Grinding with lemon juice as a drink | 4 | 3 |
| Fermented as a drink | 3 | 2 |
| Crushed to cover skin or wound | 3 | 2 |
| Crushed with water as a drink | 3 | 2 |
| Boiled with sugar, fermented and drunk | 2 | 1 |
| Ground to powder | 1 | <1 |
| Ground with water and mixed with cuttlebone and decocted | 1 | <1 |
| Pounded with coconut juice and drunk | 1 | <1 |
| Gel to cover a wound | 1 | <1 |
| Hair wash | 1 | <1 |

**Habitats and availability of medicinal plants**

The healers collected most of their medicinal plants from their home gardens (60 spp., 41%) followed by the community forest (53 spp., 36%), around their villages (24 spp., 16%), and in rice fields (10 spp., 6%). Buying the plants from other villages was the least used "habitat" for collecting medicinal plants and done for only 3 spp. (2%). The majority of medicinal plants were native to Thailand, while 3 spp. were exotic grasses (3%) and shrubs 2 spp. (1%) (Table 2).

## Discussions

**Tai Lao traditional healers**

Traditional healers continue to play a central role in community health care across many rural regions of the world (Boudjelal *et al.* 2013; Joshi & Joshi 2000; Mehta *et al.* 2013; O'Brien *et al.* 2012; Truter 2007; Yang *et al.* 2014). Their responsibilities often go beyond the treatment of physical ailments, encompassing spiritual, ritual, and cultural dimensions of healing that

reflect local traditions and worldviews (Jearanai *et al.* 2013). This pattern is also evident in Thailand, where traditional healers remain an integral part of local health systems. In this study, all 14 interviewed healers were men, reflecting a broader national trend in which males predominantly occupy formal healing roles (Junsongduang *et al.* 2020; Maneenoon *et al.* 2015; Sumungkaset & Nantasri 2016; Suwankhong *et al.* 2011). This gender imbalance may stem from cultural expectations that position men as family leaders and community providers (Junsongduang *et al.* 2020). Nevertheless, the absence of female voices represents a limitation of the present study. In many communities, women possess valuable medicinal knowledge, particularly regarding childbirth, postpartum care, and household remedies, which may differ significantly from that of male healers. Future research that includes women practitioners would thus contribute to a more comprehensive understanding of Tai Lao ethnomedicine. The healers demonstrated diverse areas of specialization. Some focused on treating specific conditions such as cancer, hemorrhoids, or musculoskeletal disorders, typically drawing on knowledge inherited from parents or ancestors. This mode of oral transmission aligns with ethnobotanical patterns observed elsewhere in northern Thailand, where traditional knowledge is rarely recorded in written form (Jearanai *et al.* 2013). Most healers relied primarily on memory and experiential familiarity with local flora, though a few had also attended government-sponsored training programs. Their therapeutic repertoire extended beyond plants to include animal- and mineral-based materials, as well as spiritual elements such as rituals, chants, and ceremonies (Burn 2003; Jearanai *et al.* 2013; Junsongduang *et al.* 2020). This holistic approach emphasizes restoring balance between body and spirit, consistent with the principles of indigenous medical traditions (Sumungkaset & Nantasri 2016). Despite their enduring cultural importance, many healers expressed concern about the future of their practice. Challenges include the lack of apprentices, declining interest among younger generations, competition from biomedical health systems, restrictive regulations on collecting medicinal resources, and limited recognition of traditional intellectual property rights (Payyappallimana 2010). These issues pose significant threats to the continuity of knowledge that has long sustained local communities. The number of medicinal plant species known by each healer did not appear to correlate with age. As reported previously (Junsongduang *et al.* 2020), some herbalists specialized in treating particular ailments such as cancer or postpartum conditions based on familial transmission of knowledge. In Sakon Nakhon Province, traditional knowledge among healers was also passed down orally from ancestors or parents, without written documentation (Jearanai *et al.* 2013). These healers relied heavily on their memory and familiarity with surrounding plant resources, while some had benefited from government training initiatives. The use of medicinal plants in indigenous communities is shaped by a combination of biological, ecological, and socio-cultural factors, including production practices, religious beliefs, gender roles, and age-related experience (Beltrán-Rodríguez et al., 2014; Sumungkaset & Nantasri 2016). To safeguard Tai Lao medicinal knowledge, future preservation efforts should prioritize intergenerational transmission. Engaging younger community members in both the documentation and practice of traditional medicine could help sustain this knowledge and ensure its long-term vitality. As younger generations increasingly interact with education and digital technologies, they may become key agents in adapting traditional wisdom to contemporary contexts, thereby enhancing its relevance, accessibility, and continuity.

**The ethnographic insights**

The Tai Lao healers also used animals and mineral substances for curing ailments; they practiced incantations and held ceremonies as part of the treatments, as has also been reported among other cultures (Burn 2003, Juntaramano *et al.* 2018, Junsongduang *et al.* 2020). Medicinal knowledge of healers aims to heal not only physical illness but also the mind and soul (Sumungkaset & Nantasri 2016). From the local healers' point of view, lack of successors, erosion of knowledge, conflicts with mainstream knowledge, lack of recognition, restrictive regulations for collecting medicinal materials, lack of adequate intellectual property protection, and incompatibility of local ownership values with contemporary laws are some of their concerns (Payyappallimana 2010). Beyond quantitative documentation, the knowledge and practices of Tai Lao healers are deeply embedded within cultural and spiritual frameworks. Ethnographic studies across Southeast Asia have shown that traditional medicine operates within systems integrating physical, social, and spiritual well-being (Jearanai *et al.* 2013; Viriyabubpa *et al.* 2013; Sringernyuang 2000). During interviews and field observations, healers described healing as a holistic process addressing not only the body but also the mind and spirit through incantations, ritual offerings, and prayer to ancestral or nature spirits. These findings align with observations from northern Thailand and Laos, where healing ceremonies often invoke spiritual forces to restore harmony between humans and their environment (Tantipidoke 2013, Sydara *et al.* 2005). Healers also highlighted that their practices are rooted in reciprocity and moral responsibility. Several expressed that successful treatment requires ethical conduct and spiritual purity: "If I heal with honesty, the plants will help me." This belief reflects the indigenous concept of "bun" (merit) and "khwan" (vital essence), emphasizing that healing power arises from moral and spiritual balance rather than pharmacological efficacy alone (Tantipidoke 2013, Jearanai *et al.* 2013). Furthermore, intergenerational transmission remains a concern. Most healers reported that younger generations show declining interest in learning traditional medicine, favoring modern biomedical systems instead. Similar trends have been reported among other ethnic groups in Thailand and Laos, where migration, urbanization, and educational changes have

disrupted traditional apprenticeship systems (Sydara *et al.* 2005, Sringernyuang 2000; Chuntum & Kamlangluea 2017). Encouraging youth involvement through documentation, cultural education, and community-based learning could therefore enhance the resilience of indigenous healing traditions.

**Number of medicinal plants**

The best represented plant family among the medicinal plants was Fabaceae, a finding consistent with previous studies in Thailand (Junsongduang *et al.* 2020; Pholhiamhan *et al.* 2018; Maneenoon *et al.* 2015). Fabaceae is a large tropical family, both species-rich and widely distributed, and its members are extensively used in traditional medicine due to their pharmacological diversity. Interestingly, in this study, Poaceae emerged as the second most important medicinal family among the Tai Lao healers. This result is particularly noteworthy because Poaceae has not been identified as a major medicinal family in Thailand at the national level (Phumthum *et al.* 2019). However, the Tai Lao case reflects the significance of local traditions. Although many Poaceae species are more commonly associated with food and fodder such as *Bambusa bambos*, *Cymbopogon citratus*, and *Zea mays,* the Tai Lao healers employed these plants for medicinal purposes. For example, *Bambusa vulgaris* was used against jaundice, while *Chrysopogon zizanioides* was applied to treat diabetes. Notably, *Cymbopogon citratus* is also widely recognized in folk medicine for treating hypertension and fever. Comparative phytochemical analyses of Poaceae species have further revealed a wide diversity of bioactive compounds, including alcohols, ketones, and esters, with antioxidant, anti-inflammatory, and antimicrobial potential (Damor *et al.* 2024). This regional prominence of Poaceae highlights how traditional healthcare systems may rely on families not typically emphasized in broader ethnobotanical surveys. Such variation reflects the interplay of ecological availability, cultural knowledge, and healer traditions. The use of vernacular names often linked to specific diseases, localities, or plant characteristics further documents this unique body of Tai Lao ethnomedicinal knowledge.

**Most used medicinal plants (UV Index)**

This study identified *Cyperus rotundus* L. (Cyperaceae) as the most important and widely used medicinal plant among Tai Lao healers. It was employed to treat gallstones, hepatitis, cancer, and flatulence. Traditionally, *C. rotundus* has been used across Asia, Africa, and the Middle East for managing gastrointestinal disorders, fever, menstrual problems, and neurological conditions (Bezerra & Pinheiro 2022). The extensive scientific research on this species further supports the healers' traditional practices. Modern phytochemical investigations have revealed more than 550 bioactive compounds, including sesquiterpenes, flavonoids, iridoid glycosides, and phenolics (Xue *et al.* 2023). Notably, extracts and essential oils from *C. rotundus* exhibit anticancer activity against colorectal, breast, liver, and ovarian cancer cell lines ailments also reported by Tai Lao healers in Thailand. These findings highlight the plant's potential as a source of novel chemotherapeutic agents (Bezerra & Pinheiro 2022; Xue *et al.* 2023). In addition to its anticancer effects, *C. rotundus* demonstrates anti-diabetic, hepatoprotective, wound-healing, and anti-inflammatory properties in preclinical studies (Rahmatullah *et al.* 2020). Such pharmacological evidence emphasizes that the Tai Lao healers' reliance on *C. rotundus* is deeply rooted in cultural tradition yet reinforced by modern science. Interestingly, this pattern contrasts with findings among the related Phu Tai healers in Roi Et Province, Thailand, where *Rothmannia wittii* (Craib) Bremek. was the most important medicinal species, primarily used to treat jaundice (Junsongduang *et al.* 2020). Similarly, research among hill tribes in northern Thailand revealed distinct ethnobotanical knowledge between the Karen and Lawa, despite their geographic proximity and shared forest resources; the two groups often used different plant species to treat the same ailments (Junsongduang *et al.* 2014). These observations align with broader evidence that variations in traditional knowledge arise from multiple influences—cultural, historical, and ecological (Gruca *et al.* 2014; Junsongduang *et al.* 2014). A comparative study across ethnic groups in Thailand further found that medicinal plant use did not necessarily show higher similarity within the same ethnic or regional groups than between different ones. Rather, each village appeared to have developed its own distinct body of ethnomedicinal knowledge (Phumthume & Balslev 2019).

**Ailments or disorders treated and the Informant Agreement Ratio (IAR)**

Globally, digestive system disorders have a substantial effect on morbidity and mortality rates, and especially so in developing countries, including in Thailand, where the majority of rural areas lack proper sanitation and awareness of disease prevention. This has led to the prevalence of different types of digestive diseases (Junsongduang *et al.* 2014; Tangjitman *et al.* 2015). This is true in both southern (Maneenoon *et al.* 2015; Neamsuvan & Ruangrit 2017) and northern Thailand (Junsongduang *et al.* 2014; Tangjitman *et al.* 2015) and beyond Thailand, such as reported by Naxi healers for farmers in northwestern Yunnan in China (Yang *et al.* 2015). The medicinal plant species used to treat digestive system disorders are mostly different in each ethnic group, such as in different hill tribes in northern Thailand, where Karen and Lua use *Leea indica* (Burm. f.) Merr. (Leeaceae) for diarrhea (Junsongduang *et al.* 2014) and the Karen use *Zingiber montanum* (J. König) Link ex A. Dietr. (Zingiberaceae) (Tangjitman *et al.* 2015) to treat the same condition. In Phatthalung in southern Thailand,

Zigiberaceae is the most used family, including species such as *Boesenbergia rotunda* (L.) Mansf., *Kaempferia galanga* L., *Zingiber officinale* Roscoe, and *Curcuma longa* L. (Maneenoon *et al.* 2015). Furthermore, a total of 37 spp. was used to treat digestive system disorders, including *Alpinia galanga* (L.) Willd. which is used as a carminative, *Curcuma longa L.,* for flatulence, and *Clausena wallichii* Oliv. and *Croton crassifolius* Geisel. for stomach disorders. However, different patterns can be found in different areas or among different ethnic groups, as demonstrated for the Phu Tai healers (Junsongduang *et al.* 2020), among whom most medicinal plants are used for treatments of tonic. Pholhiamhan *et al.* (2018), who studied the same ethnic minority group but in a different part of the Nakhonpanum province, found that most medicinal plants were used for injuries. A study among hill tribes in northern Thailand (Inta *et al.* 2018) found that skin and subcutaneous cellular tissue disorders were the conditions treated by most plants. Srithi *et al.* (2009) found that the use categories with the most use reports were for birth-related conditions. In Jashpur district of Chhattisgarh, India, skin diseases, diabetes, and weakness were the most common disorders reported (Mehta 2013). In the indigenous knowledge on medicinal plant use by traditional healers in the Oshikoto region, Namibia, disorders with the highest number of species being used were mental diseases, followed by skin infections and external injuries (Cheikhyoussef *et al.* 2011).

**Plant parts used**

Among the different parts of the medicinal plants, the stem was most frequently used for making medicines, followed by roots and leaves. This agrees with other studies in northern and northeastern Thailand (Junsongduang *et al.* 2020). Traditionally, different parts of plants, such as stems, roots, fruit, leaves, and seeds, have been used for the treatment of different ailments (Siew *et al.* 2015). The therapeutic potential of different plant parts is attributed to differences in concentrations in different plant parts of phytochemical compounds such as tannins, terpenoids, alkaloids, etc. (Ashraf *et al.* 2016). Dried wood or roots can maintain their bioactive compounds for a longer time after harvesting than leaves can (Phumthum *et al.* 2018). However, local healers are often concerned about how the use of different plant parts may affect the survival of the medicinal plants' populations (Neumsuvan *et al.* 2018). Traditionally, leaves have been the most favored part used for medicinal purposes in many parts of the world, for example in Singapore (Siew *et al.* 2015), India (Yabesh *et al.* 2014), Turkey (Güler *et al.* 2015), and Ethiopia (Yineger & Yewhalaw 2007). This may be because leaves are soft, easy to use, their drug contents can be readily extracted, and they can be harvested in every season (Phumthum *et al.* 2018). On the other hand, a study conducted in India (Mehta 2013) showed that roots were the most commonly used part, followed by leaves. This discrepancy is probably due to the diversity of plants, weather conditions, and chemical compounds present in the plant parts in different geographic areas. In southern Thailand, underground parts were also the most used part of medicinal plants. These differences can be explained by environmental conditions and cultural patterns in the traditional uses of plants by each ethnic minority (Junsongduang *et al.* 2020). However, further and detailed phytochemical screenings of medicinal herbs are required. For traditional knowledge, it is essential to have proper documentation of the plants involved and to know their potential for the improvement of health. Accepting traditional knowledge in a modern context will depend on the scientific backup of the reported effects. Importance should be given to the potential of ethnomedicinal studies, as these can be an important base for the discovery of useful medicinally active compounds in plants (Mehta 2013).

**Life forms of medicinal plants**

Five life forms of medicinal plants were used by the 14 healers, the most common one being trees (including a tree palm and a climbing tree), followed by herbs, shrubs, vines, and grasses. The same life forms were most commonly represented among medicinal plants used by the closely related ethnic minority group, the Phu Tai (Junsongduang *et al.* 2020), but healers in Phatthalung in Peninsular Thailand (Maneenoon *et al.* 2015) most commonly used shrubs as medicinal plants. In China, the majority of medicinal plants in Naxi homegardens were herbaceous, followed by trees, shrubs, and lianas (Yang *et al.* 2014), and in India, herbs are commonly used as medicinal plants (Mehta 2013).

**Preparation of medicinal plants**

The Tai Lao healers interviewed here described 19 different methods that they used to prepare plant medicines. These results differ from the Phu Tai ethnic group (Junsongduang *et al.* 2020) in the total number of methods. However, the most common preparation method, which was decoction, was also the most common method reported in previous ethnomedicinal studies in Thailand (Junsongduang *et al.* 2014; Maneenoon *et al.* 2015; Phumthum *et al.* 2018) and also in Singapore (Ashraf *et al.* 2016), Nigeria (Benarba *et al.* 2015), and India (Muheeswaran *et al.* 2011). The frequent use of oral ingestion of a decoction is most likely because it is an easy way to administer the medicine (Lamxay *et al.* 2011), and it makes it possible to adjust the taste of the medicine for individual patients. Other methods recorded here and in other studies were inhalation and fermentation. The Tai Lao healers used leaves of *Allium ascalonicum* L. to treat fevers or *Allium cepa* L. and *Nicotiana tabacum* L. to treat nasal polyps by inhalation. This method was commonly used to treat respiratory or circulatory

system disorders. The Tai Lao healers also fermented fruit of *Phyllanthus emblica* L. to treat goiter and mumps. *Tinospora crispa* (L.) Hook. f. & Thomson was prepared in the same way to treat liver disorders.

**Habitats and availability of medicinal plants**

Most medicinal plants used by Tai Lao traditional healers were gathered from their home gardens, including such species as *Allium ascalonicum* L. (Amaryllidaceae), *Allium sativum* L., *Alpinia galanga* (L.) Willd. (Zingiberaceae), *Ananas comosus* (L.) Merr. (Bromeliaceae), *Carica papaya* L. (Caricaceae), *Citrus hystrix* DC. (Rutaceae), *Allium cepa* L., *Boesenbergia rotunda* (L.) Mansf. (Zingiberaceae), and *Cymbopogon citratus* Stapf (Poaceae). The same species were also used for food by the villagers. For convenience, these medicinal plants were moved and planted in home gardens and used whenever required (Maneenoon *et al.* 2015). This was also the case among the Naxi healers in southern China (Yang *et al.* 2014), where home gardens are ecologically and culturally important systems in which healers cultivate medicinal plants for the well-being of farmers. In Naxi, only the healers cultivated medicinal plants in their home gardens, and they rarely sold them. Plant resources are important to communities where the majority of households rely on the integration of traditional knowledge and Western medicine for their well-being. Medicinal plants maintained in ethnic home gardens are valuable not only for food but also for their economic and ornamental properties (Yang *et al.* 2014). In our study, the majority of medicinal plants were native to Thailand, while a few exotic plants were used medicinally, such as *Cymbopogon citratus* Stapf (Poaceae), the shrub *Pandanus amaryllifolius* Roxb. (Pandanaceae), and *Plumbago indica* L. (Plumbaginaceae) (Additional data 1). In contrast to the dominance of homegarden plants in this study, most medicinal plants used by the Phu Tai ethnic group (Junsongduang *et al.* 2020) and in Phatthalung province, Thailand (Maneenoon *et al.* 2015), were gathered from community forests.

## Conclusion

Northeastern Thailand is rich in traditional knowledge of herbal medicine with diverse ethnobotanical values. Traditional knowledge of Tai Lao healers revealed here includes large amounts of novel information for northeastern Thailand, including 146 spp., 127 genera, and 60 families relating to the treatment of various diseases, disorders, and relief of 26 ailments. Even though conventional medicine is available, many people in rural communities continue to depend on traditional knowledge. Primary healthcare with highly experienced traditional healers is still important in their communities, at least for the treatment of simple ailments such as pain, inflammation, digestive system disorders, wound or skin diseases, and pregnancy/birth/puerperium disorders in postpartum women. Conservation efforts and evidence-based policies are needed to preserve the ecological and cultural base on the maintenance of medicinal plants that are used for rural community wellbeing. In the future, the traditional knowledge on medicinal plants of Tai Lao healers could boost new innovations in the pharmaceutical industry such as plant used for treatment of cancer; *Cyperus rotundus* L., *Cyathula prostrata* (L.) Blume, *Entada rheedii* Spreng., *Lawsonia inermis* L. should be subjected to pharmacological study to validate their use and to isolate their bioactive compounds. Plant used for injuries or wound such as *Pogonatherum paniceum* (Lam.) Hack., *Clausena wallichii* Oliv. *Clinacanthus nutans* (Burm. F.) Lindau should be examined for antibacterial activities. Plants used for tonic or nutritional disorders such as *Cissampelos pareira* L., *Imperata cylindrica* (L.) P.Beauv. or *Sida acuta* Burm. f. etc. should be determined the antioxidant activity for health promotion for Thailand healthcare sector.

## Declarations

**List of abbreviations:** IAR-Informant Agreement Ratio; Nur- number of use citations from informants for a particular plant-use category; $N_t$ - the number of taxa or species used by all informants for that specific plant use category. G-Grass; ExG-Exotic Grass; H-Herb; S-Shrub; ExS-Exotic Shrub; T-Tree; CT- Climbing Tree; PT- Palm Tree; V-Vine; UV-Use Value; Ui- the number of citations for each plant species; N- the number of informants.

**Ethics approval and consent to participate:** The development of the study followed the ethical and legal guidelines for the development of research on traditional knowledge. The data were collected with respect to confidentiality, anonymity and consent of the respondents who were informed about the aim of this study before the interviews. The project was approved by the Ethics Committee for Research with Human Beings of the Research and Development Institute (RDI) under Roi Et University. The participation of healers was subject to the acceptance of the Free and Informed Consent Form.

**Consent for Publication:** All participants shown in the images have given their permission for these images to be published.

**Availability of data and materials:** Not applicable

**Competing interests:** The authors declare no conflict of interest

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