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Diversity and Ethnobotanical Study of Medicinal Plants in Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province, Thailand

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ABSTRACT

With globalization, improved farming methods, and deforestation resulting from the expansion of cities, there is a need to preserve ethnobotanical knowledge of plants, especially medicinal plants, through systematic research. This current study aimed to collect ethnobotanical information on the biodiversity of plants and the relationship of knowledge on the uses of plants among the Thai Phuan ethnic group in Ban Phue District, Udon Thani Province, Thailand. This study was conducted between August 2022 and July 2023 using semi-structured interviews of 30 informants. Data were analyzed using Use Value (UV), Cultural Importance Index (CI), Fidelity Level)FL(, and Informant Agreement Ratio (IAR). The study showed that plants from 81 families and 243 species have beneficial properties. The most essential and valuable families of plants include the Fabaceae, Rubiaceae, and Zingiberaceae, respectively. In classifying plants according to their use, 148 species were used as food plants. The most commonly used plant parts are fruits, leaves, and young shoots. There were 113 species of medicinal plants, mainly from the Fabaceae family (11 species). The top three plant parts used for medicinal purposes are the leaves, roots, and tubers. These plants are used to treat symptoms of 13 types of diseases and for rituals, culture, traditions, and beliefs. The study also revealed that some plants were used for multiple purposes. These plants are valuable to the local people in terms of their use. Information obtained from this study can be used as a guideline for conserving plant resources in the study area for future generations.

Keywords: Ethnobotany, Thai Phuan, Ban Phue District, Udon Thani Province, Thailand.

Introduction

Ethnobotany is the scientific investigation of the relationships between plants and humans, particularly regarding their practical applications in everyday life.[1] This field exploits naturally occurring plants, particularly among local communities and traditional ethnic groups.[1-6] Ethnobotanical knowledge is suitable, precise, and varies among communities. This knowledge has been acquired and passed down to many generations. Epistemological understanding is derived from the inherent process of shaping and perfecting traditional practices.[1, 5-10] Consequently, it has acquired the status of folk wisdom or significant local technology. It should be documented as a component of ethnic history and a repository database. This subject is significant and holds considerable promise. Additionally, it provides substantial benefits to the general population. Throughout the millennia, many plant species have served essential functions in human life, including providing sustenance, materials for clothing, medicinal properties, and shelter, influencing diverse cultures.

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The utilization of plants varies among different nations and ethnicities, influenced by factors such as geographical location, plant type, and local cultural practices. Furthermore, the knowledge acquired via the accumulation of experience, which involves learning, trial, and error, eventually transforms into local wisdom that is passed down from one generation to another till the current day. Udon Thani Province is located on the nation's high plateau. Referred to as "Northern Isan," this region boasts one of the most ancient civilizations on Earth. The terrain comprises mountains, plateaus, plains, and gently rolling sections. The province in the Northeast is known for its ethnic and cultural diversity and its extensive knowledge of plant usage. These plants are utilized for various purposes such as cooking, clothing, and building houses.[5, 7, 8] Additionally, the province has a long-standing tradition of using herbal medicine to treat various illnesses. Over time, the local wisdom has evolved through invention, inheritance, refinement, and integration. Within numerous communities, there exists a distinct body of traditional knowledge that is specific to each ethnic group and is transmitted admirably from one generation to the next.[5, 6, 7, 8] Currently, it is found that the Thai Phuan ethnic group is in Ban Phue District, Udon Thani Province. Local wisdom related to using plants in various fields is still used, but it tends to decrease in importance. With technological advancements playing an essential role in our lives today, people and the new generation are not interested in traditional local wisdom. Moreover, there is a growing acceptance of new cultures within communities, directly affecting the transmission of accumulated knowledge to future generations. In order to ensure the preservation of this knowledge for our children and grandchildren, proactive measures need to be taken. Hence, this study aimed to investigate the ethnobotany of the Thai Phuan ethnic group residing in Ban Phue District, Udon Thani Province. The objective was to get insights into indigenous knowledge about the utilization of plants and safeguard this invaluable wisdom from being forgotten.

Materials and Methods

Study area

Udon Thani Province is north of northeastern Thailand (17.4294°N,102.9896°E) (Figure 1). Udon Thani has an area of approximately 15,589 square kilometers. Consisting of mountains, high plains, lowlands, and shallow undulating areas, Ban Phue District has an area of roughly 991 square kilometers. The terrain is mostly mountainous. Some parts are shallow to deep wavy areas. It is approximately 200 meters above sea level. There are high mountains alternating with low hills. Some parts are shallow undulating areas alternating with rice fields. There are lowlands near rivers, such as the Nam Mong River. This remark holds for the Thai Phuan ethnic group currently residing in the Ban Phue District in the Udon Thani Province.

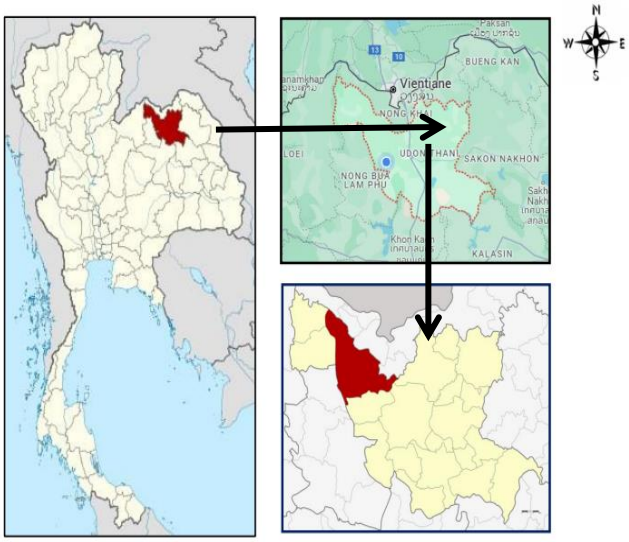

Figure 1: Map of the studies area in Ban Phue District, Udon Thani Province, Thailand

Data collection

Data on the ethnobotany of the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province, was gathered from August 2022 to July 2023. Plant use data was collected through semi-structured interviews with 30 informants from the Thai Phuan Ethnic Group. Furthermore, alongside gathering information on vernacular names and questionnaires regarding the specific parts of the edible plants utilised and ways of consumption, data was also collected on the medicinal capabilities of these plants in treating ailments and aiding in patient recovery.[11-23]

Data analysis

The data gathered from interviews were analyzed using indigenous botanical indicators, as outlined in Inta[1] and Junsongduang *et al.*[3, 4].

Use value

It is a metric that indicates the significance of any variety of plants. In any area, a high UV level indicates significant usage. If the UV is low or the value is near 0, it indicates reduced use. [11]

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

Where: Ui is the total count of reported instances for each plant category. N represents the total count of individuals providing information. A high UV rating indicates extensive utilization of that particular plant species. Conversely, when the UV is low or near 0, it suggests that the plant has lower utility.

Cultural importance index

A quantitative index is employed to categorise utilization reports into distinct groups. By categorising plants based on their specific uses, it becomes feasible to determine the significance of each plant in relation to its corresponding application. The CI value will be equal to the total number of usage categories. [1, 24]

$$\mathbf{CI} = \sum_{\boldsymbol{U=1}}^{\boldsymbol{NC}} \sum_{\boldsymbol{i=1}}^{\boldsymbol{N}} \frac{\boldsymbol{URui}}{\boldsymbol{N}}$$

Where: Ui represents the frequency of use reports for each specific type of plant and informant. N represents the overall quantity of informants. NC represents the cumulative count of utilization categories for each type of plant.

Informant Agreement Ratio

The index is utilized to gauge the level of acceptance between data providers and the utilization of plants. [11, 25] The consistent use of these plants demonstrates a significant level of acceptance and is an effective means of utilizing them.[1, 25]

$$\mathbf{IAR} = \frac{\boldsymbol{Nur-Nt}}{\boldsymbol{Nur-1}}$$

Where: *Nur* is the aggregate number of plants acquired from all data providers. Nt represents the number of plants employed for practical purposes. The IAR values range from 1 to 0. If the IAR readings are about 1 or equal to 1, it indicates that the plant has gained significant recognition among a large number of individuals.

Fidelity Level

The index is utilized to assess the most captivating plants inside each utilization category.[1]

$$\mathbf{\%FL} = \frac{\boldsymbol{Np}}{\boldsymbol{N}} \text{ x100}$$

Where: Np represents the number of plants that are used. N represents the total number of plant components that are utilized. A larger percentage of FL indicates a greater usage of plant parts. The maximum number corresponds to 100%, whereas the abbreviation "FL" with a low percentage indicates the usage of different plant parts.[1, 26]

Results and Discussion

An investigation into ethnobotany was conducted among the Thai Phuan ethnic group residing in Ban Phue District, Udon Thani Province. This study interviewed 30 individuals, including local philosophers, folk medicine practitioners, community elders, and community leaders. The findings indicate that the plant life in the research area is abundant in valuable species, with 243 species classified into 81 families (Table 1). The participants were selected randomly, according to the approach specified by Saisor *et al.*[5], Numpulsuksant *et al.*[6], and Phatlamphu *et al.*[10] The Fabaceae family had the highest number of species, with 25 species (10.29%), followed by Rubiaceae and Zingiberaceae with 10 species each (4.12%). Apocynaceae, Poaceae, and Solanaceae had 8 species each (3.29%). Amaryllidaceae, Anacardiaceae, Asteraceae, Cucurbitaceae, Lamiaceae, Phyllanthaceae, and Sapindaceae had 6 species each (2.47%) (Figure 2; Table 2). This is consistent with studies by several botanists in previous years.[5, 6, 10, 27]

Further investigation into the plant utilisation data, the plants that were most commonly used by the Thai Phuan Ethnic Groups, based on the Use value (UV) shown in Table 1, were *Musa x paradisiaca* L. (Musaceae), *Allium sativum* L. (Amaryllidaceae), *Cocos nucifera* L. (Arecaceae), *Calamus viminalis* Willd. (Arecaceae), *Annona squamosa* L. (Annonaceae), *Plumeria obtusa* L. (Apocynaceae), *Oryza sativa* L.

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Table 1: List of plants used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

Family	Scientific name	Vernacular name	*Use categories	UV	CI	Coll. number
Acanthaceae	*Andrographis paniculata* (Burm.f.) Nees	Fa Tha Lai Chon	Me	1.33	0.73	Somsak1
Acanthaceae	*Asystasia gangetica* (L.) T. Anderson subsp.	Phak Om Sab	Fo	0.83	0.60	Somsak2
Acanthaceae	*Barleria lupulina* Lindl.	Sa Let Phang Phon	Me	0.77	0.30	Somsak3
Acanthaceae	*Thunbergia laurifolia* Lindl.	Rang Jued	Me	0.47	0.27	Somsak4
Alismataceae	*Limnocharis flava* (L.) Buchenau	Phak Kan Chong	Fo, Me	1.27	1.23	Somsak5
Amaranthaceae	*Amaranthus viridis* L.	Phak Home	Fo	0.93	0.77	Somsak6
Amaranthaceae	*Gomphrena celosioides* Mart.	Dok Sam Pee Pha	Me	0.43	0.10	Somsak7
Amaranthaceae	*Gomphrena globosa* L.	Dok Sam Pee	Cu, Or	1.87	1.37	Somsak8
Amaryllidaceae	*Allium ascalonicum* L.	Thon Hom	Fo	1.10	1.00	Somsak9
Amaryllidaceae	*A. cepa* L.	Hom Hua Yai	Fo	0.83	1.00	Somsak10
Amaryllidaceae	*A. fistulosum* L.	Hom Bua	Fo	1.20	1.00	Somsak11
Amaryllidaceae	*A. sativum* L.	Kra Thium	Fo	2.17	1.00	Somsak12
Amaryllidaceae	*A. tuberosum* Rottler ex Spreng.	Kui Chai	Fo	0.50	0.90	Somsak13
Amaryllidaceae	*Crinum asiaticum* L.	Phlab Phluang	Me, Or	0.80	0.40	Somsak14
Anacardiaceae	*Bouea macrophylla* Griff.	Ma Phrang	Fo	0.73	0.93	Somsak15
Anacardiaceae	*Gluta usitata* (Wall.) Ding Hou	Nam Glaing	Me, Dy	0.67	0.43	Somsak16
Anacardiaceae	*Lannea coromandelica* (Houtt.) Merr.	Kok Khan	Me	1.33	0.13	Somsak17
Anacardiaceae	*Mangifera caloneura* Kurz	Ma Muang Pha	Fo, Eq	1.50	0.63	Somsak18
Anacardiaceae	*M. indica* L.	Ma Muang	Fo	0.73	1.00	Somsak19
Anacardiaceae	*Spondias pinnata* (L. f.) Kurz	Ma Kok	Fo	1.53	1.00	Somsak20
Annonaceae	*Annona squamosa* L.	Mak Kheib	Fo, Me	1.93	1.40	Somsak21
Annonaceae	*Cananga odorata* (Lam.) Hook.f. & Thomson	Kra Dung Nga	Or	1.00	0.37	Somsak22
Annonaceae	*Uvaria rufa* (Dunal) Blume	Mak Phee Phuan	Fo	0.93	0.53	Somsak23
Apiaceae	*Anethum graveolens* L.	Phak Chee Laos	Fo	1.00	0.83	Somsak24
Apiaceae	*Apium graveolens* L.	Khun Chai	Fo	0.80	1.00	Somsak25
Apiaceae	*Centella asiatica* (L.) Urb.	Phak Nok	Fo, Me	1.73	1.07	Somsak26
Apiaceae	*Coriandrum sativum* L.	Hom Phom	Fo	1.17	1.00	Somsak27
Apiaceae	*Eryngium foetidum* L.	Hom Phay	Fo	1.07	0.93	Somsak28
Apocynaceae	*Alstonia scholaris* (L.) R. Br.	Teen Phed	Eq	0.83	0.17	Somsak29

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Apocynaceae	*Calotropis gigantea* (L.) W.T. Aiton	Dok Rak	Cu, Or	1.83	0.83	Somsak30
Apocynaceae	*Carissa carandas* L.	Ma Muang How Ma Now Ho	Fo	1.27	0.90	Somsak31
Apocynaceae	*Holarrhena pubescens* Wall. ex G. Don	Thew Dang	Me	1.20	0.17	Somsak32
Apocynaceae	*Plumeria obtusa* L.	Lan Thome	Me, Cu, Or	1.93	0.53	Somsak33
Apocynaceae	*P. rubra* L.	Cham Pha Dang	Me, Or	1.67	0.57	Somsak34
Apocynaceae	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult.	Dok Phud	Or	1.40	0.80	Somsak35
Apocynaceae	*Urceola polymorpha* (Pierre ex Spire) D.J. Middleton & Livsh.	Bai Som Lom	Fo	1.13	0.27	Somsak36
Araceae	*Alocasia cucullata* (Lour.) G. Don	Wan Nok Khum	Me	0.40	0.10	Somsak37
Araceae	*Amorphophallus brevispathus* Gangnep.	Ee Lok	Fo	0.90	0.33	Somsak38
Araceae	*A. konjac* K. Koch	Ee Pook	Fo	0.93	0.33	Somsak39
Araceae	*Colocasia esculenta* (L.) Schott	Bon	Fo	0.87	0.40	Somsak40
Araceae	*Lasia spinosa* (L.) Thwaites.	Phak Nham	Fo	0.90	0.40	Somsak41
Arecaceae	*Areca catechu* L.	Mak	Me, Or	1.73	0.47	Somsak42
Arecaceae	*Calamus viminalis* Willd.	Hwai	Fo, Cu, Eq	2.07	1.50	Somsak43
Arecaceae	*Cocos nucifera* L.	Ma Phrow	Fo, Eq	2.17	1.40	Somsak44
Arecaceae	*Livistona speciosa* Kurz	Mak Khro	Fo	1.13	0.63	Somsak45
Asparagaceae	*Agave amica* (Medik.) Thiede & Govaerts	Dok Lee La	Cu, Or	0.73	0.20	Somsak46
Asparagaceae	*Dracaena cochinchinensis* (Lour.) S.C. Chen	Chan Pha	Me, Or	0.80	0.63	Somsak47
Asparagaceae	*D. fragrans* (L.) Ker Gawl.	Was Sa Na	Or	0.83	0.37	Somsak48
Asphodelaceae	*Aloe vera* (L.) Burm.f	Wan Hang Cho Ra Kae	Me	1.67	0.90	Somsak49
Aspleniaceae	*Asplenium nidus* L.	Kha Luang Lang Lai	Or	0.67	0.27	Somsak50
Aspleniaceae	*Diplazium esculentum* (Retz.) Sw.	Phak Good	Fo	1.07	0.67	Somsak51
Asteraceae	*Acmella paniculata* (Wall. ex DC.) R.K. Jansen	Phak Krad	Fo	0.40	0.27	Somsak52
Asteraceae	*Blumea balsamifera* (L.) DC.	Bai Nad	Me	0.77	0.53	Somsak53
Asteraceae	*Chromolaena odorata* (L.) R.M. King & H. Rob.	Phak Kee Chang	Me	0.80	0.60	Somsak54
Asteraceae	*Elephantopus scaber* L.	Dho Mai Rau Lome	Me	0.67	0.23	Somsak55
Asteraceae	*Gymnanthemum extensum* (DC.) Steetz	Nhan Chou Wei	Me	0.60	0.20	Somsak56
Asteraceae	*Tagetes erecta* L.	Daow Ruang	Or	1.33	0.97	Somsak57
Basellaceae	*Basella alba* L.	Phak Plung	Fo, Me	1.00	0.40	Somsak58
Bignoniaceae	*Dolichandrone serrulata* (Wall. ex DC.) Seem.	Kae Na	Fo, Me	1.40	0.93	Somsak59
Bignoniaceae	*Mansoa alliacea* (Lam.) A.H. Gentry	Kra Thium Thaow	Or	0.47	0.33	Somsak60
Bignoniaceae	*Millingtonia hortensis* L.f.	Khan Khong	Or	1.07	0.57	Somsak61
Bignoniaceae	*Oroxylum indicum* L. Kurz	Lein Mai	Fo, Me, Cu	1.33	0.97	Somsak62

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Bignoniaceae	*Stereospermum neuranthum* Kurz.	Kae Dong	Fo, Eq	0.73	0.33	Somsak63
Brassicaceae	*Brassica juncea* (L.) Czern.	Phak Gard Keaw Plee	Fo	0.80	0.90	Somsak64
Brassicaceae	*B. oleracea* L.	Kha Na	Fo	1.00	1.00	Somsak65
Brassicaceae	*Rorippa indica* (L.) Hiern	Phak Leen Phee	Fo, Me	0.73	0.37	Somsak66
Bromeliaceae	*Ananas comosus* (L.) Merr.	Mak Nud	Fo, Me	1.10	1.07	Somsak67
Burseraceae	*Canarium subulatum* Guillaumin	Mak Luim	Fo, Me, De	0.87	0.33	Somsak68
Cactaceae	*Selenicereus undatus* (Haw.) D.R. Hunt	Kaew Mang Kon	Fo, Me	1.07	1.40	Somsak69
Capparaceae	*Crateva adansonii* DC.	Phak Kum	Fo	0.47	0.17	Somsak70
Caricaceae	*Carica papaya* L.	Mak Hung	Fo, Me	1.50	1.10	Somsak71
Classulaceae	*Kalanchoe pinnata* (Lam.) Pers.	Kaum Tai Ngai Phen	Me, Or	0.47	0.43	Somsak72
Cleomaceae	*Cleome gynandra* L.	Pak Sein	Fo	0.67	0.47	Somsak73
Cleomaceae	*C. viscosa* L.	Pak Sein Phee	Me	0.33	0.37	Somsak74
Clusiaceae	*Garcinia cowa* Roxb. ex Choisy	Som Mong	Fo	0.50	0.37	Somsak75
Combretaceae	*Terminalia elliptica* Willd.	Hok Pha	Me, Eq	0.33	0.20	Somsak76
Commelinaceae	*Tradescantia spathacea* Sw.	Wan Karb Hoi	Or	0.67	0.43	Somsak77
Convolvulaceae	*Ipomoea aquatica* Forssk.	Phak Bung	Fo, Me	0.93	1.37	Somsak78
Convolvulaceae	*I. batatas* (L.) Lam.	Man Kaew	Fo	1.00	0.80	Somsak79
Costaceae	*Hellenia speciosa* (J. Koenig) S.R. Dutta	Eung Mai Na	Me, Or	0.50	0.57	Somsak80
Cucurbitaceae	*Benincasa hispida* (Thunb.) Cogn.	Mak Thone	Fo	0.80	0.87	Somsak81
Cucurbitaceae	*Coccinia grandis* (L.) Voigt	Tham Nin	Fo, Me	0.73	0.97	Somsak82
Cucurbitaceae	*Cucumis melo* L.	Buab Lium	Fo	0.80	0.63	Somsak83
Cucurbitaceae	*C. sativus* L.	Thang Kwa	Fo	1.00	1.00	Somsak84

Family	**Scientific name**	**Vernacular name**	***Use categories**	**UV**	**CI**	**Coll. number**
Cucurbitaceae	*Cucurbita moschata* Duchesne	Mak Aou	Fo	0.93	1.00	Somsak85
Cucurbitaceae	*Momordica charantia* L.	Phak Sai	Fo, Me	0.80	0.83	Somsak86
Cyperaceae	*Cyperus alternifolius* subsp. *flabelliformis* Kük.	Phue	Eq	0.93	0.83	Somsak87
Cyperaceae	*C. rotundus* L.	Hya Haw Moo	Me	0.40	0.10	Somsak88
Dioscoreaceae	*Dioscorea hispida* Dennst.	Kloy	Fo, Me	0.60	0.63	Somsak89
Dipterocarpaceae	*Dipterocarpus obtusifolius* Teijsm. Ex Miq.	Chad	Eq	0.33	0.17	Somsak90
Dipterocarpaceae	*D. tuberculatus* Roxb.	Thong Thung	Eq	0.27	0.17	Somsak91
Dipterocarpaceae	*Pentacme siamensis* (Miq.) Kurz	Hung	Cu, Eq	0.30	0.33	Somsak92

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Dipterocarpaceae	*Shorea obtusa* Wall. ex Blume	Chik	Eq	0.20	0.20	Somsak93
Ebenaceae	*Diospyros ehretioides* Wall. ex G. Don	Thub Tao Thone	Me	0.17	0.13	Somsak94
Ebenaceae	*D. mollis* Griff.	Ma Krue	Me, Dy	0.50	0.53	Somsak95
Elaeocarpaceae	*Elaeocarpus hygrophilus* Kurz	Ma Kok Nam	Fo	0.60	0.80	Somsak96
Euphorbiaceae	*Bridelia retusa* (L.) A. Juss.	Theng Nam	Me	0.20	0.17	Somsak97
Euphorbiaceae	*Cladogynos orientalis* Zipp. ex Span.	Chet Tha Phang Kee	Me	0.33	0.13	Somsak98
Euphorbiaceae	*Croton persimilis* Mull. Arg.	Phou	Me, Dy	1.27	0.90	Somsak99
Euphorbiaceae	*Euphorbia hirta* L.	Nam Nom Ra Cha See	Me	0.33	0.10	Somsak100
Euphorbiaceae	*Manihot esculenta* Crantz.	Man Sam Pha Lung	Fo	0.90	0.40	Somsak101
Fabaceae	*Afzelia xylocarpa* (Kurz.) Craib.	Mak Thae	Me, Eq	0.33	0.43	Somsak102
Fabaceae	*Bauhinia saccocalyx* Pierre	Shaew Pha	Fo	0.27	0.23	Somsak103
Fabaceae	*Butea monosperma* (Lam.) Kuntze	Dok Chan	Fo, Or	1.13	1.00	Somsak104
Fabaceae	*Cassia fistula* L.	Koon	Me, Cu, Or	1.27	1.40	Somsak105
Fabaceae	*Clitoria ternatea* L.	Ann Chan	Fo, Me	1.20	0.63	Somsak106
Fabaceae	*Dalbergia cochinchinensis* Pierre.	Pha Yoong	Eq	0.43	0.77	Somsak107
Fabaceae	*D. oliveri* Gamble ex Prain	Ching Chan	Eq	0.30	0.33	Somsak108
Fabaceae	*Imbralyx leucanthus* (Kurz) Z.Q. Song	Mai Kha Thon	Eq	0.17	0.33	Somsak109
Fabaceae	*Lablab purpureus* (L.) Sweet	Thou Phab	Fo	0.67	0.53	Somsak110
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit.	Kra Thin	Fo	0.83	0.67	Somsak111
Fabaceae	*Mimosa pudica* L.	Mai Ya Lab	Me	0.67	0.13	Somsak112
Fabaceae	*Mucuna pruriens* (L.) DC.	Ma Mui	Me	0.40	0.10	Somsak113
Fabaceae	*Pachyrhizus erosus* (L.) Urb.	Man Phound	Fo, Me	0.80	0.80	Somsak114
Fabaceae	*Pithecellobium dulce* (Roxb.) Benth.	Ma Kham Phae	Fo	0.50	0.80	Somsak115
Fabaceae	*Pterocarpus macrocarpus* Kurz	Phra Doo	Dy, Eq	0.67	0.77	Somsak116
Fabaceae	*Senegalia pennata* (L.) Maslin	Phak Kha	Fo, Me	1.27	0.93	Somsak117
Fabaceae	*S. rugata* (Lam.) Britton & Rose	Som Phoi	Fo, Cu	0.80	0.83	Somsak118
Fabaceae	*Senna alata* (L.) Roxb.	Chum Hed Thate	Me	0.40	0.33	Somsak119
Fabaceae	*S. siamea* (Lam.) Irwin & Barneby.	Kee Lek	Fo, Me	1.20	1.40	Somsak120
Fabaceae	*Sesbania grandiflora* (L.) Poir.	Kae	Fo, Me	1.13	0.93	Somsak121
Fabaceae	*S. javanica* Miq.	Sa No	Fo	0.67	0.57	Somsak122
Fabaceae	*Sindora siamensis* Teijsm. ex Miq.	Mak Tae Nam	Fo, Eq	0.73	0.57	Somsak123
Fabaceae	*Tamarindus indica* L.	Ma Kham	Fo, Eq	1.40	1.00	Somsak124
Fabaceae	*Vigna unguiculata* (L.) Walp.	Thour Phak Yow	Fo	1.00	1.00	Somsak125

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Fabaceae	*Xylia xylocarpa* (Roxb.) W. Theob.	Dang	Me, Eq	0.27	0.33	Somsak126
Fagaceae	*Castanopsis acuminatissima* (Blume) A. DC.	Kor Deui	Fo, Eq	0.20	0.57	Somsak127
Gentianaceae	*Cyrtophyllum fragrans* (Roxb.) DC.	Man Phlaa	Me, Or	0.20	0.37	Somsak128
Hypericaceae	*Cratoxylum cochinchinense* (Lour.) Blume	Phak Thew	Fo	0.47	0.47	Somsak129
Irvingiaceae	*Irvingia malayana* Oliv. ex A.W. Benn.	Mak Bok	Fo, Me	0.67	0.77	Somsak130
Lamiaceae	*Melissa officinalis* L.	Sa Ra Nae	Fo, Me	1.00	1.27	Somsak131
Lamiaceae	*Ocimum americanum* L.	Phak Ee Thoow	Fo, Me	1.07	1.03	Somsak132
Lamiaceae	*O. basilicum* L.	Ho Ra Pha	Fo	1.07	0.83	Somsak133
Lamiaceae	*O. tenuiflorum* L.	Ka Phow	Fo, Me	1.07	1.13	Somsak134
Lamiaceae	*Tectona grandis* L.f.	Sak	Eq	0.87	0.80	Somsak135
Lamiaceae	*Vitex pinnata* L.	Sa Mor Theen Phed	Eq	0.17	0.07	Somsak136
Lauraceae	*Litsea glutinosa* (Lour.) C.B. Rob.	Mee Men	Me	0.20	0.17	Somsak137
Lauraceae	*Persea americana* Mill.	A Wo Kha Do	Fo	0.50	0.83	Somsak138
Lecythidaceae	*Careya arborea* Roxb.	Kra Done	Fo	0.60	0.50	Somsak139
Lytharaceae	*Lagerstroemia floribunda* Jack	Tha Bak	Me, Or, Eq	0.47	0.90	Somsak140
Lytharaceae	*Punica gramatum* L.	Mak Phi Laa	Fo, Me	0.70	0.93	Somsak141
Malvaceae	*Abelmoschus esculentus*)L.(Moench	Thour Lea	Fo, Me	0.53	0.10	Somsak142
Malvaceae	*Bombax anceps* Pierre	Ngew Pha	Fo, Eq	0.67	0.67	Somsak143
Malvaceae	*Helicteres isora* L.	Phor Kra Phid	Me	0.13	0.07	Somsak144
Malvaceae	*Hibiscus rasa-sinensis* L.	Cha Ba	Or	0.53	0.40	Somsak145

Family	**Scientific name**	**Vernacular name**	***Use categories**	**UV**	**CI**	**Coll. number**
Malvaceae	*H. sabdariffa* L.	Som Por Dee	Fo, Me	0.73	0.90	Somsak146
Meliaceae	*Azadirachta indica* A. Juss.	Pak Kha Dow	Fo, Me	1.17	1.33	Somsak147
Meliaceae	*Sandoricum koetjape* (Burm.f.) Merr.	Mak Thong	Fo	0.77	0.83	Somsak148
Menispermaceae	*Tiliacora triandra* (Colebr.) Diels	Ya Nang	Fo, Me	1.33	0.77	Somsak149
Menispermaceae	*Tinospora crispa* (L.) Hook.f. & Thomson	Krue Kor Hor	Me	1.13	0.40	Somsak150
Moraceae	*Artocarpus heterophyllus* Lam.	Mak Mee	Fo, Dy, Cu	1.27	1.07	Somsak151
Moraceae	*Morus alba* L.	Mon	Fo, Me	1.17	0.90	Somsak152
Moraceae	*Streblus asper* Lour.	Khoy	Me, Or, Eq	0.80	0.73	Somsak153
Moringaceae	*Moringa oleifera* Lam.	Pak Ee Hum	Fo, Me	0.93	0.63	Somsak154
Musaceae	*Musa × paradisiaca* L.	Khuay	Fo, Cu	2.27	1.27	Somsak155

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Myrtaceae	*Psidium guajava* L.	Mak See Da	Fo, Me	1.87	1.00	Somsak156
Myrtaceae	*Syzygium antisepticum* (Blume) Merr. & L.M. Perry	Pak Mex	Fo	0.73	0.57	Somsak157
Myrtaceae	*S. cumini* (L.) Skeels	Hwa	Fo, Me	0.67	0.60	Somsak158
Nelumbonaceae	*Nelumbo nucifera* Gaertn.	Bua Luang	Fo, Me, Cu, Or	0.80	1.63	Somsak159
Nyctaginaceae	*Bougainvillea glabra* Choisy	Dok Kra Dad	Or	0.60	0.80	Somsak160
Nyctaginaceae	*Mirabilis jalapa* L.	Ban Yen	Or	0.47	0.33	Somsak161
Nyctaginaceae	*Pisonia grandis* R. Br.	Sang Chan	Or	0.33	0.33	Somsak162
Nymphaeaceae	*Nymphaea pubescens* Willd.	Bua Sai	Fo, Or	1.07	0.70	Somsak163
Ochnaceae	*Ochna integerrima* (Lour.) Merr.	Chang Nome	Me	0.20	0.17	Somsak164
Oleaceae	*Jasminum sambac (L.) Aiton*	Ma Li Chon	Cu, Or	0.60	1.43	Somsak165
Opiliaceae	*Melientha suavis* Pierre	Pak Hwan Pha	Fo	0.67	0.47	Somsak166
Oxalidaceae	*Averrhoa bilimbi* L.	Ta Ling Ping	Fo	0.67	0.63	Somsak167
Oxalidaceae	*A. carambola* L.	Ma Phuang	Fo, Me	0.80	0.57	Somsak168
Oxalidaceae	*Oxalis corniculata* L.	Pak Wan	Fo, Me	0.67	0.37	Somsak169
Passifloraceae	*Passiflora edulis* Sims	Ka Thok Rok	Fo	0.87	0.77	Somsak170

Family	**Scientific name**	**Vernacular name**	***Use categories**	**UV**	**CI**	**Coll. number**
Passifloraceae	*P. foetida* L.	Mak Hum Hor	Fo, Me	0.63	0.40	Somsak171
Phyllanthaceae	*Antidesma acidum* Retz.	Mak Maow	Fo	0.73	0.53	Somsak172
Phyllanthaceae	*Baccaurea ramiflora* Lour.	Mak Phai	Fo	0.67	0.80	Somsak173
Phyllanthaceae	*Breynia androgyna* (L.) Chakrab. & N.P. Balakr.	Pak Hwan Ban	Fo, Me	0.60	0.60	Somsak174
Phyllanthaceae	*Phyllanthus acidus* (L.) Skeels	Ma Yom	Fo, Me, Cu	0.67	1.03	Somsak175
Phyllanthaceae	*P. amarus* Schumach. & Thonn.	Mak Tai Bai	Me	0.40	0.23	Somsak176
Phyllanthaceae	*P. emblica* L.	Ma Kham Phom	Fo, Me, Cu	0.80	1.40	Somsak177
Piperaceae	*Peperomia pellucida* (L.) Kunth	Pak Ka Sang	Fo, Me	0.57	0.27	Somsak178
Piperaceae	*Piper betle* L.	Plu	Fo, Cu	0.90	0.53	Somsak179
Piperaceae	*P. nigrum* L.	Prick Thai	Fo, Me	0.80	0.63	Somsak180
Piperaceae	*P. sarmentosum* Roxb.	Pak Ee Lerd	Fo, Me	0.83	0.63	Somsak181
Plantaginaceae	*Limnophila aromatica* (Lam.) Merr.	Pak Ka Yang	Fo	0.67	0.53	Somsak182
Poaceae	*Bambusa bambos* (L.) Voss	Phai Nam	Fo, Eq	0.67	1.33	Somsak183
Poaceae	*Coix lacryma-jobi* L.	Mak Deai	Fo, Me	0.43	0.47	Somsak184
Poaceae	*Cymbopogon citratus* (DC.) Stapf	Hua King Kai	Fo, Me	1.53	1.27	Somsak185

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Poaceae	*Imperata cylindrica* (L.) Raeusch.	Ya Ka	Cu, Eq	1.33	0.83	Somsak186
Poaceae	*Oryza sativa* L.	Kaow	Fo, Cu	1.93	1.53	Somsak187
Poaceae	*Saccharum officinarum* L.	Aoy	Fo, Cu	1.40	1.17	Somsak188
Poaceae	*Vietnamosasa pusilla* (A. Chev. & A. Camus) T.Q. Nguyen	Ya Phek	Fo	0.83	0.40	Somsak189
Poaceae	*Zea mays* L.	Kaow Phode	Fo	1.33	1.00	Somsak190
Polygonaceae	*Persicaria odorata* (Lour.) Soja'k.	Pak Paew	Fo	0.90	0.30	Somsak191
Polypodiaceae	*Platycerium wallichii* Hook.	Chai Pha See Da	Or	0.50	0.40	Somsak192
Pontederiaceae	*Pontederia crassipes* Mart.	Pak Ee Joke	Fo, Eq	0.80	0.60	Somsak193
Rhamnaceae	*Ziziphus oenopolia* (L.) Mill.	Leb Maew	Fo, Cu	0.87	0.70	Somsak194
Rubiaceae	*Canthium berberidifolium* E.T. Geddes	Ngeang Dook	Me	0.23	0.17	Somsak195
Rubiaceae	*Catunaregam tomentosa* (Blume. ex DC.) Triveng.	Nam Thang	Me	0.33	0.23	Somsak196
Rubiaceae	*Dioecrescis erythroclada* (Kurz) Tirveng.	Thume Ka Dang	Me	0.27	0.10	Somsak197
Rubiaceae	*Gardenia jasminoides* J. Ellis	In Tha Wa	Cu, Or	0.60	0.50	Somsak198
Rubiaceae	*G. obtusifolia* Roxb. ex Hook.f.	See Da Koke	Me	0.27	0.13	Somsak199
Rubiaceae	*Ixora coccinea* L.	Khem	Fo, Or	0.87	0.93	Somsak200
Rubiaceae	*Mitragyna diversifolia* (Wall. ex G. Don) Havil.	Thome	Me, Or	0.37	0.33	Somsak201
Rubiaceae	*Morinda citrifolia* L.	Yor Ban	Me, Dy	0.80	0.47	Somsak202
Rubiaceae	*M. coreia* Buch. -Ham.	Yor Pha	Me	0.73	0.23	Somsak203
Rubiaceae	*Ridsdalea wittii* (Craib) J.T. Pereira	Mak More	Fo, Me	0.33	0.47	Somsak204
Rutaceae	*Aegle marmelos* (L.) Corrêa	Mak Thoom	Fo, Me	0.67	0.67	Somsak205
Rutaceae	*Citrus* × *aurantiifolia* (Christm.) Swingle	Ma Now	Fo	1.53	1.00	Somsak206
Rutaceae	*C. hystrix* DC.	Ma Khrud	Fo	1.10	0.93	Somsak207
Rutaceae	*C. maxima* (Burm.) Merr.	Som Oo	Fo, Me	0.80	1.00	Somsak208
Rutaceae	*Murraya paniculata* (L.) Jack.	Dok Kaew	Me, Or	0.93	0.80	Somsak209
Salicaceae	*Casearia grewiifolia* Vent.	Pha Sam	Eq	0.23	0.07	Somsak210
Salicaceae	*Flacourtia indica* (Burm.f.) Merr.	Mak Ben	Fo	0.50	0.73	Somsak211
Sapindaceae	*Dimocarpus longan* Lour.	Lam Yai	Fo	0.80	1.00	Somsak212
Sapindaceae	*Lepisanthes rubiginosa* (Roxb.) Leenh.	Huad Kha	Fo, Eq	0.67	0.70	Somsak213
Sapindaceae	*Litchi chinensis* Sonn.	Lin Chee	Fo	0.93	1.00	Somsak214
Sapindaceae	*Nephelium hypoleucum* Kurz	Mak Ngaew	Fo, Eq	1.00	0.93	Somsak215
Sapindaceae	*Schleichera oleosa* (Lour.) Oken	Mak Kor	Fo, Eq	0.93	0.83	Somsak216
Sapindaceae	*Sisyrolepis muricata* (Pierre.) Leenh.	Mak Kor Nam	Fo, Eq	0.40	0.33	Somsak217
Sapotaceae	*Manilkara zapota* (L.) P. Royen	La Mood	Fo	0.80	0.93	Somsak218

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Sapotaceae	*Mimusops elengi* L.	Phi Kun	Or	0.57	0.47	Somsak219
Saururaceae	*Houttuynia cordata* Thunb.	Pak Kow Thong	Fo	0.73	0.67	Somsak220
Simaroubaceae	*Eurycoma longifolia* Jack	Earn Don	Me	0.47	0.37	Somsak221
Solanaceae	*Capsicum annuum* L.	Phrick	Fo	1.00	1.00	Somsak222
Solanaceae	*Nicotiana tabacum* L.	Ya Shoob	Me	0.87	0.57	Somsak223
Solanaceae	*Solanum anguivi* Lam.	Ma Wang	Fo	0.73	0.40	Somsak224
Solanaceae	*S. lycopersicum* L.	Ma Khrue Thate	Fo, Me	1.00	1.17	Somsak225
Solanaceae	*S. melongena* L.	Ma Khrue Yaw	Fo	0.73	0.83	Somsak226
Solanaceae	*S. stramoniifolium* Jacq.	Ma Eok	Fo	0.60	0.20	Somsak227
Solanaceae	*S. torvum* Sw.	Mak Khang	Fo	0.90	0.83	Somsak228
Solanaceae	*S. virginianum* L.	Ma Khrue Prow	Fo, Cu	0.93	1.20	Somsak229
Stemonaceae	*Stemona collinsiae* Craib	Non Tai Yak	Me	0.37	0.17	Somsak230
Typhaceae	*Typha angustifolia* L.	Kok Khan Thoob	Or	0.53	0.17	Somsak231
Verbenaceae	*Lantana camara* L.	Pha Ka Khrong	Or	0.47	0.27	Somsak232
Xyridaceae	*Xyris indica* L.	Ya Kee Kak	Me	0.60	0.13	Somsak233
Zingiberaceae	*Alpinia galanga* (L.) Willd.	Kha	Fo, Me	1.17	1.33	Somsak234
Zingiberaceae	*A. malaccensis* (Burm.f.) Roscoe	Kha Pha	Me	0.50	0.60	Somsak235
Zingiberaceae	*Boesenbergia rotunda* (L.) Mansf.	Khing Kra Chai	Fo, Me	1.60	1.33	Somsak236
Zingiberaceae	*Curcuma longa* L.	Kha Min Chan	Fo, Me	0.87	1.17	Somsak237
Zingiberaceae	*C. singularis* Gagnep.	Kra Jaew Khaow	Fo, Me, Or	0.67	1.40	Somsak238
Zingiberaceae	*C. zedoaria* (Christm.) Roscoe	Kha Min Khone	Fo, Me, Cu	1.47	1.63	Somsak239
Zingiberaceae	*Hedychium coronarium* J. Koenig	Sa Ley Thay	Or	0.80	0.67	Somsak240
Zingiberaceae	*Kaempferia marginata* Carey ex Roscoe	Phrow Pha	Me	0.27	0.20	Somsak241
Zingiberaceae	*Zingiber montanum* (J. Koenig) Link ex A. Dietr.	Wan Phai	Fo, Me, Cu	0.87	1.00	Somsak242
Zingiberaceae	*Z. officinale* Roscoe	Khing	Fo, Me	1.67	1.70	Somsak243

Note: *Use categories: Fo: Food, Me: Medicines, Dy: Dyer, Eq: Equipment, Cu: Culture, Or: Ornamental

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Table 2: The common plant families used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

Family	**Number of species**
Fabaceae	25
Rubiaceae, Zingiberaceae	10
Apocynaceae, Poaceae, Solanaceae	8
Amaryllidaceae, Anacardiaceae, Asteraceae, Cucurbitaceae, Lamiaceae, Phyllanthaceae, Sapindaceae	6
Apiaceae, Araceae, Bignoniaceae, Euphorbiaceae, Malvaceae, Rutaceae	5
Acanthaceae, Arecaceae, Dipterocarpaceae, Piperaceae	4
Amaranthaceae, Annonaceae, Asparagaceae, Brassicaceae, Moraceae, Myrtaceae, Nyctaginaceae, Oxalidaceae	3
Aspleniaceae, Cleomaceae, Convolvulaceae, Cyperaceae, Ebenaceae, Lauraceae, Lytharaceae, Meliaceae, Menispermaceae, Passifloraceae, Salicaceae, Sapotaceae	2
Alismataceae, Asphodelaceae, Basellaceae, Bromeliaceae, Burseraceae, Cactaceae, Capparaceae, Caricaceae, Classulaceae, Clusiaceae, Combretaceae, Commelinaceae, Costaceae, Dioscoreaceae, Elaeocarpaceae, Fagaceae, Gentianaceae, Hypericaceae, Irvingiaceae, Lecythidaceae, Moringaceae, Musaceae, Nelumbonaceae, Nymphaeaceae, Ochnaceae, Oleaceae, Opiliaceae, Plantaginaceae, Polygonaceae, Polypodiaceae, Pontederiaceae, Rhamnaceae, Saururaceae, Simaroubacae, Stemonaceae, Typhaceae, Verbenaceae, Xyridaceae	1

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(Poaceae), *Gomphrena globosa* L. (Amaranthaceae), *Psidium guajava* L. (Myrtaceae), and *Colotropis gigantea* (L.) W.T. Aiton (Apocynaceae). A higher Use Value (UV) number signifies that the plant is being employed to a greater extent compared to other species. An instance of this is *Musa x paradisiaca* L. (Musaceae), which has a UV index of 2.27. According to utilisation data, the plant is employed as a covering for food, medicinal purposes, and cultural practices and beliefs. The diagram is shown in Figure 3. This report is consistent with studies by several botanists in previous years.[5, 6, 10, 27]

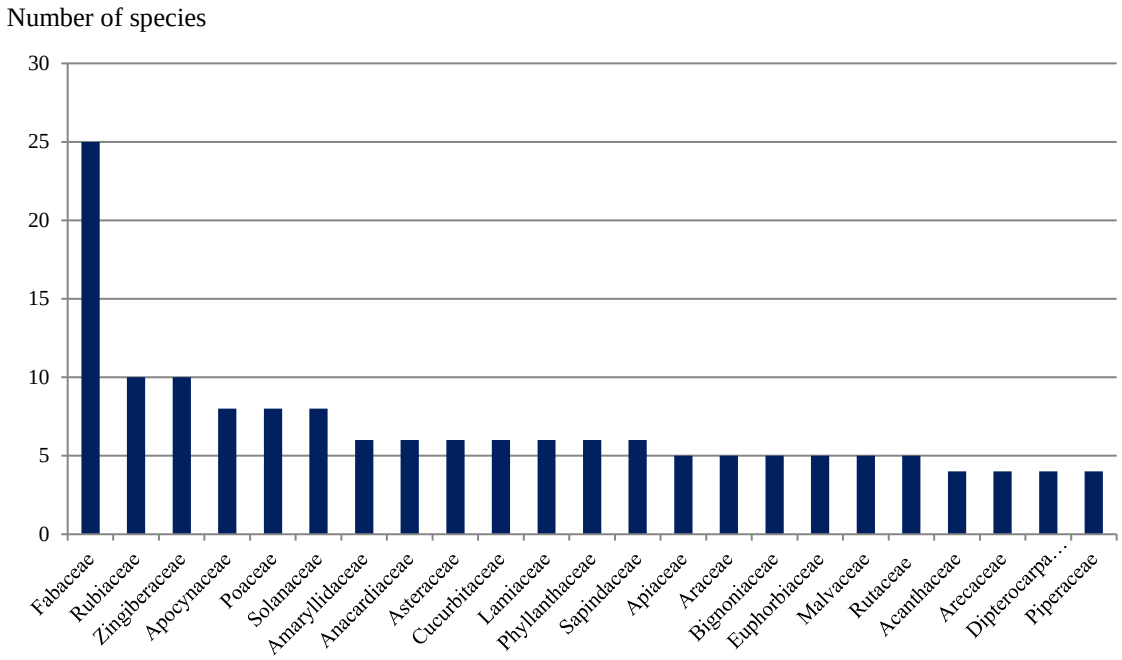

Figure 2: Twenty-three ranks of common plant families used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province.

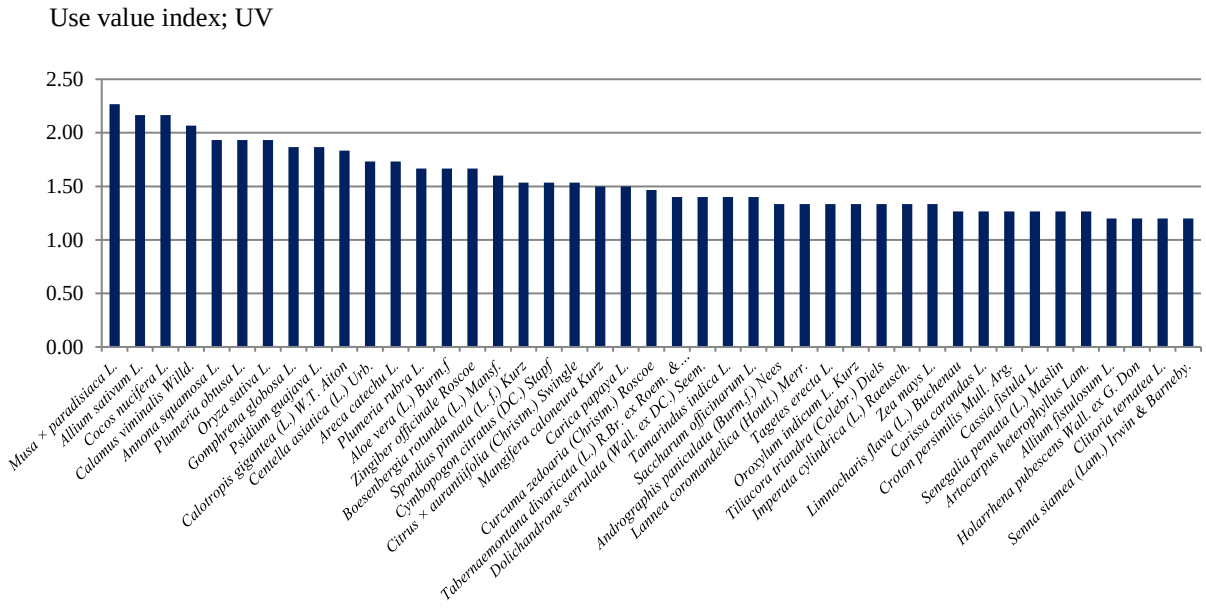

Figure 3: Use value)UV(of plant utilisation index from Thai Phuan Ethnic Groups in Ban Phue District, Udon Thani Province.

There are thirteen most frequently utilized plant species: Zingiber officinale Roscoe, Nelumbo nucifera Gaertn, and *Curcuma zedoaria* (Christm.) Roscoe, *Oryza sativa* L., *Calamus viminalis* Willd., *Jasminum sambac* (L.) Aiton, *Annona squamosa* L., *Cocos nucifera* L, *Selenicereus undatus* (Haw.) D.R. Hunt, *Cassia fistula* L., *Senna siamea* (Lam.) Irwin & Barneby., *Phyllanthus emblica* L., and *Curcuma singularis* Gagnep. (Figure 4). This UV indexes also agrees with research conducted by various botanists in earlier decades.[5, 6, 10, 27] Upon analyzing the utilization of plants from the Thai Phuan ethnic group in Ban Phue District, Udon Thani Province, it was discovered that each variety serves distinct purposes, which may be categorised into four groups of use as outlined below: as a food source, for medical purposes, in cultural practices, rituals, and beliefs, and as ornamental plants. This aligns with research conducted by other botanists in prior years.[1, 3- 8, 10, 27] The study revealed that the most plant species (148) were used for food. Among them, the Fabaceae family has the most species (15

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species), followed by Solanaceae and Zingiberaceae families (7 species each). The most often utilized portions of the plants were identified as fruits, leaves, and young shoots. These components were consumed as vegetables, blanched vegetables, cooked ingredients, fresh fruits, pickled items, roasted snacks, and consumed as snacks (See Figure 5 and Table 3). The information is presented in Figure 6 and Table 4.

Table 3: List of food plants used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

Family	Scientific name	Used part	Instruction
Acanthaceae	*Asystasia gangetica* (L.) T. Anderson subsp.	Young shoots	Eaten as a blanched vegetable, used for cooking.
Alismataceae	*Limnocharis flava* (L.) Buchenau	Young leaves and young inflorescences	Eaten as a blanched vegetable, used for cooking.
Amaranthaceae	*Amaranthus viridis* L.	Leaves and stems	Eaten as a blanched vegetable.
Amaryllidaceae	*Allium ascalonicum* L.	Leaves	Used as food ingredients.
Amaryllidaceae	*A. cepa* L.	Tubers	Used as food ingredients.
Amaryllidaceae	*A. fistulosum* L.	Leaves	Used as food ingredients.
Amaryllidaceae	*A. sativum* L.	Leaves and stems	Used as food ingredients.
Amaryllidaceae	*A. tuberosum* Rottler ex Spreng.	Leaves	Used for cooking.
Anacardiaceae	*Bouea macrophylla* Griff.	Fruits	Eaten fresh as fruit.
Anacardiaceae	*Mangifera caloneura* Kurz	Fruits	Eaten fresh as fruit.
Anacardiaceae	*M. indica* L.	Fruits	Eaten fresh as fruit.
Anacardiaceae	*Spondias pinnata* (L. f.) Kurz	Fruits	Used as food ingredients.
Annonaceae	*Annona squamosa* L.	Fruits	Eaten fresh as fruit.
Annonaceae	*Uvaria rufa* (Dunal) Blume	Fruits	Eaten fresh as fruit.
Apiaceae	*Anethum graveolens* L.	Leaves and stems	Used as food ingredients.
Apiaceae	*Apium graveolens* L.	Leaves and stems	Used as food ingredients.
Apiaceae	*Centella asiatica* (L.) Urb.	Leaves	Eaten as a vegetable.
Apiaceae	*Coriandrum sativum* L.	Leaves and stems	Used as food ingredients.
Apiaceae	*Eryngium foetidum* L.	Leaves	Used as food ingredients.
Apocynaceae	*Carissa carandas* L.	Fruits	Eaten fresh as fruit.
Apocynaceae	*Urceola polymorpha* (Pierre ex Spire) D.J. Middleton & Livsh.	Young shoots	Eaten as a vegetable.
Araceae	*Amorphophallus brevispathus* Gangnep.	Stems	Used for cooking.
Araceae	*A. konjac* K. Koch	Tubers	Used for cooking.
Araceae	*Colocasia esculenta* (L.) Schott	Leaf stalks	Used for cooking.
Araceae	*Lasia spinosa* (L.) Thwaites.	Leaf stalks	Used for cooking.
Arecaceae	*Calamus viminalis* Willd.	Stems	Used for cooking.
Arecaceae	*Cocos nucifera* L.	Fruits and young shoots	Eaten fresh as fruit.
Arecaceae	*Livistona speciosa* Kurz	Fruits	Eaten fresh as fruit.
Aspleniaceae	*Diplazium esculentum* (Retz.) Sw.	Young shoots	Used for cooking.
Asteraceae	*Acmella paniculata* (Wall. ex DC.) R.K. Jansen	Young shoots	Used for cooking.
Basellaceae	*Basella alba* L.	Young shoots	Eaten as a blanched vegetable.
Bignoniaceae	*Dolichandrone serrulata* (Wall. ex DC.) Seem.	Flowers	Eaten as a blanched vegetable.
Bignoniaceae	*Oroxylum indicum* L. Kurz	Fruits and flowers	Eaten as a vegetable.
Bignoniaceae	*Stereospermum neuranthum* Kurz.	Flowers	Eaten as a blanched vegetable.
Brassicaceae	*Brassica juncea* (L.) Czern.	Leaves	Eaten as a vegetable.
Brassicaceae	*B. oleracea* L.	Leaves and stems	Eaten as a blanched vegetable.

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Brassicaceae	*Rorippa indica* (L.) Hiern	Leaves and stems	Eaten as a vegetable.
Bromeliaceae	*Ananas comosus* (L.) Merr.	Fruits	Eaten fresh as fruit.
Burseraceae	*Canarium subulatum* Guillaumin	Seeds	Eaten fresh as fruit.
Cactaceae	*Selenicereus undatus* (Haw.) D.R. Hunt	Fruits	Eaten fresh as fruit.
Capparaceae	*Crateva adansonii* DC.	Young shoots	Pickled.
Caricaceae	*Carica papaya* L.	Fruits	Eaten fresh as fruit.
Cleomaceae	*Cleome gynandra* L.	Leaves and stems	Pickled.
Clusiaceae	*Garcinia cowa* Roxb. ex Choisy	Leaves	Eaten as a vegetable.
Convolvulaceae	*Ipomoea aquatica* Forssk.	Leaves and stems	Eaten as a blanched vegetable.
Convolvulaceae	*I. batatas* (L.) Lam.	Rhizome	Used for cooking.
Cucurbitaceae	*Benincasa hispida* (Thunb.) Cogn.	Fruits	Used for cooking.
Cucurbitaceae	*Coccinia grandis* (L.) Voigt	Young shoots and fruits	Eaten as a blanched vegetable.
Cucurbitaceae	*Cucumis melo* L.	Fruits	Used for cooking.
Cucurbitaceae	*C. sativus* L.	Fruits	Eaten as a vegetable.
Cucurbitaceae	*Cucurbita moschata* Duchesne	Fruits, flowers, and young shoots	Used for cooking.
Cucurbitaceae	*Momordica charantia* L.	Fruits and leaves	Eaten as a vegetable.
Dioscoreaceae	*Dioscorea hispida* Dennst.	Rhizomes	Used for cooking.
Elaeocarpaceae	*Elaeocarpus hygrophilus* Kurz	Fruits	Eaten fresh as fruit.
Euphorbiaceae	*Manihot esculenta* Crantz.	Roots	Used for cooking.
Fabaceae	*Bauhinia saccocalyx* Pierre	Leaves	Used for cooking.
Fabaceae	*Butea monosperma* (Lam.) Kuntze	Young pods	Used for cooking.
Fabaceae	*Clitoria ternatea* L.	Flowers	Eaten as a vegetable.
Fabaceae	*Lablab purpureus* (L.) Sweet	Fruits	Used for cooking.
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit.	Fruits and young shoots	Eaten as a vegetable.
Fabaceae	*Pachyrhizus erosus* (L.) Urb.	Rhizomes	Eaten fresh as fruit.
Fabaceae	*Pithecellobium dulce* (Roxb.) Benth.	Fruits	Eaten fresh as fruit
Fabaceae	*Senegalia pennata* (L.) Maslin	Leaves and young shoots	Eaten as a vegetable.
Fabaceae	*S. rugata* (Lam.) Britton & Rose	Young shoots	Used for cooking.
Fabaceae	*Senna siamea* (Lam.) Irwin & Barneby.	Leaves and flowers	Used for cooking.

Table 3 cont'd**:** List of food plants used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

Family	Scientific name	Used part	Instruction
Fabaceae	*Sesbania grandiflora* (L.) Poir.	Leaves and flowers	Eaten as a blanched vegetable.
Fabaceae	*S. javanica* Miq.	Flowers	Eaten as a blanched vegetable.
Fabaceae	*Sindora siamensis* Teijsm. ex Miq.	Seeds	Roasted and eaten as a snack.
Fabaceae	*Tamarindus indica* L.	Fruits	Eaten fresh as fruit, used as food ingredients.
Fabaceae	*Vigna unguiculata* (L.) Walp.	Fruits	Eaten as vegetable.
Fagaceae	*Castanopsis acuminatissima* (Blume) A. DC.	Seeds	Roasted and eaten as a snack.
Hypericaceae	*Cratoxylum cochinchinense* (Lour.) Blume	Leaves and flowers	Eaten as a vegetable.
Irvingiaceae	*Irvingia malayana* Oliv. ex A.W. Benn.	Seeds	Roasted and eaten as a snack.
Lamiaceae	*Melissa officinalis* L.	Leaves and stems	Used as food ingredients.
Lamiaceae	*Ocimum americanum* L.	Leaves and seeds	Used for cooking.
Lamiaceae	*O. basilicum* L.	Leaves	Used for cooking.
Lamiaceae	*O. tenuiflorum* L.	Leaves	Used as food ingredients.

Lauraceae	*Persea americana* Mill.	Fruits	Eaten fresh as fruit.
Lecythidaceae	*Careya arborea* Roxb.	Leaves	Eaten as a vegetable.
Lytharaceae	*Punica gramatum* L.	Fruits	Eaten fresh as fruit.
Malvaceae	*Bombax anceps* Pierre	Flowers	Eaten fresh as fruit.
Malvaceae	*Hibiscus sabdariffa* L.	Fruits and leaves	Used for cooking.
Meliaceae	*Azadirachta indica* A. Juss.	Leaves and flowers	Eaten as a blanched vegetable.
Meliaceae	*Sandoricum koetjape* (Burm.f.) Merr.	Fruits	Eaten fresh as fruit.
Menispermaceae	*Tiliacora triandra* (Colebr.) Diels	Leaves	Crush to juice and used to cooking.
Moraceae	*Artocarpus heterophyllus* Lam.	Fruits	Eaten fresh as fruit.
Moraceae	*Morus alba* L.	Fruits and Leaves	Eaten fresh as fruit.
Moringaceae	*Moringa oleifera* Lam.	Leaves and fruits	Eaten as a blanched vegetable.
Musaceae	*Musa* × *paradisiaca* L.	Fruits	Eaten fresh as fruit.
Myrtaceae	*Psidium guajava* L.	Fruits	Eaten fresh as fruit.
Myrtaceae	*Syzygium antisepticum* (Blume) Merr. & L.M. Perry	Young shoots	Eaten as a vegetable.
Myrtaceae	*S. cumini* (L.) Skeels	Fruits	Eaten fresh as fruit.
Nelumbonaceae	*Nelumbo nucifera* Gaertn.	Roots and seeds	Eaten as a vegetable.
Nymphaeaceae	*Nymphaea pubescens* Willd.	Stems	Used for cooking.
Opiliaceae	*Melientha suavis* Pierre	young shoots	Used for cooking.
Oxalidaceae	*Averrhoa bilimbi* L.	Fruits	Eaten fresh as fruit.
Oxalidaceae	*A. carambola* L.	Fruits	Eaten fresh as fruit.
Oxalidaceae	*Oxalis corniculata* L.	young shoots	Eaten as a vegetable.
Passifloraceae	*Passiflora edulis* Sims	Fruits	Eaten fresh as fruit.
Passifloraceae	*P. foetida* L.	Fruits	Eaten fresh as fruit.
Phyllanthaceae	*Antidesma acidum* Retz.	Fruits	Eaten fresh as fruit.
Phyllanthaceae	*Baccaurea ramiflora* Lour.	Fruits	Eaten fresh as fruit.
Phyllanthaceae	*Breynia androgyna* (L.) Chakrab. & N.P. Balakr.	Leaves and young shoots	Used for cooking.
Phyllanthaceae	*Phyllanthus acidus* (L.) Skeels	Fruits	Eaten fresh as fruit.
Phyllanthaceae	*P. emblica* L.	Fruits	Eaten fresh as fruit.
Piperaceae	*Peperomia pellucida* (L.) Kunth	Leaves and stems	Eaten as a vegetable.
Piperaceae	*Piper betle* L.	Leaves	Used as food ingredients.
Piperaceae	*P. nigrum* L.	Seeds	Used as food ingredients.
Piperaceae	*P. sarmentosum* Roxb.	Leaves	Eaten as vegetable.
Plantaginaceae	*Limnophila aromatica* (Lam.) Merr.	Leaves and stems	Eaten as a vegetable.
Poaceae	*Bambusa bambos* (L.) Voss	Young offshoots	Used for cooking.
Poaceae	*Coix lacryma-jobi* L.	Seeds	Used for cooking.
Poaceae	*Cymbopogon citratus* (DC.) Stapf	Stems	Used as food ingredients.
Poaceae	*Oryza sativa* L.	Seeds	Used for cooking.
Poaceae	*Saccharum officinarum* L.	Stems	Eaten fresh as fruit, sweet.
Poaceae	*Zea mays* L.	Seeds	Used for cooking.
Polygonaceae	*Persicaria odorata* (Lour.) Soja'k.	Leaves	Eaten as a vegetable.
Pontederiaceae	*Pontederia crassipes* Mart.	Youngs inflorescences	Eaten as a blanched vegetable.
Rhamnaceae	*Ziziphus oenopolia* (L.) Mill.	Fruits	Eaten fresh as fruit.
Rubiaceae	*Ixora coccinea* L.	Flowers	Eaten as a blanched vegetable.
Rubiaceae	*Ridsdalea wittii* (Craib) J.T. Pereira	Fruits	Eaten fresh as fruit.
Rutaceae	*Aegle marmelos* (L.) Corrêa	Fruits	Eaten fresh as fruit.

Rutaceae	*Citrus* × *aurantiifolia* (Christm.) Swingle	Fruits	Used as food ingredients.
Rutaceae	*C. hystrix* DC.	Fruits	Used as food ingredients.
Rutaceae	*C. maxima* (Burm.) Merr.	Fruits	Eaten fresh as fruit.
Salicaceae	*Flacourtia indica* (Burm.f.) Merr.	Fruits	Eaten fresh as fruit.
Sapindaceae	*Dimocarpus longan* Lour.	Fruits	Eaten fresh as fruit.
Sapindaceae	*Lepisanthes rubiginosa* (Roxb.) Leenh.	Fruits	Eaten fresh as fruit.
Sapindaceae	*Litchi chinensis* Sonn.	Fruits	Eaten fresh as fruit.
Sapindaceae	*Nephelium hypoleucum* Kurz	Fruits	Eaten fresh as fruit.
Sapindaceae	*Schleichera oleosa* (Lour.) Oken	Fruits	Eaten fresh as fruit.
Sapindaceae	*Sisyrolepis muricata* (Pierre.) Leenh.	Fruits	Eaten fresh as fruit.
Sapotaceae	*Manilkara zapota* (L.) P. Royen	Fruits	Eaten fresh as fruit.
Saururaceae	*Houttuynia cordata* Thunb.	Leaves	Eaten as a vegetable.
Solanaceae	*Capsicum annuum* L.	Fruits	Used as food ingredients.
Solanaceae	*Solanum anguivi* Lam.	Fruits	Eaten as a vegetable.
Solanaceae	*S. lycopersicum* L.	Fruits	Used as food ingredients.
Solanaceae	*S. melongena* L.	Fruits	Eaten as a vegetable.
Solanaceae	*S. stramoniifolium* Jacq.	Fruits	Eaten as vegetable.
Solanaceae	*S. torvum* Sw.	Fruits	Eaten as a vegetable.
Solanaceae	*S. virginianum* L.	Fruits	Eaten as a vegetable.
Zingiberaceae	*Alpinia galanga* (L.) Willd.	Young offshoots	Eaten as a blanched vegetable.
Zingiberaceae	*Boesenbergia rotunda* (L.) Mansf.	Rhizomes	Eaten as vegetable.
Zingiberaceae	*Curcuma longa* L.	Rhizomes	Used as food ingredients.
Zingiberaceae	*C. singularis* Gagnep.	Young flowers	Eaten as a vegetable.
Zingiberaceae	*C. zedoaria* (Christm.) Roscoe	Rhizomes	Used as food ingredients.
Zingiberaceae	*Zingiber montanum* (J.Koenig) Link ex A.Dietr.	Rhizomes and flowers	Eaten as a vegetable.
Zingiberaceae	*Z. officinale* Roscoe	Rhizomes	Used as food ingredients.

This current report is consistent with previous studies.[5, 6, 10, 27-33] A total of 113 species from 56 families were identified for use as therapeutic herbs. The Fabaceae family exhibited the most incredible abundance of plants, comprising 11 species, while Zingiberaceae and Rubiaceae followed closely with 9 and 8 species, respectively. According to the survey, the leaves, roots, and bulbs were the most often used parts of the plants in that specific sequence.

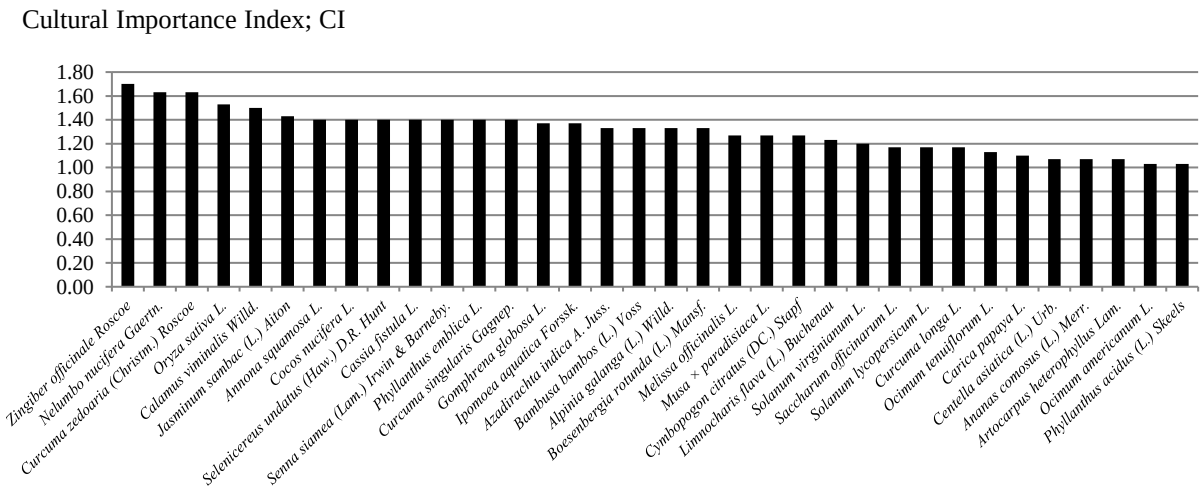

Figure 4: Cultural Importance Index)CI(of plants by Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

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Table 4: List of medicinal plants used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

Family	Scientific name	Used part	Instruction	Use-categories	%FL
Acanthaceae	*Andrographis paniculata* (Burm.f.) Nees	Stems and leaves	Treatment of fever, flu, and sore throat.	Infection	88%
Acanthaceae	*Barleria lupulina Lindl.*	Leaves	Crush or pound, apply or mask to cure insect bites, cure poisonous snake bites.	Poisonings	86%
Acanthaceae	*Thunbergia laurifolia* Lindl.	Roots, stems, and leaves	Boil and drink as tea to cool down.	Infection	71%
Alismataceae	*Limnocharis flava* (L.) Buchenau	Leaves	Help appetite.	Nutritional disorders	100%
Amaranthaceae	*Gomphrena celosioides* Mart.	Roots	Cure urinary tract infection and gallstones.	Genitourinary system	78%
Amaryllidaceae	*Crinum asiaticum* L.	Leaves	Grind, mask, and reduce swelling in the body.	Skin disorders	100%
Anacardiaceae	*Gluta usitata* (Wall.) Ding Hou	Barks	Boil and drink as a tonic.	Nutritional disorders	100%
Anacardiaceae	*Lannea coromandelica* (Houtt.) Merr.	Barks, piths, and leaves	Used to stop bleeding, cure flatulence, treat bruises, and cure thirst.	Gastroenterology	65%
Annonaceae	*Annona squamosa* L.	Leaves	Mask the head used to kill head lice.	Other	100%
Apiaceae	*Centella asiatica* (L.) Urb.	Leaves	Eat fresh, blend, squeeze water, drink to treat bruising.	Nutritional disorders	100%
Apocynaceae	*Holarrhena pubescens* Wall. ex G. Don	Roots	Boil drinking water to cure dysentery and diarrhea.	Gastroenterology	63%
Apocynaceae	*Plumeria obtusa* L.	Latex	Put on the wound and apply to cure shingles.	Poisonings	80%
Apocynaceae	*P. rubra* L.	Latex	Put on the wound and apply to cure shingles.	Poisonings	100%
Arecaceae	*Areca catechu* L.	Seeds	Ingredients for eating betel nut to prevent tooth decay.	Nutritional disorders	92%
Araceae	*Alocasia cucullata* (Lour.) G. Don	Leaves	Mask to reduce swelling.	Skin disorders	100%
Asparagaceae	*Dracaena cochinchinensis* (Lour.) S.C. Chen	Seeds	Boil, drink as tea, nourish the heart.	Nutritional disorders	100%
Asphodelaceae	*Aloe vera* (L.) Burm.f	Leaves	Mask to reduce swelling.	Gastroenterology	72%
Asteraceae	*Blumea balsamifera* (L.) DC.	Leaves	Fire protection for accident victims stimulates blood circulation.	Injuries	91%
Asteraceae	*Chromolaena odorata* (L.) R.M. King & H. Rob.	Roots, stems, and leaves	Pound and apply to the wound to stop the bleeding.	Injuries	100%
Asteraceae	*Elephantopus scaber* L.	Roots and leaves	Boil and drink as a tonic.	Nutritional disorders	100%
Asteraceae	*Gymnanthemum extensum* (DC.) Steetz	Roots, barks, and leaves	Boil, drink as tea, lower blood sugar.	Endocrine system	100%
Basellaceae	*Basella alba* L.	Leaves	Boil and drink to relieve pain and swelling.	Injuries	78%
Bignoniaceae	*Dolichandrone serrulata* (Wall. ex DC.) Seem.	Roots	Boil, resolve phlegm, nourish blood.	Nutritional disorders	63%
Bignoniaceae	*Oroxylum indicum* L. Kurz	Roots	Put on the wound, reduce swelling and inflammation.	Injuries	83%
Brassicaceae	*Rorippa indica* (L.) Hiern	All parts	Pound it, crush it, and apply a rash.	Skin disorders	100%
Bromeliaceae	*Ananas comosus* (L.) Merr.	Young shoots	Boil and drink to cure sore throat.	Respiratory system	63%
Burseraceae	*Canarium subulatum* Guillaumin	Latex	Relieve cough, expel phlegm, relieve itching.	Respiratory system	57%

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Cactaceae	*Selenicereus undatus (Haw.)* D.R. Hunt	Fruits	Eat fresh, reduce diabetes, antioxidants.	Endocrine system	83%
Caricaceae	*Carica papaya* L.	Roots	Boil, drink, and treat paresis.	Muscular-skeletal system	83%
Classulaceae	*Kalanchoe pinnata* (Lam.) Pers.	Leaves	Put on burn wounds.	Skin disorders	83%
Cleomaceae	*Cleome viscosa* L.	All parts	Relieves tendon and muscle pain.	Muscular-skeletal system	80%
Combretaceae	*Terminalia elliptica* Willd.	Stems	Boil drinking water to cure wasting disease.	Nutritional disorders	100%
Convolvulaceae	*Ipomoea aquatica* Forssk.	Stems and leaves	Eye care.	Nutritional disorders	100%
Costaceae	*Hellenia speciosa* (J. Koenig) S.R. Dutta	Leaves	Boil and drink to relieve stomach pain.	Gastroenterology	88%
Cucurbitaceae	*Coccinia grandis* (L.) Voigt	Leaves	Boil, drink, and nourish the eyes.	Nutritional disorders	100%
Cucurbitaceae	*Momordica charantia* L.	Fruits	Lowering blood sugar and lowers blood pressure.	Endocrine system	71%
Cyperaceae	*Cyperus rotundus* L.	Bulbs	Treat menstrual pain.	Pregnancy/Birth/ Puerperium	100%
Dioscoreaceae	*Dioscorea hispida* Dennst.	Bulbs	Pouring, masking, bandaging, treating body swelling.	Skin disorders	71%
Ebenaceae	*Diospyros ehretioides* Wall. ex G. Don	Fruits	Cure fever, cure internal heat.	Infection	88%
Ebenaceae	*D. mollis* Griff.	Fruits	Eaten fresh as fruit, it kills parasites.	Poisonings	100%
Euphorbiaceae	*Bridelia retusa* (L.) A. Juss.	Barks	Grilled, soaked in salt water, and drank to cure diarrhea.	Gastroenterology	100%
Euphorbiaceae	*Cladogynos orientalis* Zipp. ex Span.	Roots	Boil drinking water to cure flatulence.	Gastroenterology	100%
Euphorbiaceae	*Croton persimilis* Mull. Arg.	Leaves	Fire protection for accident victims stimulates blood circulation.	Skin disorders	83%
Euphorbiaceae	*Euphorbia hirta* L.	All parts and latexs	Help the milk to come normally.	Pregnancy/Birth/ Puerperium	56%
Fabaceae	*Afzelia xylocarpa* (Kurz.) Craib.	Stems and barks	Used as a dewormer to treat skin disease and hemorrhoids.	Skin disorders	53%
Fabaceae	*Cassia fistula* L.	Seeds	Fermentation eliminates insect pests.	Poisonings	75%
Fabaceae	*Clitoria ternatea* L.	Flowers	Dried, boiled, and drunk as tea reduces blood pressure, lowers blood sugar, and blackens hair.	Endocrine system	67%
Fabaceae	*Mimosa pudica* L.	Stems	Boil, drink, help diuretic.	Genitourinary system	100%
Fabaceae	*Mucuna pruriens* (L.) DC.	Seeds	Boil, and drink as a tonic.	Nutritional disorders	57%
Fabaceae	*Pachyrhizus erosus* (L.) Urb.	Seeds	Crushing, pounding, mixing with food, poisonous, bored of animals.	Poisonings	100%
Fabaceae	*Senegalia pennata* (L.) Maslin	Roots and barks	Boil and drink as tea.	Nutritional disorders	80%
Fabaceae	*Senna alata* (L.) Roxb.	Leaves	Fresh leaves, crushed or pounded, treat ringworm.	Skin disorders	100%
Fabaceae	*S. siamea* (Lam.) Irwin & Barneby.	Leaves and flowers	Boil, drink as tea, cure flatulence, cure diabetes, ferment, get rid of insect pests.	Endocrine system	67%
Fabaceae	*Sesbania grandiflora* (L.) Poir.	Barks and flowers	Boil and drink as tea to cool down.	Infection	77%

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Fabaceae	*Xylia xylocarpa* (Roxb.) W. Theob.	Barks, flowers and seeds	Reduce fever, nourish the heart, and cure bruises or hemorrhages.	Pregnancy/Birth/ Puerperium	67%
Gentianaceae	*Cyrtophyllum fragrans* (Roxb.) DC.	Piths	Nourish the body as an elixir.	Nutritional disorders	100%
Irvingiaceae	*Irvingia malayana* Oliv. ex A.W. Benn.	Seeds	Nourish tendons, nourish rheumatism, cure joint problems, nourish kidneys, and kill parasites.	Nutritional disorders	50%
Lamiaceae	*Melissa officinalis* L.	Leaves	Eat fresh, and expel the wind.	Gastroenterology	93%
Lamiaceae	*Ocimum americanum* L.	Seeds	Soaking in water lowers cholesterol levels.	Endocrine system	83%
Lamiaceae	*O. tenuiflorum* L.	Roots, leaves and seeds	Boil and drink as tea to relieve flatulence.	Gastroenterology	83%
Lauraceae	*Litsea glutinosa* (Lour.) C.B. Rob.	Roots	Treatment of muscle pain, as a shampoo, nourishing hair.	Other	56%
Lytharaceae	*Lagerstroemia floribunda* Jack	Barks	Cooked as an antidote for dysentery.	Gastroenterology	80%
Lytharaceae	*Punica gramatum* L.	Fruit peels	Solve diarrhea, cure dysentery, cure scurvy, and Stomach nourishment.	Gastroenterology	80%
Malvaceae	*Bombax anceps* Pierre	Barks	Boil drinking water to cure food poisoning.	Nutritional disorders	60%
Malvaceae	*Helicteres isora* L.	Fruits	Stomach pain, gastrointestinal ailments.	Gastroenterology	100%
Malvaceae	*Hibiscus sabdariffa* L.	Dried fruits	Boil drinking water to red color reduce fat in blood vessels.	Endocrine system	80%
Meliaceae	*Azadirachta indica* A. Juss.	Leaves, flowers and seeds	Blanching, nourishing, fermenting, and eliminating insect pests.	Nutritional disorders	89%
Menispermaceae	*Tiliacora triandra* (Colebr.) Diels	Leaves	Juicing, and drinking water lowers blood sugar levels.	Endocrine system	75%
Menispermaceae	*Tinospora crispa* (L.) Hook.f. & Thomson	Stems	Eat fresh, nourish.	Nutritional disorders	100%
Moraceae	*Morus alba* L.	Fruits	Eat fresh as a laxative.	Endocrine system	86%
Moraceae	*Streblus asper* Lour.	Barks	Boil, drink as tea, treat gums and teeth.	Nutritional disorders	80%
Moringaceae	*Moringa oleifera* Lam.	Leaves and seeds	Boil, drink as tea, antioxidants.	Endocrine system	83%
Myrtaceae	*Psidium guajava* L.	Leaves	Chew fresh, reduce bad breath, alcohol smell Nourish gums and teeth.	Nutritional disorders	67%
Myrtaceae	*Syzygium cumini* (L.) Skeels	Fruits	Eat fresh, cure diarrhea.	Gastroenterology	100%
Nelumbonaceae	*Nelumbo nucifera* Gaertn.	Roots and seeds	Used to make an aromatic medicine, tonic.	Nutritional disorders	67%
Ochnaceae	*Ochna integerrima* (Lour.) Merr.	Stems	Boil drinking water to relieve aches and pains, relieve back pain, and waist pain.	Muscular-skeletal system	75%
Oxalidaceae	*Averrhoa carambola* L.	Fruits	Relieve heat in fever.	Infection	71%
Oxalidaceae	*Oxalis corniculata* L.	Leaves	Wound dressing neutralise snake venom.	Poisonings	67%
Passifloraceae	*Passiflora foetida* L.	All parts	Reduce high blood pressure and nourish the heart.	Endocrine system	50%
Phyllanthaceae	*Breynia androgyna* (L.) Chakrab. & N.P. Balakr.	Leaves	Reduce fever	Infection	88%
Phyllanthaceae	*Phyllanthus acidus* (L.) Skeels	Roots	Boil and drink as tea to relieve headaches.	Defined symptoms	63%
Phyllanthaceae	*P. amarus* Schumach. & Thonn.	Roots	Boil, drink, and treat insomnia.	Nutritional disorders	100%

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Phyllanthaceae	*P. emblica* L.	Roots, barks and fruits	Boil, drink as tea, and treat diabetes.	Infection	67%
Piperaceae	*Peperomia pellucida* (L.) Kunth	Leaves	Reduce symptoms of scurvy.	Nutritional disorders	100%
Piperaceae	*Piper nigrum* L.	Seeds	Solve colic, distension.	Gastroenterology	80%
Piperaceae	*P. sarmentosum* Roxb.	Roots	Boil, drink as tea, treat diabetes.	Endocrine system	80%
Poaceae	*Coix lacryma-jobi* L.	Roots	Boil, drink, treat gallstones.	Genitourinary system	100%
Poaceae	*Cymbopogon citratus* (DC.) Stapf	Stems	Eat fresh, boiled, drink to reduce blood pressure.	Endocrine system	89%
Rubiaceae	*Canthium berberidifolium* E.T. Geddes	Roots	Boil, drink, cure tuberculosis.	Respiratory system	50%
Rubiaceae	*Catunaregam tomentosa* (Blume. ex DC.) Triveng.	Piths	Boil drinking water tonic.	Nutritional disorders	63%
Rubiaceae	*Dioecrescis erythroclada* (Kurz) Tirveng.	Barks	Apply fresh wounds to stop the bleeding.	Injuries	60%
Rubiaceae	*Gardenia obtusifolia* Roxb. ex Hook.f.	Stems	Roast it until it's yellow, boil water and drink it to make you have a good appetite.	Nutritional disorders	100%
Rubiaceae	*Mitragyna diversifolia* (Wall. ex G. Don) Havil.	Leaves	Boil to cure diarrhea.	Gastroenterology	100%
Rubiaceae	*Morinda citrifolia* L.	Seeds and piths	Boil and drink as tea.	Nutritional disorders	91%
Rubiaceae	*Morinda coreia* Buch. -Ham.	Barks	Boil is used as a fever remedy, and pomegranate is used as a head lice killer.	Other	63%
Rubiaceae	*Ridsdalea wittii* (Craib) J.T. Pereira	Roots, piths and fruits	Relieve sore throat, boil drinking water to cure fever.	Infection	83%
Rutaceae	*Aegle marmelos* (L.) Corrêa	Fruits	Slice, dry, boil, drink as tea, cure fever, reduce thirst.	Infection	56%
Rutaceae	*Citrus maxima* (Burm.) Merr.	Barks	Burn mosquito repellent insect repellent.	Poisonings	80%
Rutaceae	*Murraya paniculata* (L.) Jack.	Roots, leaves and flowers	Boil and drink as tea make menstruation normal.	Pregnancy/Birth/ Puerperium	100%
Simaroubaceae	*Eurycoma longifolia* Jack	Roots	Boil, tonic.	Nutritional disorders	100%
Solanaceae	*Nicotiana tabacum* L.	Dried leaves	Crush the water, drop it when the slugs stick to the leeches, stop the bleeding.	Injuries	53%
Solanaceae	*Solanum lycopersicum* L.	Fruits	Eat, nourish the skin, apply the face, apply the skin.	Skin disorders	80%
Stemonaceae	*Stemona collinsiae* Craib	Roots	Boil drinking water, deworm parasites.	Gastroenterology	100%
Xyridaceae	*Xyris indica* L.	Bulbs	Mixed with glutinous rice vinegar Apply to wounds with eczema, tinea.	Skin disorders	83%
Zingiberaceae	*Alpinia galanga* (L.) Willd.	Rhizomes	Relieves stomach pain, is a tonic.	Nutritional disorders	88%
Zingiberaceae	*A. malaccensis* (Burm.f.) Roscoe	Rhizomes	Boil, drink, cure tuberculosis.	Respiratory system	57%
Zingiberaceae	*Boesenbergia rotunda* (L.) Mansf.	Rhizomes	Relieve flatulence, indigestion, colic.	Gastroenterology	60%
Zingiberaceae	*Curcuma longa* L.	Rhizomes	Help appetite cure flatulence.	Gastroenterology	75%
Zingiberaceae	*C. singularis* Gagnep.	Rhizomes and flowers	Expelling wind, treating inflammatory bowel disease.	Gastroenterology	80%

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Zingiberaceae	*C. zedoaria* (Christm.) Roscoe	Rhizomes	Boil and drink as tea to cure diarrhea, nourish skin, cure ringworm.	Gastroenterology	72%
Zingiberaceae	*Kaempferia marginata* Carey ex Roscoe	Rhizomes	Wound dressing to cure insect bites.	Poisonings	67%
Zingiberaceae	*Zingiber montanum* (J.Koenig) Link ex A.Dietr.	Rhizomes	Solve flatulence.	Gastroenterology	75%
Zingiberaceae	*Z. officinale* Roscoe	Rhizomes	Boil, drink, cure fever.	Infection	89%

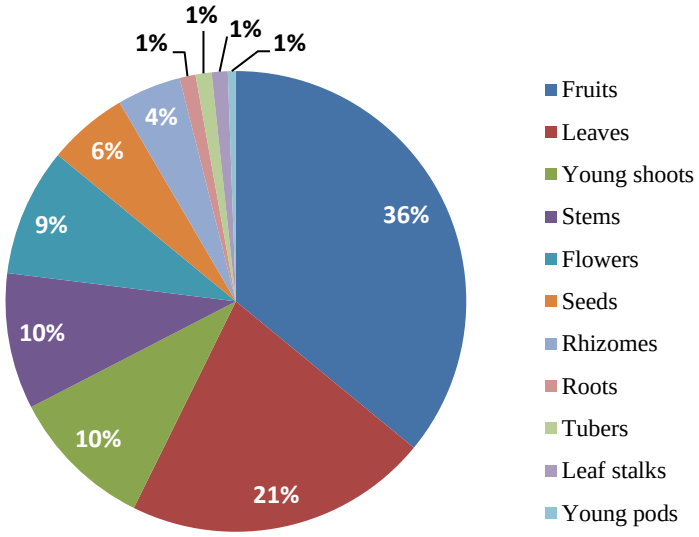

Figure 5: Comparative pie chart of percentages of parts of food plants used by Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province.

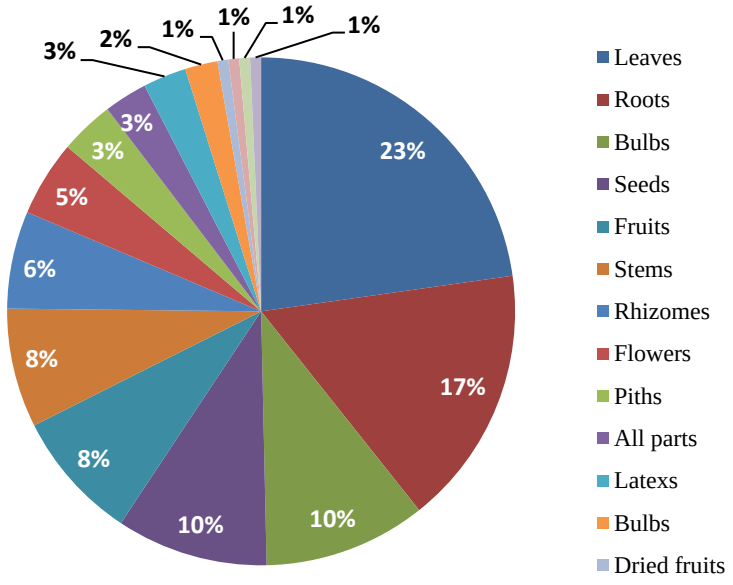

Figure 6: A comparative pie chart shows the percentages of plant parts of plants used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province.

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Again, our study is in agreement with previous reports.[5, 6, 10, 27] The study focuses on the disease symptoms and the Informant Agreement Ratio (IAR) indicator of plants utilized for therapeutic reasons by the Thai Phuan ethnic group in the Ban Phue District of Udon Thani Province. A total of 13 symptom clusters were identified, with the five highest Informant Agreement Ratio (IAR) values corresponding to specified symptoms (1.000), genitourinary system (0.917), respiratory system (0.912), muscular-skeletal system (0.895), and infection (0.885). The information is presented in Table 5.

Table 5: Disease symptom clusters and Informant Agreement Ratio)IAR(index of the therapeutic use of plants by Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

Used-categories	Disorders treated	Number of use report	Number of species	IAR
Defined symptoms	Dizziness	20	1	1.000
Genitourinary system	Diuretic, renal failure	25	3	0.917
Respiratory system	Cough	35	4	0.912
Muscular-skeletal system	Muscle pain, sprain	20	3	0.895
Infection	Fever, diarrhoea, abscess, gonorrhoea	62	8	0.885
Poisonings	Sting, parasite, insect repellent	47	8	0.848
Gastroenterology	Hemorrhoid, stomachache, gastritis, constipation, carminative	104	20	0.816
Other	Shampoo	10	3	0.778
Endocrine system	Diabetes	48	13	0.745
Pregnancy/Birth/Puerperium	Lactation stimulant, recovery (female after giving birth)	11	4	0.700
Injuries	Wound, aphthous ulcers	16	6	0.667
Skin disorders	Skin nourishment, rashes	22	10	0.571
Nutritional disorders	Nutrients supplement	58	27	0.544

A total of 21 plant species were identified to be utilized in various cultural practices. These plants are used for purposes such as worshipping the Buddha, offering garlands, decorating ceremonial spaces, creating trays for honouring teachers and displaying stability and longevity, crafting magical amulets, wrapping sacred objects, producing holy water, and planting in front of houses to seek support and patronage, including the worship of ancestral spirits (Table 6).[28, 29, 30, 31, 32, 33]

Table 6: List of cultural plants used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province

Family	Scientific name	Used part	Instruction
Amaranthaceae	*Gomphrena globosa* L.	Flowers	Decorate the pedestal in order to show respect and honor to the teacher, the Bai Sri pedestal, ensuring its durability over time.
Apocynaceae	*Colotropis gigantea* (L.) W.T. Aiton	Flowers	Decorate the plate with vibrant hues rather than the blossoming of affection.
Apocynaceae	*Plumeria obtusa* L.	Trees	Do not plant anything in the vicinity of the house, as it is considered inauspicious and may lead to hardship.
Arecaceae	*Calamus viminalis* Willd.	Stems	Create a talisman that contains the essence of luck.
Asparagaceae	*Agave amica* (Medik.) Thiede & Govaerts	Flowers	Engage in the veneration of the Buddha image.
Bignoniaceae	*Oroxylum indicum* L. Kurz	Seeds	Ceremony venue decoration.
Fabaceae	*Cassia fistula* L.	Leaves	A stone is used to cleanse the groom's feet during the wedding ceremony prior to entering the bride's residence.
Fabaceae	*Senegalia rugata* (Lam.) Britton & Rose	Seeds	Prepare a vessel with sacred water and immerse the Buddha image in it for bathing.
Moraceae	*Artocarpus heterophyllus* Lam.	Trees	The belief in assistance is firmly rooted in front of the house.
Musaceae	*Musa* × *paradisiaca* L.	Leaf-sheaths	The groom holds a bee castle building (Pasad) during the wedding.

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Nelumbonaceae	*Nelumbo mucifera*	Flowers	Worship.
Oleaceae	*Jasminum sambac* (L.) Aiton	Flowers	Mother's day symbol.
Phyllanthaceae	*Phyllanthus acidus* L. Skeels	Leaves and leaf stalks	Tie them together into a bundle and use them to sprinkle holy water. Planted in front of the house, popular belief.
Piperaceae	*Piper betle* L.	Leaves	Used for rituals.
Poaceae	*Oryza sativa* L.	Seeds	Boon Kum Khao Yai Raising ghosts, grandfather ghosts (ghosts, grandfather ghosts).
Poaceae	*Saccharum officinarum* L.	Stems	Used in the Kathin ceremony The groom's parade at the wedding.
Rhamnaceae	*Ziziphus oenoplia* (L.) Mill.	Stems and thorns	Block the door to the barn. Protection against evil.
Rubiaceae	*Gardenia jasminoides*	Flowers	Used for rituals.
Solanaceae	*Solanum virginianum* L.	Flowers	Adorn the pedestals to pay homage to teachers' belief in humility.
Zingiberaceae	*Curcuma longa* L.	Rhizomes	Dissolve water and pour water over Buddha images.
Zingiberaceae	*Zingiber montanum* (J.Koenig) Link ex A.Dietr.	Rhizomes	Exorcise ghouls.

Through interviews with elderly community members, it was discovered that in the past, numerous medicinal plants were utilized to treat various ailments among the villagers. However, their significance has diminished recently as most individuals rely on modern medicine, which offers rapid results and is more convenient to administer. Consequently, the utilization of herbal medicine has declined and is expected to persist in its decline. Furthermore, the current generation lacks enthusiasm for acquiring and conserving the wisdom amassed by preceding generations. Only a select few individuals persist in studying and transmitting their knowledge to subsequent generations. Hence, it is crucial to devise means of preserving this learning before it fades into obscurity and ultimately vanishes (Figure 7).[3-6, 10]

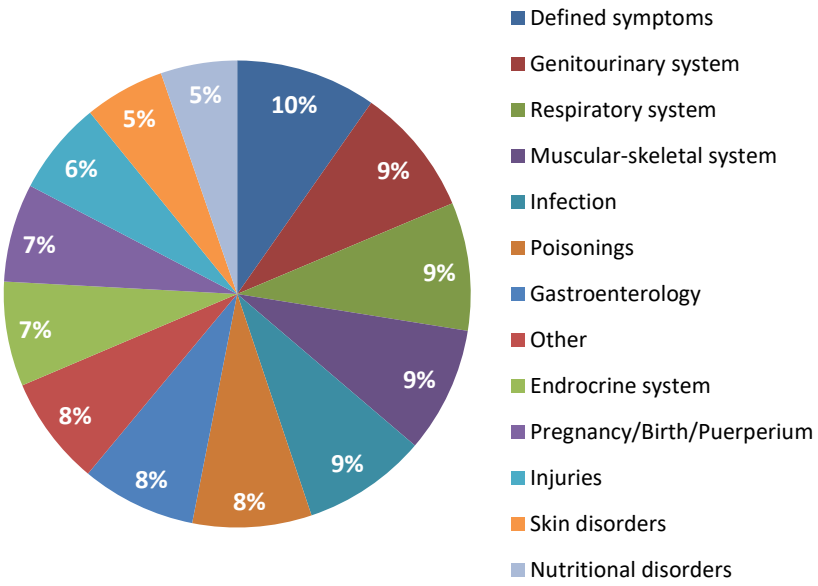

Figure 7: Comparative pie chart of percentages of the group of symptoms treated by medicinal plants used by the Thai Phuan Ethnic Group in Ban Phue District, Udon Thani Province.

In addition to the long-standing concern for collected wisdom, there is another matter to consider. The Thai Phuan community prioritises the preservation of their ancestral cultural traditions, which have been transmitted through successive generations. The various facets of life encompass cultural traditions observed monthly, including the Thai Phuan attire, the Thai Phuan dialect, and the transmission of the Thai Phuan lineage done to ensure preservation and transmission to future generations. This correlates with studies undertaken by previous botanists.[27-41]

Conclusion

The relevance of ethnobotanical study cannot be overemphasised, especially in the transfer of traditional medicine to future generations. This study highlighted the diversity of medicinal plants used by the Thai Phuan ethnic group in Ban Phue District, Udon Thani Province, Thailand. Several species of medicinal plants have been used for centuries to treat various diseases, including genitourinary infections, respiratory infections, musculoskeletal diseases, etc. The study showed

that the Fabaceae family ranked the highest in abundance and applications. Currently, the utilization of plants, especially medicinal plants, has a continuous downward trend. In addition, the new generation is not interested in studying or preserving the wisdom that previous generations accumulated. Only a few are still learning and passing on the ethnobotanical knowledge of the Thai Phuan people to the new generation.

Conflict of Interest

The authors declare no conflict of interest

Authors' Declaration

The authors hereby declare that the work presented in this article are original and that any liability for claims relating to the content of this article will be borne by them.

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