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Original Research Article

Traditional Uses of Combretaceae Species in Nong Bua Lam Phu Province, Thailand: A Study of Ethnomedicinal Practices

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ABSTRACT

The Combretaceae family plays a crucial role in traditional medicine across various cultures, including Thailand. This study investigates the diversity, ethnomedicinal uses, and preparation methods of Combretaceae species in Nong Bua Lam Phu Province. A total of 18 species from three genera—Terminalia, Combretum, and Getonia—were recorded, with Terminalia exhibiting the highest species richness. To evaluate their medicinal relevance, the study applied Relative Frequency of Citation (RFC), Informant Consensus Factor (Fic), and Fidelity Level (FL). Findings indicate that species such as *Combretum pilosum* and *Terminalia chebula* are highly valued for treating cardiovascular, gastrointestinal, and skin-related ailments, with strong consensus among informants. Traditional preparation methods—including decoction, grinding, and soaking—reflect indigenous expertise in extracting bioactive compounds. These results underscore the cultural and therapeutic importance of Combretaceae species in the region. The study highlights the urgent need to preserve this ethnomedicinal knowledge in the face of environmental change and cultural loss. It also calls for further pharmacological research and conservation initiatives to validate and protect these valuable plant resources. The results contribute significantly to the understanding of traditional plant-based medicine in Thailand and reinforces the global significance of indigenous knowledge in promoting sustainable healthcare and biodiversity conservation.

Keywords: Combretaceae, Ethnomedicine, Medicinal plants, Nong Bua Lam Phu Province, Thailand

Introduction

Throughout history, herbal plants have significantly contributed to traditional medical practices, serving as a primary source of healthcare in various parts of the world.[1,2] The dependence on plant-based treatments is especially prominent in rural areas, where access to modern medical care is frequently restricted.[3] Ethnomedicinal practices, deeply embedded in cultural traditions, offer valuable insights into plant biodiversity and therapeutic applications.[4] The Combretaceae family, comprising approximately 600 species distributed across tropical and subtropical regions,[5] is widely recognized for its medicinal properties.[6] Many species within this family have demonstrated potent pharmacological activities, including antimicrobial, anti-inflammatory, antioxidant, and cardioprotective effects, making them an essential component of traditional medicine systems worldwide.[7]

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Thailand, known for its rich biodiversity and extensive history of traditional medicine, is home to a wide range of medicinal plants, including those belonging to the Combretaceae family. Traditional Thai medicine integrates indigenous knowledge with herbal remedies, dietary practices, and spiritual healing to treat various ailments.[8] Many Combretaceae species are incorporated into this system due to their broad-spectrum medicinal properties, including their use in treating gastrointestinal disorders, skin infections, respiratory illnesses, and cardiovascular diseases.[9] The genus *Terminalia* is particularly significant in Thai ethnomedicine, with species such as *T. bellirica* and *T. chebula* being widely utilized for their diarrhea, dysentery, and headache.[10] Despite their extensive use, a clear understanding of the traditional applications, preparation methods, and cultural relevance of Combretaceae species in specific Thai communities remains limited. This gap in documentation is concerning, especially in light of challenges such as rapid urbanization, environmental degradation, and changes in lifestyle that have led to a decline in traditional knowledge transmission, posing a risk to the preservation of valuable medicinal plant resources.[11] Furthermore, overharvesting and habitat destruction threaten the sustainability of wild medicinal plant populations, necessitating urgent conservation efforts.[12] To address these challenges, systematic ethnobotanical studies are required. Such studies are critical to safeguarding indigenous knowledge, encouraging sustainable resource use, and facilitating the meaningful integration of traditional medicine into modern healthcare systems.[13] Previous research has emphasized the pharmacological importance of the Combretaceae family, with numerous species demonstrating potential bioactive compounds like tannins, flavonoids, alkaloids, and saponins.[14] These

compounds contribute to their diverse medicinal properties, including antimicrobial, anti-inflammatory, and antioxidant effects, which are crucial in managing infectious diseases, chronic conditions, and metabolic disorders.[15] However, while laboratory-based research has demonstrated the therapeutic potential of these species, ethnobotanical field studies are necessary to understand their practical applications, preparation methods, and cultural significance within indigenous communities.

The aim of this study is to investigate the diversity and ethnomedicinal applications of Combretaceae species in Nong Bua Lam Phu Province, Thailand. The specific objectives of this study are to: (i) document the Combretaceae species utilized by local communities and their geographic distribution, (ii) assess the Relative Frequency of Citation (RFC)—a measure that quantifies the importance of a species based on informant agreement—to determine ethnomedicinal significance, (iii) evaluate the Informant Consensus Factor (F_{ic}) to assess the level of agreement among informants regarding plant usage categories, and (iv) analyze traditional preparation and administration methods used in local healing practices. These methods are relevant as they combine both quantitative and qualitative approaches in ethnobotanical research. RFC and F_{ic} are widely used indices that help identify culturally important species and validate traditional knowledge. Analyzing preparation methods also reveals practical insights into how plants are used medicinally, aiding in the preservation of intangible cultural heritage and guiding future pharmacological investigations. Understanding the traditional uses of medicinal plants is crucial not only for preserving cultural heritage but also for identifying potential candidates for drug development. Ethnopharmacological research serves as a bridge between indigenous knowledge and modern scientific exploration, paving the way for novel therapeutic discoveries.[16] Given the increasing global interest in plant-based medicine, studies such as this provide valuable insights into the biodiversity, pharmacological potential, and conservation needs of medicinal plant species.[17] This research highlights the importance of ethnomedicinal knowledge, particularly concerning the Combretaceae family in Thailand. Documenting and analyzing traditional uses, especially through structured field-based ethnobotanical methods, can contribute meaningfully to conservation strategies, sustainable use, and the validation of herbal medicine within broader healthcare frameworks. By investigating the diversity, traditional use, and preparation methods of Combretaceae species in Nong Bua Lam Phu Province, this study aims to preserve and promote the sustainable utilization of these valuable medicinal resources.

Materials and Methods

Study area

Nong Bua Lam Phu is a province located in the upper northeastern region of Thailand, within the Sakon Nakhon Basin (Figure 1). It spans an area of approximately 3,859.062 square kilometers, accounting for 2.27 percent of the northeastern region. The province is administratively divided into six districts: Mueang Nong Bua Lam Phu, Na Klang, Non Sang, Si Bun Rueang, Suwannakhuha, and Na Wang.[18] The province's topography is primarily characterized by a plateau, with certain regions exhibiting shallow to deep undulating landforms. The terrain slopes predominantly towards the south and east, with an average elevation of approximately 200 meters above mean sea level. The northern portion of the province is more mountainous, containing significant peaks such as Doi Pha Wiang and Phu Sam Yot, which rise to an average altitude of around 900 meters.

Data collection

A botanical survey was carried out in Nong Bua Lam Phu Province between February 2024 and March 2025. The research process included interviews with local experts, traditional medicine practitioners, elders, and community members. In total, 120 individuals participated in open-ended discussions, offering detailed knowledge about indigenous plant names, their medicinal uses, preparation techniques, and the specific plant parts utilized. Plant species identified during the study were documented by noting local names, capturing photographs, and collecting specimens for herbarium curation. These samples were stored in the collection of the Vascular Plant Herbarium, Mahasarakham University (VMSU) and within designated national parks and conservation zones. To preserve the local ecosystem, only images and observational data were gathered in the field, avoiding the removal of any plants from their natural environment. For morphological analysis, the celandine samples underwent examination under a stereomicroscope (Stemi 2000-C, Zeiss, Oberkochen, Germany). Precise measurements were obtained using standard tools like a ruler and vernier caliper. Species identification was carried out by comparing collected specimens to original descriptions and references from Plants of the World Online (POWO). Additionally, a review of key taxonomic references and academic databases, including Google Scholar, Scopus, and Web of Science, was conducted. Visual comparisons were also made with digital herbarium images and resources available through Kew Science.

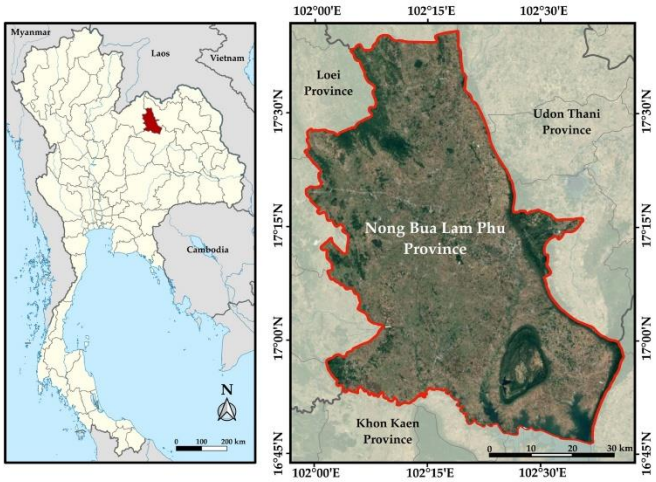

Figure 1: Map of study area, Nong Bua Lam Phu Province, Northeastern Thailand

Data analysis

Relative frequency of citation (RFC)

The Relative Frequency of Citation (RFC) is used to assess the relative importance of a particular plant species based on how frequently it is cited by respondents. This index offers valuable insight into the cultural significance and the extent to which particular plant species are utilized by the community. The RFC is calculated using the formula (equation 1):[19]

$$RFC = \frac{FC}{N}$$

In this context, FC indicates how many informants cited the use of a given species, and N represents the overall number of informants involved in the research.

Fidelity level (FL)

The Fidelity Level (FL) measures the percentage of informants who identified a specific plant species as a remedy for a particular disease in the study area. It is calculated using the formula (equation 2):[20]

$$FL = \frac{I_p}{I_u} \times 100$$

where; I_p denotes the number of informants who specifically associated the plant with a single ailment, while I_u represents the total informants who recognized the plant's medicinal use for any health condition.

Informant consensus factor (F_{ic})

The Informant Consensus Factor (F_{ic}) quantifies the degree of agreement among informants regarding the use of plant species within specific categories. It is calculated using the formula (equation 3):[21]

$$F_{ic} = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

where; n_{ur} represents the total number of use reports within a category, and n_t refers to the number of plant species utilized in that category. The

Fic value ranges from 0 to 1, with higher values indicating greater consensus among informants.

Results and Discussion

Diversity of Combretaceae usd as medicine

The study identified 18 species within three genera of Combretaceae were documented in the study area, with variation in species distribution across the genera (Table 1, Figure 2). The genus *Terminalia* exhibited the highest species richness, comprising 9 species, followed by *Combretum* with 8 species. The genus *Getonia* was represented by a single species. Among the species recorded, 17 were native and 1 was introduced species. In terms of plant distribution status, 10 species were categorized as cultivated, 1 species as wild, and 7 species as both wild and cultivated, some of which are illustrated in Figure 3.

Table 1: Diversity of Combretaceae species in Nong Bua Lam Phu Province, including their vernacular name, origin, distribution, used parts and voucher number

No.	Scientific name	Vernacular name	Origin	Distribution status for Thailand	Used parts	RFC	Voucher number
1.	*Combretum acuminatum* Roxb.	Khamin Khruea	Native	Cultivated	Leaves	0.42	TJ333
2.	*Combretum chinense* Roxb. ex G.Don	Sa Kae Thao	Native	Wild	Leaves, seeds	0.43	TJ334
3.	*Combretum indicum* (L.) DeFilipps	Leb Mue Nang	Native	Cultivated	Leaves, seeds	0.36	TJ335
4.	*Combretum latifolium* Blume	Uat Chueak	Native	Cultivated	Leaves, whole plant	0.60	TJ336
5.	*Combretum pilosum* Roxb. ex G.Don	Nguang Chum	Native	Cultivated	Roots	0.64	TJ337
6.	*Combretum quadrangulare* Kurz	Kae	Native	Cultivated	Leaves, stem	0.51	TJ338
7.	*Combretum tetralophum* C.B.Clarke	Krot	Native	Cultivated	Bark, fruits	0.37	TJ339
8.	*Combretum trifoliatum* Vent.	Khot Sang	Native	Cultivated	Bark, fruits, roots	0.44	TJ340
9.	*Getonia floribunda* Roxb.	Ting Tang	Native	Wild and cultivated	Leaves, roots	0.39	TJ341
10.	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Rok Faa Khaow	Introduced	Cultivated	Bark, Leaves	0.41	TJ342
11.	*Terminalia bellirica* (Gaertn.) Roxb.	Samo Phiphek	Native	Wild and cultivated	Fruits, seeds	0.61	TJ343
12.	*Terminalia calamansanai* (Blanco) Rolfe	Haen Daeng	Native	Wild and cultivated	Bark	0.46	TJ344
13.	*Terminalia catappa* L.	Hukwang	Native	Cultivated	Bark, Leaves, whole plant	0.47	TJ345
14.	*Terminalia chebula* Retz.	Samo Thai	Native	Wild and cultivated	Fruits, Leaves	0.63	TJ346
15.	*Terminalia citrina* (Gaertn.) Roxb.	Samo Di Ngu	Native	Cultivated	Fruits	0.58	TJ347
16.	*Terminalia corticosa* Pierre ex Craib & Hutch.	Ta Baek Lueat	Native	Wild and cultivated	Bark, stem	0.43	TJ348
17.	*Terminalia elliptica* Willd.	Rok Faa	Native	Wild and cultivated	Bark, stem	0.57	TJ349
18.	*Terminalia triptera* Stapf	Saen Kham	Native	Wild and cultivated	Bark	0.38	TJ350

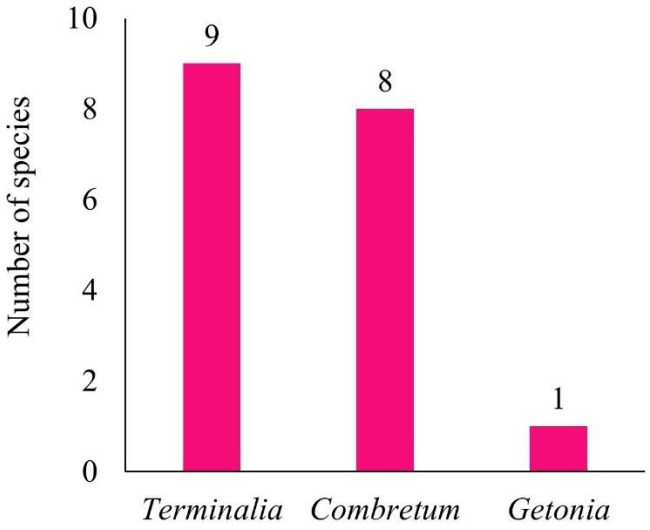

Figure 2: Diversity of Combretaceae used as medicine in Nong Bua Lam Phu Province

Relative frequency of citation (RFC) of Combretaceae used as medicine

The study documented the use of plant species within the Combretaceae family in Nong Bua Lam Phu, focusing on their ethnomedicinal applications (Table 1). A total of 18 species from three genera, *Combretum*, *Getonia*, and *Terminalia*, were identified, with their respective Relative Frequency of Citation (RFC) values calculated. Species were grouped into three categories depending on their respective RFC values: high (≥0.55), medium (0.40–0.54), and low (<0.40). Species with high RFC values, indicating frequent utilization, included *Combretum pilosum* (0.64), *Terminalia chebula* (0.63), *Terminalia bellirica* (0.61), *Combretum latifolium* (0.60), *Terminalia citrina* (0.58), and *Terminalia elliptica* (0.57). Medium RFC values were recorded for *Combretum quadrangulare* (0.51), *Terminalia catappa* (0.47), *Terminalia calamansanai* (0.46), *Combretum trifoliatum* (0.44), *Combretum chinense* (0.43), *Terminalia corticosa* (0.43), *Combretum acuminatum* (0.42), and *Terminalia arjuna* (0.41). Species with low RFC values, which were less frequently cited, included *Getonia floribunda* (0.39), *Terminalia triptera* (0.38), *Combretum tetralophum* (0.37), and *Combretum indicum* (0.36).

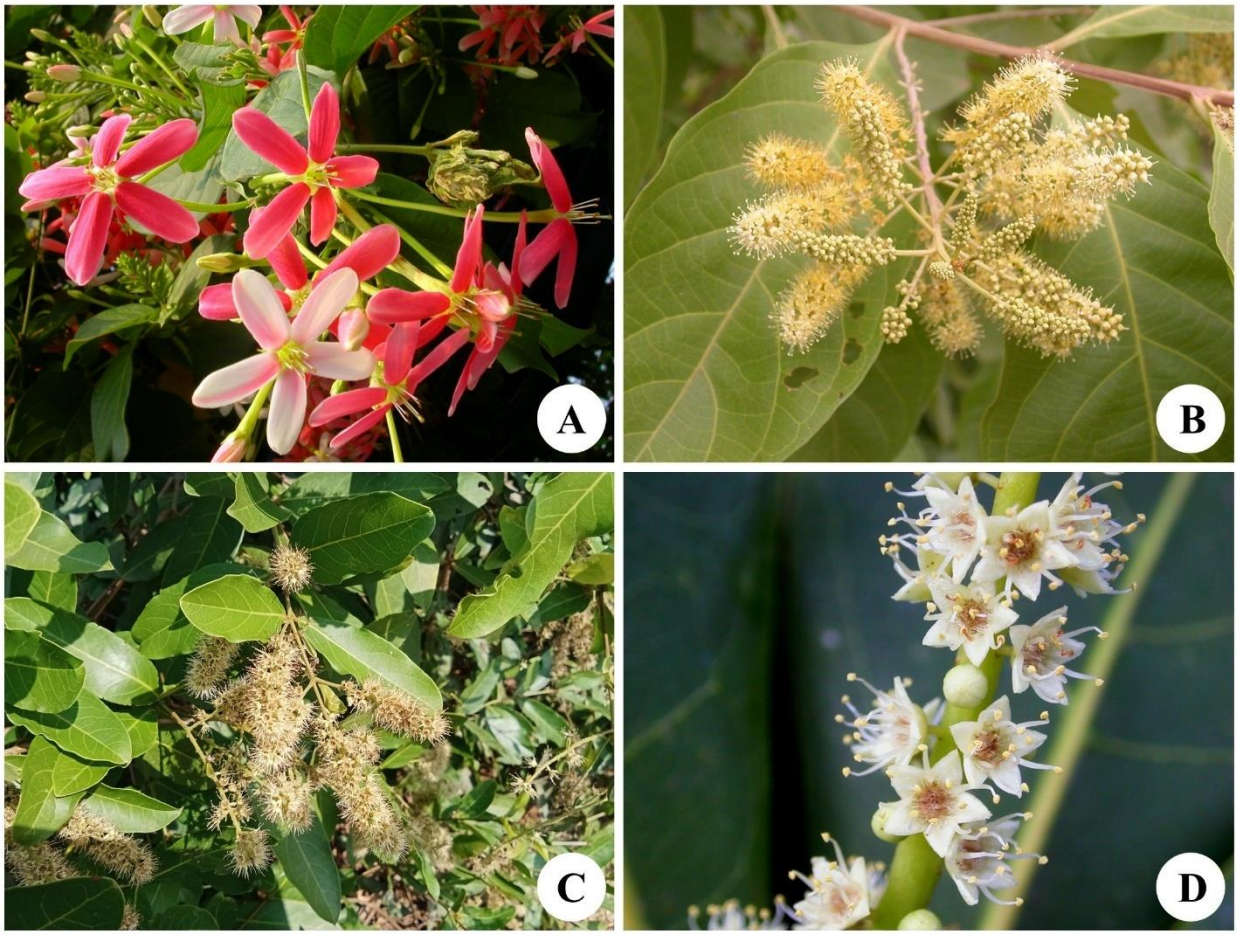

Figure 3: Examples of Combretaceae species used for medicinal purposes in Nong Bua Lam Phu Province: (A) *Combretum indicum* (L.) DeFilipps, (B) *Combretum quadrangulare* Kurz, (C) *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn, (D) *Terminalia catappa* L. Photograph by: A, B, and D. Surapon Saensouk, C. Tammanoon Jitpromma.

Mode of preparation

The preparation methods for Combretaceae species in Nong Bua Lam Phu reveal a diverse range of traditional techniques, with the majority focusing on extracting liquid preparations from various plant parts. Boiling water and filtering the plant material to obtain the liquid portion was the most common method used across all species. This approach was applied to various plant parts, including leaves, stems, bark, seeds,

fruits, and roots. The technique suggests an emphasis on extracting water-soluble compounds from the plant material.

In some cases, pounding or grinding the plant material was used, particularly for leaves, to help release essential compounds before preparation. This method was frequently paired with boiling or filtering, allowing for a more efficient extraction of medicinal components.

For certain species like *Combretum latifolium* and *C. trifoliatum*, a more specialized technique of squeezing and filtering was used, especially for extracting liquid from the leaves or roots. Additionally, some plant parts were combined with other ingredients in the preparation process. For instance, *Combretum pilosum* roots were ground with rice water, which may enhance the medicinal effect of the preparation. *Combretum trifoliatum* roots were also soaked in alcohol, likely to create a tincture for preservation or concentrated medicinal use. Fresh consumption was noted for *Terminalia chebula* fruits, which were eaten fresh as part of the ethnomedicinal practice, emphasizing the direct consumption of certain plant parts for their immediate therapeutic benefits. These diverse preparation methods demonstrate the community's adaptability and knowledge of plant materials, using various techniques to maximize the medicinal efficacy of Combretaceae species.

Used parts of Combretaceae usd as medicine

The study examined the traditional uses of various parts of Combretaceae species in Nong Bua Lam Phu. Among the plant parts used, bark was the most frequently cited, comprising 28.95% of all reported uses. Leaves followed closely at 26.32%, indicating their significant role in the local ethnomedicinal practices. The fruits of Combretaceae species were also notably used, accounting for 15.79% of the reports. Other parts, such as seeds, roots, and stems, each represented 7.89% of reported uses, while the whole plant was the least used, contributing to 5.26% of the total reports. This distribution reflects the various medicinal, ritual, or functional roles attributed to different plant parts in the community.

Informant consensus factor (F_{ic}) of Combretaceae usd as medicine

The informant consensus factor (F_{ic}) values for Combretaceae species in Nong Bua Lam Phu Province indicate varying degrees of agreement among informants regarding their medicinal use (Table 2).

Table 2: Informant consensus factor (F_{ic}) of Combretaceae species in Nong Bua Lam Phu Province.

Group of ailments	Total number of use reports (n_{ur})	The number of plant species (n_t)	F_{ic}
Skin	21	8	0.65
Infections	19	8	0.61
Gastro-intestinal system	23	7	0.73
Immunological products and vaccines	10	3	0.78
Obstetrics, gynaecology and urinary-tract disorders	10	4	0.67
Cardiovascular system	3	1	1.00
Ear, nose, oropharynx and oral cavity	4	1	1.00
Nutrition and blood	5	1	1.00
Cardiovascular system	6	2	0.80
Musculoskeletal and joint diseases	3	1	1.00

The highest F_{ic} value (1.00) was observed in four ailment categories: cardiovascular system (3 use reports), ear, nose, oropharynx, and oral cavity (4 use reports), nutrition and blood (5 use reports), and musculoskeletal and joint diseases (3 use reports), suggesting strong consensus regarding the application of one species to treat these conditions. The cardiovascular system also had another category with a F_{ic} value of 0.80 (6 use reports), indicating relatively high agreement but with multiple species involved. Other notable F_{ic} values include immunological products and vaccines (0.78, 10 use reports), gastrointestinal system (0.73, 23 use reports), obstetrics, gynecology, and urinary-tract disorders (0.67, 10 use reports), skin diseases (0.65, 21 use reports), and infections (0.61, 19 use reports). These findings highlight that informants exhibit the highest consensus when a single species is commonly used for a particular ailment, whereas categories with multiple species tend to show moderate F_{ic} values, reflecting a broader range of medicinal plant use within the Combretaceae family.

Fidelity level (FL) of Combretaceae usd as medicine

Eighteen Combretaceae species were identified as medicinal plants in Nong Bua Lam Phu Province (Table 3). Among them, *Terminalia calamansanai* and *Combretum pilosum* had the highest Fidelity Level (FL) value of 100, indicating their exclusive use for treating urinary tract stones and fever, respectively. Other species with high FL values include *C. latifolium* (83.33), used primarily for treating diarrhea, and *T. arjuna* (62.50), applied externally to treat wounds and internally to reduce blood pressure and heart palpitations. The species receiving the highest number of mentions for its applications is *Combretum acuminatum*, widely used in traditional medicine. The leaves (40.00%) are pounded or ground and applied externally to treat boils and scalds, while a decoction (60.00%) is consumed as an anthelmintic remedy. Similarly, *Combretum chinense* is also used externally (42.86%) for boils and internally (57.14%) as an anthelmintic treatment, highlighting its diverse applications. Several species were reported for gastrointestinal ailments. *Combretum tetralophum* is commonly used, with the bark (60.00%) boiled for dysentery and diarrhea, while the fruits (40.00%) are used as an anthelmintic. *Terminalia corticosa* follows a similar pattern, with bark decoctions (37.50%) used to treat diarrhea and stem infusions (62.50%) for anemia.

In terms of cardiovascular applications, *Terminalia elliptica* is a key species, with bark decoctions (30.00%) used for heart nourishment and as a diuretic (40.00%). *Terminalia triptera* is similarly important, with bark decoctions (50.00%) used for heart health, while other preparations address wounds (33.33%) and dysentery (16.67%). Several species were also used for dermatological conditions. *Terminalia chebula* leaves (33.33%) are pounded and applied to the skin to treat wounds, similar to *T. arjuna* and *Getonia floribunda*. Additionally, *Combretum quadrangulare* leaves (60.00%) are externally applied for wound healing, while the stem (40.00%) is used to expel lochia.

The present study highlights the significant role of Combretaceae species in traditional medicine, emphasizing their widespread use and diverse applications. The high species richness observed in *Terminalia* aligns with previous ethnobotanical studies by *Silén et al.*[9] and *Tiwari et al.*[22], which have reported this genus as a major source of medicinal compounds in Southeast Asia. The preference for cultivated over wild

Table 3: Fidelity level (FL) of Combretaceae species in Nong Bua Lam Phu Province

Scientific name	I_p	I_u	FL	Used parts	Preparation	Method of use	Ailment	Group of ailments
Combretum acuminatum Roxb.	2	5	40.00	Leaves	Pound or grind	Applied to skin	Treat boils and scalds	Skin
	3	5	60.00	Leaves	Boil water and filter to get only the liquid part	Drink	Anthelmintic	Infections
Combretum chinense Roxb. ex G.Don	3	7	42.86	Leaves	Pound or grind	Applied to skin	Treat boils	Skin
	4	7	57.14	Seeds	Boil water and filter to get only the liquid part	Drink	Anthelmintic	Infections
Combretum indicum (L.) DeFilipps	2	4	50.00	Leaves	Pound or grind	Applied to skin	Treat boils and scalds	Skin
	2	4	50.00	Seeds	Boil water and filter to get only the liquid part	Drink	Anthelmintic	Infections
Combretum latifolium Blume	5	6	83.33	Leaves	Squeeze and filter to get only the liquid part	Drink	Treat diarrhea	Gastro-intestinal system
	1	6	16.67	Whole plant	Boil water and filter to get only the liquid part	Drink	Treat diarrhea	Gastro-intestinal system
Combretum pilosum Roxb. ex G.Don	4	4	100.00	Roots	Ground with rice water	Drink	Treat fever	Immunological products and vaccines
Combretum quadrangulare Kurz	2	5	40.00	Stem	Boil water and filter to get only the liquid part	Drink	Expel lochia	Obstetrics, gynaecology and urinary-tract disorders
	3	5	60.00	Leaves	Pound or grind	Applied to skin	Treat wounds	Skin
Combretum tetralophum C.B.Clarke	3	5	60.00	Bark	Boil water and filter to get only the liquid part	Drink	Treat dysentery and diarrhea	Gastro-intestinal system
	2	5	40.00	Fruits	Boil water and filter to get only the liquid part	Drink	Anthelmintic	Infections
Combretum trifoliatum Vent.	2	5	40.00	Bark	Ground with rice water	Drink	Treat dysentery and diarrhea	Gastro-intestinal system
	2	5	40.00	Root	Soaked in alcohol	Drink	Treat stomach pain and colic	Gastro-intestinal system
	1	5	20.00	Fruits	Boil water and filter to get only the liquid part	Drink	Anthelmintic	Infections
Getonia floribunda Roxb.	4	6	66.67	Roots	Boil water and filter to get only the liquid part	Drink	Treat venereal diseases	Infections
	2	6	33.33	Leaves	Pound or grind	Applied to skin	Treat wounds	Skin
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	5	8	62.50	Leaves	Pound or grind	Applied to skin	Treat wounds	Skin
	3	8	37.50	Bark	Ground and mix with water	Drink	Reduce blood pressure and treat heart palpitations	Cardiovascular system
Terminalia bellirica (Gaertn.) Roxb.	2	3	66.67	Fruits	Boil water and filter to get only the liquid part	Drink	Reduce fever	Immunological products and vaccines

	1	3	33.33	Seeds	Boil water and filter to get only the liquid part	Drink	Treat dysentery	Infections
Terminalia calamansanai (Blanco) Rolfe	3	3	100.00	Bark	Boil water and filter to get only the liquid part	Drink	Treat urinary tract stones	Obstetrics, gynaecology and urinary-tract disorders
Terminalia catappa L.	3	6	50.00	Whole plant	Boil water and filter to get only the liquid part	Drink	Treat dysentery and diarrhea	Gastro-intestinal system
	1	6	16.67	Bark	Boil water and filter to get only the liquid part	Drink	Treat vaginal discharge	Obstetrics, gynaecology and urinary-tract disorders
	2	6	33.33	Leaves	Boil water and filter to get only the liquid part	Drink	Anthelmintic	Infections
Terminalia chebula Retz.	2	6	33.33	Leaves	Pound or grind	Applied to skin	Treat wounds	Skin
	4	6	66.67	Fruits	Eat fresh	Eat	Treat fever	Immunological products and vaccines
Terminalia citrina (Gaertn.) Roxb.	3	7	42.86	Fruits	Boil water and filter to get only the liquid part	Drink	Treat abdominal diseases, astringent, treat severe diarrhea	Gastro-intestinal system
	4	7	57.14	Fruits	Boil water and filter to get only the liquid part	Drink	Cough remedy	Ear, nose, oropharynx and oral cavity
Terminalia corticosa Pierre ex Craib & Hutch.	3	8	37.50	Bark	Boil water and filter to get only the liquid part	Drink	Treat dysentery and diarrhea	Gastro-intestinal system
	5	8	62.50	Stem	Boil water and filter to get only the liquid part	Drink	Treat anemia	Nutrition and blood
Terminalia elliptica Willd.	3	10	30.00	Bark	Boil water and filter to get only the liquid part	Drink	Heart nourishment	Cardiovascular system
	4	10	40.00	Bark	Boil water and filter to get only the liquid part	Drink	Diuretic	Obstetrics, gynaecology and urinary-tract disorders
	3	10	30.00	Stem	Boil water and filter to get only the liquid part	Drink	Relieves inflammation and muscle and tendon pain	Musculoskeletal and joint diseases
Terminalia triptera Stapf	1	6	16.67	Bark	Boil water and filter to get only the liquid part	Drink	Treat dysentery and diarrhea	Gastro-intestinal system
	3	6	50.00	Bark	Boil water and filter to get only the liquid part	Drink	Heart nourishment	Cardiovascular system
	2	6	33.33	Bark	Boil water and filter to get only the liquid part	Applied to skin	Treat wounds	Skin

species suggests intentional propagation and domestication by local communities actively manage and propagate these plants, ensuring their availability for medicinal use.[23] This practice reflects the cultural importance of these species and highlights the potential threat to wild populations due to overharvesting, a concern noted in other studies.[24] However, such preference may inadvertently place pressure on wild populations, especially for species not easily cultivated, reinforcing the urgent need for habitat protection and community-based conservation strategies.[25]

The high Relative Frequency of Citation (RFC) values for species like *Combretum pilosum* and *Terminalia chebula* indicate their strong ethnomedicinal significance, possibly due to their effectiveness in treating common ailments.[26] This is consistent with ethnobotanical reports from neighboring regions where these species are frequently used to treat antimicrobial, anti-inflammatory, and antioxidant

properties.[27] Their popularity may be attributed to their perceived efficacy, widespread availability, and versatility in treating a range of health conditions. This is further supported by pharmacological studies conducted by *Wang et al.*[28] and *Kim et al.*[29], which confirm the antimicrobial, antioxidant, and anti-inflammatory properties of these species. The variation in RFC values across species suggests that some plants are more deeply embedded in cultural practices, while others may be used opportunistically based on availability.

Traditional preparation methods reveal an emphasis on extracting bioactive compounds through boiling, pounding, and soaking. These techniques align with previous ethnopharmacological studies indicating that water-based extractions retain significant therapeutic properties of medicinal plants.[30] The combination of certain plant parts with other ingredients, such as rice water or alcohol, suggests an indigenous understanding of solubility and bioavailability, which could enhance the efficacy of the preparations.[13]

The informant consensus factor (F_{ic}) values indicate a high level of agreement on the use of Combretaceae species for specific ailments, particularly in treating cardiovascular diseases, gastrointestinal disorders, and skin conditions. This strong consensus supports previous reports that highlight the therapeutic relevance of Combretaceae species in managing these health concerns.[8] The high F_{ic} values for cardiovascular and gastrointestinal treatments suggest that these plants contain bioactive compounds with potential pharmacological benefits, an area that warrants further phytochemical and clinical investigation.

The fidelity level (FL) analysis reinforces the strong association between specific species and particular ailments. The exclusive use of *Terminalia calamansanai* for urinary tract stones and *Combretum pilosum* for fever suggests that these plants are highly trusted remedies within the community.[31] Such specificity has been reported in other ethnomedicinal studies, where plants with high FL values often contain well-documented bioactive compounds supporting their traditional uses.[32] Species with high FL values are often linked to unique phytochemical profiles, indicating the need for targeted phytochemical and pharmacodynamic investigations.[24,33-35]

Overall, this study contributes important comparative data to the growing body of ethnobotanical research on the Combretaceae family. The findings not only reaffirm the cultural and medicinal importance of these species in Thailand but also highlight the need for urgent conservation, particularly for species facing habitat loss and overharvesting. Recent studies have emphasized the importance of integrating ethnobotanical data with chemical profiling and ecological modeling to inform conservation priorities.[36] Furthermore, the clear ethnomedicinal potential shown here underscores the necessity for systematic pharmacological validation, especially for species with high RFC, FL, and F_{ic} values. Future research should prioritize bioactivity screening, compound isolation, and clinical trials to translate traditional knowledge into evidence-based therapeutics.

Conclusion

This study highlights the significant role of Combretaceae species in traditional medicine within Nong Bua Lam Phu Province, Thailand. The diversity of species, particularly within the genera *Terminalia* and *Combretum*, underscores their cultural and medicinal importance. The high Relative Frequency of Citation (RFC) and Informant Consensus Factor (F_{ic}) values for certain species suggest strong community reliance on these plants for treating ailments such as cardiovascular diseases, gastrointestinal disorders, and skin conditions. Traditional preparation methods, including boiling, pounding, and soaking, indicate an in-depth knowledge of plant extraction techniques to maximize medicinal efficacy. The findings emphasize the urgent need for conservation efforts to protect both cultivated and wild Combretaceae species from overexploitation. Additionally, further pharmacological research is necessary to validate the bioactive compounds responsible for their therapeutic properties. By integrating ethnomedicinal knowledge with modern scientific studies, these species hold great potential for future pharmaceutical applications. Future studies could explore the standardization of herbal formulations, assess the clinical efficacy of commonly used species through trials, and investigate sustainable cultivation practices to ensure a stable supply chain. Collaborative research involving ethnobotanists, pharmacologists, and conservationists will be key to advancing the practical use of these medicinal plants. Preserving traditional knowledge while promoting sustainable use will be crucial for ensuring the continued benefits of Combretaceae plants for local communities and beyond. Ultimately, this research lays a foundational step toward the development of evidence-based herbal medicine and the integration of traditional plant knowledge into national healthcare and biodiversity conservation strategies.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

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

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