VNU Journal of Science: Medical and Pharmaceutical Sciences

Journal homepage: https://js.vnu.edu.vn/MPS

Original Article

Traditional Knowledge of Medicinal Plants Used by the Dao People in the Duc Commune, Nguyen Binh District, Cao Bang Province

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Received 24th April 2026
Revised 24th October 2026; Accepted 4th November 2026

Abstract: An ethnobotanical survey among the Dao community in The Duc commune, Nguyen Binh district, Cao Bang province (currently Nguyen Binh commune, Cao Bang province) recorded 202 taxa used in traditional medicine, belonging to 76 families and 155 genera. These plants are employed to treat 16 categories of illnesses, with gastrointestinal disorders being most frequently addressed (64 taxa, 31.68%). Decoction for oral intake was the predominant preparation method (83.66%), and whole plants were used in 59.41% of cases. Regarding conservation, 64.85% of taxa were collected near households, 12.87% were cultivated in herbalists' home gardens, and three taxa are listed in the Viet Nam Red List of Threatened Species. Notably, twelve taxa were identified as novel records for medicinal use in Vietnam. To our knowledge, pharmacological data for *Saurauia macrotricha* Kurz. in literature and common reference databases are currently unavailable, suggesting potential for further investigation. This study represents the first systematic documentation of Dao traditional medicinal knowledge in The Duc commune, providing a scientific basis for conservation and sustainable management of medicinal plants in the region.

Keywords: Ethnobotany, Dao people, Nguyen Binh commune, medicinal plants, conservation.

1. Introduction

Vietnam possesses a diverse repository of medicinal plants, with 5,117 documented species used for medicinal purposes [1]. The Duc commune, located in Nguyen Binh district, Cao Bang province within the buffer zone of the Phia Oac-Phia Den National Park, offers favorable conditions for the growth and development of numerous medicinal plant species [2]. The Dao ethnic community in The Duc commune has

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https://doi.org/10.25073/2588-1132/vnumps.4987

longstanding experience in using local flora for traditional medicine and healthcare. However, this knowledge is gradually eroding due to multiple factors, including overexploitation, environmental pollution, natural calamities [3], and significantly, by a lack of systematic documentation. To date, no studies or records have been published on the medicinal plants or related ethnobotanical knowledge in The Duc commune. Therefore, this study was conducted to document the Dao community's traditional knowledge of medicinal plants, assess the current conservation status of these species, and propose strategies for the preservation and sustainable development of medicinal plants in the region.

2. Subjects and Methods

2.1. Study Period and Location

The study was conducted from December 2024 to June 2025 in The Duc Commune, Nguyen Binh District, Cao Bang Province (currently Nguyen Binh Commune, Cao Bang Province).

2.2. Research Subjects

Medicinal plants and the associated traditional knowledge of their use by the Dao ethnic group in The Duc commune, Nguyen Binh district, Cao Bang province.

2.3. Research Methods

2.3.1. Documentation of Traditional Medicinal Plant Knowledge

i) Data collection

The study was conducted with the prior informed consent and approval of both local authorities and survey participants. The personal information of the participants is kept confidential.

Data were collected from Key Informants (KIs). KIs comprised Dao traditional healers residing in The Duc commune, aged between 55 and 66 years. They were recommended and officially recognized by the local Traditional Medicine Association and The Duc Commune Health Center. All selected healers possessed over 20 years of practitioner experience, having inherited multi-generational herbal knowledge spanning two to four generations. A total of six KIs participated in the study. Prior to the study, all healers provided their informed consent to participate and share information.

The collected data included: information about medicinal plants (local name, used parts, medicinal uses, methods of use, etc.); photographs of the plants; and voucher specimens of the medicinal plants. Data were collected from two sources:

1) Transect surveys: Specimens and relevant ethnobotanical information were gathered for medicinal plant species located within a 3–5 m visual range along the traditional harvesting routes routinely used by local healers. Three transects were investigated (Table 1). Each transect was surveyed twice.

2) Home garden surveys: Specimens and ethnobotanical information were gathered for medicinal plant species in the homegardens of the KIs. Five gardens were investigated.

The complete dataset and associated voucher specimen details are retained by the research team and are available upon reasonable request.

Table 1. The surveyed transects

No.	Transect	Start coordinates	End coordinates	Length (km)
1	T-1	22.65300 °N; 105.92716 °E	22.65826 °N; 105.92994 °E	1,0
2	T-2	22.65502 °N; 105.94454 °E	22.66550 °N; 105.94812 °E	1,5
3	T-3	22.65508 °N; 105.94471 °E	22.66288 °N; 105.94148 °E	2,2

ii) Processing of plant herbarium specimens

Specimens were treated using the wet method, then sorted, pressed, and dried at 70-80 °C. The dried specimens are stored in the herbarium of Hanoi University of Pharmacy (HNIP).

iii) Scientific identification of medicinal plants

The scientific names were determined by comparing the morphology of the medicinal plants with type specimens at the Medicinal Herbarium of Hanoi University of Pharmacy (HNIP) and descriptive materials in reference literature, including the Flora of Vietnam, An Illustrated Flora of Vietnam, Flora of China, and the Checklist of Medicinal Plant Species of Vietnam [1, 4-6].

Scientific names and botanical author citations were verified, cross-checked, and standardized according to international taxonomic databases, including World Flora Online (WFO) and International Plant Names Index (IPNI) [7, 8].

Once taxonomic determinations were finalized, the research team disseminated the botanical identification results back to the KIs.

iv) Data processing and analysis

The data were entered into Microsoft Excel 2021 for subsequent analysis.

- The reliability of the knowledge on medicinal plant use was calculated using the formula:

$$Fv = \frac{Sij}{\sum S}$$

Components:

F_v (Fidelity level): represents the information consensus rate, determined across the total number of participants in the survey ($0 < F_v \leq 1$);

S_{ij}: Number of KIs reporting specific medicinal use of a plant species;

$\sum S$: The total number of KIs [9].

- The classification of diseases, symptoms, and medicinal uses of plants was based on the International Statistical Classification of Diseases and Related Health Problems, ICD-10 [10].

2.3.2. Assessment of the Conservation Status of Medicinal Plants

Identify the investigated medicinal plant species included in the Viet Nam Red List of Threatened Species [11] and in the list of endangered, precious, and rare forest plants and animals [12]. Determine the extent of cultivation and conservation of these medicinal plants in home gardens.

3. Results

3.1. Traditional Knowledge of Medicinal Plant Use

3.1.1. Medicinal Plants

i) Taxonomic diversity

A total of 202 medicinal plant taxa were recorded. Among them, 156 taxa were identified to the species level, 40 to the genus level, and 6 to the family level. These 202 taxa belong to four different plant divisions (Magnoliophyta, Lycopodiophyta, Pteridophyta and Polypodiophyta). Of these, the division Magnoliophyta had the highest diversity, comprising 70 families (92.11%), 150 genera (96.77%), and 196 taxa (97.03%). A total of 76 families were recorded. Asteraceae was the largest family with 25 taxa.

ii) Life-form diversity

The 202 recorded medicinal plant taxa belong to six different life forms, including herbs (81 taxa; 40.10%), shrubs (57 taxa; 28.22%), trees (26 taxa 12.87%), climbers (23 taxa; 11.39%), lianas (12 taxa; 5.94%), and parasitic plants (3 taxa; 1.49%).

3.1.2. Knowledge of Medicinal Plant Use

i) Plant parts used for medicine

Fourteen plant parts were employed by Dao traditional healers in The Duc commune. The whole plant was the most frequently used part, employed for 120 taxa (59.41%). Other frequently used parts included leaves (109 taxa, 53.96%), stems (70 taxa, 34.65%), and roots (19 taxa, 9.41%).

ii) Diseases, disorders, and medicinal uses

The 202 recorded taxa were classified into 16 groups based on diseases, disorders, or other healthcare uses. The groups with the highest number of medicinal taxa were digestive system diseases (64 taxa, 31.68%), musculoskeletal and connective tissue diseases (63 taxa, 31.19%), and genitourinary diseases (58 taxa, 28.71%). The documented medicinal plants addressed a wide spectrum of common health issues prevalent in The Duc commune.

iii) Modes of use

Medicinal plants were applied in 16 different ways. The most common were decoction for oral administration (169 taxa, 83.66%), bathing/ washing (49 taxa, 24.26%), and poultice application (33 taxa, 16.34%).

iv) Consensus in medicinal plant knowledge

Four species were employed by all six healers (Table 2).

Table 2. Species utilized by all six herbalists

No.	Scientific name	Local name	Medicinal uses
1	*Blumea balsamifera* (L.) DC.	Kim piển, mìa im	Restores health for postpartum mothers and bath to enhance newborn health, steam bath or bath to relieve colds, treats underarm odor, clears heat, health-invigorating bath, treats bone and joint pain.
2	*Blumea megacephala* (Randeria) C.T. Chang & C.H.Yu.	Hìa chìa o mia, mìa nòm ngheng, nhỏ mia, đìa chùng lẩu	Treats dizziness and vertigo, treats heart pain, heart valve regurgitation, nourishes health, treats kidney stones, colon diseases, blurred vision, watery eyes, injuries from falls.
3	*Zanthoxylum nitidum* (Roxb.) DC.	Chiểm xài ghím, hìa piêu xút, hoa chao, piều xút ghím	Treats liver diseases, treats pain from injuries, relieves pain, treats bone and joint diseases, nourishes health for postpartum mothers, treats pain from falls, treats broken arms and legs, treats paralysis.
4	*Lysionotus pauciflorus* Maxim.	Pèn mà chía, mìa nòm hủ	Treats itching, detoxifies kidneys, helps easy urination, cools the liver, treats liver diseases, treats internal itching.

The application of *Rosa chinensis* Jacq. for treating urinary disorders exhibited the highest F_v (0.67). A total of 187 taxa were reported for treating diseases, disorders, or for health care purposes with $F_v = 0.17$. The F_v index reflects the consensus ratio regarding the use of a medicinal plant taxon for a specific therapeutic purpose relative to the total number of interviewees. However, the F_v value is not directly proportional to the total number of informants reporting a given plant. Consequently, certain widely used taxa may not yield a high F_v value if their reported applications are dispersed across multiple, diverse therapeutic uses.

v) Taxa with undocumented use-knowledge

Cross-referencing the nomenclature and traditional uses of the 202 recorded taxa with commonly used botanical reference materials in Vietnam (Checklist of Medicinal Plant Species of Vietnam, Medicinal Plants and Traditional Remedies of Vietnam, Medicinal Plants and Animals in Vietnam, Dictionary of Medicinal Plants of Vietnam and Vietnam Plant Data Center) identified 12 species with previously unrecorded medicinal uses (Table 3) [1, 13-16].

To verify pharmacological and phytochemical novelties, bibliographic searches for the 12 candidate species were executed in global repositories, including PubMed, Medline, ScienceDirect, Web of Science, and Google Scholar, using botanical binomials as the primary descriptors. The research team also verified the scientific synonyms for these 12 species. As of August 2026, no literature has been reported regarding the chemical composition or ethnopharmacological properties of *Saurauia macrotricha* Kurz, underscoring significant research gaps and the novelty of the present study.

Table 3. Plant species undocumented in commonly used reference materials in Vietnam

No.	Species	Family
1	*Brachystemma calycinum* D.Don	Caryophyllaceae
2	*Callicarpa angustifolia* King & Gamble	Verbenaceae
3	*Cuscuta epithymum* L.	Cuscutaceae
4	*Hedychium gardnerianum* Sheph. ex Ker Gawl.	Zingiberaceae
5	*Heptapleurum digitatum* (Hook.f.) Lowry & G.M.Plunkett	Araliaceae
6	*Paraboea umbellata* (Drake) B.L.Burtt.	Gesneriaceae
7	*Rubus rosifolius* Sm.	Rosaceae
8	*Sanchezia speciosa* J.Leonard	Acanthaceae
9	*Saurauia macrotricha* Kurz	Actinidiaceae
10	*Saurauia roxburghii* Wall.	Actinidiaceae
11	*Sida spinosa* L.	Malvaceae
12	*Vernonia amygdalina* DeL.	Asteraceae

3.2. Conservation Status of Medicinal Plants

3.2.1. Medicinal Plants

A total of 131 medicinal plant taxa (64.85%) were collected around homesteads. Twenty-six taxa (12.87%) were gathered or transplanted from forests. Medicinal plants in home gardens were rarely tended or irrigated.

Three species are listed in the Viet Nam Red List of Threatened Species. Specifically, *Eleutherococcus trifoliatus* (L.) S.Y.Hu and *Tetrapanax papyriferus* (Hook.) K. Koch are categorized as Endangered (EN), whereas *Cibotium barometz* (L.) Sm. is classified as Vulnerable (VU). All three species currently exist exclusively in the wild and have not yet been domesticated or introduced into cultivation.

Three species belonged to group IIA of the "List of endangered, precious, and rare forest plants and animals". Among these, only *Podophyllum tonkinense* Gagnep. was found in home gardens, while *Orchidaceae* sp. and *Cibotium barometz* (L.) Sm. were found in the wild.

3.2.2. Knowledge of Medicinal Plant Use

All six KIs had transmitted, or were transmitting, their knowledge orally to daughters-in-law or daughters. Sons and sons-in-law showed little interest in learning medicinal plant knowledge, preferring other occupations that provided more stable income.

In addition, a preliminary survey involving random interviews with 13 Dao people (aged 6–82) regarding "Kim piền" (*Blumea balsamifera* (L.) DC, a species with high occurrence in The Duc commune) was conducted to assess knowledge retention within the community. Results indicated that 100% of respondents aged 6–13 were unfamiliar with the plant, whereas 100% of those over 13 years old had used or knew how to use it.

4. Discussion

4.1. Knowledge of Medicinal Plant Use

The diversity of medicinal plant taxa used by the Dao in The Duc commune was at a moderate level compared with some other Dao communities (Table 4).

The Dao in The Duc commune primarily prepared medicinal plants by decoction for oral administration (83.66%), similar to many other Dao communities in Vietnam (Table 4). In The Duc commune, whole plants were mostly used, as also reported for Dao communities in Y Han and Duong Hong [17, 18]. Variations in the groups of medicinal uses with the highest number of taxa among different Dao communities reflect the diversity of Dao traditional knowledge in Vietnam.

Table 4. Comparison of selected characteristics in medicinal plant use among Dao communities

No.	Dao community	No. of taxa	Main mode of use (%)	Main plant part used (%)	Dominant therapeutic use group (%)
1	The Duc commune	202	Decoction (83.66)	Whole plant (59.4)	Digestive system disorders (31.7)
2	Y Han area [17]	203	Decoction (60.6)	Whole plant (50.2)	Nourishing (25.6)
3	Duong Hong commune [18]	89	Not Available	Whole plant (47.2)	Not Available
4	Phan Thanh commune [9]	202	Decoction (84.7)	Leaves (66.3)	Digestive system disorders (23.8%). Bone and joint diseases (23.7)
5	Ta Dung National Park [19]	63	Decoction (44.8)	Leaves (33.0)	Women's health disorders (12.6)
6	Ba Vi National Park [20]	503	Decoction (72.8)	Stems (33.5)	Rheumatism and musculoskeletal disorders (16.5)

4.2. Conservation of Medicinal Plant Resources in The Duc commune

Overharvesting of plant parts such as stems, roots, and tubers has led to a decline in the availability of medicinal plants. Therefore, shifting toward sustainable harvesting practices or exploring alternative plant parts for medicinal use are essential strategies for local conservation.

Traditional healers were trained and began practicing from a young age. However, their activities of collecting and prescribing medicinal plants are not carried out consistently due to fluctuations in patient numbers. As a result, knowledge about plant species that are not frequently used is at risk of being lost. The study recorded 10 species that healers reported using but could not recall their names. Documentation thus serves as an important means of safeguarding and conserving traditional knowledge and provides a foundation for further developing the therapeutic potential or medicinal value of medicinal plants.

In addition, several species, such as "Tòm xung mây" (*Spatholobus suberectus* Dunn). and "Phản thọ ghím" (*Eleutherococcus trifoliatus* (L.) S. Y. Hu), were identified by local people as highly valuable. Although well-suited for local cultivation, these species are not yet widely grown. Further research and development of cultivation areas for these medicinal plants are recommended.

5. Conclusion

Regarding traditional knowledge of medicinal plants: the study documented 202 taxa belonging to 4 divisions, 76 families, and 155 genera. The division Magnoliophyta had the highest number of taxa (196). Asteraceae was the largest family with 25 taxa. Fourteen plant parts were used medicinally, with whole plants accounting for 59.41% of use. Healers employed medicinal plants for 16 therapeutic categories, most commonly for gastrointestinal disorders (31.68%). The predominant mode of preparation was decoction (83.66%).

Regarding the conservation status of medicinal plants: Herbalists' engagement in explicit conservation practices appeared limited, as evidenced by only 12.87% of taxa (26 taxa) being cultivated in home gardens. These cultivated plants were rarely tended. Three species are listed in the Viet Nam Red List of Threatened Species. Three species belonged to group IIA of the List of endangered, precious,

and rare forest plants and animals. Only *Podophyllum tonkinense* Gagnep. was cultivated in home gardens.

The study's findings provide a basis for proposing strategies to conserve and develop medicinal plants in The Duc commune (currently Nguyen Binh commune, Cao Bang province).

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