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## Diversity and indigenous knowledge of using medicinal plants of the Dao people in Ta Dung National Park, Vietnam

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**Abstract**

The paper presents research results on the diversity and indigenous knowledge of using medicinal plants of the Dao people in Ta Dung National Park, Dak Nong Province, Vietnam. Through the transect survey method and interview, 63 medicinal plants, 61 genera, belonging to 40 families were recorded by Dao people. In which, three species are listed in the Vietnam Red Data Book (2007) and the Vietnam Red List of medicinal plants (2006). There are five life-forms of medicinal plants: woody, herbaceous, shrub, vines, and epiphyte, distribution in four habitats: forests, around villages, along roadsides, and along streams. There are eight parts used of medicinal plants were identified: leaves having the highest frequency of use. These medicinal plants are harvested mainly year-round and a few are seasonal. There are three ways to the preservation and 12 methods to use medicinal plants to treat 18 different disease groups, the most common being women's diseases, skin diseases and digestive diseases.

**Keywords:** Conservation, diversity, indigenous knowledge, medicinal plant, ta dung national park

### 1. Introduction

Plants have been used since ancient times by humans. Several purposes have been served by them such as food, spices, medicine, ritual components. The knowledge of plants and their benefits have been accumulated and passed on through the generations, through writing or memory. While some knowledge has been lost other has endured presenting days and is still in use. The human being has always tried to find in the plants that nature so lavishly offers sustenance as well as healing for various diseases that afflicted the course of its existence<sup>[7]</sup>.

Plants have always been the primary source of treatment humanity used for disease and injury. Initially, they were used empirically, selected and tested. The knowledge of their effects and toxicity was then passed on. Through this process and collective memory, many plants are still used in the traditional way. The use of plants in therapy remains, worldwide an important means of combating diseases. Medicinal herbal products in developing countries account for 80% of drugs used<sup>[8]</sup>.

Studies on the use and effects of medicinal plants have been conducted around the world with a marked increase in Asia. In Vietnam, ethnographic research projects on indigenous knowledge using traditional medicinal plants have been implemented in many localities and on many different ethnic groups by the Institute of Ecology and Biological Resources. So far 3948 traditional medicinal plant species have been recognized through indigenous knowledge of different ethnic groups in 63 provinces and cities of Vietnam. In particular, much unique knowledge about medicinal plants is used to treat and care for the Dao people in the Central Highlands. Especially Dao people reside in Ta Dung National Park, Dak Nong Province.

Ta Dung National Park is home to many ethnic groups: Ma, Mong, HOA, Tay, Nung, Muong, and Dao. In particular, the Dao people retain a lot of indigenous knowledge about using medicinal plants to treat diseases and health care<sup>[4]</sup>. However, in recent years, due to population pressure, urbanization, farming practices, and forest fires, the resources of medicinal plants have been severely reduced in both quantity and quality many medicinal plants are listed in the Vietnam Red Data Book (2007), even in danger of extinction. Therefore, local knowledge sources related to traditional medicine such as morphological characteristics, harvesting methods, experience in using medicinal plant parts, especially many ways of using medicinal plants to treat Dao people have lost.

In addition, it is a worrying fact that the majority of the young generation today has very little knowledge of medicinal plants, with little interest in preserving indigenous knowledge about the use of medicinal plants. Currently, in Ta Dung National Park, there have been a number of studies assessing plant resources or biodiversity, but there have been no studies on traditional medicinal plants of the Dao people to treat diseases and health care. Therefore, the objective of this research is to the system of knowledge of the Dao people about medicinal plants: species composition, life-forms, parts used, distribution characteristics, harvesting experience, preservation methods, methods of use, disease groups, with the hope of contributing to providing more databases and preserving traditional medicinal plants here.

## 2. Materials and Methods

### 2.1 Method of field investigation and survey

Using the investigation transect method. These transects are distributed in other types of habitats including villages, fields, streams, along forest edges, fields.

### 2.2 Interview survey

Using PRA approaches to interview and collect information on the experience of using medicinal plants and medicinal remedies. Hand out questionnaires and interview the Dao people and the people with experience in using medicinal plants in the study area.

### 2.3 Collection and processing of specimens

Collect information on medicinal plants including common and ethnic names; distribution, life-forms, habitat, parts of use (stems, roots, flowers, fruits, seeds, etc.). Analyzing and classifying specimens: based on comparison morphological method based on morphological characteristics of collected plant samples combined with the experience of experts, conducting comparisons with the descriptions in the a set of specialized botanicals such as dictionary of medicinal plants (Chi VV, 1996) [2]; An Illustrated Flora of Vietnam (Ho PH, 1999-2000) [3]; Vietnamese medicinal plants and medicine (Loi DT, 2005) [5];

### 2.4 Identify the species name

Complete the scientific name and Vietnamese name (local name), the ethnic language of the species. Conduct scientific name identification and make a list of medicinal plants according to Brummit RK (1992) [4]. The list is ordered alphabetically A, B, C, etc. Assessing the species diversity and life-forms of medicinal plants: According to the method of Thin NN (2007) [12]. Assesses of parts used, distribution of medicinal plants according to the habitat and experience of using medicinal plants: based on interviews and surveys under Dao's people instruction. Assessment of threatened medicinal plants: Based on Vietnam Red Data Book [6], Red list of Vietnamese Medicinal Plants (Tap N, 2006) [10].

### 2.5 Study area

Ta Dung National Park is located on the boundary of Dak SOM Commune, Dak G' long district, Dak Nong province, with a natural area of 20,937.7 hectare, geographical coordinates from 11°47'27" to 11°59'20" Latitude North and from 107°53'10" to 108°6'32" East longitude. Ta Dung National Park belongs to the climate zone "tropical monsoon highland" with two distinct seasons, the rainy season from April to October, the dry season from November to March next year. The annual average temperature is 22.0 °C, the average temperature is 13.7 °C, the average annual rainfall is 2,339 mm the annual average humidity is 82% [4]. With the advantages of geography and climatic conditions, it has created its own characteristics by subtropical moist evergreen tropical evergreen forests and broadleaf coniferous mixed forest. These are standard samples of moist wet evergreen forest ecosystems of the highlands. According to scientists, Ta Dung National Park is quite diverse in terms of genetic resources of plants and animals, has about 2,000 species. In particular, there are 1,406 vascular plant species belonging to 760 genera and 192 families of 6 different plant branches [4], especially with many rare and endangered plant species, listed in Vietnam Red Data Book (2007): *Drynaria bonii* Christ, *Goniothalamus vietnamensis* Ban, *Coscinium fenestratum* (Gaertn.) Colebr, *Aeginetia indica* L., *Hydnophytum formicarum* Jack, *Tacca integrifolia* Ker-Gawl, etc.



Fig 1: Map of the case study area

### 3. Results and Discussion

#### 3.1 Diversity of medicinal plants were used by the Dao people

Through interviews and instructions of people who have experience in collecting and using medicinal plants, we have

recorded 63 species, 61 genera, 40 families, belonging to 2 vascular plants including Polypodiophyta and Magnoliophyta used as medicine according to the experience of the Dao people. The results are summarized in Table 1.

**Table 1:** Diversity of medicinal plants were used by the Dao people

No.	Taxon	Family		Genera		Species	
		Number	Percentage %	Number	Percentage %	Number	Percentage %
I	Pteridophyta	1	2,5	3	4,9	4	6,3
II	Magnoliophyta	39	97,5	58	95,1	59	93,7
1	Magnoliopsida	32	80	48	78,7	49	77,8
2	Liliopsida	7	17,5	10	16,4	10	15,9
	Total	40	100	61	100	63	100

Analysis of Table 1 shows that traditional medicinal plants used by the Dao for treatment and health care are quite diverse and abundant. Magnoliophyta accounts for 93.7% of species, 95.1% of genera and 97.5% of families. Of which, Magnoliopsida has 49 species (77.8%), 48 genera (78.7%) and 32 families (80%). Liliopsida has 10 species (15.9%), 10 genera (16.4%) and 7 families (17.5%). Meanwhile, Pteridophyta has 4 species (6.3%), 3 genera (4.9%) and 1 family (2.5%).

There are 8 plant families have more 3 species with a total of 27 species (42.9%), of which Asteraceae, Fabaceae, Polypodiaceae have the same 4 species (6.3%); Followed by, Araliaceae, Vitaceae, Solanaceae, Rutaceae, Poaceae have the same 3 species (4.8%). These are plant families with a large

number of species, not only of medicinal value but also used as food, essential oils, etc., especially they are distributed very popular in different habitats: in the forest, roadside, around villages, along streams, etc.

#### 3.2 The composition of medicinal plants is threatened

Based on the results of the survey, we have recorded 3 medicinal plants (4.8% of the total number of species) listed in the Vietnam Red Data Book (2007) and the Vietnam Red List of Medicinal Plants (2006). In which, there are 3 species in the list of Vietnam Red Book (2007) including *Drynaria bonii* and *Homalomena gigantea*, *Drynaria fortunei*; one species in the list of red medicinal plants of Vietnam is *Drynaria fortunei*.

**Table 2:** The composition of medicinal plants is threatened

No.	Scientific name	Vietnam red data book (2007)	Red medicinal plants of Vietnam (2006)
	<i>Drynaria bonii</i> H. Christ, 1910.	VU A1a,c,d	
2	<i>Drynaria fortunei</i> (Kuntze ex Mett.) J. Smith.	EN A1,c,d	ENB1+2b,c
3	<i>Homalomena gigantea</i> Eng	VU A1c, B1+2b,c	

#### 3.3 Diversity of life-forms of medicinal plants

The plant life-form is an expression of the plant's morphology and structure adapted to living environment conditions. It is closely related to the ecological factors of each region. Studying the life-form of plants will be the basis for comparing the vegetation of the study area with the vegetation of different regions [9]. The analysis of the diversity of life forms of the medicinal plants shows us the source of raw materials for ease of exploitation and use. From there, make appropriate policies and measures for the effective exploitation and use of this resource.

There are 5 life-forms of medicinal plants: woody, herbaceous, shrub, vines, and epiphyte were used by the Dao. The results are summarized in Table 3.

**Table 3:** Diversity of life-forms of medicinal plants

No.	Life-forms	Number of species	Percentage (%)
1	Herbaceous	23	36,5
2	Shrub	19	30,2
3	Vines	12	19,1
4	Woody	5	7,9
5	Epiphyte	4	6,3
	Total	63	100

The life-forms of medicinal plants used by the Dao people are quite diverse and abundant. In which, herbs dominated with 23 species (36.5%); shrubs with 19 species (30.2%); 12 species of vines (19.1%); woody has 5 species (7.9%); epiphyte has 4 species (6.3%). The analysis results show that

the Dao people mainly use herbs, shrubs, and vines as medicinal plants because these are fast-growing, strong natural regenerating life-forms, capable of wide distribution, preferable adapt to many different habitats and easy to harvest. The use of herbs, shrubs, and vines shows the sustainability of the harvesting methods of the Dao people. Because these life-forms are mainly one-year trees, distributed mainly under the forest canopy or crawling on shrubs and trees, the exploitation of these life-forms has little or no effect on the structure of forest resources.

#### 3.4 Diversity of medicinal plants distributed by habitat

Survey results of medicinal plant diversity by habitats are shown in Table 4.

**Table 4:** Distribution of medicinal plants by habitat

No.	Habitat	Number of species	Percentage (%)
1	In forest	44	43,1
2	Around the village	41	40,2
3	Along roadside	14	13,7
4	Along the stream	3	3
	Total	102	100

Table 4 shows that traditional medicinal plants of Dao people are distributed in four types of habitats: forests, around villages, along roadsides, and along streams. Habitat of forest environment is the place where medicinal plants are distributed the most with 44 species (43.1%); followed by is around the village has 41 species (40.2%); 14 species along the

road (13.7%); the lowest is habitat along streams with 3 species (3%).

### 3.5 Diversity the parts used of medicinal plants

In medicinal plants, compounds and chemical components are often unevenly distributed in each part of their, they often have a different composition and active. Compounds that have a therapeutic effect are not always found in plants, possibly in fruits, flowers, or in seeds, leaves, roots, bark, etc. Therefore, researching the part of medicinal plants is very important, deciding on the effectiveness of disease treatment. Based on themselves experience, the Dao people have different ways to exploit parts and application for each medicinal plant species. The results are shown in Table 5.

**Table 5:** Diversity of parts-use of medicinal plants

No.	Parts of use	Abbreviation	Number of species	Percentage (%)
1	Leaves	L	37	33,04
2	Stem	St	28	25
3	Roots	R	25	22,32
4	Fruit	F	6	5,36
5	Tubers	T	6	5,36
6	Whole plant	Wp	4	3,57
7	Flower	Fl	3	2,68
8	Seeds	S	3	2,68

Table 5 shows that the parts of medicinal plants used by the Dao are quite diverse. Leaves are the most used part with 37 species (33.04%); followed by stem parts with 28 species (25%); Roots with 25 species (22.32%); Tubers and fruits with the same 6 species (5.36%); whole plant with 4 species (3.57%); flowers and seeds have the same 3 species (2.68%). It can be seen that the leaves, stems, roots are the parts that are often used by the Dao as medicine. In particular, the use of leaves for the treatment of diseases and health care in large numbers does not affect the growth of medicinal plants, or the structure of forest resources. Besides, it also shows the sustainability and originality in the method of exploiting the medicinal plant resources of the Dao people. The Dao people just exploited medicinal plants to treat diseases but still ensuring the stability of medicinal plant resources for future generations. On the contrary, flowers and seeds are less exploited and used because flowers and seeds can only be harvested seasonally. In addition, the exploitation of flowers and fruits greatly affects the regeneration and recovery ability of medicinal plants. Therefore, the Dao do not use these parts of the medicinal plant for treatment and health care.

### 3.6 Knowledge about medicinal plant harvesting season

Knowledge about the medicinal plant harvest seasons of Dao people is shown in Table 6.

**Table 6:** Experience in harvesting medicinal plants of the Dao people

No.	Harvest time	Number of species	Percentage (%)
1	year-round	51	80,9
2	Seasonal	12	19,1
	Total	63	100

Table 6 shows the number of medicinal plants collected all year round the most with 51 species (80.9%). Medicinal plants collected throughout the year mostly use parts such as roots, leaves or whole trees; seasonal harvests of only 12 species (19%). Seasonal medicinal plants mainly use parts of flowers, fruits, and seeds.

### 3.7 Knowledge of medicinal plant preservation and use methods

Knowledge about medicinal plant preservation plays an important role because many medicinal plants can only be exploited at a certain time of year, on the other hand, when collected in large quantities, not yet used up, it must be saved preserve, when the necessary will use.

**Table 7:** Methods of preserving medicinal plants

No.	Method of preservation	Number of species	Percentage (%)
1	Dry	60	41,9
2	Fresh	43	30,2
3	Dry and fresh	40	27,9

The analysis of Table 7 shows that there are three methods of preservation, including dry storage (the most with 60 species (41.9%); followed by fresh preservation has 43 species (30.2%); dry storage and fresh with 40 species (27.9%). Depending on the type of disease, different medicinal plants that different processing and use methods. The results are shown in Table 8.

**Table 8:** Diverse ways of processing and using Dao people medicinal plants

No.	Methods used	Number of species	Percentage (%)
1	Boil to drink	60	44,8
2	Crushed	23	17,2
3	Pickling wine	13	9,7
4	Juiced	10	7,5
5	Shower	8	5,9
6	Smear on the wound	8	5,9
7	Steam	4	2,9
8	Chew alive	3	2,2
9	Cook concentrates	2	1,5
10	Mix with water	1	0,8
11	Make jelly	1	0,8
12	Warm-up to apply	1	0,8

Table 8 shows that Dao uses the boil method to drink (with 60 species, accounting for 44.8%) which is a popular method in Vietnam, often using parts: stem, root, dry leaves. Method of crushing (23 species, accounting for 17.2%) often using crushed leaves to cover skin wounds such as pimples, animal bites, scabies, etc.; Method of alcohol immersion (13 species, accounting for 9.7%) uses stems, roots, tubers soak with alcohol to treat osteoarthritis, tonic; Method of juiced to drink (10 species, accounting for 7.5%) is used to treat digestive diseases; method of showering and smeared on the wound (the same 8 species, accounting for 5.9%) used to treat skin diseases; sauna method (4 species, accounting for 2.9%) used to treat weather conditions: colds, female diseases; chewing method (3 species, accounting for 2.2%) used to treat: pharyngitis, digestive; method of mix with water and making jelly (the same one species, accounting for 0.8%) used for cooling, detoxify; method of heating an object then wrapping leaves around it and placing it on the wound (due to hematoma) (1 species accounting for 0.8%)

### 3.8 The disease groups use medicinal plants to treat diseases according to the Dao people experience

The results of the survey and information collection show that the experience of using medicinal plants of the Dao people is very unique and rich with 18 different disease groups.

**Table 9:** The disease groups use medicinal plants treated with medicinal plants of the Dao people

No.	Disease treated	Number of species	Percentage (%)
1	Women's diseases (menopause, menstrual irregularities, pregnancy control)	25	12,6
2	Skin diseases (boils, scabies, ulcers, rash)	23	11,6
3	Osteoarthritis disease (joint pain, arthritis, bone pain, lumbar spine)	23	11,6
4	Digestive diseases (diarrhea, constipation, abdominal distention, abdominal pain)	17	8,6
5	Kidney diseases (Glomerulonephritis, kidney stones, diabetes, diuretic)	14	7,1
6	Liver diseases (hepatitis, hepatomegaly)	13	6,6
7	Tonic (Kidney, blood, liver, health)	11	5,5
8	Diseases of the mouth (gingivitis, tooth decay, halitosis, stomatitis)	9	4,5
9	Detoxification (food allergy, insect allergy)	9	4,5
10	Diseases caused by animal bites (snake bite, centipede bite)	8	4,1
11	Stomach disease (stomach pain, stomach ulcers, colon)	8	4,1
12	Respiratory diseases (cough, throat, bronchus, lung, cough, cough with sputum)	7	3,5
13	Weather sickness (flu, sunburn, headache, sickness, fever)	7	3,5
14	Blood pressure diseases (low blood pressure, high blood pressure)	7	3,5
15	Diseases of children (chrysanthemum, orange, yellow skin)	6	3,1
16	Eye diseases, nose (red eyes, nosebleeds)	6	3,1
17	Hot disease in the body	4	2
18	Neurological diseases (sciatica, sedation, insomnia)	1	0,5

The group of medicinal plants used to treat women has the largest number of species (25 species, accounting for 12.6%); The next is the skin disease group (23 species, accounting for 11.6%); osteoarthritis treatment group (23 species, accounting for 11.6%); gastrointestinal disease group (17 species, accounting for 8.6%); kidney disease group (14 species, accounting for 7.1%), etc.; The lowest is neurological disease (1 species, accounting for 0.5%). The disease groups with the domination number of medicinal plants are the common disease groups common in daily life.

#### 4. Conclusion

Ta Dung National Park is not only diverse in the composition of medicinal plants but also contains abundant indigenous knowledge of the Dao people about life forms, distribution characteristics, parts used, harvesting experience, methods of preservation and the method of using medicinal plants to treat 18 groups different of diseases. However, good traditional remedies and valuable are not shared by the physician but also they are kept and considered as a secret. Younger generations are less knowledgeable about the use of medicinal plants, increasing the risk of indigenous knowledge loss. The exploitation of medicinal plants takes place at a high frequency, resulting in the decline of medicinal plants, especially endangered, precious and rare species in danger of extinction in nature. Therefore, we need to take timely action to conserve medicinal plant resources and indigenous knowledge of the Dao people before they disappear.

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