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TRADITIONAL MEDICINAL PLANTS IN BEN EN NATIONAL PARK, VIETNAM

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SUMMARY

This paper surveys the medicinal plants and their traditional use by local people in Ben En National Park, Vietnam. A total of 230 medicinal plant species (belonging to 200 genera and 84 families) is used by local people for treatment of 68 different diseases. These include species that are collected in the wild (65%) as well as species grown in home gardens. Leaves, stems and roots are most commonly used either fresh or dried or by decocting the dried parts in water. Women are mainly responsible for health care, they have a better knowledge of medicinal plants than men, and also collect them more than men at almost every age level. The indigenous knowledge of traditional medicinal plants may be rapidly lost because 43% of the young generation do not know or do not want to learn about medicinal plants, and the remainder knows little about them. Moreover, nowadays local people tend to use western medicine. Eighteen medicinal plant species are commercialized and contribute on average 11% to the income of the households. The majority of medicinal species are used by less than half of the households and 68% of the medicinal plant species have use indices lower than 0.25. Only 6 of the medicinal species of Ben En are listed in the Red data list of Vietnam, but locally 18 medicinal species are endangered because of over harvesting. A comparison of traditional uses of medicinal plants in Ben En National Park with traditional uses elsewhere in South-East Asia and the Indo-Pacific region shows that the same species may be used for widely different treatments by different ethnic groups. The conservation, sustainable use and economic potential of medicinal plants is discussed. We argue that their use, cultivation in home gardens, and marketing should be encouraged as an affordable alternative to expensive western medicine.

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Key words: Ben En National Park, traditional medicinal plants, disease treatment, conservation.

INTRODUCTION

Man is known to have utilized plants as a source of medicinal drugs for thousands of years. Medicinal plants are potential sources of new drugs and hold a great value for developing pharmaceutical products, phytomedicines, and dietary supplements (King et al. 1999).

An effective way to find new drugs is to follow the indigenous knowledge on medicinal plants (Spjut & Perdue 1976; Mendelsohn & Balick 1995; Swerdlow 2000). Using ethnobotany to identify promising plants could substantially reduce the costs for developing at least some pharmaceutical drugs (Mendelsohn 1997). About 80% of the world's population relies on traditional medicine (Farnsworth et al. 1985). Especially in remote areas in developing countries, medicinal plants may form the only available source of health care (Kasperek et al. 1996; Van Andel 2000).

Vietnam is no exception to this phenomenon. The better hospitals are all located in Hanoi, Ho Chi Minh City, and in other main cities. The health care situation in the research area of Ben En National Park is generally much less favourable. The few hospitals and health centres in the interior are often ill-equipped and suffer from lack of trained staff. Only few people can afford to travel to the hospital in the city when they need medical assistance, instead of seeking treatment in local health centres. Most local people do not have health insurance. The majority of the health problems of the local people in Ben En National Park are related to stomach ache, malaria, diarrhoea, wounds, and common colds.

Knowledge of medicinal plants, as once embedded in numerous indigenous cultures, is rapidly disappearing. Year by year, the total sum of human knowledge about the species, distribution, ecology, management, and extraction of medicinal plants is declining: the continuation of a process of loss of local cultural diversity that has been underway for centuries (Hamilton 2003). Although in many communities medicinal plants are the only available source for medical treatment, local indigenous remedies are less used now than before. In many tropical regions indigenous knowledge is at risk of extinction just as is biodiversity itself (Slikkerveer 1999, Van Andel 2000).

Ethnobotanical research can play a key role in the revitalization and revaluation of indigenous knowledge (Martin 1995). For Ben En National Park in particular very few ethnobotanical data exist. Some research has been conducted on biodiversity (Tordoff et al. 2000), and one study just listed plant or animal species, unfortunately without voucher specimens for scientific scrutiny (Anonymous 2000).

To analyse the role of medicinal plants in the indigenous communities in Ben En National Park, this study deals with the variety of medicinal plants and their uses recorded during a one year survey of non-timber forest products in that region.

The main research questions with regards to the use of medicinal plants were:

- Which plant species are being used for which disease?
- Which medicinal plant species are being commercialized in the research area?
- What is the present role of medicinal plants in the health care system of the indigenous communities?
- How does the situation in Ben En National Park compare with other local communities depending on natural forest resources in and beyond Vietnam?

We hope that the documentation of this medicinal plant knowledge contributes to the conservation of both cultural diversity and plant biodiversity in Vietnam in general and Ben En National Park in particular. By compiling and spreading this knowledge we hope to achieve those other ethnic groups in the region benefit from these local and cheap resources.

METHODOLOGY

Household surveys and interviews were carried out in 45 randomly selected households per village (out of a total of about 110-150 households per village). The standard interviews contained specific questions on age, gender, and ethnic background of the gatherers and main users of plant products. Additionally we used the 'walk-in-the-wood' method (Prance et al. 1987), to determine which products are harvested (and for what purpose) in the forests surrounding the villages. These trips were also used to collect voucher specimens for reliable identification of the harvested plants. Special collecting trips were organized with indigenous experts, e.g., traditional doctors, village elders and other local people who knew about medicinal plants. There are five traditional doctors (four females and one male) in the research area. Local names were also being noted during these surveys. Most information was confirmed by other informants. The information was also checked and compared with the 'Vietnam medicinal plants' (Loi 1995), 'Dictionary of medicinal plant of Vietnam' (Chi 1996), 'Plants of Vietnam' (Ho 2000), and the PROSEA (Plant Resources of South-East Asia) Handbooks on 'Medicinal and poisonous plants' (De Padua et al. 1999; Van Valkenburg & Bunyaphatsara 2001; Lemmens & Bunyaphatsara 2003).

Market inventories were used to determine the price of the forest products that are for sale. These surveys served as an independent way to determine which products are harvested from the surrounding forest, and to assess local uses of these forest products.

All plants that were considered by local people to have medicinal properties were collected and identified. These plants not only included wild species but also cultivated plants and wild plants that had been taken from the forest and planted in gardens or agricultural fields. Botanical specimens were collected of all useful plants. One voucher of each specimen was deposited at the herbarium of the

Vietnam Forestry University, additional vouchers were sent to the National Herbarium of the Netherlands and various specialists for identification.

The importance of medicinal plant species was identified using standard Participatory Rural Appraisal (PRA) techniques (PID & NES 1989; Ngai 2001) where local people were asked to rank a list of regularly used local medicinal plants. The importance of medicinal plants for health care was determined using two criteria: 1) proportion of local people using each listed species; and 2) frequency of use. The importance of medicinal plants species for income generation was determined by calculating the income from each listed species for the local population.

The database resulting from the ethnobotanical inventory was used to calculate a use index (UI) for each species by using the following equation:

$$UI = U_s/N$$

Where U_s is the number of households which mentioned a use for species s ; N is the total of households that were interviewed in the research area. This Use Index is a modification from the Use Value (UV) introduced by Phillips & Gentry (1993) and recently used by De Lucena et al. (2007), which is calculated from the relative number of times a species is mentioned by various informants in ethnobotanical inventories.

The market demand, intensity of collection, and abundance in the wild were classified as follows:

Market demand

- High: easy to sell in large amounts.
- Medium: difficult to sell in large amounts.
- Low: only in very small supply on the market and sometimes left unsold because the demand was not stable.

Collection intensity

- High: local people collect the plants in large amounts because of high demand of the market and/or for personal use.
- Medium: the collected amount is not big because the demand is not high, plants are not abundant, or it is difficult to collect them in large amounts.
- Low: the demand of the market is low or is non-existent. People mainly collect for home consumption, but in small amounts.

Abundance in the wild

- High: the species is easy to find and abundant.
- Medium: the species is neither abundant nor rare.

- Low: the species is rare, and although local people can find it with special effort, the species will be endangered if collection continues.

STUDY AREA

Field work was conducted in Ben En National Park 19° 30' to 19° 40' N by 105° 21' to 105° 35' E, situated in the Nhu Thanh and Nhu Xuan districts of Thanh Hoa province, Vietnam (Fig. 1.1). The highest peak is about 490 m. The core zone of the National Park covers 15,800 ha, while the buffer zone covers around 12,000 ha. About 18,000 people live in the buffer and core zones of the National Park (Tordoff et al. 2000). The majority of the people living in the national park belong to the Kinh, Thai, Muong, and Tay ethnic groups; although there are also a small number of Tho people. The interviews were carried out in three villages: Xuan Thai, Binh Luong, and Hoa Quy. Additional information on medicinal plants was collected in the markets of Ben Sung and Yen Cat. The vegetation of the core zone is dominated by disturbed tropical evergreen rain forest, which has been affected by human activities, especially logging, which was legal until the park was established in 1992, but has continued illegally up to now.

RESULTS

Diversity of medicinal plants

A total of 230 medicinal plant species were used by local people in Ben En National Park belonging to 200 genera and 84 families. These species were involved in 313 different treatments and recipes. For most species only one recipe was mentioned; some have multiple medicinal applications. A complete list of species and their local medicinal uses is given in Appendix 3.1. The total number of vascular plant species in the Park is about 1390 (Hoang et al. 2008 a).

Most of the medicinal plant species in Ben En National Park are angiosperms, only 2 species belong to the gymnosperms and 9 species are ferns. Sixteen percent of all plant species in the Park are used by local people for medicinal purposes. The number of medicinal plant species used by local people in Ben En National Park is 7.2% of the total medicinal plant species in Vietnam (Chi 1996). Diversity of taxa is shown in Table 3.1.

Table 3.1. Diversity of taxa

	Number of medicinal species	Total number of plant species in Ben En	Percent of medicinal species / total species in Ben En (%)
Ferns	9	86	10
Gymnosperms	2	9	22
Angiosperms	219	1294	17
Total	230	1389	16

Among the 84 families, the top 10 families with the highest number of medicinal species in the area are listed in Table 3.2.

Table 3.2. The 10 families with the highest numbers of medicinal species

Name of Family	Number of genera	Number of species
Euphorbiaceae	9	11
Asteraceae	8	9
Moraceae	5	9
Fabaceae	8	8
Rubiaceae	7	8
Menispermaceae	6	8
Verbenaceae	4	8
Rutaceae	5	7
Araceae	6	6
Apocynaceae	6	6

From the 230 species of medicinal plants recorded in Ben En National Park 65% of the species were collected from the wild. These were all plants naturally occurring in different vegetation types (primary, secondary and logged over forests, shrubbery, along roads, along streams, and in agricultural fields). Twenty percent of the species were cultivated in home gardens or in fields or even along the village road. This practice helps to develop the medicinal plant resources, and also makes them more widely available, especially when derived from rare and endangered species. Fifteen percent of the species were both taken from the forest, and also grown in the home gardens and agricultural fields. This semi-domestication reduces the need to cover long distances in the forest to search for plants.

Diversity of life forms of medicinal plants

The analysis of the life forms of medicinal plants used by local people in Ben En National Park is shown in Fig. 3.1. Herbaceous medicinal plants used by local people usually grow on the forest floor, along forest edges and roads, in fields and villages. They are mainly Amaranthaceae, Araceae, Asteraceae, and Zingiberaceae. Next in order of importance are forest trees mainly belonging to Euphorbiaceae, Moraceae, Rubiaceae, and Rutaceae. The smallest groups are formed by lianas and shrubs belonging to mainly Araceae, Asclepiadaceae, Cucurbitaceae, Menispermaceae, and Smilacaceae. Shrubs growing in the forest or along streams mainly are Myrtaceae and Solanaceae.

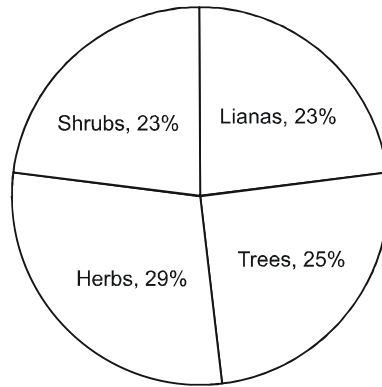


Fig. 3.1. Percentage of life forms of medicinal plants species used in Ben En National Park.

Diversity of plant parts used

In traditional medicine, different plant parts are used to treat different diseases: different components of one medicinal plant may have different effects. Some medicinal plant species have only one component that can be used, while for other species several components or the whole plant can be used. Of the identified medicinal plants in the research area, the whole plant is used of 14 species, whereas one species provides four useful components, 32 species provide three, 98 species provide two, and 85 species provide one component.

The diversity of parts used is indicated in Table 3.3. Leaves are most commonly used, either fresh or dried. Stems and roots are also common, either fresh or by decocting the dried root in water. Stems are usually chopped into small pieces and decocted in water. Often, different parts of the plants are combined to treat a disease.

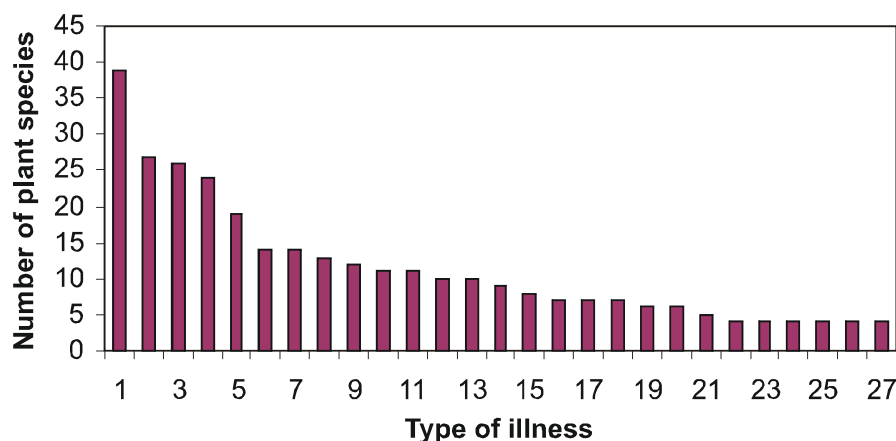
Table 3.3. Diverse parts of medicinal plants used by local people

Parts of plant	Number of species	Percent of total
Leaves	141	61
Root, rhizome	96	42
Stem	64	28
Bark	26	11
Fruit	19	8
Whole plant	14	6
Seed	9	4
Flower	9	4
Tuber	8	3
Bulb	3	1
Latex	2	1

Diseases treated with medicinal plants

The 230 medicinal plant species in Ben En National Park were used for treatment of 68 different diseases. For 20 of these diseases local people use only one medicinal plant for each disease. For example cancer was treated only with *Clausena lansium* (Rutaceae), mumps were exclusively treated with *Momordica cochinchinensis* (Cucurbitaceae), diabetes with *Aralia touranensis* (Araliaceae), aphasia with *Zanthoxylum avicennae* (Rutaceae), paralysis with *Alangium chinense* (Alangiaceae), and abscesses with *Hodgsonia macrocarpa* (Cucurbitaceae). For 12 of the 68 diseases local people used two plant species for treatment of each disease. For example, risk of miscarriage was treated with roots of *Boehmeria nivea* (Urticaceae) or with stems and leaves of *Artemisia vulgaris* (Asteraceae), and constipation was treated with leaves of *Cuscuta chinensis* (Cuscutaceae) or leaves of *Desmos cochinchinensis* (Annonaceae). For 5 diseases local people used three plant species for treatment of each disease. For example, impotence was treated with roots of *Morinda officinalis* (Rubiaceae), roots of *Morinda citrifolia* (Rubiaceae), or leaves and seeds of *Allium odorum* (Alliaceae).

The highest number of species was used to treat fairly common diseases, such as common colds, stomach ache, dysentery, weakness, itches, and diarrhoea (see Fig. 3.2).



1 Common colds, 2 Stomach ache, 3 Dysentery, 4 Weakness, 5 Itches, 6 Indigestion, 7 Diarrhoea, 8 Malaria, 9 Wounds, 10 Snake bite, 11 Fever, 12 Tooth ache, 13 Haemostatic, 14 Rheumatism, 15 Bone fractures, 16 Irregular menses, 17 High blood pressure, 18 Arthritis, 19 Sores, 20 Infection, 21 Urinating problems, 22 Sore throat, 23 Skin diseases, 24 Oedema, 25 Hemorrhage, 26 Detoxification, 27 Burns.

Fig. 3.2. Number of plant species used for different symptoms or illnesses in Ben En National Park.

Seven of the most common diseases in the research area are discussed below.

Wounds and cuts

Wounds and cuts can be caused by many agents, for instance spiny lianas, leaves of some grasses, and sharp limestone edges when people walk in the forest, and by knives, scissors, and other sharp utensils. Cuts soon become infected and may develop into deeper wounds and even skin sores. Common treatments include crushing or chewing leaves and covering cuts with them. Some plant species are commonly used for treatment of cuts and wounds, such as the leaves of *Piper betle* (Piperaceae) and leaves of *Microsorium superficiale* (Polypodiaceae), and leaves of *Eclipta prostrata* (Asteraceae).

Stomach ache

Stomach ache can be a symptom of many kinds of disease. Large numbers of medicinal plants are used against it, but only few species were said to cure the complaints completely. The Thai, Tho, and Muong ethnic groups are often quite knowledgeable on the collection and preparation of anti stomach ache plants and actively exchange recipes with other ethnic groups in the region to combat the symptoms. Medicinal plants which are used for the treatment of stomach ache are for example leaves of *Eupatorium odoratum* (Asteraceae), leaves of *Ardisia silvestris* (Myrsinaceae) or rhizomes of *Curcuma zedoaria* (Zingiberaceae).

Diarrhoea

Diarrhoea is associated with several diseases, mostly attributable to poor sanitary practices and infected drinking water. The local people in Ben En National Park prefer to drink rain water rather than boiled water. In the dry season, there is little choice, and water from Muc Lake (the lake inside the National Park) and streams is used. Many people get diarrhoea in this season. Barks, roots and leaves decoctions are specifically used to treat diarrhoea. *Celosia cristata* (Amaranthaceae) treatment was said to be effective against diarrhoea with blood, which indicates bacterial dysentery. Leaves of *Eupatorium odoratum* (Asteraceae), bark of *Melia azedarach* (Meliaceae), and bark of *Ficus auriculata* (Moraceae) are just three examples of plant species used against diarrhoea in general.

Snake bites

Naja naja, *Bugarus fasciatus*, and *Ptyas korros* are dangerous, poisonous snakes in Ben En National Park. When a person is bitten, the bite can be deadly within hours. The roots and leaves of *Gnetum montanum* (Gnetaceae), the leaves of *Phyllanthus urinaria* (Euphorbiaceae), and leaves and stems of *Gynura crepidioides* (Asteraceae) are considered to be the most effective medicinal plants to cure snake bites. The skin is sliced open, and some of the crushed or chewed plant parts are applied to the wound. This treatment must be applied as soon as possible after the bite.

Risk of miscarriage

Some medicinal plant species are used to prevent miscarriages. In the research area, pregnant women drink an extract from the leaves and stems of *Artemisia vulgaris* (Asteraceae), mixed with some salt or sugar. Another species said to be effective to prevent miscarriage is *Boehmeria nivea* (Urticaceae): boiled roots of this species are eaten during pregnancy. Muong and Tho ethnic groups claim that the older the roots, the better the effects.

Weakness

Weakness can be caused by insomnia, after giving birth or by excessive fatigue. A total of 24 plant species was used to treat weakness. Most remedies consist of a decoction of leaves and stems that is boiled and drunk as tea, such as a decoction of the stems of *Mucuna pruriens* (Fabaceae), decoction of leaves and stems of *Leonurus sibiricus* (Lamiaceae), or the whole plant of *Marsilea quadrifolia* (Marsileaceae) are used to treat insomnia. Some plants are specially used by women after childbirth, such as the leaves of *Artemisia vulgaris* (Asteraceae), roots and stems of *Jasminum subtriplinerve* (Oleaceae), or the roots of *Polygonum multiflorum* (Polygonaceae), and the stems of *Spatholobus suberectus* (Fabaceae). After sickness or exhaustion local people use the flowers of *Telosma cordata* (Asclepiadaceae), or a decoction of the roots and stems of *Fibraurea recisa* (Menispermaceae).

Common colds

A total of 39 plant species was used to treat common colds. Most remedies consisted of a decoction of leaves, which was boiled and drunk as tea, some plant species are drunk after grinding them together with sugar or salt and a little water. Some plants are specifically used to treat children's colds such as the leaves of *Allium odorum* (Alliaceae), and the leaves of *Ocimum tenuiflorum* (Lamiaceae). Some plant species could treat most kinds of colds, such as the leaves of *Blumea balsamifera* (Asteraceae), the bulbs of *Allium sativum* (Alliaceae), or leaves and roots of *Glycosmis pentaphylla* (Rutaceae). Pneumonia was clearly distinguished from the common colds and treated differently.

Collection and preparation of medicinal plants

Who is collecting medicinal plants?

From interviewing households and key informants, it emerged that women collect medicinal plants more than men at almost every age level, especially in the age classes of over 26 years old. This indicates that women are mainly responsible for health care. From the completed questionnaires it was also evident that women have a better knowledge of medicinal plants than men. Young people are rarely engaged in collecting medicinal plants (Table 3.4).

Knowledge of plants and preparation

Most of the people interviewed were familiar with the species used for the treatments of common ailments like cold/cough, fever, headache, indigestion, itches, and plant remedies were used on a regular basis. As in other rural communities (On 2003) common knowledge was learned from other community members, especially from elders and local healers who share knowledge of the mode of collection, and the preparation and administration of medicinal plants.

Table 3.4. Percentage of gender and age level of local people in Ben En National Park harvesting medicinal plants

Age	Gender	Percentage of individuals collecting medicinal plants (%)
> 50	Male	18
	Female	29
26 - 50	Male	17
	Female	27
16 - 25	Male	3
	Female	4
< 16	Male	1
	Female	1
<i>Average % of Males</i>		39
<i>Average % of Females</i>		61

Preparations of plants for medical use included decoction, paste, juice, chewing, and cooking or boiling (Table 3.5). The most common methods of the collection and preparation of medicinal plants are cutting the leaves, roots, stem or bark into small pieces and boiling them in water. For preparing a decoction, the plant parts are boiled until the liquid is reduced to about half or one third of the volume. Some decoctions are also used as steam baths. For pastes, plant parts are finely crushed or chewed, and then the resulting paste is applied to the affected part. For a juice, the plant part (mostly leaves and fruits) is extracted and drunk. For some remedies plant parts are chewed raw, then swallowed. Some plant materials can also be dried and stored for later use.

Administration of medicines

Medical administrations include oral intake, application to external body parts, rubbing/massage, and inhalation (Table 3.6). Most of the species were administered orally, mainly as a decoction or extracted from plant parts. A high number of species were externally applied mostly to treat wounds, snake bites, bleeding and itches. Rubbing applied to treat back pain, muscle pain, and in only three remedies local

people applied inhalation, for instance of steam from *Eucalyptus camaldulensis* (Myrtaceae) and bamboo leaves in boiling water, to treat fever or cold.

Table 3.5. Preparation of medicinal plants

Preparation	Medical remedies (%)
Decoction	50
Paste	24
Juice	14
Chewing	6
Cooking/boiling	4
Powder	2

Table 3.6. Mode of administration of medical remedies

Mode	No. of remedies
Oral intake	199
External application	71
Rubbing/massage	14
Inhalation	3

Commercialization of medicinal plants

A total of 18 medicinal plant species in Ben En National Park are commercialized (Appendix 3.2); of these *Zingiber officinale* (Zingiberaceae) and *Allium sativum* (Alliaceae) are cultivated species. *Curcuma zedoaria* (Zingiberaceae) is both cultivated and wild. Three wild species in high market demand are *Morinda officinalis* (Rubiaceae), *Amomum villosum* (Zingiberaceae) and *Spatholobus suberectus* (Fabaceae).

Most of the species are sold to traders or in the market of the Nhu Thanh and the Nhu Xuan districts. Traders usually sell roots of *Morinda officinalis*, roots of *Polygonum multiflorum*, roots and stems of *Smilax glabra*, roots of *Gynura japonica* and stems and barks of *Abrus precatorius* to traditional medicine shops in big cities in Vietnam. *Spatholobus suberectus* and *Amomum villosum* are exported to China.

The demand of the market and the collection intensity of *Morinda officinalis* used as aphrodisiac are especially high. From our botanical field surveys (Hoang et al. in prep.) it appeared that this species has become endangered by overcollecting of the entire plant, and will soon be extinct, at least locally, if no attempts are made to get the plant into cultivation.

Importance of medicinal plant species for the local people in Ben En National Park

Importance for health care

The eight most important species for health care by local communities are listed in Table 3.7. Most of them are used to treat common diseases such as fever, colds, flu, weakness, and for treating women after childbirth.

Five species of these important medicinal plant species are already grown in home gardens, but the number of households planting them is still low (Table 3.7).

Table 3.7. The most important medicinal plants for local people in Ben En National Park

Latin name	Common name	Origin	Percentage of households cultivating the species
Asteraceae		Họ Cúc	
<i>Artemisia vulgaris</i> L.	Ngải cứu	Temperate Europe and Asia, wild, cultivated	21
Fabaceae		Họ Đậu	
<i>Spatholobus suberectus</i> Dunn	Huyết rồng Lào	Native, wild	0
<i>Abrus precatorius</i> L.	Cam thảo	India, wild	0
Lamiaceae		Họ Hoa môi	
<i>Leonurus sibiricus</i> L.	Ích mẫu	Siberia, China, wild, cultivated	12
<i>Ocimum tenuiflorum</i> L.	Hương nhu tía	Old World Tropics, wild, cultivated	15
Plantaginaceae		Họ Mã đề	
<i>Plantago asiatica</i> L.	Mã đề	Asia, wild, cultivated	11
Zingiberaceae		Họ Gừng	
<i>Zingiber officinale</i> Blume	Gừng	China, Asia cultivated	25
<i>Amomum villosum</i> Lour.	Sa nhân	China, wild	0

The use index of the medicinal plant species varies widely (Table 3.8, Appendix 3.1), from 0.01 to 1, indicating that 2 species are only used by 1% of all households (*Lonicera japonica* (Caprifoliaceae) and *Xylopiya vielana* (Annonaceae)), while 4 species are used by all households, all of them are common and cultivated species (*Camellia sinensis* (Theaceae), *Allium fistulosum*, *Allium sativum* (Alliaceae), and *Zingiber officinale* (Zingiberaceae)). The majority of species are used by less than half of the households, and 68% of the species have use indices lower than 0.25

(Table 3.8). On average, households use 25 medicinal plant species for disease treatment (Table 3.8).

Table 3.8. Use index of medicinal plants

Use index	Number of medicinal plant species
> 0.75	18
0.51 – 0.75	16
0.25 – 0.50	39
< 0.25	157

Importance for income generation

The monetary income value for local people was calculated for each listed species. A total of 18 medicinal plant species are commercialized in Ben En National Park, but the most important species for local income are *Amomum villosum* (Zingiberaceae) and *Spatholobus suberectus* (Fabaceae). The average income from *Amomum villosum* is US\$ 11 per year per household; this is about 2.5% of the total income. *Spatholobus suberectus* yields about US\$ 18 per year per household (4.3% of the total income). The other species do not generate much income, though *Morinda officinalis* (Rubiaceae) has a high price but it is very rare in the field and the amount collected by local people is small. Income of local people per household in Ben En National Park is shown in Table 3.9.

Table 3.9. Income of local people per household in Ben En National Park

Resource	Income in US\$	Percentage (%)	Remark
Agriculture	150	36	Crops such as rice and corn
Livestock	100	24	Pigs, chickens, dogs, and cows
Non medicinal useful plants	50	12	Bamboo, rattan, resin, timber, firewood, etc.
Medicinal plants	45	11	See Appendix 3.2
Others	75	17	Employment, fishing, trading, etc.
Total	420	100	

Comparison with other regional studies on medicinal plants in Vietnam and in the region

To see whether medicinal plants in Ben En National Park had characteristics in common with those of other national parks in Vietnam, the results of this study were

compared with the medicinal plant uses recorded by other authors. Both wild and cultivated medicinal species were taken into account (Table 3.10).

The result of this study was also compared with the medicinal plant uses recorded in the PROSEA Handbooks on Medicinal and poisonous plants (De Padua et al. 1999; Van Valkenburg & Bunyapraphatsara 2001; Lemmens & Bunyapraphatsara 2003) and Van Reede tot Drakenstein's Hortus Malabaricus (1668–1692, Manilal 2003). Out of the total of 230 medicinal plant species in Ben En National Park 128 species are listed in the PROSEA Handbooks on Medicinal and poisonous plants and 41 species used by local people in Ben En National Park were also used in the 17th century in Southwest India according to Van Reede's Hortus Malabaricus (Manilal 2003). Differences and similarities in the medicinal use of these species will be considered in the discussion.

Table 3.10. Comparison of medicinal plants in Ben En National Park with other regions in Vietnam

Study	National Park	Ethnic groups	Size of population	Area (km ²)	No of Medicinal plant species
This study	Ben En	Kinh, Muong, Thai, Tay, Tho	18,000	15,800	230
Tran & Ziegler 2001	Banh Ma	Kinh, Ta ku, Van kieu, H Mong	65,000	22,031	432
On 2003	Ba Vi	Dao	46,547	6,768	503
Thin & Nhan 2003	Pu Mat	Kinh, Thai, Kho Mu, Dan Lai, Poong, H Mong, O Du, Tay	93,333	91,113	610
Chi 1996	Entire Vietnam	54 ethnic groups	85,000.000	330,000.000	3200

Public perception and awareness

In the research area many people are able to identify medicinal plants and give recipes, but the young members of the communities demonstrate little interest in learning the traditional ethnomedical lore. About 43% of young people in all households interviewed do not know about medicinal plants and 25% do not want to learn how to use traditional medicinal plants for disease treatment. Moreover, many local people tend to use synthetic medicine instead of medicinal plants. About 47% of the households interviewed prefer to use western medicine if they can afford it.

Most local people in Ben En National Park recognized that medicinal plants are important for the health care of communities, especially for poor people. They also agreed that medicinal plants in Ben En National Park would not be endangered if they are only harvested for local treatment of diseases and not for commercial purposes. About 82% are aware that such practices had caused a decline in the abundance of many species during the last few years, especially of the expensive, economically exploited species.

Conservation status

Three medicinal plant species from Ben En are listed in the Red data list of IUCN (2006). However, there are 6 medicinal plant species used by local communities in Ben En National Park that are listed in the Red Data Book of Vietnam Vol. 2 (Ban 2007) (Table 3.11). At the local level, 18 medicinal plant species appear to be endangered, rare, or threatened (Table 3.12).

Table 3.11. Medicinal plants in Ben En National Park listed in the red data book of Vietnam (Ban 2007), and Red list of threaten species of IUCN (2006).
E - Endangered; V - Vulnerable; T - Threatened; LR - Least concern; nl - not listed

Species	Family	Threat category in Red data book Vietnam	Threat category in Red list of IUCN 2006
<i>Alstonia scholaris</i> L.	Apocynaceae	nl	LR
<i>Anoectochilus roxburghii</i> (Wall.) Lindl.	Orchidaceae	E	nl
<i>Ardisia silvestris</i> Pit.	Myrsinaceae	V	nl
<i>Caesalpinia sappan</i> L.	Caesalpiniaceae	nl	LR
<i>Cycas pectinata</i> Buch.-Ham.	Cycadaceae	V	V
<i>Drynaria fortunei</i> (Mett.) J. Sm	Polypodiaceae	T	nl
<i>Polygonum multiflorum</i> Thunb.	Polygonaceae	V	nl
<i>Rauvolfia verticillata</i> (Lour.) Baill.	Apocynaceae	V	nl

DISCUSSION

The commercial potential of medicinal plants in Ben En National Park

The diversity of medicinal plants in Ben En National Park could have a much larger potential for the local people in the research area in particular and for Vietnam in general if the medicinal plants would be processed in a more sophisticated manner, e.g. in ready-to-use tonics and powders. On the other hand, the number of commercialized medicinal plant species in Ben En National Park (18 species) is lower than in other regions: for instance, 54 species in Ba Vi National Park (On 2003) are commercialized. Moreover, the prices of commercial medicinal plant species in Ben En are not stable. The two most important species to generate income

are *Amomum villosum* and especially *Spatholobus suberectus*. The revenues they generate still depend on the traders. It would be better if local communities organized the market system. Furthermore, local people should understand and establish sustainable harvesting methods, especially for the species of high value and importance for income generation. Last but not least, the commercially valuable medicinal plant species should be further studied and planted in home gardens.

Table 3.12. Medicinal plants considered as threatened species in Ben En National Park
E - Endangered, R - Rare, T - Threatened

Species	Family	Threat category
<i>Acorus gramineus</i> Sol.	Araceae	R
<i>Anoectochilus roxburghii</i> (Wall.) Lindl.	Orchidaceae	E
<i>Ardisia silvestris</i> Pit.	Myrsinaceae	E
<i>Caesalpinia sappan</i> L.	Caesalpinaceae	R
<i>Catharanthus roseus</i> L.	Apocynaceae	T
<i>Cibotium barometz</i> (L.) J. Sm.	Dicksoniaceae	T
<i>Cissampelos pareira</i> L.	Menispermaceae	R
<i>Coscinium fenestratum</i> (Gaertn.) Colebr.	Menispermaceae	E
<i>Cycas pectinata</i> Buch.-Ham.	Cycadaceae	T
<i>Drynaria fortunei</i> (Mett.) J. Sm.	Polypodiaceae	R
<i>Fibraurea recisa</i> Pierre	Menispermaceae	T
<i>Morinda citrifolia</i> L.	Rubiaceae	R
<i>Morinda officinalis</i> Haw.	Rubiaceae	E
<i>Polygonum multiflorum</i> Thunb.	Polygonaceae	V
<i>Rauvolfia verticillata</i> (Lour.) Baill.	Apocynaceae	T
<i>Smilax glabra</i> Wall.	Smilacaceae	T
<i>Stephania longa</i> Lour.	Menispermaceae	R
<i>Stephania rotunda</i> Lour.	Menispermaceae	R

Loss of traditional knowledge

Traditional medicinal plant species are not only important for health care of local communities but also of some importance to generate income. However, the present knowledge on traditional healing practices is being lost rapidly. Only few of the local people younger than 25 year participate in collecting medicinal plants compared to those older than 50 (Table 3.4). Furthermore, many young members of the communities do not know about medicinal plants and show little interest in learning the traditional ethnomedical lore. Traditional knowledge of medicinal plants can get easily lost because many local people tend to use synthetic medicine

instead of medicinal plants. To protect and develop the valuable knowledge of traditional medicinal plants their use should be encouraged, especially among the younger generation.

Comparisons with other regional studies on medicinal plants in Vietnam and in the region

The general patterns of plant use recorded in Ben En National Park show overlap with other ethnomedicinal studies from other national parks. Many of the recipes and ideas about illnesses and healing in Ben En are similar to those in Ba Vi (On 2003) and Pu Mat (Thin & Nhan 2003). But the comparisons also show that the number of medicinal plant species used by local people in Ben En is smaller than in other national parks in Vietnam (Table 3.10). The reason may be that the population living in the core and buffer zone of Ben En is much smaller than in other parks. Moreover, this is the first study on medicinal plants in Ben En National Park, while the number of medicinal plants used by local people according to earlier research in other regions also was smaller than according to more recent results, e.g. 200 species found in Ba Vi National Park (On 2000) (now 503 species); 200 species found in Pu Mat National Park (On 2003) (now 610 species). So future research may show the number of medicinal plant species in Ben En to be higher than the 230 species recorded so far.

A total of 172 medicinal plant species in Ben En National Park (about 75%) are also used medicinally by local people in Pu Mat National Park (Thin & Nhan 2003). Out of these 172 species, 138 species show at least one disease treatment overlapping in use and application in the two parks. The ethnic minority groups in the two regions are quite similar; both regions have Kinh, Thai, and Tay groups, and this could account for similar traditional uses. In the remaining 34 species there are no similarities in the medicinal uses, for example *Glochidion velutinum* (Euphorbiaceae) is used in Pu Mat to treat oedema; in Ben En it is used to treat stomach ache and tooth ache.

The Dao ethnic group in Ba Vi National Park (On 2003) use 114 of the medicinal plant species (about 49%) recorded here as traditional medicinal plants in Ben En National Park. Out of these 114 medicinal species, 48 overlap in at least one disease treatment between the two parks. In the remaining 68 species there are no similarities in the medicinal uses. For example, *Rauvolfia verticillata* (Apocynaceae) is used in Ba Vi against diarrhoea; in Ben En it is used to treat sores and itches. *Gymnema inodorum* (Asclepiadaceae) in Ba Vi is used to treat rheumatism; in Ben En it is used to cure indigestion. This huge divergence in traditional use of medicinal plant species in two regions is hard to understand. It raises questions about the efficacy of traditional healing methods on the one hand and on the role of cultural divergence in health care, on the other.

In order to place these patterns in a broader perspective our results on the medicinal uses of plants in the Ben En National Park were also compared with two other detailed sources of information on traditional use of medicinal plants in Asia: Hortus Malabaricus and the three PROSEA handbook volumes on Medicinal and Poisonous Plants from South-East Asia.

The Hortus Malabaricus by Van Reede tot Drakenstein, consulted in the English translation (Manilal 2003), contains a detailed account of 690 species from the Malabar Coast in India (the modern state of Kerala) with information on their medicinal uses contributed and verified by local traditional healers and Brahmins (Heniger 1986). Although the floras of SW India and Vietnam are far apart and very different, 41 species out of the 230 medicinal species from Ben En National Park were also used medicinally in India in the 17th century and documented in the Hortus Malabaricus (the asterisked species in Appendix 3.1). A very precise comparison of the uses and (presumed) activity of the medicinal preparations is not possible because both Hortus Malabaricus and our own survey suffer from the fact that actual diseases are not properly identified in line with modern medical knowledge, but rather very general symptoms are listed that may be caused by many different diseases (such as stomach ache, head ache, fever, swellings, weakness, etc., cf. Appendix 3.1). Nevertheless, it is most striking that the same species were in most cases apparently used to treat entirely different symptoms by the 17th century inhabitants and doctors of Kerala when compared with the 21st century local healers in Ben En National Park. For instance, out of the 41 species only 9 show some overlap in their use and application between the two regions, usually concerning only general symptoms like headaches, fever or itches. In the remaining 32 species no similarities in the medicinal uses could be detected at all. To give just two examples: *Morinda citrifolia* (Rubiaceae) was used in India to treat gout; in Ben En National Park it is used as an aphrodisiac and to treat sores; *Phyllanthus reticulatus* was used in India as a mouth wash and to treat rheumatism and stomach ailments; in Ben En it is used to cure skin burns. This huge divergence in traditional use of these 41 species raises similar questions about the efficacy and reliability of traditional healing methods in general as signalled above. One might also question the reliability of the informants in both analyses.

A total of 128 medicinal species from Ben En (56% of the species) have also been reviewed in the PROSEA Handbooks on Medicinal and Poisonous Plants from South-East Asia (De Padua et al. 1999; Van Valkenburg & Bunyaphatsara 2001; Lemmens & Bunyaphatsara 2003). In the PROSEA Handbooks information on traditional and modern use of medicinal plants is comprehensively abstracted for the whole region from continental South-East Asia (including Vietnam and Thailand) to the Indo-Pacific (Malaysia, Indonesia, the Philippines, Papua New Guinea). Here the overlap with applications documented is much greater. This is not surprising because widespread medicinal species appear to have a very wide range of traditional uses, often highly divergent from country to country or region to region,

which increases the probability that a single traditional use communicated by the local people from Ben En is among the manifold uses documented for the whole of South-East Asia. PROSEA information thus also shows a fairly high overlap with ancient uses documented in Hortus Malabaricus. In over two thirds of the medicinal species from Ben En the local application agrees with one of the numerous applications recorded in the PROSEA Handbooks. Nevertheless, for 35 species the medicinal use reported by village elders, households and local doctors in Ben En appears to be 'new'. For instance *Achyranthes aspera* (Amaranthaceae) used to treat nervous debility in Ben En, is elsewhere used to treat wounds, abscesses and boils, rheumatism, stomach ache, menstruation pains, etc.; *Tetracera scandens* (Dilleniaceae) used to treat rheumatism in Ben En, has a very wide range of applications throughout South-East Asia, including the treatment of snake bites, coughs, burns and diarrhoea without any record for rheumatism (Van Valkenburg & Bunyapraphatsara 2001). These and other divergences between our results from the field survey and interviews in Ben En and information documented in the literature suggest that both broad and narrow inventories of medicinal plants may still be very incomplete and that further critical study is needed.

APPENDIX 3.1
Medicinal plant species used by local people

Key: * species also treated in Hortus Malabaricus; + species also treated in PROSEA
Life-form W = Wood; S = Shrub; H = Herb; C = Liana; **Wild/Cultivated:** W = Wild; C = Cultivated

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
POLYPODIOPHYTA – FERNS							
Adiantaceae							
<i>Adiantum caudatum</i> L.	Họ Tóc thần vệ nữ Tóc thần vệ nữ	H	0.10	W	Leaves, stem	Fever, coughs	Decoction of leaves and stems is drunk
Aspleniaceae							
<i>Asplenium nidus</i> L.	Tổ diều	C	0.04	W	Leaves, tuber	Strained muscles	Plant parts are crushed and applied externally
Blechnaceae							
<i>Blechnum orientale</i> L.	Guột lá dứa	H	0.18	W	Leaves, stem	Wounds, snake bite	Plant parts are chewed raw or crushed, then paste applied on the affected part
Dicksoniaceae							
<i>Cibotium barometz</i> (L.) J. Sm.+	Lông cu li	S	0.25	W	Root	Haemostatic	Hairs from stipe bases are taken and applied on the affected part
Marsileaceae							
<i>Marsilea quadrifolia</i> L.	Rau bợ	H	0.23	W	Whole plant	Insomnia	Plant parts are cooked and eaten
Polypodiaceae							
<i>Drynaria fortunei</i> (Mett.) J. Sm.	Cốt toái bổ	H	0.17	W	Stem, leaves, root	Strained muscles, weakness	Decoction of plant parts is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Microsorium superficiale</i> (Bedd.) Ching	Ráng	H	0.06	W	Leaves	Wounds	Leaves are chewed and paste applied on affected part
Schizaceae	Họ Bông bong						
<i>Lygodium conforme</i> C.Chr.	Bông bong lá to	C	0.08	W	Leaves, stem	Indigestion	Plant parts are decocted and the decoction is drunk
<i>Lygodium scandens</i> (L.) Sw.	Bông bong lá nhỏ	C	0.05	W	Leaves	Rheumatism	Juice extracted from leaves are rubbed externally on affected part
PINOPHYTA-GYMNOSPERMS	Ngành Thông						
Cycadaceae	Họ Tuế						
<i>Cycas pectinata</i> Buch.-Ham.	Tuế Lược	W	0.05	W,C	Root	Tuberculosis	Roots juice is taken with warm water
Gnetaceae	Họ Gấm						
<i>Gnetum montanum</i> Markgr.	Gấm núi	C	0.16	W	Seed	Malaria	Seeds pounded is drunk with warm water
MAGNOLIOPHYTA-ANGIOSPERMS	Ngành Ngọc Lan						
MAGNOLIOPSIDA-DICOTS	Lớp 2 lá mầm						
Acanthaceae	Họ Ô rô						
<i>Rhinacanthus nasutus</i> (L.) Kurz*	Bạch hạc	S	0.12	W	Leaves, stem	Herpes, itches, wounds	Plant parts are crushes and paste applied on affected part

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Strobilanthes cystolithigera</i> Lind.	Chuồn hoa	H	0.05	W	Leaves	Bone fractures	Leaves are crushed and paste applied on broken part
Alangiaceae							
<i>Alangium chinense</i> Lour.	Thôi ba	W	0.14	W	Leaves, root	Paralysis	Plant parts are crushed in water or root are soaked in wine and applied on, then rubbed by hand
Amaranthaceae							
<i>Achyranthes aspera</i> L.* +	Cỏ xước	H	0.24	W	Flower	Nervous debility	Decoction of flowers is drunk
<i>Amaranthus viridis</i> L.	Đon đỏ	H	0.26	W	Leaves, root	Snakebite, bee stings	Leaves and roots are crushed and paste applied on affected part
					Leaves	Fever	Leaves are decocted, then the decoction is drunk
<i>Amaranthus spinosus</i> L.+	Đền cơm	H	0.26	C	Root	Fever	Roots juice is drunk
<i>Celosia cristata</i> L.	Mào gà	H	0.26	C	Stem, leaves, root	Diarrhea with blood	Plant parts are decocted, then the decoction is drunk
Anacardiaceae							
<i>Spondias lakonensis</i> Pierre	Dầu da xoan	W	0.51	W,C	Root	Weakness after childbirth	Roots decoction is given to mother after birth
Annonaceae							
<i>Annona squamosa</i> L.+	Nà	W	0.15	C	Leaves	Sores	Leaves are crushed, then applied externally
<i>Desmos cochinchinensis</i> Lour.+	Hoa gié	C	0.04	W	Stem	Constipation	Small pieces of stem are decocted and the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Fissistigma villosum</i> (Ast.) Merr.	Cánh hoa có lông	C	0.24	W	Leaves, stem	Stomach ache	Leaves and small pieces of stems are decocted then the decoction is drunk
<i>Xylopiá vielana</i> Pierre	Dền	W	0.01	W	Bark, root	Malaria	Small pieces of barks and roots are decocted, then the decoction is drunk
Apiaceae							
<i>Centella asiatica</i> (L.) Urb. +	Rau má	H	0.68	W	Whole plant	Detoxification, urinating problems	Plant parts are chewed raw and swallowed
Apocynaceae							
<i>Alstonia scholaris</i> L.*	Sữa	W	0.11	W,C	Bark	Irregular menses	Small pieces of bark are decocted, then the decoction is drunk
<i>Catharanthus roseus</i> (L) G.Don+	Dừa cạn	H	0.08	W	Root, stem	High blood pressure	Leaves and stems are decocted, then the decoction is drunk
					Leaves	Irregular menses	Leaves are decocted, then the decoction is drunk
					Root, leaves	Dysentery	Leaves and roots are decocted then the decoction is drunk
<i>Plumeria rubra</i> L.	Đại	W	0.26	C	Leaves, flower	Diarrhea	Flowers and leaves juice is drunk with warm water
<i>Rauwolfia verticillata</i> (Lour.) Baill. +	Ba gạc	S	0.23	W	Bark	Dysentery	Small pieces of barks are decocted, then the decoction is drunk
					Leaves	Sores, itches	Leaves are crushed and paste applied on affected part

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Strophanthus caudatus</i> (Burm. F.) Kurz +	Sừng Châu	C	0.04	W	Whole plant	High blood pressure	Plant parts are decocted, then the decoction is drunk
<i>Wrightia annamensis</i> Eberth. & Dub.	Mítc trung bộ	S	0.06	W	Leaves	Dysentery	Leaves are decocted, then the decoction is drunk
Araliaceae							
<i>Aralia armata</i> (Wall. ex G. Don) Seem.	Đơn châu châu	W	0.68	W	Root	Sore throat	Roots are chewed raw, then swallowed
<i>Aralia touranensis</i> Ha	Cuông	C	0.32	W	Leaves	Rheumatism	Juice extracted from leaves are rubbed externally on affected part
<i>Polyscias fruticosa</i> Harms	Đình lăng	H	0.82	C	Root	Diabetes	Roots are decocted, then the decoction is drunk
					Leaves, root	Weakness	Leaves are eaten as vegetable, roots are soaked in wine, then drunk
<i>Schefflera octophylla</i> (Lour.) Harms +	Chân chim 8 lá	W	0.84	W	Root	Indigestion	Roots are decocted, then the decoction is drunk
					Leaves, bark	Itches	Leaves and barks are crushed, then applied on the affected part
Asclepiadaceae							
<i>Gynemna inodorum</i> Deene +	Rau mơ	C	0.46	C	Root	Indigestion	Roots are chewed raw and swallowed

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Streptocaulon griffithii</i> Hook.f. +	Hà thủ ô	C	0.51	W	Root	Stomach ache	Roots are decocted, then the decoction is drunk
<i>Telosma cordata</i> (Burm.f.) Merr.	Hoa lý	C	0.19	C	Flower	Weakness	Flowers are cooked, then eaten
Asteraceae							
<i>Artemisia vulgaris</i> L.+	Ngải cứu	H	0.97	C	Leaves	Head ache	Juice extracted from leaves, then drunk
					Stem, leaves	Risk of miscarriage	Juice extracted from leaves and stems, mixed with salt or sugar then drunk
					Leaves	Weakness after childbirth	Leaves are cooked, then eaten
<i>Blumea balsamifera</i> (L.) DC.+	Đài bi	H	0.21	W	Leaves	Colds, flu, coughs	Leaves are decocted, then the decoction is drunk
					Stem	Stomach ache	Small pieces of stems are decocted, then the decoction is drunk
<i>Eclipta erecta</i> L.*+	Nhọ nôi	H	0.84	W	Root	Malaria	Roots are decocted, then the decoction is drunk
					Leaves	Haemostatic, wounds	Leaves are chewed raw or crushed, then paste applied on affected part
<i>Elephantopus scaber</i> L.*+	Cúc chi thiên	H	0.32	W	Root	Stomach ache	Roots are decocted, then the decoction is drunk
					Leaves	Dysentery	Leaves are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Emilia sonchifolia</i> (L.) DC.	Rau má lá rau muống	H	0.11	W	Leaves, root	Dysentery	Leaves and roots are decocted, then the decoction is drunk
					Leaves	Colds, flu	Leaves are decocted, then the decoction is drunk
					Leaves	Sores	Leaves are crushed, then applied on affected part
<i>Eupatorium odoratum</i> L.	Cỏ lão	H	0.40	W	Leaves	Stomach ache	Leaves are decocted, then the decoction is drunk
					Leaves	Diarrhea	Leaves are decocted, then the decoction is drunk
<i>Gynura crepidioides</i> Benth. +	Rau tàu bay	H	0.57	W	Leaves, stem	Snakebite	Leaves and stems are crushed, then paste applied on affected part
					Leaves	Haemostatic	Leaves are chewed raw or crushed, then paste applied on affected part
<i>Gynura japonica</i> (Thunb.) Juel+	Cúc Tam Thất	H	0.26	W	Leaves, root	Infection	Leaves and roots are crushed, then paste applied on affected part
					Leaves	Haemostatic	Leaves are chewed raw or crushed, then paste applied on affected part
<i>Xanthium strumarium</i> L.+	Ké đầu ngựa	H	0.51	W	Stem, leaves, root	Dysentery	Plant parts are decocted, then the decoction is drunk
					Leaves	Itches	Leaves are chewed raw then applied on affected part
Bignoniaceae	Họ Đinh						

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Oroxylum indicum</i> (L.) Vent.*+	Núc nác	W	0.09	W,C	Bark, fruit	Strained muscles	Barks and fruits are decocted, then the decoction is drunk
Bombacaceae	Họ Bông Gao						
<i>Gossampinus malabarica</i> (DC.) Merr.	Gạo	W	0.08	W,C	Leaves, bark	Bone fractures	Leaves and barks are crushed, then paste applied on broken part
Caesalpinaceae	Họ Vang						
<i>Bauhinia viridescens</i> Desv.	Móng bò	C	0.12	W	Root	Enteritis	Roots are decocted then the decoction is drunk
<i>Caesalpinia digyna</i> Rottler +	Móc mèo núi	S	0.35	W	Stem, seed	Fever, coughs	Small pieces of stems and seeds are decocted, then the decoction is drunk
<i>Caesalpinia sappan</i> L.*+	Vang	W	0.37	W	Stem	Weakness	Small pieces of stems are decocted, then the decoction is drunk
<i>Senna tora</i> L.+	Thảo quyết minh	S	0.31	W	Leaves, root	Diarrhea	Decoction of roots and leaves is mixed with honey, then drunk
					Leaves	Haemostatic	Leaves are chewed raw, then paste applied on affected part
					Flower	Anodyne	Flower is pounded, then given with warm water
					Seed	High blood pressure	Decoction of seeds is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Gleditsia australis</i> Hemsl. +	Bồ kết	W	0.28	W,C	Fruit	Tooth ache	Juice extracted from fresh fruit, then applied on affected teeth
<i>Tamarindus indica</i> L.+	Me	W	0.21	W,C	Fruit	Indigestion	Fruit is decocted, then the decoction is drunk
Caprifoliaceae	Họ Kim ngân				Fruit	Fever	Fruit is eaten
<i>Lonicera macrantha</i> (D. Don) Spreng.	Kim ngân hoa to	C	0.04	W	Leaves	Dysentery	Leaves are chewed raw, then swallowed
<i>Lonicera japonica</i> Thunb.+	Kim ngân	H	0.01	W	Leaves	Allergies	Leaves are decocted, then the decoction is drunk
<i>Sambucus hookeri</i> Rehder	Com cháy	W	0.02	W	Leaves, stem	Dysentery	Decoction of flower is drunk
Caricaceae	Họ Đu đủ						
<i>Carica papaya</i> L.*+	Đu đủ	W	0.36	C	Root, leaves	Coughs	Roots and leaves are decocted, then the decoction is drunk
Clusiaceae	Họ Bứa				Fruit	Urinating problems	Fruit are eaten
<i>Cratoxylum polyanthum</i> Korth.	Thành nganh	W	0.25	W	Root	Tooth ache	Roots are soaked in strong wine and applied on the hurting teeth
<i>Garcinia oblongifolia</i> Champ. ex Benth.	Bứa	W	0.12	W	Bark	Stomach ache	Small pieces of barks are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Combretaceae							
<i>Quisqualis indica</i> L.+	Họ Bàng Dây giun	W	0.20	W	Leaves	Itches	Leaves are crushed, then applied on affected part
					Stem	Tooth ache	Small pieces of stems are soaked in strong wine and applied on the hurting teeth
Connaraceae							
<i>Cnestis palala</i> Merr.+	Họ Khế Dây khế	C	0.29	W	Leaves, bark	Wounds	Leaves and bark are crushed, then paste applied on affected part
<i>Rauarea minor</i> (Gaertn.) Leenh.* +	Khế rừng	W	0.07	W	Leaves, bark	Dysentery	Leaves and bark are decocted, then the decoction is drunk
Convolvulaceae							
<i>Argyreia acuta</i> Lour.	Bạc thau	C	0.09	W	Stem, leaves, root	Menorrhagia	Plant parts are decocted, then the decoction is drunk
<i>Merremia boissiana</i> (Gagnep.) Ooststr.	Bìm bịp	C	0.16	W	Leaves	Indigestion	Leaves are chewed raw, then swallowed
Crassulaceae							
<i>Kalanchoe pinnata</i> (Lam.) Pers. +	Họ Thuốc bỏng Thuốc bỏng	H	0.87	W,C	Stem, leaves, root	Detoxification	Juice extracted from plant part, then drunk
					Leaves	Burns	Leaves are crushed, then paste applied on affected part
Cucurbitaceae							
<i>Cucurbita maxima</i> Lam.	Họ Bầu bí Bí đỏ	C	0.23	C	Leaves, fruit	Head ache	Leaves and fruits are cooked, then eaten

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Hodgsonia macrocarpa</i> (Blume) Cogn.+	Đại hái	C	0.05	W	Leaves	Abscesses	Leaves are crushed then paste applied on externally affected part
<i>Momordica cochinchinensis</i> (Lour.) Spreng.+	Gấc	C	0.34	C	Seed	Mumps	Seeds pounded mixed with honey, then paste applied on externally affected part
<i>Trichosanthes cucumeroides</i> (Ser.) Maxim.* +	Dưa núi	C	0.04	W	Leaves, stem	Fever	Seeds pounded is given with warm water
Cuscutaceae	Họ Tơ hồng				Seed	Food poisoning	
<i>Cuscuta chinensis</i> Lam. +	Tơ hồng	C	0.04	W	Whole plant	Back pain	Plant parts are decocted, then the decoction is drunk
Dilleniaceae	Họ Sỏ				Whole plant	Constipation	
<i>Tetracera scandens</i> (L.) Merr.+	Chặc chiu	C	0.15	W	Root	Rheumatism	Plant parts are heated, then applied on the back
Ebenaceae	Họ Thị				Root, stem	Stomach ache	Plant parts are decocted, then the decoction is drunk
<i>Diospyros decandra</i> Lour.	Thị	W	0.07	C	Leaves, fruit	High blood pressure	Juice extracted from roots is drunk
Elaeagnaceae	Họ Nhót						Small pieces of roots and stems are decocted, then the decoction is drunk
<i>Elaeagnus bonii</i> Lecomte	Nhót	S	0.08	C	Stem	Dysentery	Decoction of leaves and fruits is drunk
							Decoction of small pieces of stems is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Euphorbiaceae							
Họ Thầu dầu							
<i>Baccaurea ramiflora</i> Lour.	Dầu da dạt	W	0.25	W,C	Leaves	Itches	Leaves are crushed, then applied on affected part
<i>Bischofia javanica</i> Blume	Nhội	W	0.11	W	Leaves, fruit Bark, leaves	Indigestion Burns	Fresh leaves and ripen fruits are eaten Plant parts are crushed, then paste applied on affected part
<i>Breynia fleuryi</i> Beille	Bồ cu vễ	S	0.05	W	Root	Malaria	Roots are decocted, then the decoction is drunk
<i>Euphorbia antiqorum</i> L.*+	Xương rồng	H	0.29	W,C	Stem	Tooth ache	Juice extracted from stems, then applied on affected teeth
<i>Euphorbia hirta</i> L.+	Cỏ sữa	H	0.12	W	Whole plant	Malaria	Plants parts are decocted, then the decoction is drunk
<i>Glochidion velutinum</i> Wight+	Bọt ếch	S	0.48	W	Whole plant Leaves, stem	Dysentery Stomach ache	Plant parts are decocted, then the decoction is drunk
<i>Jatropha curcas</i> L.+	Dầu mè	W	0.04	W	Root Seed Leaves	Tooth ache Head ache Kidney failure	Roots is soaked in wine, then applied on hurting teeth Seeds oil is applied on forehead Leaves are decocted, then the decoction is drunk
<i>Mallotus barbatus</i> (Wall.) Muell. Arg.+	Bùm búp	S	0.12	W	Leaves, root	Dysentery	Leaves and roots are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Phyllanthus reticulatus</i> Poir.*+	Phèn đen	S	0.27	W	Leaves	Haemostatic	Leaves are crushed, then paste applied on affected part
<i>Phyllanthus urinaria</i> L.	Chó đẻ	S	0.52	W	Whole plant	Burns Sores, itches	Leaves are crushed, then paste applied on affected part Plant parts are crushed, then applied on affected part
<i>Ricinus communis</i> L.*	Thầu dầu	S	0.14	C	Leaves Stem, bark	Snakebite Weakness	Leaves are crushed, then paste applied on affected part Small pieces of stems and barks are decocted, then the decoction is drunk
Fabaceae							
<i>Abrus precatorius</i> L.*+	Cam thảo	S	0.86	W	Whole plant	Coughs	Plant parts are decocted, then the decoction is drunk
<i>Bowringia callicarpa</i> Champ. ex Benth.	Dây bánh nem	S	0.09	W	Bark, stem Leaves	Throat sores Rheumatism	Barks and stems are chewed raw, then swallowed Leaves are crushed in water, then rubbed externally
<i>Derris elliptica</i> Benth.+	Dây mật	C	0.03	W	Root	Nervous debility	Roots are decocted, then the decoction is drunk
<i>Desmodium caudatum</i> (Murray) DC.	Thóc lép	H	0.04	W	Root	Oedema	Roots are decocted, then the decoction is drunk
<i>Erythrina fusca</i> Lour.+	Vông đồng	W	0.27	W,C	Bark, stem	Hemorrhage	Small pieces of stems and barks are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Mucuna pruriens</i> (L.) DC.+	Mắc mề	C	0.48	W	Stem	Tooth ache	Barks are soaked in wine, then use that wine applied on affected teeth
<i>Pueraria phasecoloides</i> (Roxb.) Benth.	Sắn dây	C	0.76	C	Tuber	Weakness	Small pieces of stems are decocted, then the decoction is drunk
<i>Sophora japonica</i> L. f.	Hoa hòe	W	0.27	W,C	Seed, flower	Weakness	Powder made from tubers is drunk with water, or cooked, then eaten
<i>Spatholobus suberectus</i> Dum.	Huyết rồng lão	C	0.95	W	Stem	High blood pressure	Seeds and flowers are boiled, then drunk like tea
Hydrangeaceae	Họ Thuồng Sơn					Weakness after childbirth	Small pieces of stems are boiled in water, then drunk
<i>Dichroa febrifuga</i> Lour.	Thuồng sơn	S	0.07	W	Leaves, root, stem	Weakness after childbirth	Plant parts are decocted, then the decoction is drunk
Lamiaceae	Họ Hoa môi					High blood pressure	Roots are decocted, then the decoction is drunk
<i>Hyptis suaveolens</i> (L.) Poit.	Tía tô dại	H	0.17	W	Root	Weakness	Leaves and stems are decocted, then the decoction is drunk
<i>Leonurus sibiricus</i> L.+	ích mẫu	H	0.87	W,C	Leaves, stem	Hemorrhage	Leaves are crushed in warm water and mixed with some salt, then drunk
<i>Ocimum tenuiflorum</i> L.	Hương nhu tía	H	0.78	W,C	Leaves	Head ache	Leaves are crushed, then applied on forehead

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Lauraceae							
Họ Long não							
<i>Cassytha filiformis</i> L.*+	Tơ xanh	C	0.04	W	Stem	Malaria	Decoction of small pieces of stems is drunk
<i>Cinnamomum iners</i> Reinw. ex Blume+	Re hương	W	0.21	W	Bark	Indigestion	Barks are decocted, then the decoction is drunk (special to treat children's cold)
<i>Cinnamomum cassia</i> Blume+	Quế	W	0.82	C	Bark	Stomach ache	Barks are decocted, then the decoction is drunk
<i>Litsea cubeba</i> (Lour.) Pers.+	Mãng tang	W	0.12	W	Leaves, stem	Nervous debility	Barks are decocted, then the decoction is drunk
<i>Litsea glutinosa</i> (Lour.) C.B. Rob.	Bời lời nhớt	W	0.04	W	Bark, root	Dysentery	Small roots and barks are decocted, then the decoction is drunk
Lecaceae							
Họ Gối hạc							
<i>Leea rubra</i> Blume +	Gối hạc	S	0.07	W	Root	Arthritis	Small pieces of roots are soaked in wine, then wine is applied on affected part

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Lythraceae	Họ Bằng lăng				Root	Stomach ache	Roots are decocted, then the decoction is drunk
<i>Punica granatum</i> L.+	Lựu	W	0.15	C	Leaves	Dysentery	Young leaves are chewed raw and swallowed
Malvaceae	Họ Bông						
<i>Abutilon indicum</i> (L.) Sweet *+	Cối xay	S	0.51	W	Leaves, fruit	Fever, flu	Plant parts are decocted, then the decoction is drunk
<i>Hibiscus rosa-sinensis</i> L.*+	Dâm bụt	S	0.15	W,C	Leaves, stem	Sores	Plant parts are decocted, then the decoction is drunk
<i>Sida rhombifolia</i> L.+	Ké hoa vàng	S	0.07	W	Root, stem	Malaria	Small pieces of roots and stems are decocted, then the decoction is drunk
<i>Urena lobata</i> L.*	Ké hoa đảo	S	0.09	W	Root, stem	Malaria	Small pieces of roots and stem are decocted, then the decoction is drunk
Melastomataceae	Họ Mua						
<i>Melastoma normale</i> D. Don	Mua	S	0.19	W	Leaves, stem	Infection	Plant parts are crushed, then paste applied on affected part
<i>Melastoma sanguineum</i> Sims.	Mua bà	S	0.15	W	Young leaves	Fever	Young leaves are decocted, then the decoction is drunk
					Young leaves	Sore throat	Young leaves are chewed raw, then swallowed
Meliaceae	Họ Xoan						
<i>Melia azedarach</i> L.+	Xoan	W	0.21	C	Leaves, root	Stomach ache	Plant parts are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Menispermaceae	Hồ Tiết dẻ				Inner bark	Diarrhea	Inner barks are decocted, then the decoction is drunk
<i>Cissampelos pareira</i> L.+	Tiết dẻ	C	0.11	W	Leaves, stem, root	Rheumatism	Leaves, stems and roots are crushed, then paste applied on externally
<i>Coclinium fenestratum</i> (Gaertn.) Colebr. +	Vàng đắng	C	0.04	W	Root, stem	Fever	Decoction of roots and stems is drunk
					Root	Dysentery	Roots are decocted, then the decoction is drunk
					Leaves	Wounds	Plant parts are crushed, then paste applied on affected part
<i>Fibraurea recisa</i> Pierre	Hoàng đằng	C	0.12	W	Stem	Wounds	Plant parts are crushed, then paste applied on affected part
					Stem, root	Weakness	Small pieces of roots and stems are decocted, then the decoction is drunk
<i>Pericampylus glaucus</i> (Lam.) Merr. Lôi tiên		C	0.12	W	Leaves, stem	Snakebite	Plant parts are crushed, then paste applied on affected part
<i>Pycnarrhena poilanei</i> (Gagnep.) Forman	Phi đằng	C	0.08	W	Leaves, root	Eye sores	Plant parts are decocted, then the decoction is drunk
<i>Stephania japonica</i> (Thunb.) Miers+	Cam thảo	C	0.35	W	Stem, root	Diarrhea	Plant parts are decocted, then the decoction is drunk
<i>Stephania longa</i> Lour.	Lôi tiên	C	0.16	W	Root	Stomach ache	Plant parts are decocted, then the decoction is drunk

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<i>Stephania rotunda</i> Lour.	Củ bình vôi	C	0.51	W	Tuber	Stomach ache	Tuber decocted, then the decoction is drunk
Mimosaceae							
Họ Trinh nữ							
<i>Acacia farnesiana</i> (L.) Willd. +	Keo ta	W	0.03	C	Bark, stem	Wounds	Plant parts are crushed, then paste applied on affected part
<i>Entada phaseoloides</i> (L.) Merr.+	Bàm Bàm	C	0.05	W	Bark, flower, leaves	Itches	Plant parts are crushed, then applied on affected part
<i>Leucaena leucocephala</i> (Lam.) De Wit	Keo dậu	W	0.02	W,C	Bark Seed	Malaria Hookworm	Decoction of barks is drunk Seeds pounded, then drunk with warm water
Moraceae							
Họ Dầu tằm							
<i>Artocarpus tonkinensis</i> A. Chev. ex Gagnep.	Chay	W	0.12	W,C	Bark	Tooth ache	Juice extracted from barks is dipped on affected teeth, or bark are soaked in wine, then use that wine to applied on affected teeth
<i>Broussonetia papyrifera</i> L.	Dương	W	0.15	W	Leaves, root	Haemostatic	Plant parts are crushed, then paste applied on affected part
<i>Ficus auriculata</i> Lour.	Vả	W	0.18	W	Bark	Diarrhea	Barks are decocted, then the decoction is drunk
<i>Ficus benjamina</i> L. +	Si	W	0.14	W,C	Latex	Itches	Latex is paste applied on affected part

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<i>Ficus heterophylla</i> L.f.*	Vú bò	S	0.15	W	Root, stem	Weakness, icterus	Small pieces of roots and stems are decocted, then the decoction is drunk
<i>Ficus hispida</i> L.f.*+	Ngái	S	0.15	W	Bark, leaves	Itches	Latex is paste applied on affected part
<i>Ficus racemosa</i> L.*	Sung	W	0.22	W,C	Leaves, bark	Diarrhea	Plant parts are decocted, then the decoction is drunk
<i>Morus alba</i> L.+	Dâu	W	0.26	W,C	Fruit	Stomach ache, dysentery	Plant parts are decocted, then the decoction is drunk
<i>Streblus asper</i> Lour.*+	Duối	W	0.19	W,C	Root, leaves	Weakness	Fruits are soaked in water with sugar, then eaten and drunk
					Leaves	Sunburn	Juice extracted from leaves and roots is applied on affected part
						Flu	Leaves are boiled, then inhaled
	Họ Đon nem						
<i>Ardisia silvestris</i> Pit.	Lá khôì	H	0.37	W	Fruit, leaves	Stomach ache	Plant parts are decocted, then the decoction is drunk
<i>Embelia ribes</i> Burm.f.*+	Chua ngút	C	0.19	W	Leaves, fruit	Hookworm	Leaves and fruits are chewed and swallowed
<i>Maesa balansae</i> Mez	Đon nem núì	S	0.10	W	Leaves, bark	Snakebite	Plant parts are crushed, then paste applied on affected part
					Leaves	Hiccups	Leaves are chewed raw and swallowed
					Leaves	Hookworm	Juice from leaves mixed with sugar is drunk with warm water

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<i>Maesa sinensis</i> A. DC.	Đon nem	S	0.12	W	Leaves, stem	Oedema	Plant parts are decocted, then the decoction is drunk
Myrtaceae							
<i>Baeckea frutescens</i> L.	Thanh hao	S	0.14	W,C	Leaves	Infection	Leaves crushed then paste applied on affected part
<i>Eucalyptus camaldulensis</i> Dehnh.+ Bành dàn trắng		W	0.51	C	Leaves, stem	Irregular menses	Plant parts are decocted, then the decoction is drunk
<i>Eucalyptus exserta</i> F.Muell.	Bành dàn	W	0.52	C	Leaves	Colds, flu	Leaves are boiled with leaves of bamboo, then steam is inhaled
		W		C	Leaves	Colds, flu, head ache	Leaves are boiled with leaves of bamboo, then steam is inhaled
					Root	Rheumatism	Roots are crushed in water, then applied on affected part
<i>Psidium guajava</i> L.*+	ổi	W	0.27	C	Leaves	Diarrhea, dysentery	Young leaves are chewed raw, then swallowed
<i>Rhodomyrtus tomentosa</i> (Aiton) Hassk.+	Sim	S	0.11	W	Stem, root	Diarrhea	Decoction of stems and roots is drunk
Oleaceae							
<i>Jasminum scandens</i> Vahl	Lài leo	C	0.04	W	Root, stem, leaves	Back pain	Plant parts are steamed, then paste applied on the back
<i>Jasminum subtripplinerve</i> A.DC.+	Vằng	C	0.11	W	Leaves, root	Itches	Leaves and roots crushed, then applied on affected part

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Oxalidaceae	Họ Chua me						
<i>Oxalis corniculata</i> L.+	Chua me dất	H	0.10	W	Root, stem	Weakness after childbirth	Plant parts are decocted, then the decoction is drunk
Passifloraceae	Họ Lạc tiên						
<i>Passiflora foetida</i> L.	Lạc tiên	C	0.07	W	Root, leaves, stem	Heart weakness, anodyne	Plant parts are decocted, then the decoction is drunk
Piperaceae	Họ Tiêu						
<i>Piper betle</i> L.*+	Trầu không	C	0.53	C	Leaves	Wounds, itches	Leaves are crushed, then paste applied on affected part
<i>Piper lolot</i> C.DC.+	Lá lốt	H	0.32	C	Leaves	Tooth ache	Juice from leaves, then applied on the hurting teeth
Plantaginaceae	Họ Mã đề						
<i>Plantago asiatica</i> L.+	Mã đề	H	0.79	W,C	Leaves, stem	Kidney failure	Plant parts are decocted, then the decoction is drunk
Polygonaceae	Họ Rau răm						
<i>Polygonum chinensis</i> L.* +	Mía giò	H	0.16	W	Leaves, stem	Urinating problems, cough	Leaves are decocted then the decoction is drunk
						Dysentery	Leaves and stems are chewed raw and swallowed
						Snakebite	Leaves are crushed, then paste applied on affected part

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<i>Polygonum multiflorum</i> Thunb. +	Hà thủ ô đò	H	0.21	W	Root	Weakness after childbirth	Small pieces of roots are decocted, then the decoction is drunk
<i>Polygonum odoratum</i> Lour.	Rau răm	H	0.08	C	Leaves	Malaria	Leaves are decocted, then the decoction is drunk
Portulacaceae	Họ Rau sam						
<i>Portulaca oleracea</i> L.*+	Rau sam	H	0.68	W	Stem, leaves	Weakness	Plant parts are cooked, then eaten
Rhamnaceae	Họ Táo						
<i>Ziziphus mauritiana</i> Lam.*+	Táo nhà	W	0.46	C	Leaves, root	Rheumatism	Juice extracted from leaves and roots is applied externally
					Leaves	Stomach ache	Leaves are decocted, then the decoction is drunk
					Leaves	Swellings	Leaves are crushed with salt, then paste applied on affected part
<i>Ziziphus oenoplia</i> (L.) Mill.+	Táo đại	W	0.04	W	Leaves, root, stem	Menorrhagia	Plant parts are decocted, then the decoction is drunk
Rosaceae	Họ Hoa Hồng						
<i>Duchesnea indica</i> (Andr.) Focke	Dâu núi	H	0.05	W	Leaves, root, stem	Stomach ache	Plant parts are decocted, then the decoction is drunk
<i>Persica vulgaris</i> Mill.	Đào	S	0.09	W,C	Flower, stem	Irregular menses	Plant parts are decocted, then the decoction is drunk
<i>Rosa chinensis</i> Jacq.	Hoa hồng	S	0.18	C	Flower, stem	Hemorrhage	Small pieces of stems and flowers are decocted, then the decoction is drunk
<i>Rubus cochinchinensis</i> Tratt.	Ngây	S	0.15	W	Leaves, fruit	Oedema, icterus	Fruits are eaten, or juice from leaves and fruit is drunk

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Rubiaceae	Họ Cà Phé						
<i>Canthium horridum</i> Blume+	Găng gai	S	0.25	W	Root	Dyspnea	Decoction of roots is drunk
<i>Hedyotis capitellata</i> Wall. ex G.Don+	Dạ cảm	S	0.13	W	Leaves	Wounds	Leaves are crushed, then paste applied on affected part
<i>Morinda citrifolia</i> L.*+	Mật qui	S	0.08	W	Leaves, root, stem	Bone fractures	Plant parts are crushed, then paste applied on affected part
					Whole plant	Sores	Plant parts are decocted, then the decoction is drunk
<i>Morinda officinalis</i> Haw.+	Ba Kích	C	0.24	W	Root	Aphrodisiacs	Roots are soaked in wine, then drunk, the longer the better
					Root, stem	High blood pressure	Plant parts are decocted, then the decoction is drunk
<i>Mussaenda cambodiana</i> Pierre ex Pit.	Bướm bạc	C	0.04	W	Root	Aphrodisiacs	Roots are soaked in wine, then drunk, the longer soaking the better.
<i>Neolamarckia cadamba</i> (Roxb.) Bossel**	Gáo	W	0.12	W,C	Leaves, root	Arthritis	Decoction of roots and leaves is drunk
<i>Paederia foetida</i> L.+	Mỡ	C	0.81	C	Leaves	Itches	Leaves are crushed, then applied on affected part
<i>Psychotria rubra</i> (Lour.) Poit.	Lầu	S	0.56	W	Leaves, root	Dysentery, diarrhea	Leaves are chewed raw and swallowed, or cooked with chicken egg, then eaten
						Kidney failure	Decoction of roots and leaves is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Rutaceae							
Họ Cam							
<i>Clausena excavate</i> Burm.f.+	Hồng bì đại	W	0.09	W	Leaves	Stomach ache	Leaves are decocted, then the decoction is drunk
<i>Clausena lansium</i> (Lour.) Skeels+	Quất hồng bì	W	0.10	W,C	Leaves, fruit	Cancer	Plant parts are decocted, then the decoction is drunk
<i>Euodia leptota</i> (Spreng.) Merr. +	Ba gạc	S	0.21	W	Leaves	Measles	Leaves are heated, then paste applied on affected part
<i>Glycosmis pentaphylla</i> Spreng.	Côm rượu	S	0.17	W	Leaves, root	Itches	Leaves are crushed, then applied on affected part
<i>Micromelum hirsutum</i> Oliv.	Mát trâu	W	0.09	W	Leaves	Colds, flu, coughs	Juice extracted from leaves and roots is drunk with warm water
<i>Zanthoxylum avicennae</i> (Lamk) DC. +	Xén	W	0.06	W	Leaves	Stomach ache	Leaves are decocted, then the decoction is drunk
<i>Zanthoxylum nitidum</i> (Lamk.) DC.	Xuyên tiêu	W	0.10	W	Leaves, bark	Itches, skin diseases	Leaves are crushed, then applied on affected part
Simaroubaceae							
Họ Thanh Thất							
<i>Eurycoma longifolia</i> W. Jack	Bách bệnh	S	0.19	W	Leaves, bark, root	Diarrhea	Plant parts are decocted, then the decoction is drunk
					Leaves	Infection	Leaves are crushed, then paste applied on affected part

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Solanaceae							
Họ Cà							
<i>Capsicum annuum</i> L.*	ớt	S	0.08	C	Root, fruit	Malaria	Plant parts are decocted, then the decoction is drunk
<i>Datura metel</i> L.*+	Cà độc dược	S	0.12	W	Leaves	Swellings	Leaves are crushed, then paste applied on affected part
<i>Solanum indicum</i> L.	Cà đại hoa tím	S	0.22	W	Leaves, root	Tooth ache	Juice extracted from roots and leaves, then paste applied on affected teeth
<i>Solanum torvum</i> Sw.+	Cà dại	S	0.13	W	Root	Vomiting	Juice extracted from roots is drunk with warm water
Sterculiaceae							
Họ Chôm							
<i>Helicteres angustifolia</i> L.	Thầu kén dực	S	0.20	W	Leaves	Snakebite	Leaves are crushed, then paste applied on affected part
<i>Sterculia lanceolata</i> Cav.	Sáng nhung	W	0.12	W	Leaves, bark	Snakebite	Leaves and barks are crushed, then paste applied on affected part
Styracaceae							
Họ Bồ Đề							
<i>Styrax tonkinensis</i> (Pierre) Craib+	Bồ đề	W	0.02	W	Leaves	Pneumonia	Decoction of leaves is drunk
Theaceae							
Họ Chè							
<i>Camellia sinensis</i> (L.) Kuntze+	Chè	S	1	C	Leaves	Indigestion	Tea made from fresh leaves is drunk
Ulmaceae							
<i>Trema orientalis</i> (L.) Blume*	Hu Đay	W	0.12	W	Leaves	Vomiting	Leaves are chewed raw with salt and swallowed

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Urticaceae							
Họ Gai							
<i>Boehmeria nivea</i> (L.) Gaudich.+	Gai	S	0.48	C	Root	Risk of miscarriage	Roots are boiled, then eaten
<i>Pouzolzia zeylanica</i> (L.) Benn.*+	Bộ mần	S	0.15	W	Leaves	Infection	Leaves are crushed, then paste applied on affected part
Verbenaceae							
Họ Tểch							
<i>Clerodendrum cyrtophyllum</i> Turcz. Đẳng cây	Ngọc nữ	S	0.08	W	Leaves	Itches	Leaves are crushed, then applied on affected part
<i>Clerodendrum fragrans</i> Vent.+	Ngọc nữ	S	0.29	W	Root, Leaves	Haemostatic	Roots and leaves are decocted, then the decoction is drunk
					Root	Rheumatism	Juice extracted from roots is rubbed externally
					Root	Irregular menses	Roots are decocted, then the decoction is drunk
<i>Clerodendrum japonicum</i> (Thunb.) Sweet+	Xích đồng nam	S	0.34	W	Root	Metritis, leucorrhoea, Irregular menses	Roots are decocted, then the decoction is drunk
					Root	Irregular menses	Decoction of roots is drunk
<i>Clerodendrum paniculatum</i> L.+	Mò trắng	S	0.10	W	Leaves, root	Haemostatic	Roots and leaves are decocted, then the decoction is drunk
<i>Stachytarpheta jamaicensis</i> (L.) Vahl +	Cây đuôi chuột	H	0.06	W	Whole plant	Arthritis	Plants parts are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Verbena officinalis</i> L.+	Cỏ roi ngựa	H	0.24	W	Leaves	Cold	Decoction of leaves is drunk
<i>Vitex quinata</i> (Lour.) F. N. Williams +	Đền	W	0.09	W	Leaves	Skin diseases	Leaves are crushed, then applied on affected part
<i>Vitex trifolia</i> L.*+	Cỏ roi ngựa	H	0.24	W	Leaves	Itches	Leaves are crushed, then applied on affected part
<i>Vitaceae</i>					Root, stem	Dysentery	Roots and stems are decocted, then the decoction is drunk
<i>Cayratia japonica</i> (Thunb.) Gagnep.	Đền 3 lá	W	0.09	W	Fruit, leaves	Fever	Decoction of fruits and leaves is drunk
<i>Cissus modeccoides</i> Planch.	Họ Nho	W	0.07	W	Fruit	Indigestion	Fruits are eaten
<i>Tetrastigma strumarium</i> Gagnep.	Nho rừng	C	0.12	C	Leaves	Bone fractures	Leaves are crushed, then paste applied on affected part
	Chia vôi	C	0.07	W	Root, stem	Arthritis	Decoction of leaves and stems is drunk
	Dây quai bị	C	0.08	W	Leaves	Bone fractures	Leaves are crushed, then paste applied on affected part
LILIOPSIDA – MONOCOTS					Leaves, root	Arthritis	Decoction of leaves and roots is drunk
<i>Agavaceae</i>	Lớp 1 lá mầm						
<i>Cordyline terminalis</i> Kunth	Họ Huyết đu	H	0.45	W,C	Root, leaves	Haemostatic	Roots and leaves are decocted, then the decoction is drunk
<i>Alliaceae</i>	Huyết đu						
	Họ Hành						

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Allium fistulosum</i> L.+	Hành	H	1	C	Leaves, stem, Bulb	Flu, cold	Plant parts are cooked with rice, then eaten (onion soup)
<i>Allium odorum</i> L.+	Hẹ	H	0.61	C	Leaves	Cold	Juice extracted from leaves, then mixed with sugar is drunk (special to treat children's colds)
<i>Allium sativum</i> L.+	Tỏi	H	1	C	Bulb	Dysentery, coughs, flu	Juice extracted from leaves is drunk or seed soaked in wine is drunk (the longer soaked the better effect) Fresh bulbs are eaten
Araceae							
<i>Acorus gramineus</i> Aiton et Soland	Họ Ráy Thạch xương bò	H	0.24	W	Leaves, stem	Stomach ache	Leaves and stems are decocted, then the decoction is drunk
<i>Aglaonema modestum</i> Schott	Vạn niên thanh	H	0.17	W,C	Leaves, tuber	Bone fractures	Leaves and tubers are crushed, then paste applied on affected part
<i>Alocasia macrorrhizos</i> (L.) G. Don+	Ráy	H	0.14	W,C	Stem, leaves	Wounds, burns	Leaves and stems are crushed, then paste applied on affected part
<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicol.*+	Khoai nua	H	0.09	W,C	Leaves	Detoxification	Leaves are cooked, then eaten
<i>Homalomena occulta</i> (Lour.) Schott	Thiên niên kiện	H	0.22	W,C	Tuber	Weakness, coughs	Decoction from tubers is drunk
<i>Pothos repens</i> (Lour.) Druce	Chân rết	H	0.09	W	Whole plant	Food poisoning	Plant parts are decocted, then the decoction is drunk
Areaceae							
Họ Cau dừa							

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Areca catechu</i> L.+	Cau	W	0.09	C	Root, fruit	Dysentery, diarrhea	Plant parts are decocted, then the decoction is drunk
<i>Caryota mitis</i> Lour.	Đùng đình	W	0.12	W	Root	Stomach ache	Small pieces of roots are decocted, then the decoction is drunk
Asparagaceae							
<i>Asparagus cochinchinensis</i> (Lour.) Merr.+	Tóc tiên	H	0.16	W,C	Root	Tuberculosis	Decoction of roots is drunk
Commelinaceae							
Họ Thai Lài							
<i>Commelina communis</i> L. +	Thai lài	H	0.21	W,C	Stem, leaves	Dysentery	Plant parts are decocted, then the decoction is drunk
Cyperaceae							
Họ Cói							
<i>Cyperus rotundus</i> L.+	Cỏ gấu	H	0.09	W	Tuber	Diarrhea	Tubers are decocted, then the decoction is drunk
<i>Kyllinga monocephala</i> Rottb.*+	Cỏ bạc đầu	H	0.21	W	Stem, leaves	Flu, fever	Plant parts are steamed, then paste applied on forehead
Dioscoreaceae							
Họ Củ mài							
<i>Dioscorea glabra</i> Roxb.	Củ từ	C	0.06	W,C	Tuber	Dysentery	Decoction from tubers is drunk
<i>Dioscorea pycnostachya</i> Prain & Burkill+	Củ mài	C	0.13	W	Tuber	Fever	Tubers are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
Hypoxidaceae							
Họ Sâm Cau							
<i>Curculigo orchiooides</i> Gaertn.*+	Sâm cau	H	0.15	W	Leaves, root, stem	Rheumatism	Decoction of plant parts is drunk
Iridaceae							
Họ Sâm Đại Hành							
<i>Eleutherine bulbosa</i> (Mill.) Gagnep.	Sâm đại hành	H	0.16	W	Bulb	Weakness, Indigestion	Bulbs are decocted, then the decoction is drunk
Orchidaceae							
Họ Phong Lan							
<i>Anoectochilus roxburghii</i> (Wall.) Lindl.	Kim Tuyền	H	0.03	W	Whole plant	Weakness	Plant parts are decocted, then the decoction is drunk
Pandanaceae							
Họ Dứa							
<i>Pandanus tectorius</i> Parkinson+	Dứa gỗ	S	0.06	W	Leaves, root, stem	Hemorrhage	Plant parts are decocted, then the decoction is drunk
<i>Pandanus tonkinensis</i> Mart. ex Stone	Dứa	S	0.05	W	Fruit	Sunburn	Juice extracted from fruits is rubbed externally
Phormiaceae							
Họ Hương bài							
<i>Dianella ensifolia</i> (L.) DC.+	Hương bài	H	0.30	W	Root	Wounds, infection	Roots are crushed, then paste applied on affected part
Poaceae							
Họ Cỏ							
<i>Chrysopogon aciculatus</i> (Retz.) Trin.*	Cỏ may	H	0.09	W	Leaves, root, stem	Stomach ache	Plant parts are decocted, then the decoction is drunk

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Cymbopogon citratus</i> (DC.) Stapf. + Să		H	0.08	C	Whole plant	Bone fractures	Plant parts are crushed, then paste applied on affected part
<i>Eleusine indica</i> (L.) Gaertn.	Cỏ Mần trầu	H	0.15	W	Leaves	Flu	Leaves are decocted, then the decoction is drunk
Smilacaceae							
	Họ Cầm Cang				Root	Urinating problems	Fresh roots are chewed and swallowed
<i>Smilax corbularia</i> Kunth+	Kim cang bạc	C	0.09	W	Leaves, root, stem	Indigestion	Plant parts are decocted, then the decoction is drunk
<i>Smilax glabra</i> Wall. +	Thổ phục linh	C	0.12	W	Root, stem	Arthritis	Plant parts are decocted, then the decoction is drunk
					Root, stem	Skin diseases	Juice are extracted from roots and stems is rubbed externally
					Root, stem	Bone fractures	Plant parts are crushed, then paste applied on affected part
Zingiberaceae							
	Họ Gừng				Seed	Stomach ache	Seeds pounded is mixed with honey, then drunk with cold water
<i>Annonum villosum</i> Lour. +	Sa nhân	H	0.36	W	Seed	Malaria	Seeds pounded is given with warm water
<i>Curcuma domestica</i> Valetton = C. longa L. +	Nghệ	H	0.77	C	Rhizome	Throat sores	Fresh pieces of rhizomes are chewed and swallowed
					Rhizome	Stomach ache	Small pieces of rhizomes are cooked with honey, then eaten

Scientific name	Common name	Life form	Use index	W/C	Part utilized	Medicinal application	Preparation and administration
<i>Zingiber officinale</i> Blume*+ <i>Zingiber officinale</i> Blume*+	Gừng	H	1	C	Rhizome	Weakness	Small pieces of rhizomes are soaked in wine, then drunk
<i>Curcuma zedoaria</i> (Berg.) Roscoe+	Nghệ đen	H	0.48	C	Rhizome	Indigestion, flu Stomach ache	Juice extracted from rhizomes is given with warm water Small pieces of rhizomes are cooked with honey, then eaten

APPENDIX 3.2
Commercial medicinal plant species

Scientific name	Common name	Abundance in the wild	Intensity of collection	The price in US\$ (1\$ = 16,000 Vietnamese dong)	Market demand
POLYPODIOPHYTA-FERNS	Ngành Dương xỉ				
Dicksoniaceae	Họ Long cu li				
<i>Cibotium barometz</i> (L.) J. Sm.	Long cu li	Low	Medium	0.32/dried kg root	Medium
MAGNOLIOPHYTA-ANGIOSPERMS	Ngành Ngọc Lan				
MAGNOLIOPSIDA-DICOTS	Lớp 2 lá mầm				
Araliaceae	Họ Ngũ ra bi				
<i>Schefflera octophylla</i> (Lour.) Harms	Chân chim 8 lá	High	Medium	0.07/kg fresh leaves	Medium
Asclepiadaceae	Họ Hà thủ ô				
<i>Streptocaulon griffithii</i> Hook.f.	Hà thủ ô	Medium	Medium	Not stable	Medium
Asteraceae	Họ Cúc				
<i>Gynura japonica</i> (Thunb.) Juel.	Cúc Tam Thất	Medium	Medium	Not stable	Medium
Fabaceae	Họ Đậu				
<i>Abrus precatorius</i> L.	Cam thảo	Medium	Medium	Not stable	Medium
<i>Spatholobus suberectus</i> Dum.	Huyết rồng lão	High	High	0.06/kg dried stem	High
Lauraceae	Họ Long não				
<i>Cinnamomun cassia</i> Blume	Quế	Low	Low	0.7/ kg dried bark	Medium
Myrsinaceae	Họ Đơn nem				
<i>Ardisia silvestris</i> Pit.	Lá khô	Low	Low	0.1/kg fresh leaves	Medium

Scientific name	Common name	Abundance in the wild	Intensity of collection	The price in US\$ (1\$ = 16,000 Vietnamese dong)	Market demand
Polygonaceae	Họ Rau răm				
<i>Polygonum multiflorum</i> Thunb.	Hà thủ ô đò	Low	Medium	0.6/kg fresh tuber	Medium
Rubiaceae	Họ Cà Phê				
<i>Morinda officinalis</i> Haw.	Ba Kích	Low	High	2.5/kg fresh tuber	High
<i>Mussaenda cambodiana</i> Pierre ex Pit.	Bướm bạc	Medium	Medium	Not stable	Low
LILIOPSIDA-MONOCOTS	Lớp 1 lá mầm				
Alliaceae	Họ Hành				
<i>Allium sativum</i> L.	Tỏi	Cultivated		0.07/4 tubers	High
Araceae	Họ Ráy				
<i>Acorus gramineus</i> Soland	Thạch xương bò	Medium	Medium	1.9/kg dried stem	Low
<i>Homalomena occulta</i> (Lour.) Schott	Thiên niên kiện	Medium	Medium	0.32/kg dried stem	Medium
Smilacaceae	Họ Củm Càng				
<i>Smilax glabra</i> Wall. ex Roxb.	Thỏ phục linh	Medium	Medium	Not stable	Medium
Zingiberaceae	Họ Gừng				
<i>Amomum villosum</i> Lour.	Sa nhân	High	High	0.6/kg dried seed	High
<i>Curcuma zedoaria</i> (Berg.) Roscoe	Nghệ đen	Low in wild, but cultivated	Medium	0.95/kg fresh rhizome	High
<i>Zingiber officinale</i> Blume	Gừng	Cultivated		0.7/kg fresh rhizome	High