

*Full Length Research Paper*

# **A survey of medicinal plants in mangrove and beach forests from sating Phra Peninsula, Songkhla Province, Thailand**

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**This study aimed to survey medicinal plants in mangrove and beach forests from Sating Phra Peninsula, Songkhla Province. Three representative districts including Sing Ha Nakhon, Sating Phra and Ranode were selected. Semi-structured interview was conducted to six local healers for asking about local names, parts of use, preparation and properties. Plant specimens also were collected. Identification was done and the specimens were deposited at The Prince of Songkla University herbarium (PSU). A total of 110 species belonging to 100 genera and 51 families was found. Among them, 69 species were only found in the beach forests, 35 species were only found in the mangrove forests and 6 species could be found in both areas. Fabaceae was the most important family in term of species used. Herb was the most frequently used habit of plants. Most plant species were used for curing fever (18.52%), skin diseases (10.65%) and gastrointestinal tract problems (10.19%), respectively. Interestingly, 34 species relate to pharmacological activities, while 13 species have never been investigated. Therefore, their biological activity should be investigated to support utilization of herbal medicine.**

**Key words:** Medicinal plant, mangrove forest, beach forest, Sating Phra Peninsula, Songkhla Province.

## **INTRODUCTION**

A survey of medicinal plants has been carried out throughout Thailand, especially the studies based on knowledge of minority ethnic groups due to their traditional and cultural identity. Since almost minorities have settled down in various kinds of forests such as evergreen, deciduous dipterocarp, or mixed deciduous ones, then medicinal plants which are endemic to those areas have been studied. However, some interesting types of forest such as beach and mangrove which are occupied by few dwellers have been neglected for the investigation.

Mangrove forest is a vegetation group occupying the intertidal zone in tropical shorelines or estuaries (Chanyong, 2009), that is, the west and east coast of Thailand. It is only in the peninsular Thailand that it is composed of 932 km on the Gulf of Thailand (East coast)

which spread over 173,310 km<sup>2</sup> and 710 km on Andaman coast (West coast) with an estimated area of 155,591 km<sup>2</sup> (Plathong and Plathong, 2004). Generally, plants in mangroves survive and even thrive in saline condition of coastal areas, and most of them are evergreen vegetation.

Mangroves are not only important for serving as breeding and nursing ground for marine species and reducing the devastation impact of natural disasters, such as tsunamis and hurricanes (Giri et al., 2008), but they are also the socioeconomically important ecosystem, especially for inhabitants of coastal regions (Bandaranayake, 1998) who depend on them for fuel (Day et al., 1987), food, medicine, and other basic necessities (Cornejo et al., 2005).

Beach forest is plant community growing along sandy shores and up to high tidal zone which is exposed to salt spray. The vegetation is found on sand dunes, sometimes on sand gravel or rock. Beach forests may be open which composed of dense grasses, shrubs and herbs. On the other hand, it may be grove or forest with

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close canopy. Plants can tolerate salt spray (Halophytes), strong wind and drought (Rueangphanich, 2005). For Gulf of Thailand, beach forests can be found around shorelines from Chonburi to Trad province and the seacoast from Petchburi province to Malaysia border at Narathiwat province. For Andaman coast, it can be found from Ranong to Satun province.

Beach forest is a crucial natural resource which is important for the ecosystem of any economy. Nowadays, Thai coastal areas have been exploited severally. The beautiful beaches have not only been used for attracting tourism, but they also play the important role on other ecosystems (Defeo et al., 2009) such as supporting several macrofauna and microfauna populations (Goncalves, 2009), serving as nursery area for juvenile fishes, nesting sites for shorebirds, bait and food organisms, as well as wave dissipation and associated buffering against extreme events (storms, tsunamis) (Defeo et al., 2009).

Although mangrove and beach forests are greatly important for ecosystems and being human, mangrove areas in Thailand have rapidly decreased from 3,679,000 km<sup>2</sup> in 1961 to 1,686,825.6 km<sup>2</sup> in 1993. The major cause of this situation is conversion of mangrove forests to aquaculture especially the shrimp farming (Giri et al., 2009; Chuenpagdee, 2003). In addition, the beach areas are also lost by conversion to tourist attractions and tourist residences, that is, resorts (Chuenpagdee, 2003). Mangrove and beach forests are composed of many plant species. However, the survey of medicinal plants in mangrove and beach forests has been scattered and documented as a minor part of medicinal plant books. For example, Upho (2005) studied about ethnobotany of Buddhist and Muslim Thais in some locations in the lower part of Southern Thailand, then a few districts of Trang province located on mangrove and beach forest were included as a part of that study. The study found only 16 species of medicinal plants. In addition, Thaewchatturat (2000) studied about ethnobotany of Mogen ethnic group in Phang nga Province in which 4 species of mangrove and 27 species of beach plants were used for herbal medicine. According to previous reports, there is a small number of used plants from mangrove and beach forest, while some documents indicated that 48 mangrove and 77 beach species have been found in Southern Thailand (Working Group of academic standard for Pilot National Park, 2007) and beach forest only was found to contain 167 species in Peninsular Thailand (Laongpol et al., 2009).

Recent studies on medicinal plants in mangrove and beach forests in Thailand were focused on Andaman coast, but there was no any close study in Gulf of Thailand in spite of a large number of folk healers existing (Golomb, 1988). Therefore, it is interesting to study the medicinal plants from the East coast of Thailand. In this study, we decided to survey mangrove and beach forests from Sating Phra peninsula, Songkhla

province. In the past, there were the extensive areas of mangrove and beach forests in Sating Phra peninsula. However, nowadays, these forests have been decreased by destruction through various forms such as building, tourism and shrimp farming (Trisurat, 2006). Consequently, mangrove and beach plants are decreased both in species richness and abundance. Hence, it is urgent to study the utilization of medicinal plants before the disappearance of beach and mangrove forests along with losing of plant species and knowledge of ethnobotany.

The objective of this study was to collect and survey the use of medicinal plants in mangrove and beach forests from the local healers established in Sating Phra peninsula, Songkhla province.

## MATERIALS AND METHODS

### Study area and local healers

Sating Phra peninsula (Figure 1), located on peninsular Thailand, composes of 4 districts: Ranode, Sating Phra, Krasaesin and Singha Nakhon. It is bordered to the north by Hua Sai district, Nakhon Si Thammarat province, to the south by Mueang Songkhla district, Songkhla province, to the east by Gulf of Thailand, and to the west by Songkhla lagoon. The total area is approximately 1,228.2 km<sup>2</sup>. Most of local people are Buddhist. Their occupations mostly are agriculture namely, farming and fishing (Songkhla Statistical Office, 2010). A prominent landscape of this study area is sand bars lying between Gulf of Thailand and Songkhla lagoon.

In this study, three districts were selected; Singha Nakhon, Sating Phra and Ranode. Studied mangrove forests were from Baan Ta Hin village in Sating Phra district, Baan Cha Lae village, Baan Bo Pab village and Baan Hua Khao village in Singha Nakhon district. Studied beach forests were from Hat Kaew beach in Singha Nakhon, Muang Ngam beach, Di Luang beach and Maharatch beach in Sating Phra district, and Bo Tru beach as well as Pak Rawa beach in Ranode district. Six local healers also were selected.

### Field study

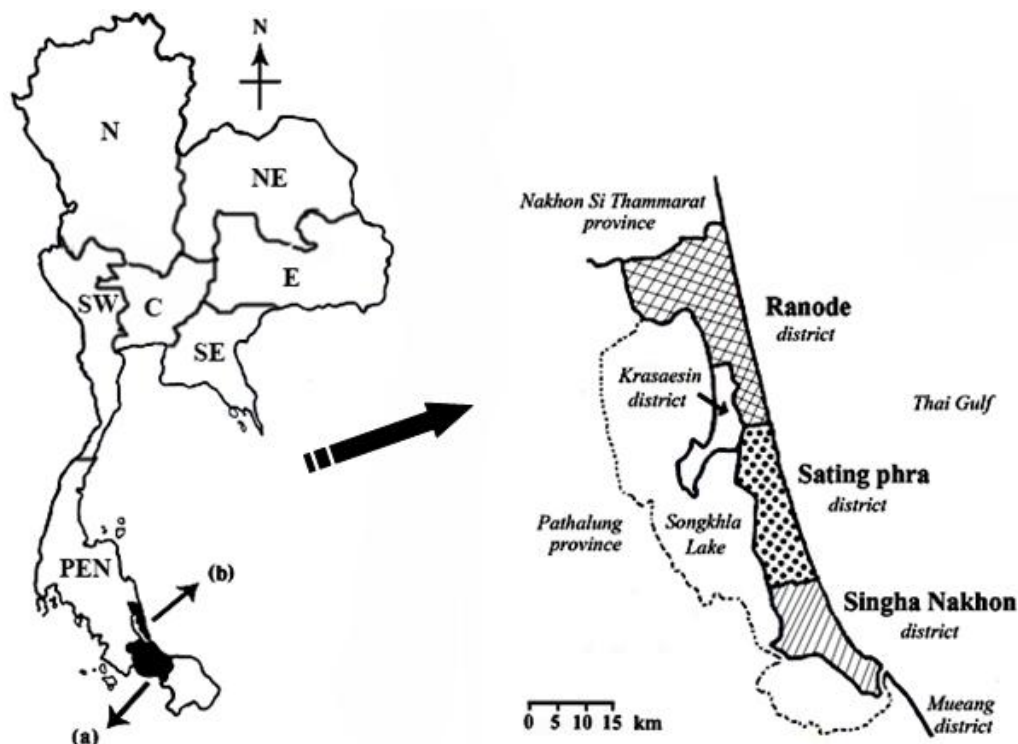
The field study was conducted in July 2010 to November 2010, once monthly. The semi-structured interview was used for asking the local healers about local name of medicinal plants, plant part used, how it is used and its properties. The folk healers were interviewed at their houses and also during collection of the specimens in the fields. To confirm the plant properties, one type of use was mentioned by at least 2 healers.

### Herbarium specimens

All medicinal plants utilized by the local healers were photographed and then collected for making voucher specimens according to Chayamarit's (1997) method. The voucher specimens were deposited at PSU Herbarium, Department of Biology, Faculty of Science, and Faculty of Traditional Thai Medicine Herbarium, Prince of Songkla University.

### Medicinal plants identification

The collected specimens were identified with the aids of relevant



**Figure 1.** Study site: Thailand map represent Songkhla province (a+b) as well as Sathig Phra peninsular (b) (Left) and 3 selected districts in Sathig Phra peninsular (Right) (N=northern, C=central, SW=southwestern, NE=northeastern, E=eastern, SE=southeastern, and PEN=peninsula).

literature e.g. Flora of Thailand, Flora Malesiana, Flora of China and Flora of British India.

#### Data analysis

The data were analyzed by descriptive statistics and interpretation. The results were also compared to the close studies.

## RESULTS

#### Plant use

Totally, 110 medicinal plants species belonging to 100 genera in 51 families were collected (Table 1). Thirty five species (31.82%) were found only in mangrove forests. Sixty nine species (62.73%) were found only in beach forests. In addition, 6 species (5.45%) were found in both types of forests. The higher number of species in beach forest than mangrove one is congruent with the survey of plant diversity in Tarutao National Park (Working Group of academic standard for Pilot National Park, 2007).

The families most frequently used were Euphorbiaceae (10 species), Fabaceae (9 species) and Rubiaceae (5 species), respectively. In addition to the mostly used families, Fabaceae and Rubiaceae are also grouped in

the largest family in terms of species (Clayton and Renvoize, 1986), this reflects that people tend to use plant resource present in their environment. It is recorded that these 3 families were always used in other parts of the world such as Kenya (Bussmann et al., 2006), Nepal (Kunwar et al., 2010), Uganda (Kamatenesi et al., 2011) and Peru (Luziatelli et al., 2010).

Ninety five species (86.36%) were dicotyledons, twelve species (10.91%) were monocotyledons and tree species (2.73%) were ferns.

According to plant habit, herbs were most frequently used with 30 species (27.27%), followed by trees with 29 species (26.36%), shrubs with 24 species (21.82%), climber with 22 species (20%) and epiphytic plants with 5 species (4.55%). The most use of herbs as medicinal plants is also in agreement with the study of Coe and Anderson (1996), as well as Luziatelli et al. (2010).

#### Disease/symptom to treat

The 110 medicinal plants were classified into 26 categories according to disease or symptom to treat (Table 2). However, most categories based on species number were fever with 40 species (18.52%), skin diseases with 23 species (10.65%) and gastrointestinal

**Table 1.** Medicinal species list found in Sating Phra Peninsula, Songkhla Province.

Botanical name	H1	Specimen	Local name	H2	Part/preparation/administration/disease
<b>Acanthaceae</b>					
<i>Acanthus ebracteatus</i> Vahl		NS 001			Whole plant/ decoction/ oral/cancer
<b>Amaranthaceae</b>					
<i>Achyranthes aspera</i> L.	H	NS 024	Phanngu khao	B	Whole plant/ decoction/ oral/ fever
<i>Alternanthera sessilis</i> (L.) R. Br. ex DC.	H	NS 069	Phak ped khao	B	Whole plant/ decoction/ oral/ menstrual disorder Whole plant/ poultice/ topical/ infant convulsion, parasites, fever
<i>Amaranthus viridis</i> L.	H	NS 081	Phak khom	B	Whole plant/ decoction/ oral/ fever
<b>Annonaceae</b>					
<i>Melodorum siamensis</i> (Scheff.) Bân	C	NS 115	Nom maeo	M	Stem and leaves/ decoction/ oral/ diarrhea and dysentery
<i>Uvaria rufa</i> Blume	C	NS 033	Nom kwai	M	Leaves/ decoction/ oral/ joint and muscle pain Wood/ decoction/ oral/ fever
<b>Asclepiadaceae</b>					
<i>Calotropis gigantea</i> (L.) Dryander ex W.T. Aiton	S	NS 056	Rak Khao	B	Latex/ juice/ topical/ decayed tooth, warts and corns; Leaves/ poultice/ inhalation/ sinusitis and snuffy nose
<i>Tyrophora indica</i> (Burm.f.) Merr.	C	NS 061	Ton pan rak	B	Whole plant/ decoction/ oral/ abscess and contusion
<b>Asteraceae</b>					
<i>Chromolaena odoratum</i> (L.) R.M.King & H.Rob.	H	NS 101	Sapsuea	B	Leaves/ poultice/ topical/ wound (bleeding) Roots/ decoction/ oral/ diabetes mellitus
<i>Pluchea indica</i> (L.) Less.	S	NS 092	Khlué tale	B, M	Leaves/ bath/ oral/ diabetes mellitus Leaves/ decoction/ oral/ dysuria, kidney stone, hemorrhoid Leaves/ poultice / topical/ parasites
<i>Vernonia cinerea</i> (L.) Less.	H	NS 076	Ya khrao maeo	B	Leaves/ poultice / topical/ wound (bleeding)
<i>Wedelia biflora</i> (L.) DC.	C	NS 046	Benchamart -numkhem	M	Leaves/ poultice / topical/ wound Whole plant/ poultice / topical/ prickly heat
<b>Avicenniaceae</b>					
<i>Avicennia alba</i> Blume	T	NS 002	Samae khao	M	Heart wood/ decoction/ oral/ blood tonic
<i>Avicennia officinalis</i> L.	T	NS 001	Samae dum	M	Heart wood/ decoction/ oral/ fatigue

Table 1. Contd.,

<b>Capparidaceae</b>					
<i>Capparis sepiaria</i> L.	C	NS 042	Nam ngai	M	Wood/ powder/ topical/ contusion
<b>Casuarinaceae</b>					
<i>Casuarina equisetifolia</i> J.R. & G.Forst	T	NS 103	Son thale	B	Root/ decoction/ oral/ headache, encephalitis
<b>Celastraceae</b>					
<i>Pleurostyliia opposita</i> (Wall.) Alston	S	NS 107	Thing thuad	B	Root, barks/ decoction/ oral/ malaria
<i>Salacia chinensis</i> L.	S	NS 064	Kumpang jed chan	B	Barks/ decoction/ topical/ toothache Stem/ decoction/ oral/ fatigue
<b>Combretaceae</b>					
<i>Lumnitzera racemosa</i> Willd.	T	NS 008	Fard dok khao	M	Wood/ powder/ wound
<b>Combretaceae</b>					
<i>Combretum quadrangulare</i> Kurz	T	NS 044	Sakae	M	Whole plant/ decoction/ oral/ parasites Seed/ raw/ oral/ parasites Stem/ charcoal/ sauna/ post partum
<b>Commelinaceae</b>					
<i>Commelina benghalensis</i> L.	H	NS 074	Ya nam dub fai	B	Whole plant/ decoction/ oral/ fever; whole plant/ poultice/ topical/ abscesses, contusion
<i>Murdannia</i> sp.	H	NS 095	Bae phu	B	Whole plant/ decoction/ oral/ fever
<b>Convolvulaceae</b>					
<i>Cuscuta reflexa</i> Roxb.	Ep	NS 053	Foithong	B	Whole plant/ decoction/ oral/ fatigue
<i>Ipomoea pes-caprae</i> (L.) R. Br.	H	NS 019	Phak bung thale	B	Leaves/ poultice / topical/ wound caused by jellyfish Leaves/ juice/ oral/ constipation
<i>Tetracera</i> sp.	C	NS 043	Pod	B, M	Stem/ decoction/ oral/ liver diseases and splenopathy, Joint and muscle pain
<b>Euphorbiaceae</b>					
<i>Breynia</i> sp.	S	NS 111	Kangpla dang	B	Roots/ decoction/ oral/ fever
<i>Bridelia stipularis</i> (L.) Blume	S	NS 029	Sa ai	B	Wood/ decoction/ oral/ malaria
<i>Euphorbia heterophylla</i> L.	H	NS 066	Phak bung dong	B	Leaves/ raw/ oral/ constipation
<i>Euphorbia hirta</i> L.	H	NS 017	Namnom- ratchasi	B	Leaves/ raw/ oral/ constipation Whole plant/ decoction/ oral/ Herpes zoster, Lactogogue

Table 1. Contd.

<i>Excoecaria agallocha</i> L.	T	NS 084	Tatum thale	M	Latex/ juice/ oral/ constipation Heart wood/ decoction/ oral/ blood tonic
<i>Micrococca mercurialis</i> (L.) Benth.	H	NS 051	Tamyae maeo	B	Whole plant/ poultice / topical/ wound Whole plant/ decoction/ oral/ vomiting
<i>Microstachys chamaelea</i> (L.) Müll. Arg.	S	NS 079	Phraow- nok khoom	B	Fruits/ raw/ oral/ joint and muscle pain Whole plant/ decoction/ oral/ diabetes mellitus
<i>Mallotus hymenophyllus</i> Airy Shaw	S	NS 036	Prik	M	Leaves/ poultice / topical/ fever
<i>Shirakiopsis indicum</i> (Willd.) Esser	T	NS120	Samore thale	M	Leaves/ decoction/ steam bath/ diet
<i>Sauropus bacciformis</i> (L.) Airy Shaw	S	NS 093	Phraow- nokkhoom	B	Whole plant/ decoction/ oral/ parasites
<b>Fabaceae</b>					
<i>Abrus precatorius</i> L.	C	NS 106	Maklam ta nu	B	Roots/ Decoction/ Oral/ Fever (decrease high-bodily temperature) Seeds/ decoction/ oral/ thirsty relief Leaves/ poultice / topical/ athlete's foot
<i>Senna sophera</i> L.	S	NS 080	Phak khet	B	Seeds/ decoction/ oral/ thirsty relief Leaves/ decoction/ oral/ constipation Whole plant/ decoction/ oral/ toxin in the body
<i>Senna tora</i> L.	S	NS 067	Khilek jued	B	Whole plant/ decoction/ oral/ fever
<i>Crotalaria retusa</i> L.	S	NS 048	Hinghai	B	Whole plant/ decoction/ oral/ fever, toxin in the body
<i>Dalbergia candenatensis</i> (Dennst.) Prain	C	NS 027	Sakkhi	M	heart wood/ decoction/ oral/ blood tonic
<i>Derris scandens</i> (Aubl.) Pittier	C	NS 038	Thaowan priang	M	Roots/ decoction/ oral/ cancer
<i>Derris trifoliata</i> Lour.	C	NS 009	Thopthaep nam	M	Leaves/ decoction/ oral/ constipation Stems/ decoction/ oral/ joint and muscle pain
<i>Indigofera tinctoria</i> L.	S	NS 040	Khram	M	Leaves/ poultice/ topical/ inflammation of abscess Whole plant/ decoction/ oral/ fever
<i>Pithecellobium dulce</i> (Roxb.) Benth.	T	NS 005	Makham tate	M	Bark/ decoction/ topical / toothache, gingivitis Roots/ decoction/ oral/ menstrual disorder
<b>Flagellariaceae</b>					
<i>Flagellaria indica</i> L.	C	NS 121	Wai ling	B	Leaves/ decoction/ oral/ cardiogenic, antenatal care Rhizome/ decoction/ oral/ fever, malaria, jaundice

Table 1. Contd.

<b>Guttiferae</b>					
<i>Calophyllum inophyllum</i> L.	T	NS 026	Krating	M	Fruits/ oil/ topical/ joint and muscle pain Flowers/ oil/ topical/ hair and scalp damage
<i>Garcinia hombroniana</i> Pierre	T	NS 114	Wa	B	Fruits/ raw/ oral/ constipation Latex/ juice/ oral/ to stimulate vomiting Bark/ decoction/ topical/ toothache
<b>Labiatae</b>					
<i>Clerodendrum inerme</i> (L.) Gaertn.	S	NS 045	Sam ma li nga	M	Leaves/ decoction/ bath/ prickly heat and pruritic rash Leaves/ poultice/ topical/ inflammation of abscesses
<i>Hyptis suaveolens</i> (L.) Poit.	S	NS 097	Maenglak kha	B	Whole plant/ decoction/ oral/ fever, fatigue Seeds/ dessert/ oral/ constipation
<i>Leucas zeylanica</i> (L.) R. Br.	H	NS 073	Brek	B, M	Whole plant/ decoction/ oral/ menstrual disorder Leaves/ poultice/ topical/ asthma, wound (bleeding)
<i>Vitex rotundifolia</i> L. f.	S	NS 057	Kontiso tale	B	Leaves/ decoction/ oral/ carminative, malaria, fever Roots/ decoction/ oral/ joint and muscle pain
<b>Liliaceae</b>					
<i>Asparagus racemosus</i> Willd.	C	NS 117	Rak samsip	B	Roots/ decoction/ oral/ fatigue, antenatal care
<i>Gloriosa superba</i> L.	C	NS 105	Dong dung	B	Rhizome/ powder/ oral/ hemorrhoid
<b>Malvaceae</b>					
<i>Hibiscus tiliaceus</i> L.	T	NS 011	Po thale	M	Bark, wood, roots/ decoction/ oral/ dysuria
<i>Sida acuta</i> Burm. f.	S	NS 083	Ya khat mon	B	Whole plant/ decoction/ oral/ joint and muscle pain, Roots, stem/ powder/ topical/ Herpes zoster
<i>Sida cordifolia</i> L.	S	NS 059	kledpla kradi	B	Whole plant/ decoction/ oral/ fever
<b>Melastomataceae</b>					
<i>Melastoma malabathricum</i> L.	S	NS 122	Blae	M	Roots/ decoction/ oral/ fever, wound, abscess
<b>Meliaceae</b>					
<i>Xylocarpus granatum</i> J. Koenig	T	NS 031	Ta boon	M	Bark/ Decoction/ Oral/ Mucous and bloody dysentery, diarrhoea

Table 1. Contd.

<b>Menispermaceae</b>					
<i>Tiliacora triandra</i> Diels	C	NS 104	Ya nang	B	Root/ decoction/ oral/ fever, toxin in the body
<b>Myrtaceae</b>					
<i>Melaleuca cajuputi</i> Roxb.	T	NS 014	Samet khao	B	Inflorescence/ raw/ oral/ aphthous ulcer, follicular pharyngitis, fever Leaves/ decoction/ bath/ itching
<i>Rhodomyrtus tomentosa</i> (Aiton) Hassk.	S	NS 098	Thoh/ Pha ya rak dam	B	Fruit/ raw/ oral/ diarrhea Roots/ decoction/ oral/ tonic
<i>Syzygium gratum</i> (Wight) S.N.Mitra	T	NS 050	Samet daeng	B	Inflorescence/ raw/ oral/ carminative
<b>Nyctaginaceae</b>					
<i>Boerhavia diffusa</i> L.	H	NS 022	Phak khom hin	B	Whole plant/ decoction/ oral/ dysuria, menstrual disorder
<b>Olacaceae</b>					
<i>Oxalys scandens</i> Roxb.	C	NS 035	Joh to	B, M	Whole plant/ decoction/ oral/ abscesses Fruits/ raw/ oral/ abscesses
<b>Oleaceae</b>					
<i>Jasminum nervosum</i> Lour.	C	NS 068	Bleh tuan	M	Leaves/ decoction/ topical/ aphthous ulcer
<b>Pandanaceae</b>					
<i>Pandanus odoratissimus</i> L. f.	T	NS 116	Lam chiak	B	Root/ decoction/ oral/ dysuria, toxin in the body
<b>Passifloraceae</b>					
<i>Passiflora foetida</i> L.	C	NS 018	Ka tok rok	B	Whole plant/ decoction/ oral/ cough, expectorant, dysuria, fever
<b>Poaceae</b>					
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	H	NS 086	Ya chaoshu	B	whole plant/ decoction/ oral/ dysuria, kidney stone renal disease
<i>Dactyloctenium aegyptium</i> (L.) Willd.	H	NS 094	Ya paak kwai	B	Whole plant/ decoction/ oral/ fever, dysuria
<i>Perotis indica</i> (L.) Kuntze	H	NS 110	Ya hang krarak	B	Whole plant/ decoction/ oral/ dysuria
<i>Spinifex littoreus</i> (Burm. f.) Merr.	H	NS 087	Ya looklom	B	Roots/ decoction/ oral/ joint and muscle pain
<b>Polypodiaceae</b>					
<i>Drynaria sparsisora</i> (Desv.) T. Moore	Ep	NS 113	Wao ta le	B	Rhizome/ decoction/ oral/ fever Rhizome/ powder/ topical/ wound (snake bites)



Table 1. Contd.

<i>Pyrrrosia piloselloides</i> (L.) M.G. Price	Ep	NS 013	Bia lan	B	Whole plant/ decoction/ bath/ psoriasis Whole plant/ decoction/ oral/ fever, dysuria
<b>Portulacaceae</b>					
<i>Portulaca pilosa</i> L.	H	NS 085	Sao chiang mai	B	Whole plant/ poultice/ topical/ wound Whole plant/ decoction/ oral/ urinary system, menstrual disorder
<b>Rhamnaceae</b>					
<i>Colubrina asiatica</i> (L.) Brongn.	C	NS 006	Pak wan tale	M	Whole plant/ decoction/ oral/ abscesses
<i>Ziziphus mauritiana</i> Lam.	T	NS 088	Phut sa	B	Roots/ juice/ topical/ conjunctivitis Leaves/ poultice/ topical/ hair and scalp damage
<i>Ziziphus oenopolia</i> (L.) Mill. var. <i>oenopolia</i>	C	NS 096	Yap yio	B	whole plant/ decoction/ oral/ dysuria, kidney stone Leaves/ decoction/ oral/ blood tonic Fruits/ raw/ oral/ expectorant
<b>Rhizophoraceae</b>					
<i>Bruguiera cylindrica</i> (L.) Blume	T	NS 004	Thua khao	M	Flowers/ decoction/ oral/ expectorant
<i>Rhizophora apiculata</i> Blume	T	NS 003	Kongkang bailek	M	Fruits/ decoction/ oral/ fever
<i>Rhizophora mucronata</i> Lam.	T	NS 007	Kongkang Baiyai	M	Fruits/ decoction/ oral/ fever; Bark/ decoction/ oral/ dysentery; Roots/ decoction/ oral/ dysuria, kidney stone
<b>Rubiaceae</b>					
<i>Catunaregam spathulifolia</i> Tirveng.	T	NS 118	Nam khet	B	Fruits/ poultice/ topical/ athlete's foot Wood/ decoction/ oral/ cancer
<i>Morinda elliptica</i> (Hook. f.) Ridl.	T	NS 010	Yo pa	M	Wood/ decoction/ oral/ parasites, to release lochia; Fruits/ decoction/ bath/ fever, seborrheic dermatitis
<i>Hedyotis corymbosa</i> (L.) Lam.	H	NS 090	lin ngu	B	Whole plant/ decoction/ oral/ fever, wound (snake bites), cancer
<i>Oldenlandia heynei</i> Oliv.	H	NS 100	Lin ngu lek	B	Whole plant/ decoction/ oral/ fever, wound (snake bites), cancer
<i>Spermacoce articularis</i> L. f.	H	NS 063	pik malang wan	B	Whole plant/ decoction/ oral/ kidney stone
<b>Rutaceae</b>					
<i>Glycosmis pentaphylla</i> (Retz.) DC	S	NS 089	Khoei tai	B	Roots/ decoction/ oral/ fever; Bark/ decoction/ oral/ abscesses; Fruits, flowers/ poultice/ topical/ scabies, herpes simplex, Herpes zoster

Table 1. Contd.

<b>Sapindaceae</b>					
<i>Allophylus cobbe</i> (L.) Raeusch.	S	NS 039	To sai	M	Roots, wood/ decoction/ oral/ joint and muscle pain Leaves/ poultice/ topical/ fever
<i>Cardiospermum halicacabum</i> L.	C	NS 077	Poo om	B	Whole plant/ decoction/ oral/ fever Roots/ decoction/ oral/ wound (snake bites), constipation Fruits/ decoction/ oral/ choleric
<i>Mischocarpus sundaicus</i> Blume	T	NS 015	Si fun	B	Roots/ decoction/ oral/ fever, malaria
<b>Sapotaceae</b>					
<i>Pouteria obovata</i> (R. Br.) Baehni	T	NS 112	Ram tua phu	B	Fruits/ decoction/ oral/ menstrual disorder
<b>Schizoeaceae</b>					
<i>Lygodium microphyllum</i> (Cav.) R. Br.	Ep	NS 055	Li phao yung	B	Roots/ decoction/ oral/ fever Whole plant/ decoction/ oral/ orchitis, cancer, joint and muscle pain
<b>Scrophulariaceae</b>					
<i>Lindernia ciliata</i> (Colsm.) Pennell	H	NS 109	Ya kra tai jam	B	Whole plant/ decoction/ oral/ fever, dysuria
<i>Lindernia crustacea</i> (L.) F. Muell.	H	NS 054	Ya kled hoi	B	Whole plant/ decoction/ oral/ fever
<b>Solanaceae</b>					
<i>Physalis minima</i> L.	H	NS 102	Thong theng	B	Whole plant/ poultice/ oral/ tonsillitis Fruits/ raw/ oral/ sore throat
<i>Solanum trilobatum</i> L.	C	NS 123	Ma waeng- khrua	B, M	Leaves/ poultice/ topical/ Herpes zoster Whole plant/ decoction/ oral/ dysuria, diabetes mellitus Fruits/ raw/ oral/ fever, aphthous ulcer, sore throat
<b>Sonneratiaceae</b>					
<i>Sonneratia caseolaris</i> (L.) Engl.	T	NS 082	Lam phu	M	Roots/ powder/ topical/ Herpes simplex Fruits/ raw/ oral/ wound, diarrhea
<b>Sterculiaceae</b>					
<i>Heritiera littoralis</i> Aiton	T	NS 041	Ngon kai thale	M	Wood/ decoction/ oral/ menstrual disorder
<b>Tiliaceae</b>					
<i>Corchorus trilocularis</i> L.	H	NS 072	Nguag pla mo	B	Whole plant/ decoction/ oral/ hypotension
<i>Microcos tomentosa</i> Sm.	T	NS 037	Plab pla	M	Fruits/ raw/ oral/ toxin in the body; Fruits/ decoction/ oral/ mouth sore

Table 1. Contd.

<b>Urticaceae</b>					
<i>Pouzolzia pentandra</i> (Roxb.) Benn.	H	NS 025	Khob cha nang	M	Whole plant/ decoction/ oral/ fever; Whole plant/ decoction/ topical/ toothache
<b>Verbenaceae</b>					
<i>Phyla nodiflora</i> (L.) Greene	H	NS 070	Ya lek khoo	B	Whole plant/ bath/ oral/ joint and muscle pain Whole plant/ decoction/ oral/ parasites, fever,
<i>Stachytarpheta jamaicensis</i> (L.) Vahl	S	NS 078	Ya pan ngoo kheaw	B	Dysuria, wound Whole plant/ poultice/ topical/ abscesses
<i>Vitex peduncularis</i> Wall.	T	NS 021	Non	B	Whole plant/ decoction/ oral/ joint and muscle pain, fever Whole plant/ decoction/ topical/ mouth sore
<b>Vitaceae</b>					
<i>Cayratia trifolia</i> (L.) Domin	C	NS 071	Thao khan khao	B M	Stem/ decoction/ oral/ expectorant, Menstrual disorder, abscess
<b>Zygophyllaceae</b>					
<i>Tribulus terrestris</i> L.	H	NS 058	Khok kra soon	B	Whole plant/ decoction/ oral/ dysuria, kidney stone, fever

H1= Habit (C=climber, Ep=epiphyte; H=herb, S=shrub, T=tree); H2= habitat (B=beach forest, M=mangrove forest).

tract problems with 22 species (10.19%), respectively.

Fever or pyrexia was the common illness with high-bodily temperature, weakness and headache. Then, the medicinal plants to get rid off that symptoms were applied such as roots of *Casuarina equisetifolia* L. used to cure headache and encephalitis, whole plant of *Commelina benghalensis* L. used as antipyretic, and roots of *Abrus precatorius* L. used to decrease high-bodily temperature.

In skin disease, the symptoms were oozing eczema due to lymphatic disorder, herpes simplex and herpes zoster. Then, the medicinal plants to get rid off that symptoms were such as latex of *Calotropis gigantea* L. used to cure warts and

corns, leaves of *Indigofera tinctoria* L. used to cure inflammation of abscess, and fresh fruits of *Catunaregam spathulifolia* Tirveng. used to cure athlete's foot.

In gastrointestinal tract problems, the symptoms were grouped, including constipation, diarrhea, dysentery and hemorrhoid. The medicinal plants used to cure these were such as leaves of *Euphorbia heterophylla* L. and roots of *Cardiospermum halicacabum* L. used as laxative.

#### Plant parts used

There were 9 plant parts used by traditional healers for treatment of diseases and (Table 3).

However, whole plant was the most frequently utilized for 48 species (29.63%), followed by root/rhizome for 27 species (16.67%) and leaves for 26 species (16.05 %), respectively.

Notably, some species could be used for more than one plant parts either for healing one or different diseases. For example, root and bark of *Pleurostyliia opposita* (Wall.) Alston also could be used for curing malaria. In contrast, leaf of *Chromolaena odoratum* (L.) R.M. King & H. Rob. was used to stop bleeding, while its root was used for diabetes mellitus.

Traditionally, whole plant refers to 5 parts of plant: Root, stem, leaf, flower and fruit. In case of small or herbaceous plant, it means really whole plant. However, it is only representative of those

**Table 2.** Diseases or symptoms to be cured by medicinal plants in Sating Phra Peninsula, Songkhla Province.

Diseases/symptoms	Frequency	Percentage
Fever	40	18.52
Skin diseases	23	10.65
Gastrointestinal tract	22	10.19
Problems		
Urinary system	17	7.87
Wound	16	7.41
Joint and muscle pain	13	6.02
Menstrual disorder	11	5.09
Dental hygiene	10	4.63
Respiratory	7	3.24
Toxin in the body	4	1.85
Thirsty relief	2	0.93
Jaundice	2	0.93
Hair and scalp	2	0.93
Syndrome		
Fatigue	8	3.70
Cancer	7	3.24
Parasites	5	2.32
Malaria	5	2.32
Midwifery	6	2.78
Blood tonic	4	1.85
Diabetes mellitus	4	1.85
Visceral organ	3	1.39
Damage		
Infant convulsion	1	0.46
Diet	1	0.46
Cardiotonic	1	0.46
Eye problems	1	0.46
Hypotension	1	0.46

**Table 3.** Plant part used.

Plant part	Frequency	Percentage
Whole plant	48	29.63
Root/rhizome	27	16.67
Leaf	26	16.05
Fruit	17	10.49
Wood/heart wood	16	9.88
Bark	8	4.94
Stem	7	4.32
Flower/inflorescence	6	3.70
Seed	4	2.47
Latex	3	1.85

**Table 4.** Methods for herbal preparation.

Method	Frequency	Percentage
Decoction	97	64.24
Poultice	23	15.23
Raw	15	9.93
Powder	6	3.97
Juice	5	3.31
Bath	2	1.36
Oil	1	0.66
Charcoal	1	0.66
Dessert	1	0.66

**Table 5.** Administration for medicinal plants.

Administration	Frequency	Percentage
Oral	99	71
Topical	34	24
Bath	3	2
Inhalation	1	1
Sauna	1	1
Steam Bath	1	1

5 parts if it is shrub or tree.

### Herbal preparations

There were 9 herbal preparations documented from this study (Table 4). The most frequently used preparation was decoction for 97 species (64.24%), followed by poultice for 23 species (15.23%) and raw for 15 species (9.93%). It should be noted that some plants were prepared with more than one method for treating different disease. For example, *Alternanthera sessilis* (L.) R. Br. ex DC. with whole plant was prepared as decoction for curing menstrual disorder, whereas it may also be prepared as poultice to cure intestinal parasitism in childhood.

According to preparation method, decoction was classified into 3 kinds. Firstly, medicinal materials in clean drinking water would be boiled until liquid decreased to be a one third, then it was used for drinking. Secondly, medicinal materials in clean water were boiled until steam is obtained, then it was used for taking a bath. Finally, medicinal materials in clean drinking water were boiled until steam is obtained, then it was drunk as tea.

In addition, poultice was crushed, pinched, chopped, or pounded medical materials for mostly applying on skin. Raw was the utilization of any plant parts without processing. In this study, plant parts were eaten as raw vegetables or fruits. Powder was prepared by grinding plant parts. This received more fine granules than poultice method, and it was mostly used for skin disease.

Juice was gathered from extraction of any plant parts. It might be from squeezing or damaging materials to get watery sap or latex. The method of bath entails placing plant parts in hot water or parboiling them. This method was performed with plant parts which were eaten as parboiled vegetables. Oil was made by extraction method, while dessert was prepared by putting plant parts in syrup.

### Herbal administration

Local drugs were administered through 6 routes (Table 5): Oral, topical, inhalation, sauna, steam bath and bath. Oral administration was the most frequently used route with 99 plant species (71.22%), followed by topical administration with 34 species (24.46%) and bath with 3 species (2.16%), respectively. It showed that some plants could be administered with more than one routes. *Pouzolzia pentandra* (Roxb.) Benn. was an example that its decoction of whole plant was oral administered as fever relieving, while that decoction was also topical administered by keeping it in mouth to cure toothache.

Administration by oral route is in agreement with many previous studies in various tribes around the world (Coe and Anderson, 1996; Kamatenesi et al., 2011; Collins et al., 2007).

## DISCUSSION

### The most common disease

From the study, it showed that the symptom or disease that local healers knew many plants for curing were pyrexia or fever. This is related to the report of Ministry of Health Thailand (2010) which indicated that pyrexia of unknown origin was a disease having high morbidity rate in Thailand since 1983. Moreover, it was reported that people in Southern Thailand suffered from pyrexia of unknown origin with 704.04 people per 1,000 people a year. Therefore, it reflected the truth why local healers knew many plants for curing this symptom or disease. In this study, however, the fever mostly mentioned by local healers was Khai-phid-nam.

### Khai-Phid-Nam

Khai is a fever in Thai language. Khai-phid-nam is a kind of fever, caused by a return of fever after patients took their bath and were absolutely relieved of the last illness. The chief complaint of this fever is lower temperature at both feet, while higher one at other body parts.

According to healers' knowledge, there were 7 species of medicinal plants used for treating Khai-Phid-Nam including *Bridelia stipularis* (L.) Blume, *Breynia* sp., *Flagellaria indica* L., *Melaleuca cajuputi* Roxb., *Solanum*

*trilobatum* L., *Glycosmis pentaphylla* (Retz.) DC, *Mischocarpus sundaicus* Blume and *Sida cordifolia* L.

### Comparison to related study

The folk knowledge of herbal utilization obtained from this survey was compared to 2 closely related studies. The former Thaechatturat's study (2000) about using medicinal plants of Morgan tribe in Phang-nga province, the resembling properties to present study were found in 2 species, namely *C. odoratum* (L.) R.M. King & H.Rob. used for wound treating and *Morinda elliptica* (Hook. f.) Ridl. used as anthelmintic. The latter Upho's study (2005) about using medicinal plants of Buddhist and Muslim Thais in Trang province, a total of 12 species with resembling properties to this study was found, namely *C. odoratum* (L.) R.M. King & H.Rob. used for wound healing, *Vernonia cinerea* (L.) Less. used to stop bleeding, *Ipomoea pes-caprae* (L.) R. Br. used for curing toxin from jellyfish, *Euphorbia hirta* L. used as lactagogue, *Senna sophera* L. used as antidote, *Chrysopogon aciculatus* (Retz.) Trin. used for gravel treatment, *Tiliacora triandra* Diels used for relieving fever, *Oldenlandia corymbosa* L. used to treat cancer, *Glycosmis pentaphylla* (Retz.) DC used to treat herpes simplex as well as herpes zoster, *Lygodium microphyllum* (Cav.) R. Br. used to relief fever. Moreover, 2 species namely *Xylocarpus granatum* J. Koenig and *Rhodomyrtus tomentosa* (Aiton) Hassk. were used as antidiarrhoeal.

### Biological confirmation

From this study, 34 medicinal plants showed that their folk properties were concordant to pharmacological activities studied previously (Table 6). For example, *Abrus precatorius* L, the traditional healer used to cure Athlete's foot while the biological research showed that its leaf extract (Adelowotan et al., 2008), root extract (Mistry et al., 2010) and seed extract (Prashith Kekuda et al., 2010) were potentially against the Gram positive organism *Staphylococcus aureus*, causing pus and ulcer (Franklin, 1998).

*Alternanthera sessilis* (L.) R. Br.ex DC was used to cure fever. Simultaneously, Praveen et al.'s (2010) study showed that its extract has potential to cure antipyretic activity. In addition, Johnson et al.'s (2010) study showed that leaves extracts are more effective against *Proteus vulgaris*, *Streptococcus pyogenes*, *Bacillus subtilis* and *Salmonella typhi*.

However, there were 13 species that have never been studied about biological activities including *Drynaria sparsisora* (Desv.) T. Moore, *Jasminum nervosum* Lour., *Uvaria ridlei* King, *Fimbristylis sericea* R. Br., *Lindernia ciliata* (Colsm.) Pennell, *Lindernia crustacea* (L.) F. Muell., *Allophylus cobbe* (L.) Raeusch., *Microstachys*

**Table 6.** The species with biological confirmation

Scientific name	Traditional healer uses (plant part/ disease)	Pharmacological activities (References)
<i>Abrus precatorius</i> L.	Leaves/ athlete's foot	Antibacterial activity (Adelowotan Bobbarala and Vadlapudi, 2009; Prashith et al., 2008; Mistry et al., 2010; Kekuda et al., 2010); antifungal activity (Prashith Kekuda et al., 2010)
<i>Acanthus ilicifolius</i> L.	Whole plant/ cancer	Antitumour activity (Babu et al., 2002); antioxidant activity (Babu et al., 2001)
<i>Alternanthera sessilis</i> (L.) R. Br.ex DC.	Whole plant/ fever	Antipyretic activity (Praveen et al., 2010)
<i>Calophyllum inophyllum</i> L.	Fruits/ joints and bones pain	Antibacterial activity (Johnson et al., 2010) Antiinflammamtory activity (Shah et al., 2006)
<i>Rhizophora apiculata</i> Blume	Fruits/ fever	Antiviral activity (Jassim and Najji, 2003)
<i>Rhizophora mucronata</i> Lam.	Fruits/ fever; stem bark/ diarrhea, mucous; bloody dysentery,	Antibacterial activity (Jelager et al., 1998)
<i>Rhodomyrtus tomentosa</i> (Aiton) Hassk.	Fruits/ diarrhoeal	Antibacterial activity (Surasak et al., 2009)
<i>Sida cordifolia</i> L.	Whole plant/ fever	Antibacterial activity (Mahesh and Satish, 2008)
<i>Solanum trilobatum</i> L.	Leaves/ herpes simplex; Fruits/ sore throat, fever Whole plant/ diabetes mellitus	Analgesic activity (Annamalaia et al., 2009) Antiinflammatory and analgesic activity (Ramakrishna et al., 2011) Antibacterial activity (Swapna Latha & Kannabiran, 2006); antidiabetic activity ( Doss et al., 2009)
<i>Tiliacora triandra</i> Diels	Stem/ fever	Antimalarial activity (Saiin and Markmee, 2003); antipyretic activity (Jongchanapong et al., 2010)
<i>Tribulus terrestris</i> L.	Whole plant/ Dysuria, Kidney stone	Diuretic activity (Al-Ali et al., 2003) CaOx crystallization inhibition (Aggarwal et al., 2010)
<i>Vernonia cinerea</i> (L.) Less.	Whole plant/ wound Whole plant/ smoking cessation	Antiinflammatory activity (Mazumder et al., 2003); Antibacterial activit(Gupta et al., 2003 ) Smoking cessation (Wongwiwatthananutit et al., 2009)
<i>Xylocarpus granatum</i> J. Koenig	Stem bark/ diarrhoeal, mucous bloody dysentery	Antibacterial activity (Alam et al., 2006)
<i>Ziziphus mauritiana</i> Lam.	Leaves/ seborrheic dermatitis	Antibacterial activity (Abalaka et al., 2010)
<i>Calotropis gigantean</i> (L.) W.T. Aiton	Latex/ toothache, corns	Antibacterial activity (Alam et al., 2008; Subramanian and Saratha, 2010) ; wound healing (Waya et al., 2009)
<i>Senna tora</i> L.	Whole plant/ fever	Antibacterial activity (Roopashree et al., 2008); antibacterial activity (Chavan et al., 2011)
<i>Cayratia trifolia</i> (L.) Domin	Stem/ used as emmenagogue	PGE2 inhibition (Siriwatanametanova, 2010)

Table 6. Contd.

<i>Chromolaena odoratum</i> L.	Leaves/ bleeding	Would healing (Phan et al., 2001)
<i>Clerodendrum inerme</i> (L.) Gaertn.	Leaves/ fever, exanthemathous prickly heat and puritic rash	Antiinflammatory and Analgesic activity (Yankanchi and Koli, 2010); antibacterial activity (Chahal et al., 2010)
<i>Combretia quadrangulare</i> Kurz.	Seeds/ anthelmintic	Anthelmintic activity on <i>Ascaridia galli</i> (Sritong et al., 2005)
<i>Commelina benghalensis</i> L.	Whole plant/ fever	Antibacterial activity (Bagchi et al., 1999)
<i>Crotalaria retusa</i> L.	Whole plant/ fever	Antibacterial activity (Gangoue-pieboji et al., 2006)
<i>Derris scandens</i> (Aubl.) Pittier	Roots/ cancer	Antimigration of cancer cells (Laupattarakasem et al. 2007)
<i>Euphorbia heterophylla</i> L.	Whole plant, leaves/ purgative	Laxative activity (Falodun and Agbakwuru, 2004)
<i>Euphorbia hirta</i> L.	Whole plant/ lactogogue; Whole plant/ herpes zoster	Lactogogue activity (Blanc et al., 1963); Antiviral activity (Gyuris et al., 2009)
<i>Hyptis suaveolens</i> (L.) Poit.	Seeds/ anti diarrhoeal	Antimicrobial activity (Nantitanon et al, 2007)
<i>Ipomoea pes-caprae</i> (L.) R. Br.	Leaves/ toxin from jellyfish; Leaves/ insect bites	Neutralization of toxic effects (Pongprayoon et al., 1991)
<i>Lippia nodiflora</i> (L.) Michx.	Whole plant/ Joint and muscle pain	Antiinflammatory and analgesic activity (Forestieri et al., 1996 )
<i>Lumnitzera racemosa</i> Willd.	Wood, roots, stems/ wound healing	Antibacterial activity (Souza, 2010)
<i>Melaleuca cajuputi</i> Roxb.	Inflorescence/ wound in oral cavity	Antibacterial activity (Khare, 2007)
<i>Morinda elliptica</i> (Hook. f.) Ridl.	Friuts,stem bark/ fever, oozing eczema due to lymphatic disorder and seborrhoeic dermatitis; Roots/ fever causing convulsion	Antibacterial activity (Ali et al., 2000)
<i>Physalis minima</i> L.	Whole plant/ tonsillitis Fruits/ sore throat	Antiinflammatory and analgesic activity (Khan et al., 2009); antibacterial activity (Shariff et al., 2006)
<i>Pithecellobium dulce</i> (Roxb.) Benth.	Stem bark/ toothache, gingivitis	Antiinflammatory activity (Sahu and Mahato, 1994); antiinflammatory and antibacterial activity(Chandran and Balaji, 2008)
<i>Plucea indica</i> Less.	Whole plant/ dysuria	Diuretic effect (Nilvises et al., 1989)

*chamaelea* (L.) Mull. Arg., *Perotis indica* (L.) Kuntze, *L. microphyllum* (Cav.) R. Br., *Pouteria obovata* (R. Br.) Baehni, *Oldenlandia heynei* Oliv. and *Bridelia stipularis* (L.).

Therefore, it is interesting to study about pharmacological activities of the rest.

It should be noted that only the old local healers know different utilization of medicinal plants whereas many plants are rapidly destroyed by human activities,

nowadays. Therefore sustainable conservation should be conducted for preserving both indigenous knowledge and medicinal plants.

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