



Ethnomedicinal Practices in Kilikhar, Mongar

Bimal Kumar Chetri^{1*}, Phuntsho Wangdi² and Tshering Penjor²

¹*Sherubtse College, Royal University of Bhutan, Bhutan.*
²*Environment and Life Sciences, Sherubtse College, Bhutan.*

Authors' contributions

This work was carried out in collaboration between all authors. Author BKC designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors PW and TP managed the analyses of the study. Authors BKC and PW managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/APRJ/2018/v1i226275

Editor(s):

- (1) Dr. Nesreen Houssien Abou- Baker, Associate Professor, Department of Soil and Water Use, Division of Agricultural and Biological Research, National Research Centre, Giza, Egypt.
(2) Dr. Langa Tembo, Lecturer, Department of Agriculture Production, Makerere University, Kampala, Uganda and Department of Plant Science, University of Zambia, Lusaka, Zambia.

Reviewers:

- (1) Charles Emeka Umenwa, University of Ibadan, Nigeria.
(2) Fatiha El Azzouzi, IbnTofail University, Morocco.

Complete Peer review History: <http://www.sciencedomain.org/review-history/27647>

Short Research Article

Received 29 September 2018
Accepted 02 December 2018
Published 07 December 2018

ABSTRACT

This study records medicinal plants used in different treatment by the local healer at Kilikhar *Chiwog* of Mongar *Dzongkhag*, Bhutan. A total of 61 different medicinal plants were recorded from 52 species identified belonging to 37 different families. Preference ranking of plant species helped to validate the efficacy of the plants used for treating diseases. It is also observed that a single plant species is used to treat single to multiple diseases.

Keywords: *Local healer; Kilikhar Chiwog; preference ranking; medicinal plants; treatment.*

1. INTRODUCTION

People used Indigenous Knowledge (IK) of plants in extracting food, medicines, fibres, handicraft, fodder, vegetables and timber from the plant resources. In Bhutan, the use of plants

by the rural folk in extracting food, medicines, fodder, agriculture tool, manufacture of *desho (traditional)* paper, wood crafting, timber is common. For a majority of rural and semi-urban communities, plants are still the main source of livelihood [1]. Recent survey in local communities

*Corresponding author: E-mail: bimal_kum.sherubtse@rub.edu.bt;

of Bumdeling Wildlife Sanctuary (BWS), reported a large number of people depending on plants uses [2]. Despite this dependency on the forest resources and plants crude uses, the literature documenting such important information is sparse. Also, people relying on modern health system² the traditional healing practices have become uncommon even among rural folk. However, we get to see many people still with so much trust on local healers and their medication mostly seen in the rural part of the country [3]. Bhutan is known to be one of the biological hotspots in the world. Forest is the main source of livelihood for the majority of the rural and semi-urban people of Bhutan with valuable ethnobotanical and ethnomedicinal plant [1] covered by a forest of 70.40% as of 2010 [4]. The transition of culture and economics associated with globalisation in the world have threatened the IK [3] and currently such practices are confined to rural communities only [2,5,6]. Apart from a few sporadic surveys and chain analysis carried out by the Department of Forest (DoF), Medicinal and Aromatic Plant Section (MAPS) and ITMS, little research has been done related to IK Therefore documenting highly vulnerable IK related to use of plants and their products is imperative before it disappears from these group of potential knowledgeable local healers.

2. MATERIALS AND METHODS

2.1 Study Area

Kilikhar *Chiwog* (village sub-block) (Fig. 1) is located approximately 9km away from the Mongar *Dzongkhag* (District) towards the Trashigang highway. The *Chiwog* constitutes four villages viz., Bartong, Tamang, Sakarwang and Pangthangdaza with the total numbers of 73 households [7]. The altitude ranges from 500 to 2500 masl with a warm subtropical climate in the south and temperate climatic conditions in the north. The farmers of this area practice an integrated type of farming. They rely on agriculture products, livestock and forest resources for their livelihood. Besides medicinal plants and healing practices, people of this area also use forest resources as a source of firewood, bamboo, fodder, wild mushroom, fern tops and cane shoot (Tshering, *Gewog* (village block) Extension Officer, personal communication, November 15, 2013). This research is solely based on the information and data collected from the Local healer popularly known as Khenpa Tashi. He is from Kilikhar *gewog* known through authors' personal acquaintances and his popularity in healing local people within and outside of *gewog* since a long time.

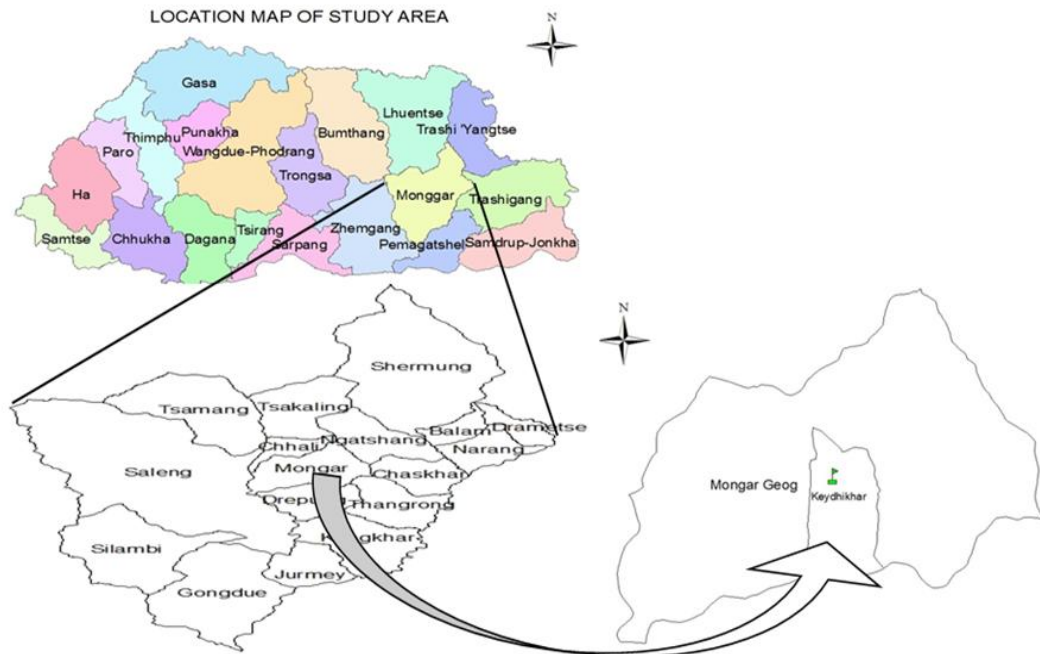


Fig. 1. Map of study area Kilikhar. Courtesy to Pema Thinley, RNR-RDC Wengkhari

2.2 Data Collection and Plants Identification

Plant specimens were collected directly from the nearby home-gardens and forest nearby within the gewog consecutively for three days along with the local healer. Medicinal uses of the plants collected were recorded using a paper tag with voucher name and reference number immediately in the sites of the collection with local names. Later during the evening of each day of collection cross-referring with the *in-situ* photographs and reference number, detail information about the plant specimens was tabulated via informal talk, semi-structured or structured questionnaires in the local dialect of the healer. Accordingly free listing (FL) and preference ranking (PR), diseases treated, part(s) used, the habit was recorded and interpreted as per Martin [8], and collected specimens were processed [9].

The local healer was requested to accompany the researchers to the field to specify the plants he often uses for treating local people. Voucher specimens of all the plants were identified in the lab referring to the Flora of Bhutan [10-15].

3. RESULTS AND DISCUSSION

During this study, it was observed that apart from performing rituals, the local healer was also invariably using medicinal plants which were collected from *Korila* (high altitude pass). Study records a total of 52 plants species belonging to 37 different families. The information such as botanical name, local name, mode of ethno-preparation, type of diseases treated and habit of the plants (Table 1, Plates 1 and 2), which includes 30 species as herbs (58%), seven each climber and shrubs (13%), four species of Pteridophytes (8%), three trees (6%) and one creeper (2%). The local healer mostly collects these plants or parts of the plant(s) during summer and autumn season depending upon his need and diseases to be treated. There are other records [16,17,18] from the region on medicinal plants. The most represented family with the highest number of utilised medicinal plants in the area were Asteraceae, Gentianaceae, Rosaceae, and Polypodiaceae with three plant species each, followed by Begoniaceae, Cucurbitaceae, Geraniaceae, Ranunculaceae, Rubiaceae, Saxifragaceae, and Zingerberaceae

with two plants species each. Out of 52 plant species, 51 plants are categorised as wild, while only one species *Berginia ciliata* is found cultivated as well as in wild condition. In his treatment, he also mixes other potential animal products (Plate 3) for ethno-preparations which are packed later and applied externally to the patients' affected part of the body or orally administered to them in appropriate doses. Sometimes these medicines are given for a week to the patients. These treatments were kind of first aid services to local people. As informed by his regular patients to us, healer used natural way of healing systems with fewer side effects. The healer uses single plant or decoction from two or more plants to treat diseases commonly hypertension, ulcer, vomiting, dysentery, swellings and poison. Besides, he also treats witch-craft related diseases (locally called *Galp, Soendey*) and the poisoning. During the interview, it was known that *Begonia josephii*, (*Braksey-local name*) is the most recommended medicinal plant with the potential to cure common diseases in the study area. Rhizomes of *Begonia josephii* are harvested, dried and converted into powder for use.

The most frequently used medicinal plant parts are Leaves (40%), followed by whole plant (13%), stem/shoot(20%), rhizome/tuber(8%), root and seed(5%), fruit(4%), bark(3%) and latex (1%).The medicines are prepared mostly as powder followed by decoction, poultice or plant parts are given in appropriate dose to patients for chewing. Medicinal Plants are prioritised (Table 2) to three categories as I (*most preferred*), II (*moderate*) and III (*less preferred*). Healer uses plants parts like rhizome, root, leaves, flowers, stem, bark, seeds and fruits either collected timely from the nearby forest or home-gardens. Some medicinal plants which were found previously in the same area are not found anymore. The informant has the least idea about the impact of environmental change and why there is a decline in the numbers of medicinal plants. Reports [19-23] on common threats to medicinal plants in the Himalayan regions are mainly by habitat loss including deforestation, habitat fragmentation, overgrazing by livestock and unsustainable harvesting including poaching and illegitimate trade of important medicinal plants, deforestation, soil erosion, overgrazing and drought are the major factors that affected different medicinal plants in the study area [24].

Table 1. List of medicinal plants used by local healer with their ethnomedicinal preparation and diseases treatment

Sl. #	Botanical Name	Family [Count]	Local Name	Ethnomedicinal preparation	Treatment[s]
1.	<i>Centella asiatica</i> (L.) Urb.	Apiaceae (1)	Zalamombaring	Decoction from whole plant/consumed as raw	Hypertension & improved memory
2.	<i>Rauvolfia serpentine</i> (L.) Benth. ex Kurz	Apocynaceae (1)	-	Roots pounded & use its extract	Hypertension & fever
3.	<i>Remusatia hookeriana</i> Schott	Araceae (1)	Satsa	Fresh or dried leaves/shoot is powdered & consumed mixed with water	Hypertension, weak body & ulcer
4.	<i>Panax trifolius</i> . L.	Araliaceae (1)	Kangchigpa	Leaves, stem and seeds are powdered and ingested as solution	Vomiting
5.	<i>Sonchus asper</i> (L.) Hill	Asteraceae (3)	Samaen	Leaves and root are powdered & consumed orally mixed with water	Tuberculosis, vomiting & shivering
6.	<i>Saussurea</i> sp.		Khirmamaen	Leaves & stems are powdered & taken orally/ applied externally	Headache, fever, stomach disorder, limb pain & wounds
7.	<i>Inula</i> sp.		Rabanaa	Poultice from leaves	Piles
8.	<i>Impatiens</i> sp.	Balsaminaceae (1)	Sarokpumaen	Leaves and shoot are powdered & sniffed /applied externally	Nose pain, body swells & ulcer contd.
9.	<i>Begonia hatacoa</i> Buch.-Ham. ex D.Don	Begoniaceae (2)	Sokmaen	Leaves & stem are powdered & prepared as tea	Extend life span
10.	<i>Begonia josephii</i> A.DC.		Braksey	Sun-dry rhizome is powdered & used alone or mixed with other medicines as solution	Hypertension, poison, sore throat, stomach pain & diarrhea (Multi-purpose)
11.	<i>Cynoglossum furcatum</i> Wall. ex Roxb.	Boraginaceae (1)	Rimaen	Poultice from leaves and stem is used in the affected part	All swelling categories
12.	<i>Lobelia nummularia</i> Lam.	Campanulaceae (1)	PhakpaJiru	Aqueous extract of fruits and leaves	Epilepsy, boils & ear pus
13.	<i>Commelina</i> sp.	Commelinaceae (1)	Kohlmaen	Decoction from whole plant	Dysentery, shivering (<i>Drangsong</i>) & catalepsy
14.	<i>Rohdea nepalensis</i> (Raf.) N.Tanaka	Convallariaceae (1)	Chosmom	Decoction from whole plant	Diarrhoea, piles, head & stomach ache & ulcer
15.	<i>Capparis</i> sp.	Capparaceae (1)	Zuneyh	Leaves & stem are powdered & applied externally or wore as	<i>Soendrey</i> & <i>Galp</i>

Sl. #	Botanical Name	Family [Count]	Local Name	Ethnomedicinal preparation	Treatment[s]
				<i>Sungkey</i>	
16.	<i>Diplocyclos palmatus</i> (L.) C. Jeffrey	Cucurbitaceae (2)	Kohmaen	Dried leaves & rhizomes powdered and consumed mixed with water	Diarrhoea& dysentery
17.	<i>Hodgsonia macrocarpa</i> (Blume) Cogn.		Dhasumpa	Decoction from leaves. Leaves heated & wrapped in cloth-piece & treated gently on affected part of cancer diseases	Head ache, leprosy, cancer, body pain, nose bleeding, eye diseases
18.	<i>Kyllinga brevifolia</i> Rottb.	Cyperaceae (1)	Thogchigpa	Leaves and roots are powdered & sniffed directly	Red nose (<i>Yathra</i>) & wounds
19.	<i>Cyrtomium falcatum</i> (L. f.)C. Presl	Dryopteridaceae (1)	Pang dawai	Leaves are powdered and applied externally on the body mixed with <i>delda</i> oil	Bone fracture and skin crack
20.	<i>Euphorbia hirta</i> L.	Euphorbiaceae (1)	-	Use fresh latex	Wart
21.	<i>Swertia</i> sp.	Gentianaceae (3)	Brangsamaen	Whole plant is powdered & consumed mixed with water	Deworming (<i>Beykha</i>), Tuberculosis & weak body
22.	<i>Swertia bimaculata</i> (Siebold&Zucc.) Hook. f. & Thomson ex C.B. Clarke		Pangser	Dried leaves and stems are powdered & consumed orally mixed with water	Tuberculosis, malaria, pneumonia, ulcer & vomiting
23.	<i>Crawfordia speciosa</i> C.B.Clarke		JaaTapi	Dried leaves & rhizomes are powdered & consumed mixed with water/applied externally on affected part mixed with <i>dalda</i> oil	Poison, head & stomachache & water borne diseases
24.	<i>Geranium nepalense</i> Sweet	Geraniaceae (2)	Jurmaen	Leaves and stem are powdered & consumed or applied externally on affected part	Tonsil, skin diseases (rashes, mange) & lip crack
25.	<i>Didymocarpus pedicellatus</i> R.Br.		Karmaen	Leaves and stem are powdered & mixed <i>Litsea cubeba</i> fruit & applied externally on the affected parts	Mange, wounds & stomach swell/disorder, tuberculosis & poison
26.	<i>Leucas ciliata</i> Benth.	Lamiaceae (1)	Thogsampa	Powdered leaves consumed mixed with water/ apply externally mixed with <i>delda</i> oil	Hypertension, fracture & boil
27.	<i>Alysicarpus</i> sp.	Leguminosae (1)	Chhumaen	Decoction from whole plant is taken orally or pulverised is applied externally	Body pain, cold, fever, headache and body twist

Sl. #	Botanical Name	Family [Count]	Local Name	Ethnomedicinal preparation	Treatment[s]
28.	<i>Litsea cubeba</i> (Lour.) Pers.	Lauraceae (1)	Nengshing	Leaves/bark/stem/fruits/seeds are directly consumed or powdered & consumed blended with water	Fever & limbs inflammation
29.	<i>Sida rhombifolia</i> L.	Malvaceae (1)	-	Leaves, root & stem, extract-boil with mustard oil and apply	Body pain
30.	<i>Tinospora sinensis</i> (Lour.) Merr.	Menispermaceae (1)	Rumaen	Leaves are pounded, mixed with <i>delda</i> oil & applied externally for wounds & body swell & ingested as solution for dysentery	Dysentery, wounds, body swell & shivering
31.	<i>Myrsine</i> L.	Myrsinaceae (1)	Sohmaen	Leaves and stem are powdered / chewed freshly. It is used as ointment and sniff	Toothache, red nose (<i>Yathra</i>) & body itching
32.	<i>Calanthe</i> sp.	Orchidaceae (1)	Tshammaen	Extract of whole plant is drank	Hair loss
33.	<i>Oxalis corniculata</i> L.	Oxalidaceae (1)	Jatsheyrigpa	The whole plant is powdered & sprinkled over the other medicines	Retain fragrance of the medicines
34.	<i>Phaseolus</i> sp.	Papilionaceae (1)	Rutsimaen	Leaves and stem are powdered & consumed mixed with water	Head & stomach ache, lip/tongue crack
35.	<i>Phytolacca acinosa</i> Roxb.	Phytolaccaceae (1)	Omshamenlamo	Rhizome is powdered & consumed as solution while leaves and barks are crushed & extract is applied externally on the affected area.	Muscle sprain, bone fracture, body inflammation (<i>Chung chung</i>), & Poison
36.	<i>Polygonum</i> sp.	Polygonaceae (1)	Lungmaen	Decoction and poultice from whole plant	Dysentery, piles, swelling, Tuberculosis & pressure
37.	<i>Microsorium membranaceum</i> (D.Don) Ching	Polypodiaceae (3)	Shurminmaen	Poultice from leaves	Initial stage of cataract (sore eye or itching eye) & Shivering
38.	<i>Pyrrosia mollis</i> (Kunze) Ching		Narangmaen	Whole plant is powdered & applied externally on the affected parts	Genital pain/scrotum swelling
39.	<i>Polypodiodes lachnopus</i> (Wall. ex Hook.) Ching		Tsamendawai	Eat berries	Subside thirst
40.	<i>Clematis buchananiana</i> DC.	Ranunculaceae (2)	Kuyo	Leaves are powdered & mixed with <i>delda</i> oil is applied externally	Wounds in mouth, skin crack, back pain and joint pain
41.	<i>Thalictrum</i> sp.		Zhingmaen	Pulverised leaves are consumed mixed with water	Improve fertility rate & poison

Sl. #	Botanical Name	Family [Count]	Local Name	Ethnomedicinal preparation	Treatment[s]
42.	<i>Neillia rubiflora</i> D.Don	Rosaceae (3)	Zumaen	Leaves & seeds are pulverised. Ingested as solution or applied on the affected part mixed with <i>delda</i> oil.	Deworming and joint pain
43.	<i>Prunus cerasoides</i> Buch.-Ham. ex D.Don		Tsamaen	Leaves and seeds are pulverised & applied mixed with <i>delda</i> oil on the affected parts	Joint & back pain, body twist (<i>Tsakumney</i>)
44.	<i>Agrimonia pilosa</i> Ledeb.		Tshatshamaen	Leaves and tender stem are powdered & consumed as solution mixed with water	Dysentery, heart ache, fever, hair fall
45.	<i>Paederia foetida</i> L.	Rubiaceae (2)	Kheeroo	Whole plant is powdered & consumed as solution mixed with water	Headache, asthma, eye pain, Tuberculosis, hypertension & vomiting
46.	<i>Wendlandia</i> sp.		Phamaen	Leaves are powdered & consumed as solution/ apply externally on body swells	Ulcer, , stomach & head ache, diarrhea & body swelling
47.	<i>Astilbe rivularis</i> Buch.-Ham. ex D. Don	Saxifragaceae (2)	Jamaen/Khunmaen	Decoction from shoot is taken as orally	Dysentery and vomiting
48.	<i>Bergenia ciliata</i> (Haw.) Sternb.		Menchhana	Fresh leaves & rhizomes are powdered & applied on the affected part as paste or consumed powder mixed with water	Wounds, leg pain, poison and stomach & head ache& shivering
49.	<i>Brugmansia suaveolens</i> (Humb. &Bonpl. exWilld.) Bercht. &J.Presl	Solanaceae (1)	Gangmeto	Leaves powdered & consumed mixed with water or fresh leave extract is used as ointments	Ulcer, stomach ache & ringworm
50.	<i>Vitex negundo</i> L.	Verbenaceae (1)	Charpashing	Decoction from leaves used as ointment	Body & joint pain
51.	<i>Globba clarkei</i> Baker	Zingiberaceae (2)	Samaen	Leaves and rhizomes are powdered & taken as solution mixed with water	Fever, headache, vomiting, giddiness & pressure
52.	<i>Roscoea tibetica</i> Batalin		Shingmeto	Leaves powdered & consumed	TB, vomiting, poison, epilepsy

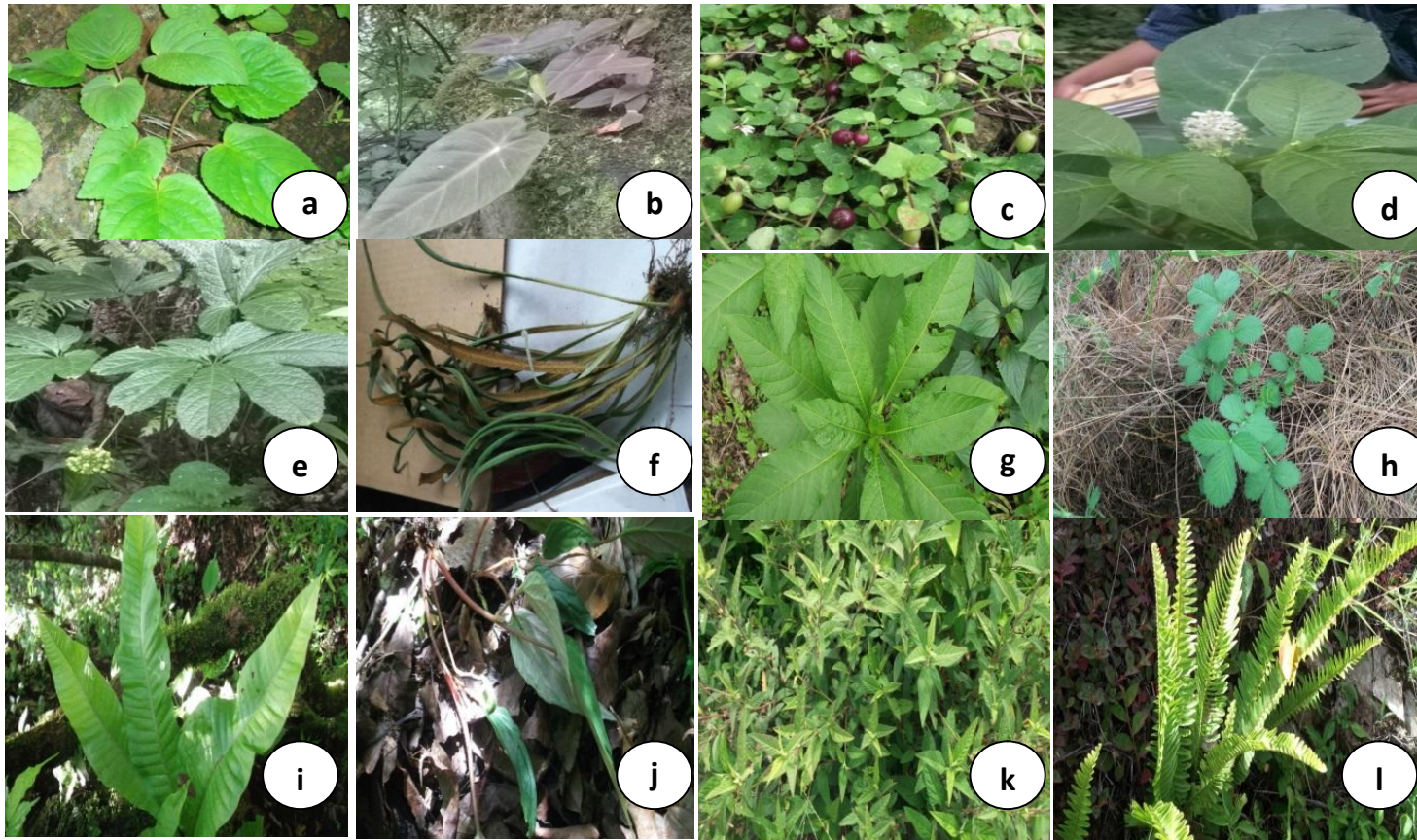


Plate 1. Medicinal Plant Reported (a-l): a. *Didymocarpus pedicellatus* R.Br. b. *Remusatia hookeriana* Schott c. *Lobelia nummularia* Lam. d. *Phytolacca acinosa* Roxb. e. *Panax trifolius*. L f. *Pyrrosia mollis* (Kunze) Ching g. *Brugmansia suaveolens* (Humb. & Bonpl. ex Willd.) Bercht. & J.Presl h. *Agrimonia pilosa* Ledeb. i. *Microsorium membranaceum* (D.Don) Ching j. *Begonia hatacoa* Buch.-Ham. exD.Don k. *Sidar hombifolia* L. l. *Polypodiodes lachnopus* (Wall. ex Hook.) Ching

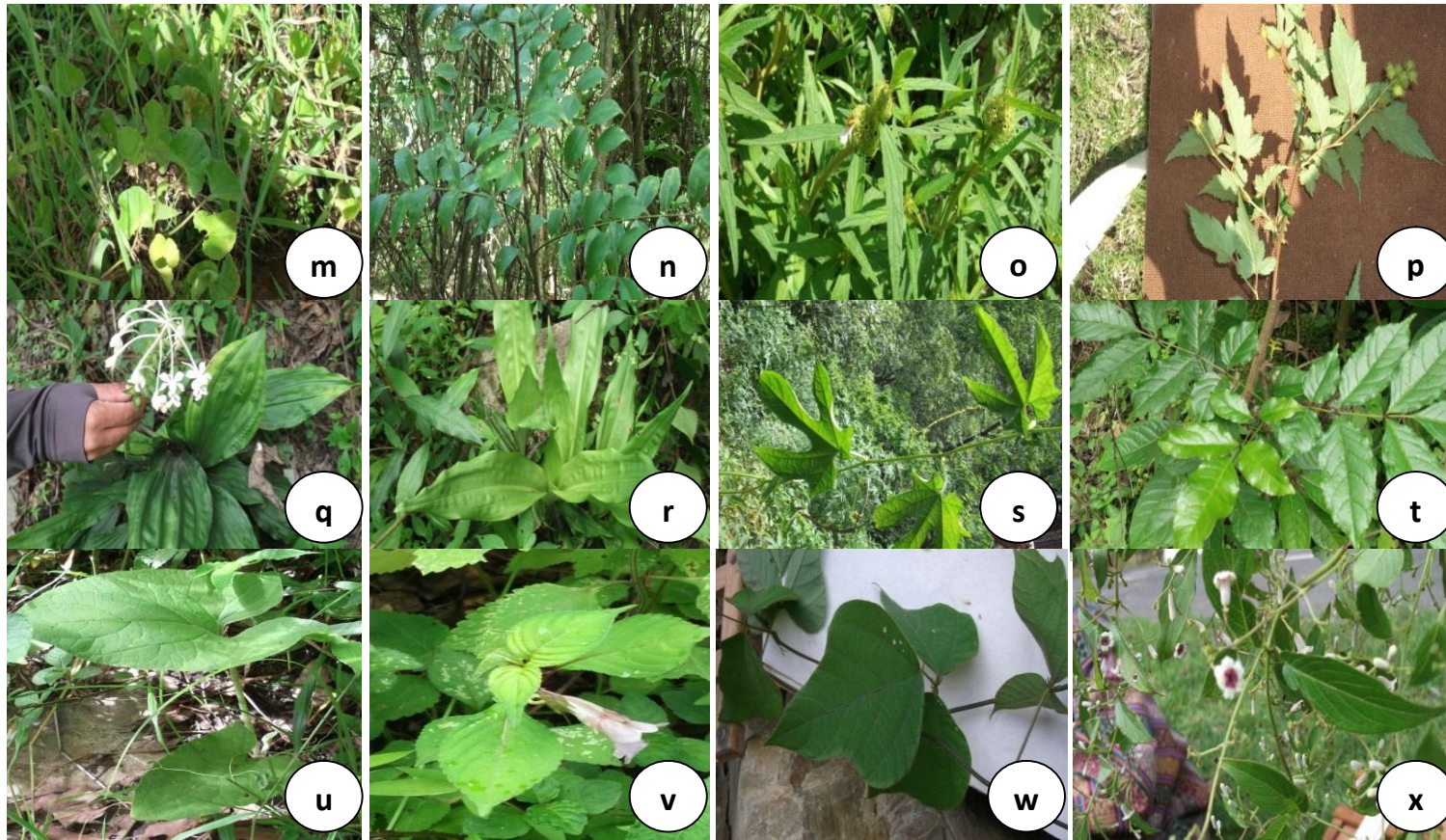


Plate 2. m. *Centella asiatica* (L.) Urb. n. *Capparis* sp. o. *Leucas ciliate* Benth. p. *Neillia rubiflora* D. Don q. *Calanthe* sp. r. *Rohdea nepalensis* (Raf.) N.Tanaka s. *Hodgsonia macrocarpa* (Blume) Cogn. t. *Myrsine* L. u. *Saussurea* sp. v. *Impatiens* sp. w. *Phaseolus* sp. x. *Paederia foetida*

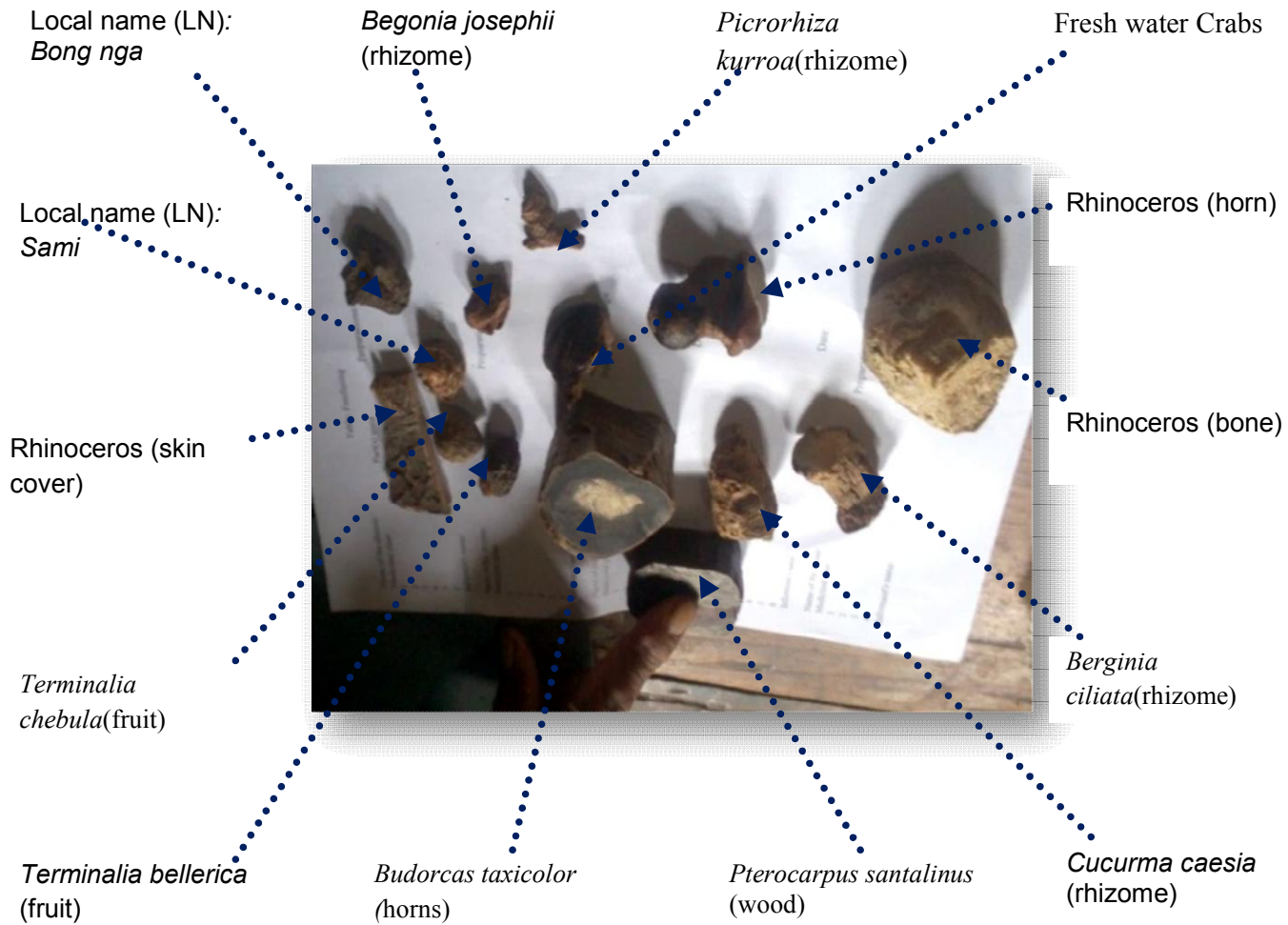


Plate 3. Dried raw material parts of medicines

Table 2. Preference ranking (PR) of the uses of medicinal plants for treating common diseases preferred by the healer (Khepa Tashi), Categorised into as I (Most preferred), II as (moderate) & III as (less preferred)

Treatment: Dysentery	Rank
<i>Commelina</i> sp.	III
<i>Polygonum</i> sp.	III
<i>Agrimonia pilosa</i> Ledeb	I
Treatment: Dysentery	Rank
<i>Myrsine</i> L.	III
<i>Clematis buchananiana</i> DC.	I
<i>Tinospora sinensis</i> (Lour.) Merr.	II
<i>Kyllinga brevifolia</i> Rottb	III
Treatment : Muscle cramps	Rank
<i>Commelina</i> sp.	II
<i>Paederia foetida</i> L.	I
<i>Phytolacca acinosa</i> Roxb.	III
Treatment: Fracture and broken limbs	Rank
<i>Leucasciliata</i> Benth.	II
<i>Cyrtomium falcatum</i> (Linn.) Presl	I
<i>Phytolacca acinosa</i> Roxb.	III
<i>Alysicarus</i> sp.	III
Treatment: Jaundice	Rank
<i>Clematis buchananiana</i> DC.	I
<i>Tinospora sinensis</i> (Lour.) Merr.	II
Treatment: Tuberculosis	Rank
<i>Didymocarpus pedicellatus</i> R.Br.	I
<i>Swertia bimaculata</i>	II
<i>Paederia foetida</i> L.	III
<i>Swertia foetida</i> L.	II
<i>Sonchus asper</i> L.	I
<i>Polygonum</i> sp.	III
Treatment: Shivering (drangsong)	Rank
<i>Commelina</i> sp.	I
<i>Tinospora sinensis</i> (Lour.) Merr.	II
<i>Microsorium membranaceum</i>	III
<i>Sonchus asper</i> L.	III
<i>Bergenia ciliata</i> (Haw.) Sternb.	I
<i>Wendlandia</i> sp.	II
Treatment: Ulcer	Rank
<i>Brugmansia suaveolens</i> (Willdenow) Berchtold & Presl	III
<i>Wendlandia</i> sp.	III
<i>Tupistra aurantiaca</i>	III
<i>Impatiens</i> sp.	II
<i>Swertia bimaculata</i> (Siebold & Zuccarini) J. D. Hooker & Thomson ex C. B. Clarke, J. Linn.	I
<i>Remusatia hookeriana</i> Schott	III
Treatment: Diarrhoea	Rank
<i>Diplocyclos palmatus</i>	I
<i>Wendlandia</i> sp.	III
<i>Begonia josephii</i> A. DC.	II
<i>Tupistra aurantiaca</i> (Baker) Wall. Ex Hook. f.	III
Treatment: Hypertension	Rank
<i>Remusatia hookeriana</i> Schott.	II
<i>Paederia foetida</i> L.	III
<i>Begonia josephii</i> A. DC.	I
<i>Leucas ciliata</i> Benth.	III

Treatment : Against witch-craft/Poisoning	Rank
<i>Begonia josephii</i> A.DC.	I
<i>Didymocarpus pedicellatus</i> R.Br.	III
<i>Roscoea tibetica</i> Batalin	III
<i>Crawfordias peciosa</i> Wall.	II
<i>Bergenia ciliata</i> (Haw.) Sternb.	III
<i>Phytolacca acinosa</i> Roxb.	III
<i>Thalictrum</i> sp.	III

4. CONCLUSION

Local people of Kilikhar *chiwog* and as well as people from outside study regions still believe in a traditional healer for treating common diseases like cold, fever, headache, poison, toothache, hypertension, dysentery and jaundice. Potential active principle(s) in medicinal plants used by the local healer(s) to cure wide spectrum of human diseases including cattle requires further pharmaceutical analysis.

ACKNOWLEDGEMENTS

We would thank the key informant Khepa Tashi (Traditional Healer) for his contribution to document and collect the plant specimens from the study area and Mr Danapati Dhungyel (Wengkhar, RNRRC) and Professor Sadruddin for helping us to identify the plant specimens. We immensely thank College Research Committee (CRC), Sherubtse College for funding this research project.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Mukhial PK, Sinclair B, Peldon S. Impacts of harvesting methods on the sustainability of four wild medicinal plant species in Lingshi, Thimphu, Bhutan. *Pharmaceutical Research*. 2011;5:7.
- Wangyal JT. Ethnobotanical knowledge of local communities of Bumdeling wildlife sanctuary, Trashiyangtse, Bhutan. *Indian Journal of Traditional Knowledge*. 2012;11(3):447-452.
- Lhendup P. Ethnomedicinal plant knowledge of a traditional healer in Shershong, Bhutan. Retrieved on August 20th, 2013. Available:[http://www.academia.edu/3997509/ethnomedicinal_plant_knowledge_of_a](http://www.academia.edu/3997509/ethnomedicinal_plant_knowledge_of_a_traditional_healer_in_shershong_bhutan)
- Pelden S. Forest cover 70.40 percent. *Bhutan Land Covers Assessment*. 2010;2011
- Kala CP. Indigenous knowledge of Bhotiya tribal community on wool dyeing and its present status in the Garhwal Himalaya, India. *Current Science-Bangalore*. 2002;83(7):814-817.
- Kala CP. Indigenous uses, population density, and conservation of threatened medicinal plants in protected areas of the Indian Himalayas. *Conservation Biology*. 2005;19(2):368-378.
- Annual Dzongkhag Statistics, National Statistics Bureau, Dzongkhag Administration, Mongar, 2011.
- Martin GJ, *Ethnobotany: A methods manual* (Vol. 1). Earthscan; 2004.
- Alexiades MN. Collecting ethnobotanical data: An introduction to basic concepts and techniques. In: Alexiades M.N. (ed) *Selected Guidelines for Ethnobotanical Research: A Field Manual*. The New York Botanical Garden, Bronx, New York. 1996; 53-94
- Grierson AJC, Long DG. *Flora of Bhutan: including a record of plants from Sikkim*. Volume 1. Part 1. Edinburgh: Royal Botanic Garden; 1983.
- Grierson AJC, Long DG. *Flora of Bhutan: including a record of plants from Sikkim*. Volume 1. Part 2. Edinburgh: Royal botanic garden; 1984.
- Grierson AJC, Long DG. *Flora of Bhutan: including a record of plants from Sikkim*. Volume 1. Part 3. Edinburgh: Royal Botanic Garden. 1987;41
- Grierson AJC, Long DG. *Flora of Bhutan*. Volume 2 Part 1: Edinburgh: Royal Botanic Garden; 1991.
- Grierson AJC, Long DG. *Flora of Bhutan: including a record of plants from Sikkim and Darjeeling*. Volume 2 Part 2. Edinburgh: Royal Botanic Garden Edinburgh; 1999.

15. Grierson AJC, Long DG, Springate LS. Flora of Bhutan: including a record of plants from Sikkim and Darjeeling. Volume 2. Part 3. Edinburgh; [S.I.]: Royal botanic garden; Royal government of Bhutan; 2001.
16. Sadruddin, Medicinal Plants of Bhutan: A Conspectus. Sherub Doenme 3 (1 & 2), 1997;32-55.
17. Tenzin S. Collection of medicinal plants and production of traditional medicines in Bhutan. Menjong So-rig Journal. 2008;1: 118-124.
18. Bhattacharyya G. An Ethnobotanical wealth of the "druk-yul"(Bhutan). In: Ethnobotany and medicinal plants of the Indian subcontinent, Jodhpur: Scientific Publishers (India), edited by Maheswari JK. 1999;94-98.
19. Hamilton AC, Radford EA. Identification and Conservation of Important Plant Areas for Medicinal Plants in the Himalaya. Plantlife International, Salisbury, United Kingdom, and Ethnobotanical Society of Nepal, Kathmandu, Nepal; 2008.
20. Wangchuk P, Ugyen, Olsen A. Vulnerable medicinal plants and the risk factors for their Sustainable use of Bhutan. Journal of Bhutan Studies. 2008;66-90
21. Badola, Hemant K, Mohinder Pal. Threatened medicinal plants and their conservation in Himachal Himalayas. Indian Forester. 2003;129(1):55-68.
22. Singh G, Rawat GS. Ethnomedicinal survey of Kedarnath wildlife sanctuary in western Himalaya, India. Ind J Fundam Appl Life Sci. 2011;1:35-36.
23. Dhar U, Rawal RS, Upreti J. Setting priorities for conservation of medicinal plants- a case study in the Indian Himalaya. Biol Conserv. 2000;95:57-65. DOI:10.1016/S0006-3207(00)00010-0.
24. Mesfin K, Tekle G, Tesfay T. Ethnobotanical study of traditional medicinal plants used by indigenous people of Gemad District, Northern Ethiopia. Journal of Medicinal Plants Studies. 2013;1(4):72-37.

© 2018 Chetri et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history/27647>*