



Ethnobotanical resources: Edible plants consumed by the Moyon Naga tribe of Manipur (India) and Myanmar

Wanglar Alphonsa Moyon¹, Elija Chara², Ng Khosirngak Moyon³, Ringphamchung Khartu Moyon⁴

¹ Assistant Professor, Department of Zoology, South East Manipur College, Komlathabi, Manipur, India

² Assistant Professor, Department of Sociology, Highland National College, Kanglatongbi, Manipur, India

³ Assistant Professor, Department of Education, South East Manipur College, Komlathabi, Manipur, India

⁴ Assistant Professor, Department of Botany, South East Manipur College, Komlathabi, Manipur, India

Abstract

Moyon, or Moyon Naga, is one of the indigenous tribes settling the hills of Manipur state in India and Myanmar. The tribe makes good use of the locally available plants to supplement their diet. The study documented 167 species of plants belonging to 57 families that are consumed by the people. Of the total plant species, 113 are wild, 47 are semi-domesticated and 11 are fully domesticated. This study focussed on the different plants and their useful parts consumed including stems, rhizomes, leaves, fruits, flowers, seeds and legumes, as well as the different modes of consumption ranging from fresh and raw to boiling, steaming and roasting. The study also indicates the botanical diversity of the land inhabited by the Moyon tribe and the choices of locally available plants are wholesome.

Keywords: Moyon Naga, edible plants, Manipur, Myanmar; botanical diversity

Introduction

The state of Manipur is located in the North-East of India bordering the states of Assam, Mizoram and Nagaland to the West, South and North respectively and Myanmar in the East. Manipur is situated within the junction of world's two biodiversity hotspots, viz, Eastern Himalaya and the Indo-Burma, which means that the region is rich in biodiversity. This rich biodiversity acts as a source of livelihood, food and survival of the indigenous tribes. Wild plants are especially source of food during events of famines (Reyes-Garcia *et al.* 2015) [16]. Various tribes and communities consumed wild plants to supplement their nutrition since time immemorial (Leonti *et al.* 2006; Luczaj *et al.* 2013) [12, 13]. Some of the edible plants are also reported to have medicinal properties and extensively used in traditional herbal remedies to treat various ailments (Devi *et al.* 2015; Rajkumari *et al.* 2015; Singson *et al.* 2016; Singh *et al.* 2017; Chara & Moyon 2021; Pampuinath & Meitei 2021) [4, 15, 19, 18, 2, 14].

The importance of wild plants as a source of food among the indigenous tribes and communities of Manipur and Myanmar is demonstrated in various studies on the same. Gangte *et al.* (2013) [17] reported 86 species of wild edible plants belonging to 36 families from the Zou tribe of Manipur. Rajkumari *et al.* (2015) [15] reported 69 edible plant species in a study among the Chiru tribe. Devi and Salam reported '56 species of edible plants belonging to 35 families' (2016) and '68 species belonging to 39 families of edible plants' (Devi *et al.* 2011) [4] consumed by the Monsang Naga tribe of Manipur. Other findings on edible plants in the state of Manipur include 68 species by Konsam *et al.* (2016) [11], 105 species belonging to 48 families by Dedrilkumar and Binu (2016) [3] and 115 species belonging to 46 families by Guite (2016) [9]. Shin *et al.* (2018) [17] listed 83 species from 44 families in a study of wild edible

plants from Shan state of Myanmar. Aryal *et al.* (2020:iv) [1] reported 103 edible plants species from Putao in Myanmar. The Moyon Naga tribe of Chandel and Tengnoupal District of Manipur and Sagaing Region of Myanmar also extensively depend on wild plants as a source of food. The Moyon tribe is of the 33 indigenous tribes inhabiting Manipur state of India. They are also one of the many Naga tribes inhabiting Myanmar. Like all the communities across the globe, the Moyons also depend on available botanical resources as a source of food since time immemorial. These plants were either totally wild or semi-domesticated. The Moyon Nagas prepare the edible plants in various ways. They are,

1. **Simple boiling (*Naenteh na isuwng*):** Edible parts of plants are boiled in water. No salt or spices are added.
2. **Steaming (*Naenthu na burum*):** Vegetables are steamed in a steamer made of woven bamboo.
3. ***Buwchung na burum*:** This is also another form of steaming where vegetables are kept on top of cooking rice.
4. **Roasting (*Iru*):** Leaves, tubers and rhizomes are roasted in fire or on charcoal.
5. ***Tongka na isuwng*:** Vegetables are cooked in a special kind of bamboo instead of pots.
6. ***Ynthee (frying)*:** Vegetables are fried either in oils derived from plants or animal fats.
7. ***Akii (Fresh)*:** *Akii* actually means 'raw', in which case the fresh leafy portions of plants or even stems, rhizomes and tubers are eaten whole.
8. ***Thingsuw*:** It is a cuisine as well as a method preparation. It consists of chilli paste and various portions and parts of plants (either cooked or raw). *Thingsuw* can be made from anything and everything, and in fact it is of the inseparable cuisine and dish of the Moyon Nagas.

9. Fermentation: Some parts of plants like bambooshoot or soybeans are fermented for future consumption. Fermentation can also be used for preparation of fruit based light alcoholic drinks.

Despite the popularity of edible plants among the Moyon Nagas, there has been no significant research to study these wild plants consumed by them. The few botanical studies on the Moyon tribe were on medicinal plants and ichthyotoxic plants. Chara and Moyon (2021) [2] reported 66 plants with medicinal properties used in folk remedies; some of the plants are also consumed as vegetable. Moyon and Singh (2017) reported 45 species of ichthyotoxic plants within 21 families used for fishing, while Moyon (2018) reported 14 ichthyotoxic plants specifically used by the Moyon tribe in fishing.

The Moyon's dietary preference of wild plants is somewhat similar to neighbouring indigenous tribes like the Maring

Naga, Anal Naga and Monsang Naga of Manipur and the Shan and Kachin tribes of Manipur. Considering the lack of available studies on the Moyon Nagas, this paper focuses on the botanical diversity of the land inhabited by the Moyon tribe and the various plants and parts of plants used as a source of food. Wild plants are especially important source of food for the Moyons, thus the article also aims towards the need for conservation of natural vegetation.

Materials and Method

Ethnobotanical surveys at the field were conducted between July 2020 and September 2021 in five selected Moyon villages, viz, Kapaam, Tungphae, Khungjuur, Matung and Bujuur Khuwfhuw. Information on the plants and their parts consumed are obtained from interviews, field observations and anecdotes. The plant samples were collected following routine botanical methods. The coordinates and topography of the study sites are as follows,

Table 1

Sl no.	Name of the village	Coordinates	Topography/elevation of the village area
1	Kapaam	24°25'35"N 94°00'46E	795 m to 1080 m
2	Tungphae	24°25'27"N 94°01'13"E	810 m to 870 m
3	Khungjuur	24°17'29"N 94°04'22"E	918 m to 1500 m
4	Matung	24°20'08"N 94°03'44"E	940 m to 1530 m
5	Bujuur Khuwfhuw	24°18'42"N 94°12'59"E	345 m to 1200 m

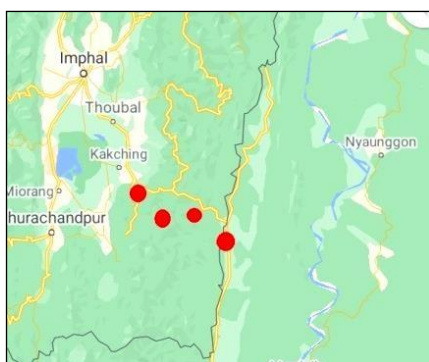


Fig 1: Map showing the areas inhabited by the Moyon Nagas (in red dot) (Source: google, n.d.)

The scientific (binomial) names of the collected plants were identified by consulting relevant botanical experts of the South East Manipur College, Manipur, India. In addition, various ethno botanical papers on edible plants based on Manipur state and Myanmar were also consulted to compare and ascertain the botanical names of the plants consumed by the Moyons. The consulted works include Devi *et al.* (2011; 2016) [4] Gangte *et al.* (2013) [17], Rajkumari *et al.* (2015) [15], Konsam *et al.* (2016) [11], Shin *et al.* (2018) [17] and Aryal *et al.* (2020) [1]. Botanical database of Manipur

Encyclopedia of Medicinal Plant (2021) and Wild Edible lists of Plants by ENVIS Hub, Manipur (2011) [20] were also referred to ascertain and cross check the names of the plants. Terms used for the availability status of the plants are-

1. Wild: Plant species collected in the wild to be consumed as food or drink (Shin *et al.* 2018) [17]. They are not cultivated and grow mostly in forests, meadows, wastelands, fields and roadsides; requires no human care.
2. Semi Domesticated: Plant species between wild and domestic crops; grown around farms and requires human intervention to care and maintain (Hari *et al.* 2017) [10]. Wild plants grown at gardens are also included in this list.
3. Grown: Plants grown as crops; requires human caring and intervention.

Results

The survey recorded 167 edible plant species belonging to 57 families consumed by the Moyon Nagas. Details of the plants viz. - Scientific name (Binomial name), family, local name (Moyon), useful parts of the plants, modes of preparation/consumption and the status of cultivability are as follows.

Table 2: Plants and useful parts consumed by the Moyon Naga tribe of Manipur (India) and Myanmar

Scientific name	Family	Local name (moyon)	Useful parts	Mode of consumption	Status: w or sd or grown
<i>Alocasia cucullata</i> (Lour.) G. Don	Araceae	Thingsuw sheersshah	Tuber	Raw (sliced into small pieces and mixed with chilli paste and herbs to prepare <i>thingsuw</i>)	W
<i>Alocasia esculata</i>	Araceae	Sheersshah yndup	Fleshy petiole	Boiled to make <i>thingsuw</i>	SD
<i>Alocasia indica</i> (Roxb.) Schott.	Araceae	Sheersshah	Whole plant	Cooked as vegetable	Grown
<i>Alocasia macrorrhizos</i> (L.) G. Don.	Araceae	Bathuwng	Fleshy petiole	Ingredient for making <i>Ngathuw</i> (fermented fish)	W

<i>Colocasia esculenta</i> (L.) Schott	Araceae	Baar/Endor	Fleshy petiole and tuber	Petiole and tuber as vegetable	Grown
<i>Colocasia fallax</i> Schott	Araceae	Chiidor	Fleshy petiole	Cooked with sour leaves and chilli (not be stirred)	W
<i>Lasia spinosa</i> (L.) Thwaites	Araceae	Muwmuwbree	Leaves	Cooked as vegetable	W
<i>Xanthosoma sagittifolium</i> (L.) Schott.	Araceae	Lampa Sheersshah	Whole plant	Simple boiled	SD
<i>Allium hookeri</i> Thwaites	Amaryllidaceae	Aethuw	Leaves	Fresh	SD
<i>Allium chinense</i> G.Don.	Amaryllidaceae	Mashar sham aethuw	Leaves	Fresh	SD
<i>Allium monanthum</i> Maxim.	Amaryllidaceae	Mashar sham	Leaves	Fresh	W
<i>Allium odorum</i> Linn.	Amaryllidaceae	Thingkrik	Leaves	Fresh	SD
<i>Amaranthus cruentus</i> L.	Amaranthaceae	Voh encham Ishen	Leaves	Cooked as vegetable	W
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Voh encham	Whole plant	Cooked as vegetable	W
<i>Amaranthus viridis</i> L.	Amaranthaceae	Voh encham	Whole plant	Cooked as vegetable	W
<i>Chenopodium album</i> L.	Amaranthaceae	Ifhuwr encham	Whole plant	Fried or cooked	W
<i>Mangifera sylvatica</i> Roxb.	Anacardiaceae	Haeriih	Fruit	Eaten fresh or cut into pieces and mixed with salt and chilli	W
<i>Rhus chinensis</i> Mill.	Anacardiaceae	Khomae	Seeds and tender leaves	Pounded and mixed with chilli. It is also boiled to make a refreshing drink. Tender leaves eaten fresh.	W
<i>Spondias pinnata</i> (L.f.) Kurz	Anacardiaceae	Taettoo	Fruits	Eaten raw or pounded with chilli	W
<i>Calamus caesius</i> Blume	Arecaceae	Ichiing	Ripe fruit	Raw	W
<i>Phoenix loureiroi</i> Kunth	Arecaceae	Innu	Nuts	Fresh	W
<i>Asclepias hirtella</i> (Pennell) Woodson	Apocynaceae	Lamkuurthingsuw na	Leaves	Boiled/steamed to make <i>thingsuw</i>	W
<i>Eryngium foetidum</i> L.	Apiaceae	Buwsuwmoro	Leaves	Fresh, boil, steam. Herb.	SD
<i>Hydrocotyle asiatica</i> Linn.	Apiaceae	Siiven	Whole plant	Eaten fresh or cooked	W
<i>Laserpitium siler</i> L.	Apiaceae	Shamshaang	Leaves	Boiled/steamed to make <i>thingsuw</i>	W
<i>Oenanthe javanica</i> (Blume) DC.	Apiaceae	Kongpreh	Leaves	Fresh (as salad)	W
<i>Petroselinum crispum</i> (Mill.) Fuss	Apiaceae	Taatra	Whole plant	Boiled/steamed for making <i>thingsuw</i> . Added as <i>spice</i> in taro curry	SD
<i>Blumea sinuate</i> (Lour.) Merr.	Asteraceae	Duungfuw	Leaves	Cooked/steamed to make <i>thingsuw</i>	W
<i>Crassocephalum crepidiodes</i> (Benth.) S.Moore	Asteraceae	Tuungnu	Whole plant/ tender leaves	Cooked as vegetable. Also eaten as <i>thingsuw</i>	W
<i>Erigeron sumatrensis</i> Retz.	Asteraceae	Buzuw encham	Whole plant	Boiled/steamed to make <i>thingsuw</i>	W
<i>Sonchus arvensis</i> L. 1753	Asteraceae	Naesuwhbuw	Tender leaves	Boiled/steamed to make <i>thingsuw</i> ; also cooked with peas to make porridge	W
<i>Sonchus asper</i> (L.) Hill	Asteraceae	Anaeisuwmbuw	Tender leaves	Boiled/steamed to make <i>thingsuw</i> ; also cooked with peas to make porridge	W
<i>Spilanthes acmella</i> (L.) Murray	Asteraceae	Shaapa	Leaves	Cooked as vegetable	W
<i>Spilanthes ciliate</i> Kunth.	Asteraceae	Shaapa idii	Leaves	Cooked as vegetable	W
<i>Justicia adhatoda</i> L.	Acanthaceae	Paarchiip ivaar	Flower	Eaten fresh and boiled	SD
<i>Phlogacanthus thysiformis</i> Nees.	Acanthaceae	Paarchiip	Leaves and flowers	Eaten fresh and boiled	SD
<i>Trevesia palmate</i> (Roxb. Ex Lindl) Vis.	Araliaceae	Tungkung	Fruits	Cooked as vegetable; also friend; steamed to make <i>thingsuw</i>	SD
<i>Diplazium esculentum</i> (Retz.) Sw.	Athyriaceae	Chokoruwbuw	Leaves	Steamed or fried	W
<i>Oroxylum indicum</i> (L.) Benth. Ex Kurz.	Bignoniaceae	Vaak tumder	Pod	Fresh (as <i>thingsuw</i>) and pickled	SD
<i>Trichodesma kumareum</i>	Boraginaceae	Chiintapaar	Flower buds	Eaten fresh or steamed	W
<i>Momordica charantia</i> L.	Cucurbitaceae	Karot ikha	Fruit	Cooked or friend	SD
<i>Momordica subanggulata</i> Blume	Cucurbitaceae	Shakmuw	Fruits	Cooked/steamed as vegetable	W
<i>Momordica dioica</i> Roxb. Ex Willd.	Cucurbitaceae	Karot	Fruits and Young leaves	Cooked as vegetable	W

<i>Cucumis anguria</i> L.	Cucurbitaceae	Aar shaemae	Fruit	Eaten fresh	W
<i>Commelina benghalensis</i> Linn.	Commelinaceae	Aardang	Whole plant	Cooked as vegetable; also eaten as <i>thingsuw</i>	W
<i>Costus speciosus</i> (J.Koenig) Sm.	Costaceae	Shabating	Leaves	Cooked as vegetable. Also eaten as <i>thingsuw</i> .	W
<i>Ipomoea batatas</i> (Linn.) Lam.	Convolvulaceae	Mangkra	Tuber	Roasting and cooked as vegetable	SD
<i>Cycas pectinata</i> D. Don.	Cycadaceae	Entang	Young tender leaves	Cooked as vegetable	W
<i>Dioscorea alata</i> L.	Dioscoreaceae	Bra	Tuber	Cooked	SD
<i>Dioscorea bulbifera</i> Linn.	Dioscoreaceae	Jingkher	Fruit (air potato)	Cooked or roasted	SD
<i>Dioscorea pentaphylla</i> L.	Dioscoreaceae	Lampaa Bra	Tuber	Cooked	W
<i>Dryopteris marginata</i> (C.B.Clarke) Christ	Dryopteridaceae	Aarkheebasham	Tender leaves	Cooked/steamed to make <i>thingsuw</i>	W
<i>Mallotus japonicus</i> (L.f.) Müll.Arg.	Euphorbiaceae	Beengkhi	Leaves	Boiled as vegetable and for making <i>thingsuw</i>	W
<i>Manihot esculenta</i> Crantz.	Euphorbiaceae	Thing mangkra	Young leaves and tuber	Steamed or boiled to make <i>thingsuw</i> ; tuber is cooked or fried	Grown
<i>Diospyros kaki</i> Thunb.	Ebenaceae	Ningrup ithuwr	Ripe fruit	Eaten raw	W
<i>Elaeagnus pyriformis</i> Hook.f.	Elaeagnaceae	Bachae	Ripe fruit	Eaten raw or mixed with salt and chilli. Also pickled or fermented to make alcoholic beverage	SD
<i>Elaeocarpus floribundus</i> Blume.	Elaeocarpaceae	Kaerom	Fruit	Eaten raw. Fermented to make alcoholic beverage.	W
<i>Bauhinia purpurea</i> L.	Fabaceae	Envae	Flower	Steamed or cooked as vegetable or to make <i>thingsuw</i>	SD
<i>Bauhinia variegata</i> (L.) Benth.	Fabaceae	Envae ivaar	Flower	Steamed or cooked as vegetable or to make <i>thingsuw</i>	SD
<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Jaangthing	Tender pods and seeds	Cooked as vegetable	Grown
<i>Canavalia gladiata</i> (Jacq.) DC.	Fabaceae	Kora Chingshaeh	Pods and seeds	Pods is sliced and mixed with chilli to make <i>thingsuw</i> ; the seeds are also roasted for eating	Grown
<i>Entada scandens</i> Benth.	Fabaceae	Kongkraeh	Tender leaves	Steamed/boiled for making <i>thingsuw</i>	W
<i>Gliricidia sepium</i> (Jacq.) Steud.	Fabaceae	Paarshaen	Young leaves and flowers	Boiled or steamed to make <i>thingsuw</i>	SD
<i>Lablab purpureus</i> (L.) Sweet.	Fabaceae	Kochareh ishen	Young pods, beans and leaves	Cooked as vegetable	Grown
<i>Leucaena glauca</i> Benth.	Fabaceae	Juungchah idii	Legume	Fresh	SD
<i>Neptunia oleracea</i> Lour.	Fabaceae	Chii ikaidabi	Roots	Fresh (as salad)	W
<i>Phaseolus lunatus</i> L.	Fabaceae	Kochareh	Beans and leaves	Cooked as vegetable	SD
<i>Parkia speciosa</i> Hassk.	Fabaceae	Juungchah	Flower, Pods and Beans	Freshly peeled pod; cooked or roasted. Fresh flower is soaked in hot water and then mixed with chilli to make <i>thingsuw</i>	SD
<i>Sesbania cannabina</i> (Retz.) Pers.	Fabaceae	Haaair	Flowers and tender legume	Cooked or steamed	W
<i>Senegalia pennata</i> (L.) Maslin	Fabaceae	Buungthuw	Leaves	Fresh or cooked as vegetable	W
<i>Castanopsis armata</i> (Roxb.) Spach	Fagaceae	Rusii	Nuts	Roasted	W
<i>Rhynchosyche ellipticum</i> (Wall.ex Dietrich) A.DC.	Gesneriaceae	Yenpum	Leaves	Boiled as vegetable and with meat. Also used for making <i>thingsuw</i> .	W
<i>Gnetum gnemon</i> L.	Gnetaceae	Enling	Leaves	Boiled or steamed for making <i>thingsuw</i>	W
<i>Exbucklandia populnea</i> (R.Br.ex Griff.) R.W.Br	Hamamelidaceae	Ichiipakna	Leaves	Boiled/steamed/roasted to make <i>thingsuw</i>	W
<i>Juglans</i> sp.	Juglandaceae	Mangkhaa	Kernel	The nut is boiled in water and dried on sun. The cooked and dried nut's shell is broken using a hammer to extract the fatty kernel for eating.	W
<i>Lilium longigulium</i>	Liliaceae	Kuroh	Bulb	Roasting	W
<i>Cinnamomum cassia</i> (L.) J Presl	Lauraceae	Jerhing	Dried bark	As spices	W

<i>Cinnamomum tamala</i> (Buch.-Ham.) T.Nees & C.H.Eberm.	Lauraceae	Tejpata (En Jerhing)	Leaves	Leaves used as spice for preparing fried dish	W
<i>Litsea cubeba</i> (Lour.) Pers.	Lauraceae	Siiraar	Seeds	Eaten fresh or mashed with chilli to make <i>thingsuw</i> paste	W
<i>Clerodendrum indicum</i> (L.) Kuntze	Lamiaceae	Khaensii-chirer	Leaves	Boiled/steamed to make <i>thingsuw</i>	W
<i>Clerodendrum serratum</i> (L.) Moon	Lamiaceae	Nungsuwmden	Leaves	Steamed	W
<i>Clerodendrum glandulosum</i> Lindl.	Lamiaceae	Enphuw	Leaves	Steamed or boiled; cooked as vegetable	W
<i>Elsholtzia blanda</i> (Benth.)	Lamiaceae	Rikniingjaat	Leaves and flower	Both fresh and dried leaves/flowers are added in curry/soup/ <i>thingsuw</i>	W
<i>Ocimum canum</i> Sims	Lamiaceae	Akvarikniing	Leaves and flower	Eaten fresh; also added to soups and <i>thingsuw</i>	SD
<i>Mentha spicata</i> L.	Lamiaceae	Namrengmoro	Leaves	Eaten fresh; also fried	SD
<i>Perilla frutescens</i> (L.) Britton	Lamiaceae	Rikniing	Leaves and flowers	Fresh and dried as herb	SD
<i>Atrocarpus lacucha</i> Buch.-Ham.	Moraceae	Itaeh	Ripe fruit	Eaten fresh	W
<i>Ficus auriculata</i> (Lour.) Roxb.	Moraceae	Thachang/Khaamba	Fruit and leaves	Ripe fruits eaten fresh. Leaves boiled for making <i>thingsuw</i> .	W
<i>Ficus benjamina</i> L. 1767	Moraceae	Peerchiip	Tender leaves	Boiled or steamed to make <i>thingsuw</i>	W
<i>Ficus palmata</i> Forssk.	Moraceae	Fhuwring Thachang	Fruit	Eaten fresh	W
<i>Ficus semicordata</i> Buch.-Ham. Ex Sm.	Moraceae	Thachang	Fruit	Eaten fresh	W
<i>Ficus geniculata</i> (Putkal)	Moraceae	Mumuwng	Leaves (tender shoots)	Eaten fresh or cooked as vegetable	W
<i>Ficus lacor</i> Buch.-Ham.	Moraceae	Havikho Mumuwng	Leaves (tender shoots)	Eaten fresh or cooked as vegetable	W
<i>Ficus racemosa</i> L.	Moraceae	Chii Khaamba	Leaves	Boiled; used for making <i>thingsuw</i>	W
<i>Morus alba</i> L.	Moraceae	Aar-thuwr	Leaves and ripe fruits	Mixed with pea flour and fried in hot oil to make snack Ripe fruits are eaten fresh; also fermented to make alcoholic drink	SD
<i>Garcinia pedunculata</i> Roxb. Ex Buch-Ham	Clusiaceae	Changnaeh	Fruit	Ripe fruit is eaten fresh or pickled	W
<i>Garcinia xanthochymus</i> Hook.f. ex T.Anderson	Clusiaceae	Thaeshavor	Fruit	Ripe fruit is eaten fresh (mixed with salt and chilli)	W
<i>Hibiscus acetosella</i> Welw. Ex Hiern.	Malvaceae	Enthuwr ishen	Leaves	Boiled for making hibiscus tea; also cooked to make soup	SD
<i>Hibiscus cannabinus</i> L.	Malvaceae	Enthuwr ivaar	Leaves and calyces	Boiled as vegetable; to prepare hibiscus tea	SD
<i>Hibiscus sabdariffa</i> L.	Malvaceae	Enthuwr	Leaves and Calyces	Boiled as vegetable; to prepare hibiscus tea	SD
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Rumi	Fruits	Ripe fruit is eaten fresh. It is also fermented to make alcoholic drink.	W
<i>Psidium guajava</i> L.	Myrtaceae	Panghaentuur	Fruit	Eaten fresh	SD
<i>Ensete glaucum</i> (Roxb.) Cheesman	Musaceae	Changkeer	Stem and flower	Stem is cooked with pork. Flower is also cooked to make <i>thingsuw</i> .	W
<i>Musa 5cuminata</i> Colla	Musaceae	Naachang	Inner stem and flower	Cooked as vegetable and to make <i>thingsuw</i>	SD
<i>Musa balbisiana</i> Colla 1820	Musaceae	Lampa naachang	Inner stem and flower	Cooked as vegetable	W
<i>Meleinthia suavis</i> Pierre	Opiliaceae	Tungkeng lakjaar	Leaves and tender flowers	Leaves steamed/boiled. Flower is fried.	W
<i>Averrhoa carambola</i> L.	Oxalidaceae	Haenohchom	Fruits	Ripe fruit is eaten fresh (or also mixed with chilli and salt)	SD
<i>Oxalis latifolia</i> Kunth	Oxalidaceae	Pukcheeng	Fruit	Eaten by children to pass time	W
<i>Passiflora edulis f.edulis</i> (<i>Passiflora edulis</i> Sims, 1818)	Passifloraceae	Ronohae lachii	Leaves and ripe fruit	Leaves are eaten fresh or roasted, cooked as vegetable and as <i>thingsuw</i> Ripe fruit is eaten fresh; juice is also extracted	SD
<i>Sephalostachyum capitatum</i> Munro	Poaceae	Ruw	Bambooshoot	Boiled or fermented	W
<i>Fagopyrum osum</i>	Polygonaceae	Enbreekur	Leaves	Cooked as vegetable	W

(Trevir.) Meisn.					
<i>Persicaria maculosa</i> Gray	Polygonaceae	Kaekuwngham	Tender leaves	Fresh	W
<i>Persicaria odorata</i> (Lour.) Sokák	Polygonaceae	Phuphae	Leaves	Fresh; mixed with other herbs to prepare <i>thingsuw</i>	SD
<i>Persicaria chinensis</i> L.H.Gross	Polygonaceae	Enpum	Leaves	Boiled for making sour vegetable soup or <i>thingsuw</i>	W
<i>Persicaria wallichii</i> Greuter & Burdet.	Polygonaceae	Enbree	Leaves	Boiled for making sour vegetable soup or <i>thingsuw</i>	W
<i>Rumex maritimus</i> Linn.	Polygonaceae	Shamangnuw encham	Leaves	Boiled to make simple soup	W
<i>Baccaurea ramiflora</i> Lour., 1790	Phyllanthaceae	Pheh	Ripe fruits	Eaten fresh	W
<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Shaeruw	Fruit	Eaten fresh, dried or pickled; Also used for making alcoholic drinks by fermenting with jagerry	W
<i>Antidesma acidum</i> Retz.	Phyllanthaceae	Tisii	Leaves	Cooked for soup	W
<i>Antidesma bunius</i> (L.) Spreng.	Phyllanthaceae	Siiraar	Fruits	Eaten raw (mixed with salt and chilli)	W
<i>Antidesma montanum</i> Blume	Phyllanthaceae	Lampaa tisii	Leaves	Cooked for soup	W
<i>Plantago major</i> L.	Plantaginaceae	Lamkung	Whole plant	Cooked as vegetable	W
<i>Prunus persica</i> (L.) Batsch 1801	Rosaceae	Nungsii	Ripe fruit	Eaten fresh	W
<i>Prunus salicina</i> Lindl.	Rosaceae	Haekha	Ripe fruit	Eaten fresh; also used for making jam	SD
<i>Pyrus communis</i> Linn.	Rosaceae	Naaspati	Fruit	Eaten fresh	Grown
<i>Rubus ellipticus</i> Sm. 1815	Rosaceae	Thimuw	Fruit	Ripe fruit is eaten fresh	W
<i>Rubus niveus</i> Thunb. 1813	Rosaceae	Thimuw ynlor	Fruit	Ripe fruit is eaten fresh	W
<i>Capsicum annum</i> L.	Solanaceae	Bazuw bros	Fruit	Eaten fresh; mashed with fermented fish and salt to make paste; primary ingredient of indigenous salad by the name ' <i>Thingsuw</i> '	W
<i>Capsicum chinense</i> Jacq.	Solanaceae	Bros fluw	Fruit	Eaten fresh; mashed with fermented fish and salt to make paste; primary ingredient of indigenous salad by the name ' <i>Thingsuw</i> '	Grown
<i>Physalis angulata</i> L.	Solanaceae	Shamangpa lipstik	Fruit	Eaten fresh or as salad	W
<i>Solanum aethiopicum</i> L.	Solanaceae	Phae shamchoh	Fruit	Eaten fresh, fried, boiled or cooked as vegetable	Grown
<i>Solanum nigrum</i> L.	Solanaceae	Aar bros	Leaves and ripe berries	Leaves cooked as vegetable. Berries eaten fresh.	W
<i>Solanum torvum</i> Sw.	Solanaceae	Phae shamchoh	Fruit	Steamed or boiled to make <i>thingsuw</i>	W
<i>Solanum violaceum</i> Ortega	Solanaceae	Shamchoh	Fruit	Eaten raw, steamed, cooked and as pickle	W
<i>Houttuynia cordata</i> Thunb.	Saururaceae	Kiriim	Whole plant	Fresh (used in making <i>thingsuw</i>)	W
<i>Microcos paniculata</i> Linn.	Tilliaceae	Haetuk	Fruit	Fresh and fried	W
<i>Camellia sinensis</i> (Linn.) O. Kuntze.	Theaceae	Chaa	Leaves	Dried; boiled for making beverage	W
<i>Schima wallichii</i> (DC.) Korth.	Theaceae	Mankhiing	Tender shoots/leaves	Boiled or steamed to make <i>thingsuw</i>	W
<i>Ampelopteris prolifera</i> (Retz.) Copel.	Thelypteridaceae	Chiikuur Chakohruwbuw	Tender leaves	Cooked/steamed as vegetable; also fried	W
<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Boroi	Fruits	Fresh (raw)	W
<i>Vangueria spinosa</i> Linn.	Rubiaceae	Haeppey	Leaves and fruit	Leaves used for making <i>thingsuw</i> (salad) Fruit is eaten raw or dried	W
<i>Wendlandia glabrata</i> DC.	Rubiaceae	Bachiim	Tender flower	Boiled for making <i>thingsuw</i>	W
<i>Murraya koenigii</i> (L.) Sprengel	Rutaceae	Nim	Leaves	Used as herb in curry	SD
<i>Citrus latipes</i> (Swingle) Tanaka	Rutaceae	Sheerphoh	Rind/Peel of fruit and leaves	Rind is added to curry/soup; leaf is also added in curry	SD
<i>Citrus lomgilimon</i>	Rutaceae	Blok Basheer	Fruit	Fresh rind is eaten raw.	SD

Tanaka				Juice is extracted from carpel	
<i>Citrus maxima</i> (Burm.) Merr.	Rutaceae	Nobaat	Fruit	Inner carpel is eaten as afternoon delicacy in winter	SD
<i>Citron medica</i> L.	Rutaceae	Basheer	Fruit	Fresh rind is eaten raw. Juice is extracted from carpel.	SD
<i>Zanthoxylum armatum</i> DC.	Rutaceae	Shinii	Seeds and leaves	Seeds are powdered to use as spice. Fresh leaves are consumed as vegetable.	SD
<i>Zanthoxylum laetum</i> Drake	Rutaceae	Buzuwr	Leaves	Eaten fresh. Also boiled or steamed to make <i>thingsuw</i> .	W
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	Rutaceae	Buzuwr ynlor	Seeds	Eaten raw or mashed with salt and chilli	W
<i>Viola pilosa</i> Blume	Violaceae	Manshang	Whole plant	Boiled to make <i>thingsuw</i>	W
<i>Viola betonicifolia</i> Sm.	Violaceae	Manshang ynlor	Whole plant	Boiled to make <i>thingsuw</i>	W
<i>Cissus adnata</i> Roxb.	Vitaceae	Jaangkim	Leaves	Boiled as vegetable	W
<i>Cissus javana</i> DC.	Vitaceae	Jaangkimchar	Leaves	Boiled as vegetable	W
<i>Alpinia allughas</i> (Retz.) Roscoe	Zingiberaceae	Purii	Rhizome	Boiled, steamed	W
<i>Alpinia galanga</i> (L.) Willd.	Zingiberaceae	Chaekho	Rhizome	Fresh rhizome is powdered	SD
<i>Alpinia nigra</i> (Gaertn.) B.L. Burt, 1977	Zingiberaceae	Puriitumdur	Rhizome and petiole	Cooked as vegetable	W
<i>Alpinia officinarum</i> H.	Zingiberaceae	Bunglamsiingchan gvei	Rhizome	Dried; used as spice	W
<i>Amomum aromaticum</i> Roxb.	Zingiberaceae	Aerijjat	Tender flower pod	Boiled/steamed for making <i>thingsuw</i>	W
<i>Amomum dealbatum</i> Roxb.	Zingiberaceae	Aerii	Tender flower pod	Boiled/steamed for making <i>thingsuw</i>	W
<i>Cucurma angustifolia</i> Roxb.	Zingiberaceae	Aetaang	Flower	Cooked or Fried	W
<i>Curcuma amada</i> Roxb.	Zingiberaceae	Chuhae	Rhizome		SD
<i>Curcuma longa</i> L.	Zingiberaceae	Jinghaang	Rhizome, flower	Dried rhizome as spice. Flower is boiled/steamed	Grown
<i>Etingera linguiformis</i> (Roxb.) R.M.Sm.	Zingiberaceae	Bunglamsiing	Tender shoot	Boiled for making <i>thingsuw</i>	W
<i>Hedychium coronarium</i> J.Koenig	Zingiberaceae	Lokriiae	Rhizome	Cooked as vegetable	W
<i>Zingiber montanum</i> (J. König) Link ex. A	Zingiberaceae	Lamsiing	Rhizome	Fresh (pounded)	W
<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Siing	Rhizome	Fresh	Grown



Fig 2: Some of the wild edible plants and their consumable portions: *Bauhinia variegata* (A); *Glicridia sepium* (B); *Erigeron sumatrensis* (C); *Clerodendrum indicum* (D); *Petroselinum crispum* (E); *Spilanthes ciliate* (F); *Antidesma acidum* (G); *Antidesma bunius* (H); *Schima wallichii* (I); *Juglans* sp. Walnut (J); *Costas speciosus* (K)

Discussion and Conclusion

The ethnobotanical study identified and recorded 167 plants consumed by the Moyon Nagas. Of the recorded plants, 113 are wild, 43 are semi-domesticated and 11 are fully domesticated. Most of the wild plants grow in forests, meadows, wastelands and riversides. The semi-domesticated plants in the survey include wild plants that are also grown at home or gardens to some extent, domestic plants that have become feral and introduced species that become feral or naturalised. Some important semi-domesticated plants like *Phaseolus lunatus*, *Momordica charantia*, *Momordica dioica*, *Eryngium foetidum*, *Prunus salicina*, *Passiflora edulis*, *Elaeagnus pyriformis*, *Psidium guajava* and *Citrus maxima* were previously domesticated but had become feral and grow naturally in the wild in the recent decades. On the other hand, *Curcuma amada*, *Alpinia galangal*, *Citrus latipes*, *Bauhinia purpurea*, *Bauhinia variegata*, *Gliricidia sepium* etc. were actually wild plants but most of them are also grown at homes and kitchen gardens for home consumption (by taking rhizomes, saplings, seeds, stems etc. from the wild plant); however these wild plants grown at home were observed to not able to develop properly.

It was observed that the Moyon Nagas collected/harvested wild plants and parts mostly for home consumption. Even the domestically grown vegetables and semi-domestic plants were also harvested for home consumption or gifted to relatives and friends. Only very few parts and portions of plants were sold by the Moyons in the market. One of the reasons is the less quantity of harvests and the other is the lack of marketing opportunities due to non-availability of transportation and consumer. On the other hand, many of the wild edible plants and their parts are not popular among the younger generation who mostly prefer market, farmed, exotic and hybrid vegetables and fruits. The survey collected the market value of the few popular edible parts of plants, they are as follows.

Table 3: Market value of few selected edible plants from the ethno-botanical survey

Plant and parts sold	Unit Quantity	Unit Price (in Indian Rupees)
<i>Zingiber montanum</i> (Rhizome)	100 grams	100
<i>Colocasia esculenta</i> (tuber)	1 kg	100
<i>Zanthoxylum laetum</i> (leaves)	50 grams	20
<i>Capsicum chinense</i> (chilli)	1 kg	400 (fresh)
		2000 (dry)
<i>Citrus latipes</i> (fruit)	1 kg	100
<i>Allium hookeri</i> (chives)	100 grams	10
<i>Parkia speciosa</i> (pods)	4 pods	100
<i>Ficus benjamina</i> (leaves)	500 grams	20
<i>Ficus geniculata</i> (leaves)	500 grams	20
Poeaceae (Bambooshoot)	1 kg	100 (fresh)
		500 (fermented)
		2000 (dried)
<i>Wendlandia glabrata</i> (tender flower)	100 grams	50

Of the 167 edible plants identified in the survey, 27 species were reported to have medicinal properties and used in folk remedies to treat various maladies and ailments (Chara and Moyon 2021) [2]. This indicates that the edible plants not only supplement the dietary and nutritional needs of the people but also ensures the health of the consumers as well. The availability of these consumable plants also suggests

the rich biodiversity of the region and hence, it is vital to protect the environment (especially the forests) as it is the life giver.

Plants collected from the forests are mostly pollution and chemical free; hence the Moyons consumed a lot of fresh-raw leaves, stems and fruits. However it is also observed that wild and feral plants grown at river banks, roadsides and fallow fields in Kapaam and Tunghphae area are affected by air and chemical pollutions from vehicular exhausts, fertilisers and other human activities. Thus, even though they are edible, people usually avoid such plants. It is interesting to also note that areas that were once free of pollution few decades back are now plagued with pollution which also makes people to question the safety values of wild edible plants.

Another issue observed from the field sites is deforestation. Deforestation in the region are mainly for firewood collections, charcoal making, slash and burnt cultivation and also development activities. Although deforestation and wild fires per say are bad for the environment, some plants depend on such anthropogenic factors to grow. For instance, *Antidesma acidum*, *Zanthoxylum laetum* and *Zanthoxylum laetum* grow best in fallow lands following slash and burn cultivation, whereas *Momordica subangulata* grows best in deforested areas, abandoned fields and wastelands. Overall, deforestation threatens many edible wild plants that have not yet been identified, recorded or surveyed. For example, wild edible plants (creepers and vines) like *Naenkhouruwbuw*, *Ruwthuwnaa*, *Enneer*, *Masiiruwbuw*, *Tungkengruwbuw* and *Enfhuw* were not reported in this paper because of their rarity, which was caused by deforestation. If deforestation continues, some plant species will become more dominant while endemic plant species could disappear from the region. One more issue worth mentioning is the overharvesting and exploitation of plants for food. For example, *Zingiber montanum* and *Lilium longilulium* were exploited so much that they are becoming rare to find them. *Lilium longilulium* (Kuroh) is an endangered lily found only in Chandel and Tengnoupal Districts of Manipur, India. The lily is beautiful but people love to eat the bulb. Thus, exploitation of the bulb for consumption is making the lily even rarer and threatened. It is the right time to conserve the environment. Conservation will ensure the abundant supply of wild edible plants, cleaner environment and healthier lifestyle and also contribute to the economy of the individuals depending on sales of edible plants. Preserving the environment and plant resources will not only provide food and shelter to humans and animals alike, but it will also ensure the continuity and sustainability of the indigenous food culture and their rich ethno-botanical knowledge.

Acknowledgement

The authors extend their appreciation to Kapaam, Tunghphae, Khungjuur, Matung and Bujuur Khuwfhaw for their contributions to the knowledge on plants. Special words of appreciation are also extended to Ms. Agnes Phanitin, Mr. Cr Loveyear, Mrs. R Lemjabi and Mr. Cr Livingstone for their contributions towards identifying the local names of the surveyed plants.

Conflict of interest

No potential conflict of interest was reported by the authors.

References

1. Aryal K, Moe AT, Hein PP, Bay YHS, Htay T, Aung HW *et al.* Wild and non-cultivated edible plants and their contributions to local livelihoods in Putaom Myanmar. International Centre for Integrated Mountain Development (ICIMOD): Kathmandu, Nepal, 2020. www.icimod.org/himaldoc
2. Chara E, Moyon WA. Medicinal plants used in folk remedies by the Moyon naga tribe of Manipur, India. International Journal of Botany Studies,2021;6(5):10-18.
3. Dedrilkumar S, Binu M. Wild edible plants used by the Meitei community of Eastern Himalayas, India. International Journal of Agricultural Sciences,2016;8(53):2699-2702.
4. Devi MA, Singh PK, Dutta BK. Traditional knowledge on vegetable treasure of Monsang Naga tribe of Manipur, India. Pleione,2011;5(2):274-279.
5. Devi MR, Salam S. Wild edible plants used by the Monsang Naga tribe of Manipur, India. Pleione,2016;10(1):90-96.
6. Encyclopedia of Medicinal Plants. Manipur Medicinal Plants, 2021. <https://medicinalplants.co.in>
7. Gangte HE, Thoudam, NS, Zomi GT. Wild edible plants used by the Zou tribe in Manipur, India. International Journal of Scientific and Research Publications,2013;3(5):1-8.
8. Google Maps. Manipur and Myanmar. Google Maps [Online] Available at <https://www.google.co.in/maps/@23.9792459,94.0265853,8z> (Accessed 10 September 2021)
9. Guite, C. Study of wild edible plants associated with the paite tribe of Manipur, India. International Journal of Current Research,2016;6(11):40927-40932.
10. Hari B KC, Joshi BK, Acharya AK, Aryal K. Semi-domesticated plant genetic resources in Nepal. In Conservation and Utilization of Agricultural Plant Genetic Resources in Nepal, Proceedings of 2nd National Workshop on CUAPGR, Kathmandu, Nepal,2017:408-412.
11. Konsam S, Thongam B, Handique AK. Assessment of wild leafy vegetables traditionally consumed by the ethnic communities of Manipur, northeast India. Journal of Ethnobiology and Ethnomedicine,2016;12(9):1-15. DOI: 10.1186/s13002-016-0080-4
12. Leonti M, Nebel S, Rivera D, Heinrich M. Wild gathered food plants in the European Mediterranean: comparative analysis. Economic Botany,2006;60(2):130-142.
13. Luczaj L, Koehler P, Piroznikow E, Graniszewska M, Pieroni A, Gervasi T. Wild edible plants of Belarus: from Rostafiński's questionnaire of 1883 to the present. Journal of Ethnobiology and Ethnomedicine,2013;9(21):1-17. Doi:10.1186/1746-4269-9-21
14. Pampuinath B, Meitei MD. Traditional knowledge of medicinal plants among the Thangal-Naga ethnic group of Manipur, India. Current Science,2021;120(5):945-950.
15. Rajkumari R, Singh PK, Das AK, Dutta BK. Ethnobotanical investigation of wild edible and medicinal plants by the Chiru tribe of Manipur, India. Pleione,2015;7(1):167-174.
16. Reyes-Garcia V, Menedez-Baceta P, Aceituno-Mata L, Acosta-Naranjo R, Calvet-Mir L, Domínguez P *et al.* From famine foods to delicatessen: interpreting trends in the use of wild edible plants through cultural ecosystem services. Ecological Economics,2015;120:303-311.
17. Shin T, Moe AZ, Kazumi F, Hiroshi U. Traditional knowledge of wild edible plants in Southern Shan State, Myanmar. Journal of Ethnobiology and Ethnomedicine,2018;14(48):1-13. DOI 10.1186/s13002-018-0248-1
18. Singh HD, Deshworjit SN, Singh PK, Limasenla. Status of threatened ethno-medicinal plants found in sub-alpine areas of Ukhrul and Senapati Districts of Manipur. International Journal of Applied Research,2017;3(6):544-548.
19. Singson N, Deshworjit SN, Nanda Y, Rao A. Home remedial plants used by the Thadou kuki tribe of Manipur, India: A case study. International Journal of Scientific Research,2016;4(6):389-391.
20. Wild Edible Plants. ENVIS Hub Manipur, 2011. https://manenvis.nic.in/Database/WildEdiblePlants_2940.aspx
21. Kachhawa G, Charan SK, Choudhary R. Diversity and pollination probability of insect pollinators of *Tagetes Erecta* L. in the Chomu Tehsil, Rajasthan, India. International Journal of Entomology Research. 2020;5(6):106-10.