



Non-Conventional food Plants available in and around Loktak Lake, Bishnupur (Manipur)

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Summary

Loktak Lake is the largest fresh water lake in North East India. The lake is situated at Moirang in the Bishnupur District, Manipur about 48 km to South from Imphal city. This Lake extends about 287 km². Loktak Lake has an indispensable relationship with the people of the state since time immemorial from socio-cultural and economic viewpoints. Many edible plants are available in and around the Lake. The food plants which are not commonly available in the market and those which are not commonly utilized as food throughout the country are considered as non-conventional food plants. There are various plants which grow in the lake as submerged, free floating, rooted with floating leaves, emergents, etc. and some are found to grow on the floating humus (Phum). The main food of the Brow Antlered Deer (*Rucervus eldi eldi*) which is found only in Keibul Lamjao National Wildlife Sanctuary near the Loktak Lake is a variety of young shoots of grasses, herbaceous plants, *Zizania latifolia*, etc. Some important non-conventional food plants available in and around the Lake are *Hedichium flavum* (Loklei), *Alpinia allughas* (Pullei), *Euryale ferox* (Thangjing), *Nymphaea stellata* (Thariktha), *Nymphaea alba* (Tharo angouba), *Oenanthe javanica* (Komprek), *Ipomoea aquatica* (Kolamni), *Nelumbo nucifera* (Thambou, Thamchet and Thamna khenjong), *Sagittaria sagittifolia* (Koukha), *Trapa bispinosa* (Heikak) *Zizania latifolia* (kambong) etc. Some plants such as *Ipomoea aquatica* (Kolamni) and *Alpinia allughas* (Pullei), *Neptunia oleracea* (Eshing Ekaithabi), *Ludwigia adscendens* (Eshing Kundo), etc. have medicinal importance. These food plants are very rich in vitamins and minerals.

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Introduction

Manipur is a small land-locked hilly state on the North Eastern region of India. Though, it is small in its geographical feature, the state is the home of various ethnic groups bestowed with abundant natural resources and traditional foods. In India, out of 800 species consumed as food plants mainly by the tribal inhabitants, 300 species occur in the North-Eastern India (Singh & Arora, 1978; Arora 1881; Kanjilal et al., 1940). Manipur has enormous wetlands with rich biological resources due to its unique topographical and climatic conditions. In Manipur, there were numerous Lakes in the past. However, most of these Lakes are now degraded to a great extent due to encroachment of the catchment areas, agricultural practices and cultural eutrophication (Sharma, 1999; 2001). The Loktak Lake of the state has been included under the Ramsar sites of India. The bioresources of the state has also been included under the list of the 'Biodiversity hotspots' of the world (Myers

et al., 2000, Bana et al. 2022). Therefore, persistent ecological studies are necessary for the conservation of the biodiversity of the existing lakes.

The Loktak Lake is one of the most important freshwater lakes of Manipur. One of the special features of Loktak Lake is the occurrence of floating mass of vegetation called Phum/ Phumdis (floating islands), which are formed by soil particles, decomposed organic plant garbage that are in various stages of decomposition. The thickness of these floating islands varies from a few cm to two meters. Some part of the Phum (about 20%) is above the water while the rest remains submerged in water. The Phumdis float around the water due to decay from bottom. Some of the Phumdis are so big that it can support a small hut (Phumsang) to live in by the local people mostly fishers and their transportation takes place through local made narrow wooden boats. One integral part of the Lake is the Keibul Lamjao National Park. This park is the only floating park in the world and is the only habitat of the endangered Brow Antlered Deer, *Rucervus eldi eldi* (Sangai). The main food of this animal is the young shoots of grasses, herbaceous plants, *Zizania latifolia*, etc. Loktak Lake has an indispensable relationship with the people of Manipur since time immemorial from socio-cultural & economic point of view. Various types of edible and economically important plants occurring in

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this Lake provide economic support and livelihood to the surrounding poor people. Aquatic food plants are rich in vitamins and minerals and they play a very important role in supplementing shortage of food resource. However, traditional knowledge about the use of wild aquatic plants as food has been neglected due to socio-economic changes and modernization of life styles of the people (Nivanonee 2020; Haldhar et al. 2017; Sarangthem et al. 2023). Hence, intensive study on wild edible aquatic plants is very essential for conservation of the traditional use of aquatic food resources. Thus, the present study has been taken up on the non-conventional aquatic food plants of the Loktak Lake as a measure for conservation of traditional knowledge about the use of the aquatic food resources.

Materials and Methods

Loktak Lake is situated at Moirang in the Bishnupur District of Manipur about 48 kilometers from Imphal, the capital of Manipur. It lies between 93°45' to 93°55' E longitudes and 24°25' to 24°40' N latitudes. and the Lake extends about 287 km² area. The field survey was conducted on monthly basis from January 2021 to March 2022 in the different study sites by using local boats. The present study is based primary on spot observation (field survey), visiting the local people in different villages and secondarily on visits at different local markets in different seasons. Group discussions were conducted with the local people inhabiting around the lake to understand the type of plant parts, part used as food, vegetables and medicine. The study is also based on thorough survey and collections of wild flowers, fruits, rhizomes and different plant parts from local markets near Loktak Lake. The vegetation found in summer and rainy season is different from the winter season. Some non-conventional aquatic food plants are found in Moirang Keithel, Bishnupur Keithel & Ningthoukhong Keithel at different seasons. There are more than 40 villages in and around Loktak Lake. The name of the villages of the study sites includes Phubala, Thanga, Karang, Nongmaikhong, Phoubakchao, Komlakhong, Nachou, etc. During the investigation period, plant samples were collected from the different study sites to make herbarium and photographs of the different species were also collected. The collected plants were identified by using relevant standard literatures. Some

herbal practitioners or healers were also consulted to understand the type of plants, parts of plants which are useful for medicinal / ailment purposes.

Result and discussion

During the present investigation a total of twenty-one (21) species were recorded under different families as non-conventional food plants, which is shown in Table 1 & eleven (11) species as medicinal plants (Table 2). The food plants which are not commonly available in the market and not cultivated as crop in the field and those which are not utilized as food throughout the country are considered as non-conventional food plants. Generally tender shoots and leaves, petioles, tubers, flowers, inflorescences, fruits, rhizomes etc are used as food vegetables. It is noticed that tender shoots and leaves are the most commonly used edible parts. Most of the edible food plants are consumed as processed food or cooked and some plants are consumed raw. People of Manipur use some wild vegetable as favourite cuisine and some plants (*Hedychium flavum*, *Alpinia allughas*, *Trapa bispinosa*, etc) are offered to God 'Lainingthou' at the time of Meitei New Year (Cheiraoba) as these plants are possessing ritualistic values in Meitei society. The non-conventional food plants which are found in Loktak Lake are *Alpinia allughas* (Pullei), *Euryale ferox* (Thangjing), *Nymphaea stellata* (Thariktha), *Nymphaea alba* (Tharo angouba), *Oenanthe javanica* (Komphek), etc. The plants that have medicinal properties comprises *Ludwigia adscendens* (Eshing kundo), *Centella asiatica* (Peruk), *Nymphaea stellata* (Thariktha), *Nelumbo nucifera* (Thambal), etc. These food plants are very rich in vitamins and minerals. Usually, womenfolk carry out collection of these plants for culinary preparation of delicacies. The non-conventional food plants of the study areas provide nutritional value for good health maintenance of the people and some plants are found medicinally important in various health problems such as blood pressure, cold and cough, dysentery, constipation, pile, dyspepsia, diabetes, jaundice, skin diseases, etc. Sharma, et al., (2003) have published a paper on "Ethnomedicinal uses of monocotyledonous plants of Manipur" The book "The Economic Plants of Manipur and their uses", was compiled by Singh (2009) and about the "Herbal Medicine of Manipur" was compiled by Singh et al. (2003).

Table 1. List of the non-conventional food plants

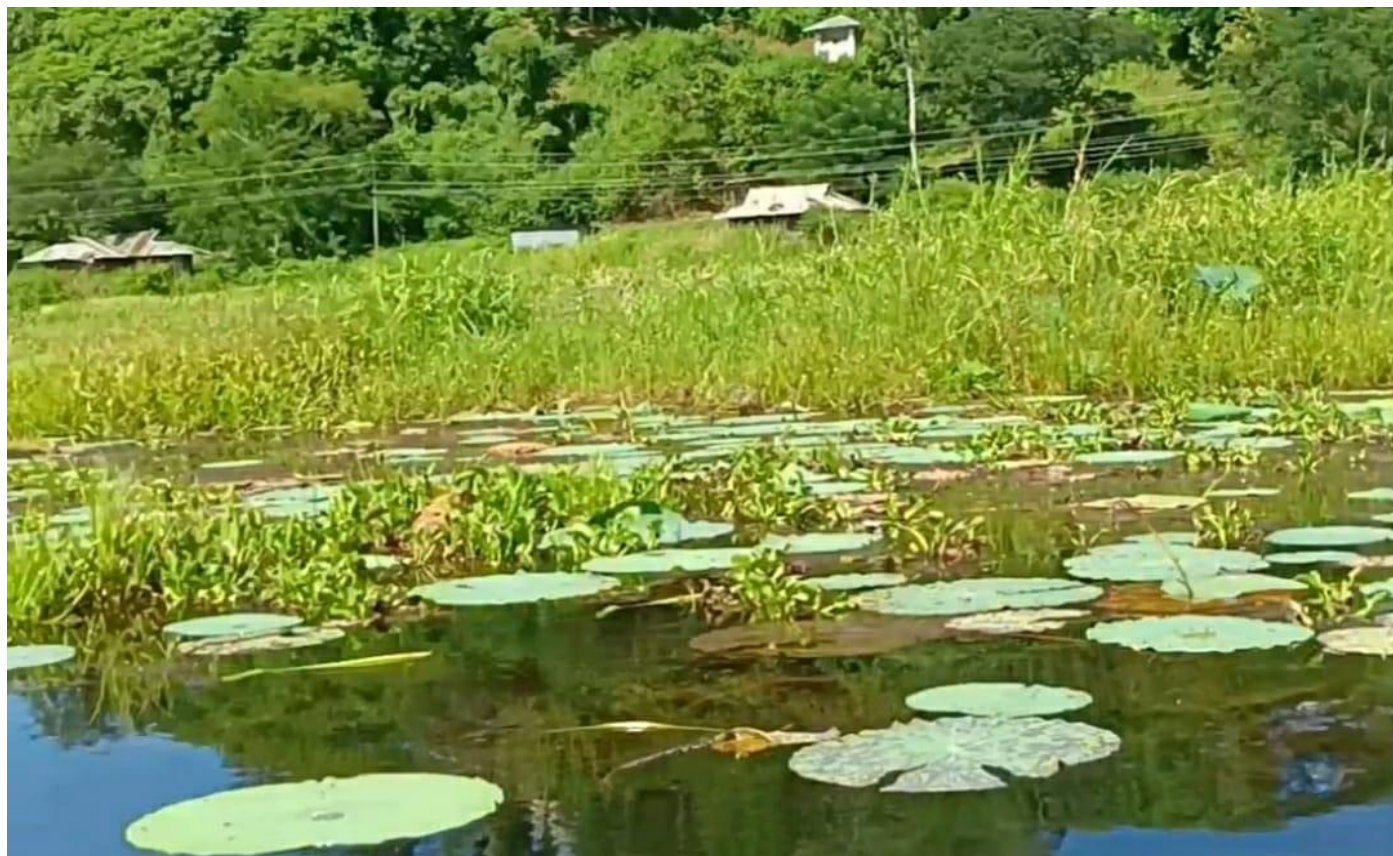
S. No.	Botanical name	Local Name (Manipuri)	Family	Parts used and mode of utilization.
1	<i>Alpinia allughas</i> Roscoe	Pullei	Zingiberaceae	Rhizome is used in the preparation of eromba (a special Chutney of Manipuri people)
2	<i>Alocasia cucullata</i> (Lour.) Schott	Pallukabi (Singju pan)	Araceae	Corm is cooked or can be consumed fresh as Singju, a traditional salad which is prepared by mixing with fermented fish, chilli powder, etc.
3	<i>Centella asiatica</i> (Linn.) Urban.	Peruk	Apiaceae	Boil with other vegetables in the preparation of champhut (soup) or eaten as kangsu (a special salad of the Manipuries).
4	<i>Curcuma angustifolia</i>	Yaipal	Zingiberaceae	The whole head with inflorescence is eaten

	Roxb.			with other vegetables as curry (sabji)
5	<i>Enhydraa fluctuans</i> Lour.	Komprek-tujombi	Asteraceae	Tender shoot are eaten as salad (Singju)
6	<i>Euryale ferox</i> Salisb.	Thangjing	Nymphaeaceae	Tender petioles, mature fruits containing nuts are eaten raw or cooked.
7	<i>Hedichium flavum</i> Roxb.	Loklei	Zingiberaceae	Rhizome and young shoots are cooked and prepared eromba.
8	<i>Ipomoea aquatica</i> Forssk.	Kolamni	Convolvulaceae	Tender young shoots are eaten either as salad or cooked.
9	<i>Ludwigia adscendens</i> (L.) H.Hara.	Eshing kundo	Onagraceae	Tender shoots are consumed as vegetable.
10	<i>Nelumbo nucifera</i> Gaertn.	Thambal	Nelumbonaceae	Young rolled leaves and rhizomes are consumed as vegetable, seeds are also eaten raw.
11	<i>Neptunia oleracea</i> Lour	Eshing ekaithabi	Fabaceae	Young shoots can be eaten raw or cooked
12	<i>Nymphaea alba</i> L.	Tharo angoubaa	Nymphaeaceae	Petiole can be consume raw (singju) or cooked.
13	<i>Nymphaea stellata</i> Willd	Thariktha	Nymphaeaceae	Petiole is eaten raw (singju), a special salad of the Manipuries.
14	<i>Oenanthe javanica</i> (Bl.) DC.	Komprek	Apiaceae	Tender shoots are used in the preparation of singju (salad).
15	<i>Persicaria posumbu</i> (Buch-Ham.ex D.Don) H. Gross.	Kengoi	Polygonaceae	Whole areal part is cooked with dry fishes (Kangsoi), a delicious curry (soup) of the Meiteis.
16	<i>Pistia stratiotes</i> Linn.	Kangjao	Araceae	Leaf cooked as ooti (a special curry of the meiteis)
17	<i>Polygonum barbatum</i> L.	Yelang	Polygonaceae	Tender shoots are eaten raw or cooked.
18	<i>P. chinense</i> Linn.	Angom-yensil	Polygonaceae	Young shoots are eaten cooked.
19	<i>Sagittaria sagittifolia</i> Linn.	Koukha	Alismataceae	Root-like nodules/corms are fried & consumed or used as an ingredient of iromba (a special chutney of the Manipuries)
20	<i>Trapa bispinosa</i> Roxb.	Heikak	Trapaceae	Young tender petioles & fruits are eaten raw or cooked.
21	<i>Zizania latifolia</i> (Griseb.) Stapf.	Eshing kambong	Poaceae	Smut infected inflorescence at the culms are eaten raw or roasted.

Table 2. List of some medicinal plants

S. No.	Botanical name	Local Name (Manipuri)	Family	Therapeutic indication and parts used
1	<i>Alpinia galanga</i>	Kanghu	Zingiberaceae	Boiled extract of the rhizome is used in constipation, pile, liver trouble and skin diseases.
2	<i>Centella asiatica</i>	Peruk	Apiaceae	Plant extract is given in cold, cough & dyspepsia. Powdered leaves are used in skin diseases.
3	<i>Euryale ferox</i>	Thangjing	Nymphaeaceae	Leaf Petiole paste is applied on burns and raw fruit is taken against diabetes.
4	<i>Hedichium flavum</i>	Loklei	Zingiberaceae	Decoction of the leaves is used in gargle in throat complaints.
5	<i>Ipomoea aquatica</i>	Kolamni	Convolvulaceae	Decoction of fresh shoot is used in insect bite and anti-dot of opium poisoning.
6	<i>Ludwigia adscendens</i>	Eshing kundo	Onagraceae	Fresh leaves possess Anti- typhoid properties.
7	<i>Nelumbo nucifera</i>	Thambal	Nymphaeaceae	Seeds protects Liver & Skin, reduce hypertension, petiole is consumed for stomach ulcer.
8	<i>Neptunia oleracea</i>	Eshing ekaithabi	Fabaceae	Raw tender shoots and leaves are consumed in diabetes.

9	<i>Nymphaea stellata</i>	Thariktha	Nymphaeaceae	Plant extract is given in piles, sore throat and in constipation.
10	<i>Trapa bispinosa</i>	Heikak	Trapaceae	Petioles are used for normal blood circulation, genital infections, dysentery, etc.
11	<i>Zizania latifolia</i>	Eshing kambong	Poaceae	Infected shoot (kambong) is used for dyspepsia. Culms, Rhizomes are used against anaemia and fever. They are also used as heart, kidney and liver troubles.



Picture 1. Phum site



Picture 2. *Polygonum barbatum* (Yellang)



Picture 3. *Neptunia oleracea* (Eshing ekaithabi)



Picture 4. *Oenanthe javanica* (Komprek)



Picture 5. *Nymphaea stellata* (Thariktha)



Picture 6. *Nymphaea alba* (Tharo angouba)



Picture 7. *Alpinia allughas* (Pullei)



Seed



Rhizome



Tender leaves

Picture 8. *Nelumbo nucifera* (Thambal)

Conclusion

The present study revealed that a number of aquatic food plants existing in Loktak Lake are closely linked with the livelihood and socio-economic conditions of the poor people who are inhabited in and around the Loktak Lake. However, over exploitation of the wild edible aquatic plants due to population expansion may cause threat to certain species. Hence, it is important to draw consciousness among the public about the indispensable relationship between human society and aquatic bioresources so that the aquatic bioresources may remain sustainable as well as to check from further degradation.

Declaration of interests

The authors have no conflict of interest to declare.

Data Sharing

All relevant data are within the manuscript.

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