Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

December 2021, Volume 34, Issue 2, Page 114-125

Zingiberaceae in Phayeng Community Forest of Manipur, India

Neekee Th[1] • Kh Romesh Singh[1] • Ch Raghumani Singh[1] • RS Loushambam[1]*

[1]Department of Forestry and Environmental Sciences, Manipur University, Imphal, Manipur, India-795003

ARTICLE INFO

Article history:
Received: 24 September, 2021
Revision: 10 November, 2021
Accepted: 17 November, 2021

Key words: conservation, cultivation, domestication, economic, Zingiberaceae.

ABSTRACT

Zingiberaceae forms an important group of plant family having considerable economic potential. Family Zingiberaceae consists of a large number of medicinal plants and is well known for it's used in ethno-medicine. Zingiberaceae is one of the largest families of the plant kingdom with 53 genera and over 1300 species. About 80 species are mainly distributed in Eastern Himalaya to Southern China, India and South-Eastern Asia. An extensive field survey was conducted in the community forest managed by a local committee for the last 50 years and renowned as India's first carbon positive settlement "Phayeng Village". A study was conducted with the aim to document the traditional knowledge including their uses and way forward for its sustainable use and conservation of selected Zingiberaceae species for future pharmacological studies. A total of 15 species in 5 genera were recorded, representing about 55.55% of the total species found in the valley districts of Manipur. Interestingly, most of them were found to be used as vegetables, spices and condiments, edible fruits, dyes, wrapper, ornaments and as medicines purposes by the local people for curing different ailments and diseases. Our findings call for support the need to encourage domestication, cultivation and to implement the conservation measures of these economically important species to ensure food security and harness benefit to humankind in several ways.

1. Introduction

Zingiberaceae plant species is an important natural resource that provides useful products for food, spices and condiments, medicines, dyes, perfumes and aesthetics to human mankind (Bhunia and Mondal, 2012). Zingiberaceous plants are characterized by generally rhizomatous herbs with distichous, sheathing, usually ligulate leaves. The inflorescence is mostly terminal spike or raceme, bracteate with zygomorphic, bisexual and epigynous flowers. The perianth of flowers is biseriate and trimerous. The median posterior stamen is fertile and dithecous with the petaloid staminodes forming the showy labellum. The terminal style is positioned in the furrow of the filament and between anther thecae. The placentation of trilocular ovary is mostly axile with many anatropous, bitegmic ovules. 2 epigynous nectaries are present. Fruit is a capsule (Sabu, 2006).The important genera under Zingiberaceae are *Alpinia*, *Amomum, Curcuma*, *Elettaria, Hedychium, Kaempferia* and *Zingiber* which has been exploited in the wild and some of them are domesticated. Hedychium is the largest genus of the family Zingiberaceae in India with about 44 taxa, mostly restricted to North-Eastern states (Sanoj *et al.*, 2010). *Hedychium aureum, Hedychium dekianum, Hedychium robustum* are threatened ornamental species of this group (Singh *et al.*, 2012). Many Zingiberaceae species are economically important plants and also a source for income generation (Sukumar, 2009). Around 53 genera and over 1,200 species of Zingiberaceae are present in the world (Kress *et al.*, 2002) with India representing about 22 genera and 178 species (Jain and Prakash, 1995). The Manipur-Nagaland (NE India) belt, one of the megabiodiversity hot spot regions contributes 19 genera and 88 species (Prakash and Mehrotra, 1996). Manipur, a state of north eastern India is known for its ecologically distinctive and rich biodiversity having many endemic flora and fauna and rich cultural diversity (Singh *et al.*, 2012). Manipur mainly comprises of hilly terrain surrounding a centrally located saucer shaped valley of 1856 Km^2. The tribal and rural people of valley districts of

*Corresponding author: bentloushambam@gmail.com

Manipur are highly dependent on this plants species for food as well as medicinal values for meeting their health care needs.

2. Materials and Methods

Study site

Phayeng is a scheduled caste village of the Chakpa community in Lamshang sub-division in Imphal West District (Fig. 1). It lies in 24.8468°N, 93.8172°E with the total geographical area of 10 sq. km. It is one of the oldest village of Manipur and they are actively support the conservation of its surrounding biodiversity with the population of only 2780 people of 660 households (in 2011 census). They have a small well conserved community forest which is managed by a local committee. They have been protecting the forest for 50 years. Phayeng village has been tagged as the India's first carbon positive settlement. It is one of the tourist hotspot of the state.

Data collection

Extensive field surveys were conducted in the community forest of Phayeng Village, Imphal West districts during May,2019-june,2020. The plant specimens were photographed and identified with the help of available literatures (Sinha, 1966; Larsen and Delin,2000). Some wild and rare species are collected and planted in pots for observation and study. Field information regarding their habit, habitat, dominance, local uses, their harvesting techniques, processing methods were collected. Vegetative composition parameters were recorded and the procedures are followed according to Cottan and Curtis (1956).

3. Results and Discussion

Altogether 15 species under 5 genera were recorded from the Phayeng Community Forest in this present study. Traditional uses of rhizomes, leaves, flowers, inflorescences, young shoot and seed pods of 15 species are used by local the Chakpa community has been shown (Table 1) along with photographes, description, flowering and fruiting season and conservation status. Few species of them are sold at markets having economic value. *Hedychium spp.* species are also an important ornamental plant apart from their high medicinal value.

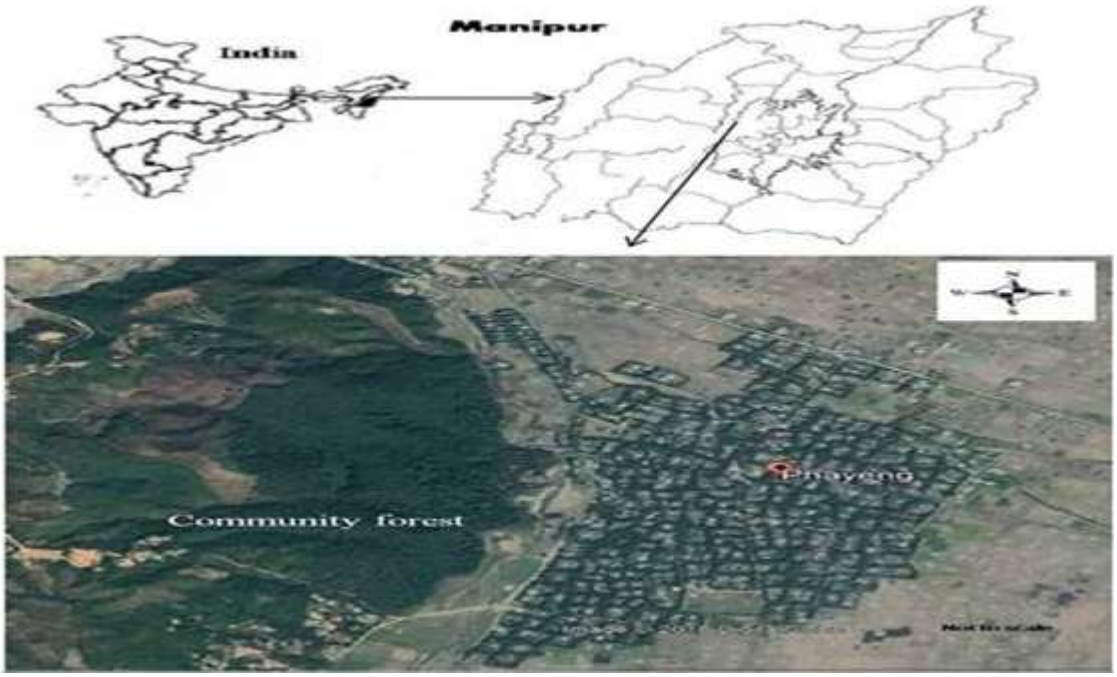

Fig 1. Map showing the study area of the Phayeng village

A total number of 24 species, 6 genera of Zingiberaceae family were found in the valley districts of Imphal (Devi *et al*., 2014). The differences in the number of species may be due to variation in climatic conditions, edaphic characteristics, biotic disturbances and altitude variations. Among these plant species *Hedychium maximum* and *Alpinia nigra* is an important food sources for Sangai *(Rucervus eldii eldii*) (Devi *et al*., 2016). So there is the importance of sustainable utilization of such plants in view of conservation of endangered Sangai.

The Chakpa caste has a close association with their natural environment and they were very much concerned about the changing ecosystem due to climate change. The tradition to use plants as medicine is still in vogue in these remote areas and they prefer the use of folk medicare system over modern medical facilities except in critical health conditions. Other than the home prepared remedies these people turn to the traditional healers for treatment of severe health conditions with medicinal plants because of low cost and readily available. Poor economic condition is responsible as another factor for use of medicinal plants in day-to-day health care and treatment as modern treatments are fairly expensive (Thokchom *et al*., 2018). The importance of the indigenous plant species of Zingiberaceae in our lives, their production and consumption is still negligible and it is mainly attributed due to lack of general awareness and capacity building programmes in all sectors of the society. Moreover, it was also noticed that due to population explosion, gradual urbanization, forest encroachment for agricultural and human settlement in the forest lands especially in the buffer zone by the socio- economically ridden people, lead to the gradual deforestation and ultimately extinction of many medicinally and economically important plants (Devi *et al*., 2014). On this contention, there calls an urgent need to intervene several capacity building programmes, incentives to farmers, provision of quality planting materials and proper guidelines from Government side to strengthen the marketing potentials of economically important plants for improving the socio-economic status of the rural people on one side and conservation of important medicinal plants on the other side. In India, the Biological Diversity Act (2002) for conservation of biodiversity strongly recommends the creation of Biodiversity Management Committees (BMC) at village level. It also provides mechanism for declaration of the areas being conserved for agricultural or wildlife biodiversity as Biodiversity Heritage Sites (BHS). The degree of threats to natural population of plants leading to population decline was due extreme anthropogenic pressures like habitat destruction, forest fires, jhum cultivation and overexploitation for wild. Regarding the conservation status majority of the species falls under the Vulnerable species (VU) and Near threatened (NT) which can be concluded that there is a severe threat in their habitats. Additionally, mass reproduction, cultivation of commercially viable species, mass awareness for proper collection methods and conservation status are suggested. Moreover, there should be strict and priority measures from Forest department and concerned authorities for their effective conservation (Singh *et al*., 2020). There is a scope for collection and documentation of these plant species. So, the present study would help in emphasizing the proper study of flora of Zingiberaceae for conservation of the existing diversity and not only to protect such potentially useful economic plant wealth but also helps in creating the important hub pharmaceutical based industries.

4. Conclusion

Nevertheless, developmental activities cannot be stopped, so efforts have to be made for minimal harm to the habitat of threatened plants while carrying out developmental projects in the future. At present, multiplication and reintroduction of such endangered plants by use of tissue culture techniques is being considered as the most effective method to conserve the threatened and rare plants. Mass awareness should also be created among the local people for better utilization and conservation of such important natural resources for future generation. There is need for creation of village panchayat level committees for their active participations and mass awareness among the local inhabitants. At the same time, we also need to focus on identification of wild relatives having economically exploited plants, not only for increasing their variability but also for implementing their conservation strategies. On this line our present study may build a strong linkage towards the policy implementation and mass awareness among the different stakeholders for judicious exploitation of these important plant species.

5. Acknowledgements

The authors gratefully acknowledge to the Pradhan, Village Chief of Phayeng Village, President of the Phayeng Forest Committee and in particular the local people of Phayeng in general for their kind cooperation during our field works. The first author is also thankful to the Department of Forestry and Environmental Science, Manipur University for permitting the use of laboratory facilities.

Table 1. List of Zingiberaceae plant species documented in the Phayeng Community Forest, Imphal West, Manipur, Northeast India.

Sl. No.	Scientific name	Local/common Name	Description	Part(s) used and Use(s)
1.	 *Alpinia galanga* (Linn.) Willd	**Local name**: Kanghu **Common name**: Greater Galangal.	**Description**: *A. galanga* is a large, aromatic, tuberous rhizome, perennial plant. Rhizomes are cylindrical, branched; leaf oblong-lanceolate, glabrous beneath; inflorescence compound panicle; flowers shortly pedicelled; corolla- lobes linear-oblong, greenish-white; lip obovate clawed emarginate, white veined with lilac; staminodes reduced at the base of lip; stamen arcuate, shorter than the lip; ovules 1–2 in a cell. **Flowering-Fruiting season**: April-September. **Conservation Status**: Cultivated, Semi-cultivated, Wild	Rhizome and young inflorescences buds as tonic, vegetable purposes.
2.	 *Alpinia officinarum* Roxb.	**Local name**: Pulei-manbi. **Common name**: Lesser galangal.	**Description**: A. officinarum is a perennial rhizomatous, aromatic, forming dense 1.5-2 m tall tuft. Rhizome elongate, terete; leaves sessile; ligule lanceolate, entire, 2-3cm, membranous; leaf blade linear, glabrous, base attenuate, raceme erect; rachis tomentose; bracteoles very small, less than 1cm; pedicel 1-2mm; calyx puberulent, apex 3 toothed; corolla tube shorter than calyx, lobes oblong, labellum white with red streaks, ovate; ovary tomentose, capsule red, globose. **Flowering-Fruiting season:** April to November. **Conservation Status**: Cultivated, Wild	Rhizome as condiment.

3.	 ***Alpinia nigra* (Gaertn.) Burtt**.	**Local name:** Pullei. **Common name**: Black galangal.	**Description**: *A. nigra* is a perennial, large and aromatic rhizome; leaves long, oblong, sessile; ligule entire and pubescent. Inflorescence are appear on terminal leafy stem; bract scariose, pubescent; flower short live, pedicelled; calyx greenish-white, scariose at the margins; corolla 3-lobed, unequal, posterior lobe hooded, dirty white; lip cuneate pink distinctly emarginate with 2 small linear-subulate glands at the base, clawed; stamen arcuate, shorter than the lip. **Flowering-Fruiting season**: April-September. **Conservation Status:** Wild **IUCN conservation status: Least concern**	Rhizome and young shoots as vegetable purposes.
4.	 ***Amomum aromaticum* Roxb.**	**Local name**: Kukrubi. **Common Name:** Bengal Cardamom,	**Description:** *A. aromaticum* is a large, rhizomatous, aromatic plant. Rhizome creeping just below soil surface, sometimes emitting long stolons covered with scale-like organs, terminating in sterile apex; leaf distichous, leaf sheaths with free margins (open on the side opposite the lamina); petiole may or may not be present; ligule short; inflorescences lateral immediately from a rhizome near base of leafy stem; bracts rather to very numerous, not connate; corolla-lobes white, nearly as long as the tube; lip pale-yellow. **Flowering-Fruiting season**: April-September. **Conservation Status:** Cultivated, Wild	Seed pods and fruits as spice.

5.	 ***Amomum dealbatum* Roxb.**	**Local name**: Nashikhong/ thin-chobi **Common name**: Java cardamom	**Description:** *A. dealbatum* is a rhizomatous, perennial plant which can only grow in wet and marshy area all around year. Rhizome medium size, well developed, robust; leafy stem long with basal girth, robust; leaf oblong, lanceolate, pubescent underneath, hairs short, velvety; inflorescence globose, epi-terranean arising from rhizome with short peduncle; floral bud as numerious; bract scariose, imbricate, ovate, hairy; flower pedicelled, sparsely hairy; calyx 3-lobed, apices acute, pale yellow; corolla-lobes pale yellow, dorsal hooded over the lateral ones; lateral staminodessubulate; lip pale yellow with a reddish yellow throat, hairy; anther lobes 2, connective appendage membranous; stigma hairy, funnel-shaped; ovary pale yellow coloured. **Flowering-Fruiting season**: April-September. **Conservation Status:** Semi-cultivated, Wild **IUCN conservation status**: Data deficient	Seed pods and fruits as spice.
6.	 ***Curcuma angustifolia* Roxb.**	**Local name**: Yaipan **Common name**: Tall Hidden Ginger.	**Description**: *C. angustifolia* is a non-perennial rhizome plant which induces spike peduncle only in summer. Rhizome are pale yellow, small, aromatic, globe; Pseudostem are 15–30 cm long, leaves are large, oblong, lanceolate, glabrous; fertile bract are greenish, ovate; coma bract few or many, pink; corolla tube are upper segment ovate, laterals shorter, oblong; staminode pale yellow; lip bright yellow, the lateral orbicular cuneate, emarginated. **Flowering season**: March-April, spring season. Inflorescence spike appearing before leaves. **Conservation Status:** Wild	Flower and shoots as vegetable purposes.

7.	 ***Curcuma aromatica*** **Salisb.**	**Local name**: Lam Yai **Common name**: Wild Turmeric	**Description:** *C. aromatica* is a rhizome, aromatic, non-perennial plant which only grown during spring season to summer season. Rhizome tuberous, sessile, grayish-yellow inside and aromatic; fertile bracts greenish and coma pink; flower shorter than the bracts; corolla lobes pinkish white; staminodes as long as the corolla segments; lip deflexed, orbicular, yellow. Inflorescence spike induce from middle of the plant. **Flowering season**: August-September. **Conservation Status:** Wild **IUCN conservation status**: Data deficient	Rhizome and inflorescences as spice and vegetable purposes.
8.	 ***Curcuma caesia*** **Roxb.**	**Local name**: Yaimu. **Common name**: Black Zedoary.	**Description:** *C. caesia* is a rhizome, non-perennial plant which only grown during spring season to summer season. Rhizome are large, sessile tubers bluish grey inside; leaves are large, oblong with a broad purple-brown cloud down the mid-rib; petiole long green, glabrous beneath; fertile bract are greenish; coma bract few or many, pink; flower pale yellow with bright yellow throat; calyx translucent white; corolla red. **Flowering season:** August- September. And they barely form fruits. **Conservation Status:** Wild	Rhizome as Medicine (Stomachic and tonic).

9.	 ***Hedychium coccineum* Buch. Ham. ex Sm.**	**Local name**: Ingalei. **Common name**: Scarlet Ginger Lily.	**Description:** *H. coccineum* is a rhizomatous and ornamental plant. Leaves are lanceolate, dark green with reddish on the back side, base rather rounded, narrowed gradually from the middle to the point; spike long, moderately dense flowered; bracts oblong; flowers red; calyx not longer than the bract; corolla segments linear, reflexing; staminode bright red; lip orbicular, distinctly clawed, deeply bifid; stamen longer than lip. **Flowering- Fruiting season:** Flowering starts from April-November but fruits are rarely formed. **Conservation Status:** Semi-cultivated, Wild	Flowers as ornamental purposes.
10.	 ***Hedychuim flavum* (J. Koenig) Kuntze**	**Local name**: Takhel-lei **Common name**: Butterfly Ginger Lily.	**Description**: *H. flavum* is an aromatic, rhizomatous, ornamental plant. Leaves are oblong-lanceolate; spike dense flowered; bracts large oblong imbricate 3–4 flowered; flowers white or tinged with yellow patch in the centre; staminodes oblong or oblong-lanceolate, lip broad shallowly bifid distinctly clawed; stamen as long as or rather longer than the lip; filament orange colored or white; capsule oblong, glabrous. **Flowering- Fruiting season**: Flowering starts from April-September but fruits are rarely formed. **Conservation Status**: Cultivated, Ornamental, Wild	Flowers as ornamental purposes.

11.	 ***Hedychium maximum* Roscoe.**	**Local name:** Loklei. **Common name:** Giant Butterfly Ginger Lily.	**Description:** *H. maximum* is a large rhizomatous, aromatic and ornamental plant. Leaves are oblong-lanceolate; spike dense flowered; bracts large oblong imbricate 3–4 flowered; flowers pure white, scented, larger; staminodes broad, oblong-lanceolate, lip broad shallowly bifid distinctly clawed; stamen as long as or rather longer than the lip; filament white; capsule oblong, glabrous. **Flowering- Fruiting season:** Flowering starts from April-November but fruits are rarely formed. **Conservation Status:** Cultivated, Ornamental, Wild **IUCN conservation status:** Data deficient	Rhizome, young shoots and inflorescences as vegetable as well as ornamental purposes.
12.	 ***Hedychium spicatum* Sm.**	**Local name:** Takhellei-macha **Common name:** Spiked ginger lily.	**Description:** *H. spicatum* is an aromatic, perennial, large, rhizomatous, ornamental plant. Pseudo- stem long, thick; leaves oblong- lanceolate, large, long, glabrous; spikes long, dense flowered; bracts oblong, obtuse, green, flowers pale yellow; calyx long; corolla tube long, lobes linear; staminodes linear-lanceolate, long; lip deeply bifid; stamen long; filament pale red, anther linear; capsule glabrous, subglobose. **Flowering-Fruiting season**: July- November. **Conservation Status:** Wild	Inflorescences as ornamental purposes.

13.	 *Hedychium stenopetalum* Lodd.	**Local name:** Loklei-bon. **Common name**: White Star Ginger	**Description:** *H. stenopetalum* is an aromatic, perennial, large, rhizomatous, ornamental plant. Pseudo-stem thick, long; leaf sessile, long; ligule, slightly brown or cream colour, glabrous, abaxial pubescent, narrowly linear, sheathing leaf blade 19cm, woolly at midrib and sparsely distributed at the marginal; leaf apex acuminate, leaf margin entire, spikes ellipsoidal, 30-46 cm. **Flowering-Fruiting season**: August to November. **Conservation Status:** Semi-cultivated, Wild	Inflorescences as ornamental purposes.
14.	 *Zingiber cassumunar* Roxb.	**Local name**: Tekhaoyaikhu. **Common name**: Cassumunar Ginger	**Description:** *Z.cassimunar*is a large, rhizomatous, highly aromatic, non- perennial plant. Rhizome are bright yellow inside; leaves oblong-lanceolate, pubescent; ligule very reduced, inflorescence lateral spike with long, large peduncle; bract broadly ovate, purplish brown; flowers cream and labellum with a deeply bifid midlobe. **Flowering season:** August-September and fruit or seed rarely form. **Conservation Status:** Cultivated, Wild **IUCN conservation status:** Data deficient	Rhizome as medicine (tonic).

15.	 ***Zingiber zerumbet (Linn.)*** **Rosc. ex Sm.**	**Local name:** Sing ban **Common name**: Shampoo Ginger.	**Description**: *Z. zerumbet* is a large, aromatic, tuberous rhizome plant. Rhizomes are biennial, pale yellow inside; leaves oblong-lanceolate, glabrous beneath; spike cone-shaped, very dense, liquid substance present; peduncle very much longer than its spike, erect, pubescent, scales on peduncle red; bracts closely appressed, apical parts in all bracts or at least in the higher bracts of the spike incurved, green–red with dark red margins; corolla-lobes whitish; lip sulfur yellow, unspotted, midlobe orbicular, basal lobes small; stamen pale yellow, as long as the lip. **Flowering season**: August-September and fruit or seed rarely form. **Conservation Status**: Cultivated, Ornamental, Wild **IUCN conservation status:** Data deficient	Rhizome as medicine (stomachic, analgestic and narcotic).

6. References

Bhunia D, and AK Mondal (2012) Antibacterial activity of *Alpinia L.* (Zingiberaceae) from Santal and Lodha Tribal areas of Paschim Medinipur Districts in Eastern India. Advances in Bioresearch 3(1): 54-63.

Cottan G, and JT Curtis (1956) The use of distance measurement in phytosociocal sampling. Ecology 37:451-460.

Devi KS, Devi YS, and PK Singh (2014) A census on edible flowers found in the valley districts of Manipur. Ethnobotany 20:232–239.

Devi NB, Das AK, and PK Singh (2016) *Zingiber roseum* (Zingiberaceae): A new record of Ginger from Imphal Valley District, Manipur. Indian Journal of Applied Research 6(10): 551-552

Jain SK, and V Prakash (1995) Zingiberaceae in India: Phytogeography and Endemism. Rheedea 5: 154-169.

Kress WJ, Prince LM, and KJ Williams (2002) The phylogeny and a new classification of the gingers (Zingiberaceae): evidence from molecular data. American Journal of Botany 89: 1682-1696.

Larsen K, and W Delin (2000) Flora of China 24:322-377

Prakash V, and BN Mehrotra (1996) Zingiberaceae of Northeast India: diversity and taxonomic status. Proceedings of the 2nd symposium of the family Zingiberaceae 262-273.

Sabu M (2006) Zingiberaceae and Costaceae of South India Kerala: Indian Association for Angiosperm Taxonomy, University of Calicut.

Sanoj E, Sabu M, and TR Kumar (2010) *Hedychium foresttii* (Zingiberaceae) with a new synonymy and a variety from India. Journal of Botanical Research Institute of Texas 4: 633-639.

Singh JS, Batra VK, Sanjive KS, and JS Thiyam (2012) Diversity of underutilized vegetable crops species in North-East India with special reference to Manipur: A review. Nebio 03(2): 87-95.

Singh HD, Ningombam DS, and Limasenla (2020) Diversity, distribution and uses of threatened ethno-medicinal plants of Manipur. Journal of Biodiversity and Environmental Sciences 17(3): 74-92.

Sinha S C (1996) Medicinal plants of Manipur. MASS & Sinha, p.208.

Sukumar SS (2009) The economic plants of Manipur and their uses.

Thokchom AD, Talukdar AD, Chingakham BS, and SS Ningthoujam (2018) Traditional Usage of Ethnomedicinal Plants in Treating Liver Disorders at Manipur, North East India, European Journal of Medicinal Plants 23(3):1-10