

Ethnobotanical investigation of wild edible plants consumed by the Bodo tribal community of BTAD region of Assam, India

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Present study documents the wild edible plant used by the Bodo community of BTAD, Assam. Study was carried out in 10 villages of each BTAD district from 2022 to 2024. Total of 160 informants were interviewed which used 154 ethnobotanical species belonging to 130 genera and 66 plant families. 120 species out of 154 plant species reported were dicots, 31 species were monocots, while 3 species have been reported as pteridophytes. *Hypericum japonicum* (Hypericaceae) was reported with highest Use Value Index (UV: 0.045), followed by *Oldenlandia corymbosa* with (UV: 0.0375.) Plant used for the preparation of the yeast cake demonstrated highest value of Fic (0.89).

Keywords: Assam, Bodo tribes, BTAD, Ethnobotany, Wild edible plants

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Plants are important bioresources utilize in food, medicine, housing, farming, pharmaceuticals, and nutraceuticals¹. Wild edible plants, like other plants, provide a crucial source of food for human^{2,3}. Due to the abundance of essential minerals, vitamins, and bioactive compounds, wild plants offer numerous health benefits and hold a special place in promoting wellness^{4,5}. Wild edible plants have been reported to have significant cultural, economic, and medicinal values⁶. Fewer than 20 out of 20,000 wild edible plant species provides 90% of the world's food requirement⁷. Vegetables provide essential vitamins, proteins, oils, carbohydrates, and minerals that may not be available in other foods. It can be consumed in raw or cooked, as a whole or in parts⁸⁻¹⁰. Vegetables are crucial for a balanced and healthy diet^{11,12}. The diets of vegetables and fruits origin have been linked to a reduced risk of diseases such as diabetes, cancer, coronary heart disease, and neurodegenerative ailments¹³⁻¹⁵.

State of Assam is one of the richest biodiversity hotspot regions in the North East India with rich sources of wild edible plants. As per Forest Survey of India (2011), the total area of Assam is 78,438 sq km

out of which 26,832 sq. km has been identified as forest area. Bodo are the ethnic group, referred to as early settlers of Assam and they are the major and dominant inhabitant of the state, particularly in the Bodo land Territorial Autonomous District (BTAD)^{16,17}. Previous ethnobotanical reports of the Bodo indicated usage of some important wild edible plants in their daily diet^{18,19}. Although the ethnobotany of the Bodo community has been studied, comprehensive documentation of their wild edible plants remains scarce. Literature studies have identified potential research gaps in the four BTAD region of Assam²⁰ which need detailed ethnobotanical investigation.

Therefore, objective of this study was to conduct ethnobotanical survey in the BTAD region to document the traditionally consumed wild edible plants of the Bodo tribal community, an area with limited prior research.

Methodology

Field survey

Ethnobotanical survey was conducted in the year 2022 - 2023 in the Udalguri, Baksa, Chirang and Kokrajar districts of BTAD region of Assam (Fig. 1) for collecting the information related to wild edible

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plants used by the Bodo tribal community living in 4 districts of BTAD region following the standard methods^{21,22}. To assess the taxonomic diversity and traditional utilization knowledge of the wild edible plants, we interviewed a total of 160 informants (40 informants/household from each district). The middle aged and elderly informants of age group ranging between 35-50 years, 50-65 years and 65 years above were selected and interviewed from 40 villages (10 villages from each district) of BTAD region because elderly informants are believed to possess more refined form of ethnobotanical wisdom due to their long-term exposure and experience of utilizing the diverse form of ethnobotanical resources of the given biocultural environment. The demography of the informants, taxonomic diversity of wild edible plants, frequency of plant habit and habitat, and part harvested were analysed and presented in the table and graphical form using Microsoft Excel.

A field survey was carried out in the both rural and semi-urban localities of BTAD with the help of the knowledgeable informants. The ethnobotanical utilization knowledge of wild edible plants were recorded in the field notebook. Local markets survey was conducted and utilization of each plant species were recorded from the informants using structured, semi-structured, focused group discussion method and transect walk with key informants in the community forest area^{22,23}. Prior Informed Consent (PIC) was obtained from local residents prior to actual interview.

The binary and multiple-choice questionnaire sheets with following details were used during structured field interview: (i) village details, (ii) Name, age, and occupation of the informants; (iii) vernacular name of the medicinal plants; (iv) plant parts harvest and use; and (v) method of preparation of medicine and dose administration.

The voucher specimen of species was collected by transect walk with local residents in the kitchen garden and community forest area^{24,25}. Digital photographs were taken for each species using a CANON 1500D camera. The voucher specimens were identified using standard floras including *Flora of British India*²⁶, *Bengal Plants*²⁷, *Flora of Assam*²⁸, and *Flora of BTAD*²⁹. Plant species were mostly identified through field observations, morphological analysis, and expert verification, including consultation with local botanists and reference to herbarium specimens. Accepted scientific names were verified in the POWO - plants of the world online [<https://powo.science.kew.org>]. A set of voucher specimens were deposited in the HAU (Herbarium of Arunachal University), Rajiv Gandhi University, Arunachal Pradesh for future reference.

Quantitative evaluation of data

Use value (UV) index

Among the quantitative indices preferred in ethnobotanical studies, the use value (UV) index introduced by Phillips and Gentry was used to measure the relative importance of the species³⁰.

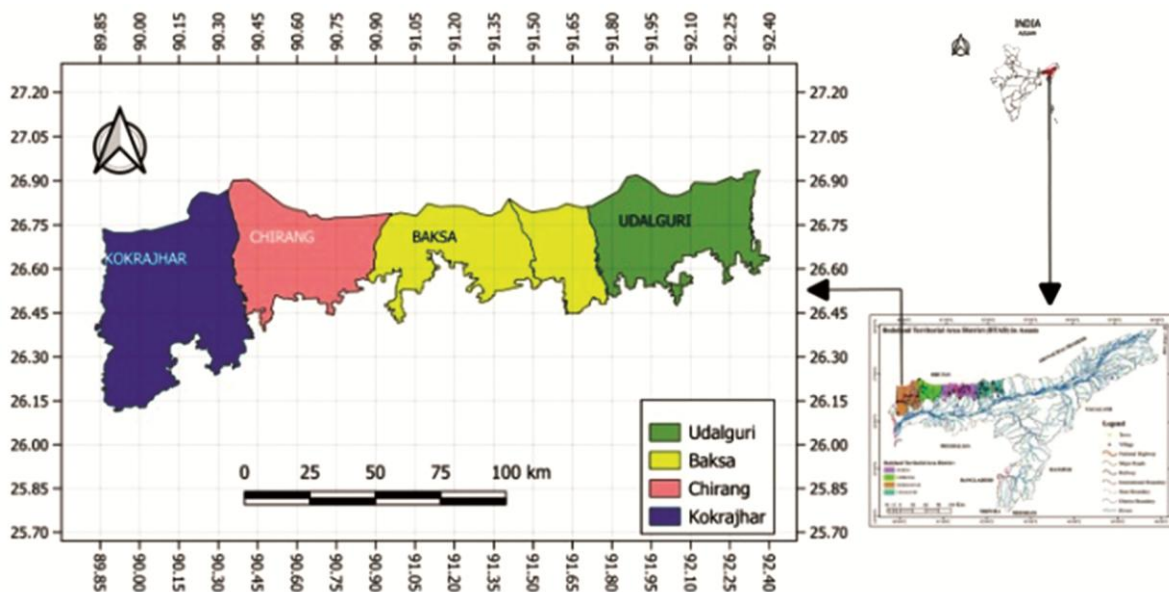


Fig. 1 — Map showing the total districts of BTAD, Assam, North East India (Source: Authors)

The UV index of each species was calculated by using the following formula:

$$UVC = \Sigma U / ns.$$

Where U is the sum of the total number of use citations by all informants for a given species, divided by the total number of informants (ns) interviewed³¹. Maximum value of UV index ranges between 0 - 1.

Informant consensus factor (F_{ic})

The informant consensus factor (F_{ic}) of each species was evaluated quantitatively to determine the homogeneity of plant species utilization among traditional informants postulated by Trotter and Logan (1986)³².

The F_{ic} was determined by using the following formula (Trotter and Logan (1986)³³:

$$Fic = Nur - Nt / Nur - 1$$

Where, Nur = number of use citation for wild edible plant in each category (as raw, cooked etc.)

Nt = number of plant species used in each use category.

The F_{ic} value typically ranges between 0 to 1.

Result and Discussion

Demography of the informants

Present study revealed that, of the total 160 informants interviewed (Table 1, Fig. 1), 31.875% were farmer, 28.75% were herbal practitioner, 26.875% were house wife while 12.5% falls within

other category of occupation. Highest number of informants (74) was recorded under age group 35-50 which account for 46.25% of the total informants interviewed. This is followed by informants (47) under age group 50-65 years (29.37%) while least number of informants were recorded under age group 65 years (24.37%). Significant numbers of plant species utilization knowledge were contributed by the informants under age group between 50 years and above. This could be due to the long-term experience and exposure of the senior informants to their natural biocultural environment.

Taxonomic diversity of wild edible plant species

Present study has documented 154 species of wild edible plant belonging to 130 genera and 66 families (Fig. 2) used by the Bodo tribal community of BTAD region of Assam. A total of 120 species were reported as dicots, 31 monocots, and 3 pteridophytes. Lamiaceae was reported with highest number of species (10 species), followed by Asteraceae (9 species), Amaranthaceae and Rubiaceae with 8

Table 1 — Demography of the informants

Variable	Categories	No. of informants	Percentage
Gender	Male	80	50
	Female	80	50
Age group	35-50	74	46.25
	50-65	47	29.37
	Above 65	39	24.37
Occupation	Herbal practitioner	46	28.75
	House wife	43	26.875
	Farmer	51	31.875
	others	20	12.5

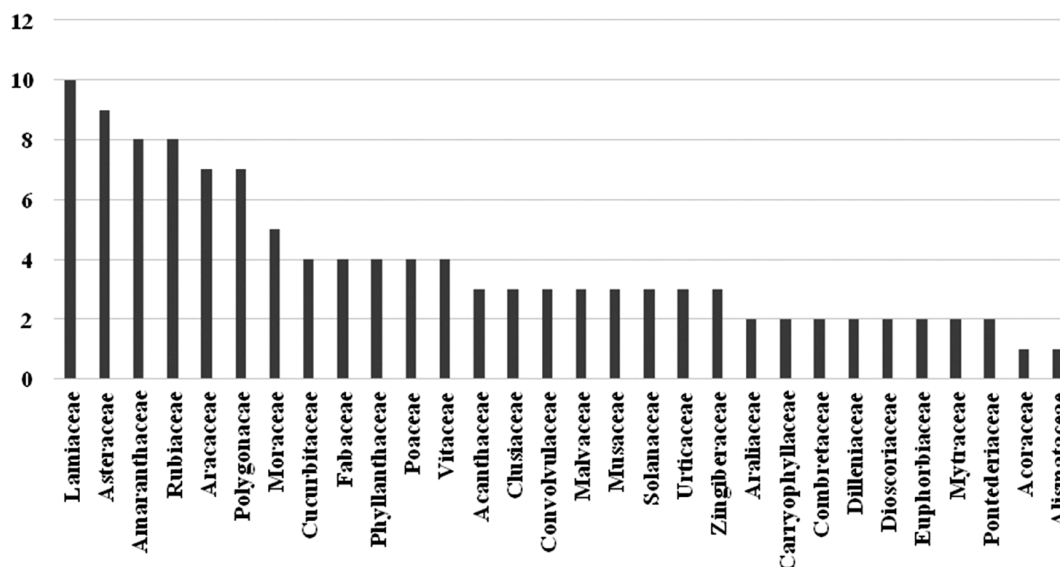


Fig. 2 — Frequency of frequently harvested wild edible plant families for livelihood supports in BTAD region

species each, Polygonaceae and Araceae with 7 plant species each, Moraceae with 5 species, Cucurbitaceae, Fabaceae, Phyllanthaceae, Poaceae and Vitaceae with 4 species each, Acanthaceae, Clusiaceae, Malvaceae, Musaceae, Solanaceae, Urticaceae, Zingiberaceae and Convolvulaceae with 3 species each. Out of the recorded 143 species, 68 are herbs the remaining 26 are shrubs, 23 are trees, 21 are climbers and 1 small tree (Fig. 3).

The detailed checklist, Use Value (UV) Index and traditional uses of 154 species of ethnobotanical plants used by the Bodo community of BTAD region of Assam is provided as Supplementary File (Supplementary Table S1). This study also reported highest number of herbaceous species (44.81%) which is followed by shrub (18.83%), tree (18.83%), climber (12.99%), aquatic herb (3.90%), and under shrub (0.65%) which is presented in Figure 3. The edible plant parts reported in present study include leaves or tender shoots, tubers, fronds, petioles, stems, flowers, fruits, rhizomes, and roots which is presented in Figure 4. Herbaceous species were found

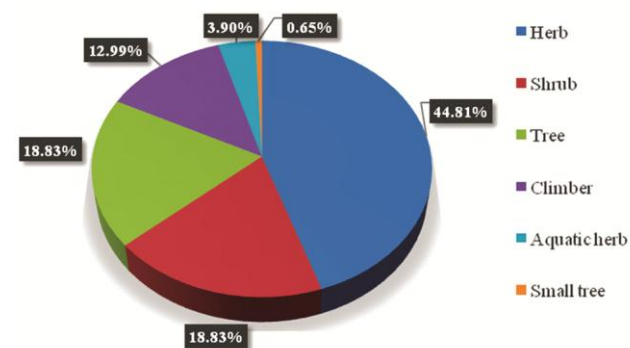


Fig.3 — Frequency of plant habit - wild edible plants used by Bodo community of BTAD

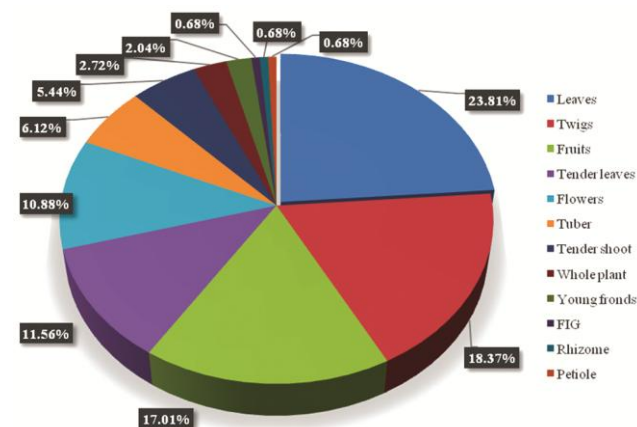


Fig. 4 — Frequency of plant parts harvest and used by the Bodo community of BTAD region, Assam

frequently harvested and consumed by the villagers as they are found readily available in the BTAD throughout the year.

Plants used in local festival *Bwisagu* and traditional dishes (*Gwkhagwkhwi*)

During local festival called *Bwisagu*, villagers collect various types of wild edible vegetables from their community forest. A minimum of 101 plant species and maximum of 118 species are collected, prepared as local dishes by mixing with chicken meats called *Gwkhagwkhwi*. These species are *Acmella paniculata* (twigs), *Alocasia indica* (twigs), *Alpinia nigra* (shoots), *Alternanthera philoxeroides* (twigs), *Alternanthera sessilis* (twigs), *Bacopa monnieri* (twigs), *Bambusa balcooa* (shoots), *Bambusa tuldoidea* (young shoot), *Basella alba* (twigs), *Bidens pilosa* (twigs), *Calamus tenuis* (twigs), *Casearia glomerata* (twigs), *Diplazium esculentum* (young fronds), *Drymaria cordata* (tender leaves), *Euphorbia hirta* (leaves), *Fagopyrum cymosum* (tender leaves), *Fagopyrum esculentum* (tender leaves and shoots), *Gonostegia hirta* (twigs), *Hellenia speciosa* (leaves), *Hydrocotyle sibthorpioides* (whole plant), *Hypericum japonicum* (whole plants), *Ipomoea aquatica* (twigs), *Justicia adhatoda* (flowers), *Kaemferia galanga* (leaves), *Lasia spinosa* (young leaves), *Leucas aspera* (twigs), *Mikania micrantha* (twigs), *Ocimum tenuiflorum* (twigs), *Oldenlandia corymbosa* (whole plant), *Persicaria perfoliata* etc. are among the important plant species used for the preparation of local dishes (Supplementary Table S1).

Traditional belief system and health benefit associated with *Gwkhagwkhwi* cuisine

Traditionally, the *Gwkhagwkhwi* cuisine is prepared and consumed one day before the start of the new month of the Bodo known as *Bwisag*, the month of procreation. It is a customary belief among the Bodo that the consumption of *Gwkhagwkhwi* dish enhance physical stamina and boost immune system which protect the human against various diseases throughout the year. *Oja* is the medical practitioner who offer treatment for a variety of illnesses, including jaundice, pneumonia, typhoid, bone fractures, and many others. During time of food scarcity, *Oja* promote use of *Gwkhagwkhwi* for good health and wild edible plants for alternative sources of nutrients and rural income.

Plants used for the preparation of fermenter yeast

Different plant species such as *Ananas comosus* (young leaves), *Artocarpus heterophyllus* (leaves),

Clerodendrum infortunatum (twigs), *Musa balbisiana* (leaves), *Oryza sativa* (rice), *Mussaenda roxburghii* (leaves), and *Plumbago zeylanica* (leaves) are primarily used for the preparation of fermented yeast cake (*Emao*) mixed with rice power for fermentation of local wine.

Preparation of *Onla*

Onla is another traditional cuisine of the Bodo community prepared in a curry form by adding different plant parts into rice flour and mixed with 10 mL (approx.) of alkaline substance called *Kharwi*. The plant species used for *Onla* preparation are *Phlogacanthus thyriformis* (flowers), *Dendrocnide stimulans* (flowers), *Gmelina arborea* (flowers), *Carica papaya* (male flowers), *Justicia adhatoda* (flowers), and *Sesbania grandiflora* (flowers).

Diversity and economic importance of edible fruit species

The fruits of *Tamarindus indica*, *Baccaurea ramiflora*, *Artocarpus heterophyllus*, *Diospyros ebenum*, *Ficus semicordata*, *Garcinia cambogioides* var. *cambogioides*, *Garcinia pedunculata*, *Garcinia xanthochymus*, *Dillenia indica*, *Musa balbisiana*, *Musa × paradisiaca*, *Phyllanthus acidus*, *Terminalia bellirica*, *Terminalia chebula*, *Syzygium cumini*, and *Syzygium jambos* are found harvested and used as major source of carbohydrate, vitamins and proteins beside selling in the market to support livelihood.

Medicinal importance of edible plants

Some of the important edible plant species (Supplementary Table S1) such as *Centella asiatica*, *Oroxylum indicum*, *Acmella paniculata*, *Bacopa monieri*, *Drymaria cordata*, *Houttuynia cordata*, *Thunbergia grandiflora*, *Tamarindus indica*, *Hypericum japonicum*, *Hydrocotyle sibthorpioides*, and *Musa balbisiana* mentioned in present study has been reported to have medicinal uses indicated in various literatures. *Centella asiatica* has been reported against numerous ailments like blood purifier, appetizer, and also to treat diarrhea, leprosy, tuberculosis, amoebiasis, etc.³⁴⁻³⁵ while *Oroxylum indicum* has been used against treatment of Jaundice and have nutritional and prophylactic effect³⁶, while *Acmella paniculata* has been reported as potential antibacterial agent³⁶. *Bacopa monieri* has been reported with many medicinal uses such as, cognitive enhancer and neuroprotective³⁷, effective against the Alzheimer's disease³⁸ and proven to reduce inflammatory pathways in the brain^{39,40}, and useful remedies against neurological disorders⁴⁰. Analgesic and antipyretic activities and

phytochemical⁴¹ aspects of the *Drymaria cordata* have been reported⁴². *Houttuynia cordata* has been reported to be protective against heart, lung and kidney, and also reported as antitumour, immunomodulatory, antibacterial and toxicity activities⁴³. *Tamarindus indica* has been reported to possess antidiabetic, antimicrobial, antivenomic, antioxidant, antimalarial, cardioprotective, hepatoprotective, antiasthmatic, and laxative properties while *Hypericum japonicum* has been reported to possess anti-hyperlipidemic and hepatoprotective effect. *Hydrocotyles sibthorpioides* has been reported to cure edema, dysentery, rheumatism, whooping cough, jaundice, throat pain, hepatitis-B infection, soothing pain, brain tonic, and also reported as detoxifying agent, anti-cancer, antiviral, antibacterial, antifungal and hepatoprotective agent⁴⁴.

Quantitative analysis

Use value (UV) index and relative importance of edible plant

The analysis of the use value index of 154 species of wild edible plants has revealed relative importance of each species used among the villagers of Bodo tribes of BTAD region of India (Supplementary Table S1). *Hypericum japonicum* (Hypericaceae) was recorded with highest UV index (UV: 0.045) which is followed by *Oldenlandia corymbosa* (UV: 0.0375) *Centella asiatica*, *Clerodendrum infortunatum*, *Musa balbisiana* *Paederia foetida*, and *Artocarpus heterophyllus* with (UV: 0.031); *Ananas comosus*, *Musa balbisiana* (UV: 0.025); *Acmella paniculata*, *Argyrea nervosa*, *Basella alba*, *Moringa oleifera*, *Musa x parasidica*, *Nyctanthes arbor-tritis*, *Persicaria chinensis* and *Vitex negundo* (UV: 0.187). *Justicia adhatoda*, *Acorus calamus*, *Celosia gigantean*, *Acmella paniculata*, *Centipeda minima*, *Carica papaya*, *Leucas aspera*, *Nyctanthes arbor-tritis*, *Ludwigia perenis*, *Antidesma acidum*, *Bacopa moneri*, *Bambusa balcooa*, *Persicaria hydropiper*, *Madhuca longifolia var latifolia*, *Lippia alba* has demonstrated moderate UV index (UV: 0.0125) while lowest UV index (0.00625) was recorded for rest of the species. Higher UV index reflects higher consensus and citations of the economically importance ethnobotanical species used by the informants^{31,32}. It typically measures the relative important of ethnobotanical species and indicates the most useful plants which are frequently used among the ethnic communities as food, medicines or for other cultural or economic purposes. Community preference on these plant species with high UV indices also reflects

Table 2 — Informant Consensus Factor (F_{ic}) by usage categories of edible plants used by the Bodo tribal community of BTAD region of Assam

Usage categories	Total number of species (Nt)	Number of use report (Nur)	F_{ic}
Plants used in local festival <i>Bwisagu</i> and dishes (<i>Gwkha Gwkhwi</i>)	103	791	0.87
Plants used in yeast cake preparation	7	56	0.89
Preparation of <i>Onla</i> Curry	16	78	0.80
Edible fruit	6	38	0.86
Medicinal plants	11	67	0.83

their population abundance, seasonal availability, high nutritional and medicinal values.

Informant consensus factor (F_{ic})

Present analysis revealed F_{ic} value ranges from 0.83 to 0.89 (Table 2). Highest informant consensus factor (F_{ic}) was recorded under the usage category - plant used for the preparation of the yeast cake (F_{ic} : 0.89) which is followed by plants used in local festival *Bwisagu* and preparation of dish *gwkhangwkhwi* (F_{ic} : 0.87), edible fruit (F_{ic} : 0.86), medicinal plants (F_{ic} : 0.83) while lowest F_{ic} was recorded for usage category - preparation of *Onla* curry (F_{ic} : 0.80). F_{ic} is a measure of the citation and consensus use of the wild edible plants³³. The higher F_{ic} value indicates higher citation and consensus of the utilization of wild edible plants which signifying the higher preferences among the informants on particular species. It was also observed that these species were found deeply linked with community dish culture, and found available throughout the year in BTAD region of Assam.

Conclusion

Present study unveiled traditional utilization knowledge of important wild edible species reported by the senior informants of age group above 50 years among the Bodo community of BTAD region of Assam. The traditional knowledge related to recipe and cuisine formulation (*Gwkhangwkhwi* and *Bwisagw*) of Bodo people by using 101 species of wild edible plants were found to be unique, nutritious and reported to have multiple health benefits to the consumers. It was also observed that majority of the wild edible plants are found sold in the local market and they were found to support the livelihood of the marginal farmers and villagers but also found to be contributing towards nutritional and medicinal

supplement for the villagers living in the rural localities. The WEP species with higher UV index and higher F_{ic} value should be prioritized for further nutritional analysis using modern tools and methods.

Supplementary Data

Supplementary data associated with this article is available in the electronic form at [https://nopr.nispr.res.in/jinfo/ijtk/IJTK_24\(8\)\(2025\)788-795_SupplData.pdf](https://nopr.nispr.res.in/jinfo/ijtk/IJTK_24(8)(2025)788-795_SupplData.pdf)

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Conflict of Interest

Authors declare that there is no conflict of interest.

Author Contributions

JB: Plant collection and interview, plant identification and writing-original draft. PKH and HT: Research design, mentoring, final drafting and communication of manuscript.

Prior Informed Consent

PIC were sought from local informants and community knowledge holders prior to extensive field survey.

Ethics Approval

Prior approval was taken from community knowledge holders prior to extensive field survey.

Data Availability

Ethnobotanical data will be automatically made available to public domain once published.

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