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Review Article

A Review on the Underutilised Fruits and Vegetables of West Bengal: Nutritional Potential and Conservation Priorities

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Abstract

Underutilised fruits and vegetables (UFVs) in West Bengal are important reservoirs of dietary diversity, micronutrients and culturally embedded food knowledge. This review synthesises published ethnobotanical surveys, nutritional analyses and regional reports to identify prominent underutilised fruits and indigenous leafy vegetables (ILVs) of West Bengal, summarise their potential nutritional and health benefits, and outline conservation, value-chain and research priorities to promote their wider use. The review argues that integrating UFVs into local food systems will advance nutritional security, climate resilience and livelihood opportunities if supported by targeted research, market development and participatory conservation.

Keywords: *Ethnobotany; Indigenous Leafy Vegetables; Nutritional Security; Underutilised Crops; West Bengal*

Introduction

Dietary diversity and micronutrient adequacy remain critical challenges in India and particularly in marginal rural communities. Dietary diversification is central to achieving nutrition security in South Asia, where hidden hunger due to micronutrient deficiencies persists despite increased staple food production (Fanzo et al., 2018). Globally, underutilised or "orphan" crops are recognised for their potential to provide micronutrients, diversify incomes, and enhance climate resilience (Padulosi *et al.,* 2013).

Food security is still a significant challenge in developing and emerging countries, and sustainable foods are currently in demand. Considering the significance of future smart and sustainable foods, neglected and underutilized species are the best choice for a rapid global population, particularly in developing and poor countries. These underutilized plants can widen the prospect of becoming a future resilient food (Talucder *et al.,* 2024).

West Bengal harbours a wide array of underutilised fruits and vegetables that provide vital nutrition, ecological resilience, and cultural identity. Despite their abundance and affordability, these crops are marginalised in agricultural research and markets, often labelled as "poor man's diet." Recommendations include systematic documentation, cultivar-level nutrient profiling, community-led conservation, and value-chain development to reframe these foods as "nutrient-rich heritage crops" rather than "poor man's diet."

India's rich biodiversity encompasses a vast array of wild edible plants and underutilized leafy vegetables, which have been integral to the diets and cultures of indigenous and rural communities. These plants often thrive in forested areas, hills, and remote regions, where they are harvested for their nutritional, medicinal, and cultural value (Golait, 2021).

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Documentation of wild edible fruits and underutilized leafy vegetables have been done by several authors in India. In North Maharashtra, a study documented 62 wild leafy vegetable species traditionally used by tribal communities. The majority of these species belong to the families Amaranthaceae, Araceae, Asteraceae, and Fabaceae, with herbs being the predominant growth habit. Forest habitats serve as the primary source for these wild vegetables, which are utilized for both food and medicinal purposes. However, factors such as loss of vegetation and erosion of traditional knowledge pose threats to their continued use (Golait, 2021).

A broader survey in Maharashtra identified 314 wild edible plants from 84 families, with 70% categorized as least concern by the IUCN. Among these, 18.8% are leafy plants used for food and medicine. The study emphasizes the importance of these plants in local diets and their potential as functional foods with nutraceutical properties (Aswani *et al.,* 2024).

In Nagaland, a survey across three districts documented 142 underutilized edible plants, including 126 plant species and 16 species of wild edible mushrooms. These plants are categorized based on their parts used and are integral to the local diet and culture (Deb *et al.,* 2019). In Nagaland documentation was done (Konyak, & Konyak, 2020).

The northeastern region of India, particularly Karbi Anglong in Assam, is known for its rich biodiversity. A study highlighted the significance of underutilized leafy vegetables consumed by the Karbi tribes, noting their role in food security and cultural practices. These plants are often found in wild forms and serve as non-timber forest products, contributing to the livelihood of local communities (Terangpi *et al.,* 2024).

In Central India, the Achanakmaar-Amarkantak Biosphere Reserve hosts a diverse range of wild edible plants. A study examined their role in meeting the dietary and nutritional needs of indigenous communities, revealing significant variations in utilization patterns among different ethnic groups (Mishra *et al.,* 2021). These examples underscore the importance of documenting and conserving wild edible plants and underutilized leafy vegetables in India. Such efforts are crucial for preserving biodiversity, promoting food security, and maintaining cultural heritage.

Underutilised fruits and vegetables (UFVs) in West Bengal

While commercial fruit and vegetable production is dominated by a few species (e.g., mango, banana, citrus), West Bengal hosts a rich but under-documented pool of minor fruit species and indigenous leafy vegetables (ILVs) that contribute to local diets, seasonal food security and traditional healthcare (Kundu, 2006; Mazumder & Sarkar, 2019; De, 2021). Underutilised Fruits and Vegetables (UFVs) are defined here as species that are locally important but neglected by formal research, extension and markets. They often harbour valuable micronutrients, bioactive compounds and ecological resilience traits that make them suitable for promotion under climate variability and nutritional interventions (Meena *et al.,* 2022; Knez *et al.,* 2024).

Phytogeographical Diversity of West Bengal

West Bengal, located in eastern India, exhibits remarkable phytogeographical diversity owing to its varied topography, climate, and soil conditions (Fig. 1). The state spans the Himalayas in the north to the coastal Sundarbans in the south, encompassing several ecological zones that support distinct vegetation types.

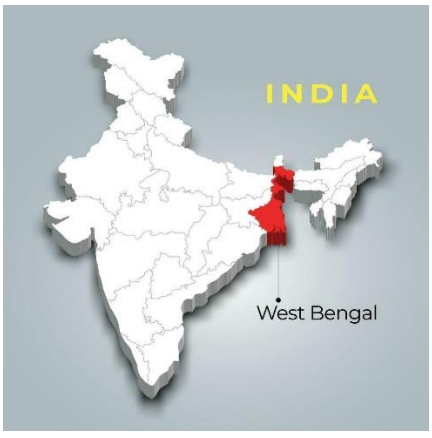

Figure 1: *The Map of India with the State of West Bengal Highlighted in Red*

The Darjeeling Himalayas harbour montane and temperate forests rich in oaks, rhododendrons, and bamboos, while the Terai and Duars regions are dominated by tropical moist deciduous forests (Ghosh, 2015). The lateritic tracts of western West Bengal support drought-tolerant dry deciduous and scrub vegetation, contrasting with the fertile alluvial plains of the Gangetic delta, where rice, jute, and numerous aquatic plants thrive (Banerjee & Chakraborty, 2017). The coastal Sundarbans represent the world's largest mangrove ecosystem, providing critical habitat for diverse halophytes and mangrove associates (Naskar & Mandal, 1999). This mosaic of phytogeographical zones makes West Bengal a biodiversity hotspot, where Himalayan, Indo-Gangetic, and coastal floristic elements converge.

Minor fruits and Green Leafy Vegetables (GLV) of West Bengal

West Bengal, due to its diverse agroecological zones hosts a remarkable range of minor fruits and Green Leafy Vegetables (GLVs) (De, 2021). These foods play a crucial role in household nutrition, particularly among tribal and rural communities. Yet they remain absent from formal dietary guidelines, under-represented in research, and undervalued in markets.

This review collates regional ethnobotanical inventories and nutritional studies to provide a state-focused synthesis for researchers, development practitioners and policymakers interested in leveraging UFVs of West Bengal.

Objectives of the study

The objectives are:

To list major UFVs reported from West Bengal, to summarise known nutritional values and functional properties and to identify priority actions required to conserve, study and promote these species.

Methods

A targeted literature search was conducted across peer-reviewed journals, regional technical reports and ethnobotanical inventories that document underutilised fruits and leafy vegetables in West Bengal and the broader Indo-Gangetic region. Emphasis was placed on sources that provided species lists, nutritional composition data or ethnobotanical use records. Key sources included regional surveys of minor fruits, the Terai-Dooars ULV inventory, reviews on underutilised fruit crops in India, and species-level nutritional analyses.

Overview of underutilised fruits and vegetables in West Bengal

Several studies and reports identify a consistent set of minor fruits and ILVs in West Bengal. Although heterogeneity exists among districts and ecological zones, recurring categories include:

Aquatic/semi-aquatic crops:

Euryale ferox Salisb. (makhana, fox nut) is an aquatic species producing nutritionally valuable seeds that are traditionally harvested and processed in eastern India. *Euryale ferox* Salisb. grows as an exclusive aquatic cash crop in shallow water bodies especially in Bihar and Jharkhand. It is known as Makhana. It is now cultivated in some parts of West Bengal. It has nutritional and medicinal properties and supports cottage industry (Kumar *et. al.,* 2017).

Minor fruits and homestead trees: Rose apple (*Syzygium jambos* (L.) Alston), water apple (*Syzygium aqueum (Burm.f.) Alston*), carambola (star fruit, *Averrhoa carambola* L), longan (*Dimocarpus longan* Lour.), custard apple (*Annona reticulata* L.), bael (*Aegle marmelos* (L.) Corr), ber (*Ziziphus mauritiana* Lam.), wood apple (*Limonia acidissima* L., Amla (*Emblica officinalis* Gaertn), are reported from southern and northern parts of West Bengal (Kundu, 2006; De, 2021). Some are seasonal fruits:

Indigenous leafy vegetables (ILVs) and wild greens: A large diversity of leafy taxa used as vegetables in Terai-Dooars and other rural areas were documented by Mazumder and Sarkar who documented 103 species across 44 families consumed locally (Mazumder & Sarkar, 2019).

These include various *Amaranthus* spp., *Centella asiatica* (L.) Urban known as Thankuni in Bengali,, *Alternanthera* spp., *Basella alba* L. (malabar spinach or Piu Shaak in Bengali), *Ipomoea aquatica* Forssk. (water spinach), *Enhydra fluctuans* Lour. (water cress or helencha in the Bengali and many lesser-known herbs and shrubs. *Marsilea quadrifolia* L., a pteridophyte is a unique plant with high medicinal value. It is widely distributed in the state of West Bengal and is known as Shushni Shaak. *Diplazium esculentum* (Retz.) Sw. commonly known as Fiddlehead ferns or 'Dheki Shak' in

Bengali is a pteridophyte is used as a nutritive leafy vegetable by the local communities of Terai and Duars parts of West Bengal (Sarkar *et al.*, 2018).

The diversity documented reflects both cultivated minor species and wild or semi-wild plants gathered seasonally. Consumption patterns are mediated by cultural preferences, seasonal availability and local knowledge of preparation and medicinal uses.

Selected species: nutritional potential and evidence

The following section summarises nutritional information and functional properties for selected UFVs documented in West Bengal. These examples demonstrate the nutritional opportunities contained within the region's biodiversity.

Euryale ferox (Makhana / Fox nut)

Makhana is a traditional aquatic crop whose seeds (fox nuts) are consumed toasted or processed into snacks. Recent compositional studies show that makhana is a good source of carbohydrates, low in fat, contains dietary fibre, and provides minerals and certain bioactive compounds (Kumar *et al.,* 2017). Researchers have highlighted makhana's potential as a nutrient-dense snack and its bioactive profile including antioxidant constituents, which supports its promotion as a health food. Cultivation and post-harvest processing improvements could increase local incomes and nutritional availability.

Indigenous Leafy Vegetables (ILVs)

ILVs recorded across West Bengal encompass a wide nutritional spectrum. Many ILVs are rich in micronutrients especially iron, calcium, vitamin A precursors (carotenoids) and vitamin C and contain significant levels of polyphenols and other bioactive molecules (Mazumder & Sarkar, 2019). Elemental analyses of underused aquatic and leafy greens show promising micronutrient concentrations and potential to contribute to daily dietary requirements when consumed regularly.

Common ILV genera in the region such as *Amaranthus*, *Centella* and *Basella* are well documented elsewhere for high iron, calcium and vitamin content, while wild greens used locally often possess ethnomedicinal attributes (e.g., anti-inflammatory, digestive aids). Their regular inclusion in diets can help address 'hidden hunger' (micronutrient deficiencies) in rural communities.

Minor fruit trees (rose apple, carambola, longan, bael, ber)

Minor homestead fruits frequently reported in district-level surveys provide vitamins (notably vitamin C), minerals and dietary fibre, and many have documented phytochemicals with antioxidant activity (Kundu, 2006). Although detailed nutrient composition is lacking for many local landraces, their traditional use for fresh consumption, preserves and medicinal preparations indicates nutritional and functional value. For instance, bael (*Aegle marmelos* (L.) Corr**.**) is known for its medicinal properties in digestive health and contains several bioactive compounds.

Barriers to utilisation and conservation concerns

Despite nutritional potential, UFVs face multiple barriers:

- **Knowledge erosion:** Younger generations increasingly prefer marketed staples and commercial vegetables, leading to declining knowledge of wild edible plants and their preparation methods (Mazumder & Sarkar, 2019).
- **Market access and value chains:** Weak value chains and lack of processing/standards reduce profitability for smallholders who could commercialise minor fruits and makhana products (Kundu, 2006).
- **Research gaps:** Nutritional composition data are sparse for many local species and varieties; agronomic and post-harvest research is limited relative to major crops (Sarkar *et al.,* 2024).
- **Conservation threats:** Habitat loss, wetland degradation (affecting species like *Euryale ferox* Salisb.) and land-use change threaten populations of wild and semi-wild UFVs.

Opportunities and recommendations

To harness UFVs for nutrition, livelihoods and resilience in West Bengal, the following priority actions are recommended:

a) **Document and map local diversity.** Build district-level inventories (Mazumder & Sarkar, 2019) to prioritise species for research and conservation.

b) **Nutritional analyses and food composition data.** Conduct laboratory analyses for proximate composition, micronutrients and bioactive compounds of priority species to validate nutritional claims and design nutrition interventions.
c) **Value-chain development.** Support small-scale processing (e.g., fortified makhana snacks, preserved minor fruit products), quality standards, and market linkages to improve incomes and demand.
d) **Participatory conservation and on-farm cultivation.** Encourage home-gardens and community nurseries for minor fruits and ILVs to reduce pressure on wild stocks and maintain genetic diversity.
e) **Nutrition education and school programs.** Integrate UFVs into school feeding and local nutrition education to revive traditional recipes and increase demand.
f) **Policy support and research funding.** Advocate for inclusion of UFVs in state agricultural planning, extension packages and research agendas, focusing on climate resilience and nutrition outcomes.

Discussion

West Bengal, with its diverse agro-climatic zones, harbors a rich array of underutilized fruits and vegetables that are often overshadowed by more commercially popular crops. These lesser-known species, however, possess significant nutritional and medicinal value, making them crucial for enhancing food security and promoting sustainable agriculture in the region.

Nutritional Significance
Many underutilized fruits and vegetables in West Bengal are rich in essential nutrients. For instance, traditional fruits like *aonla* (Indian gooseberry), *ber* (jujube), and *bael* (wood apple) are known for their high vitamin C content and antioxidant properties. Similarly, green leafy vegetables such as *amaranth*, *malabar spinach*, and *fenugreek leaves* are excellent sources of iron, calcium, and dietary fibre. Incorporating these underutilized species into the diet can help address micronutrient deficiencies prevalent in rural populations.

Medicinal and Therapeutic Benefits
Beyond their nutritional value, many of these plants have medicinal properties. For example, *aonla* is renowned for its immunomodulatory and anti-inflammatory effects, while *bael* is traditionally used to treat digestive disorders. The therapeutic potential of these species underscores the importance of their conservation and integration into local healthcare practices

Conservation and Sustainable Utilization
The conservation of underutilized fruits and vegetables is imperative to maintain biodiversity and ensure sustainable food systems. These species are often well-adapted to local environmental conditions, requiring fewer inputs and exhibiting resilience to pests and diseases. Promoting their cultivation can reduce dependency on high-input, monoculture farming systems and contribute to ecological balance**.**

Challenges and Recommendations
Despite their benefits, the cultivation and utilization of underutilized species face several challenges. These include limited awareness among farmers and consumers, lack of research and development, and inadequate market access. To overcome these barriers, it is essential to:

- **Enhance Awareness**: Conduct community-based programs to educate farmers and consumers about the nutritional and medicinal benefits of underutilized species.
- **Research and Development:** Invest in research to improve cultivation practices, post-harvest technologies, and value addition processes for these species.
- **Market Linkages:** Develop marketing strategies to promote these products, including certification schemes like Geographical Indications (GI) to enhance their market value.

Conclusion

West Bengal's underutilised fruits and indigenous leafy vegetables represent an under-exploited resource for improving dietary diversity, micronutrient intake and rural livelihoods. Existing ethnobotanical inventories and species studies provide a foundation, but substantial gaps remain in nutritional profiling, agronomy and value-chain development. Coordinated action *viz.* combining

documentation, laboratory analysis, participatory conservation, processing innovation and policy support can integrate UFVs into resilient, nutrition-sensitive food systems in the state.

The underutilized fruits and vegetables of West Bengal offer a promising avenue for improving nutritional security and promoting sustainable agriculture. By addressing the challenges hindering their widespread adoption and focusing on conservation efforts, these species can play a pivotal role in the region's food systems. Collaborative efforts from researchers, policymakers, and communities are essential to unlock the full potential of these valuable resources.

Conflict of Interest

The authors declare that they have no competing interests.

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References

Aswani, M. A., Khyade, M., Kasote, D. M., Jagtap, S. D., Vyavahare, S., Kunchiraman, B. N., ... & Ranjekar, P. (2024). Wild edible plants from western peninsular and Deccan Plateau regions of India: valued nutritional and functional foods. *Discover Plants*, *1*(1), 62. https://link.springer.com/article/10.1007/s44372-024-00060-9

Banerjee, A., & Chakraborty, S. (2017). Vegetation diversity and phytogeography of West Bengal: An overview. *Journal of Environment and Ecology*, 8(2), 23–34. https://doi.org/10.5296/jee.v8i2.11654

De, M. (2021). Documentation of the Minor Edible Fruits Sold in Phoolbagan, Kolkata, India. *International Journal of Management and Human Science (IJMHS)*, *5*(4), 31-36. https://doi.org/10.31674/ijmhs.2021.v05i04.004

Deb, C. R., Khruomo, N., & Paul, A. (2019). Underutilized edible plants of Nagaland: a survey and documentation from Kohima, Phek and Tuensang District of Nagaland, India. *American Journal of Plant Sciences*, *10,* 162-178. https://doi.org/10.4236/ajps.2019.101014

Fanzo, J., Hunter, D., Borelli, T., & Mattei, F. (Eds.). (2013). *Diversifying food and diets: Using agricultural biodiversity to improve nutrition and health*. Routledge. https://cgspace.cgiar.org/server/api/core/bitstreams/fb01ecd2-b95a-423e-bfdf-1af9e0ba1959/content

Ghosh, S. (2015). Forest types and vegetation dynamics of West Bengal. *Indian Journal of Forestry, 38*(4), 301–310.

Golait, S. D., Auti, S. G., & Laware, S. L. (2021). Documentation of wild edible leafy vegetable traditionally used by tribal and rural communities of North Maharashtra, India. *Plantae Scientia*, *4*(3), 148-159. https://doi.org/10.32439/ps.v4i3.148-159

Knez, M., Ranić, M., & Gurinović, M. (2024). Underutilized plants increase biodiversity, improve food and nutrition security, reduce malnutrition, and enhance human health and well-being. *Nutr Rev*. *82*(8), 1111-1124. https://doi.org/10.3389/fsufs.2023.00023

Konyak, Z., & Konyak, E. P. (2020). Documentation of wild edible fruits (WEFs) from Mon district of Nagaland, India. *Journal of Medicinal Plants Studies*, *8*(5), 101-106.

Kumar, A., Singh, I. S., Thakur, A. K., Choudhary, A. K., Jha, V., Singh, S. P., ... & Kumar, R. (2017). Bioaccumulation of Plant Nutrients by Euryale ferox Salisb. Growing in Field Condition in Northern Bihar of North India. *Int. J. Curr. Microbiol. App. Sci*, *6*(7), 1229-1237. http://dx.doi.org/10.20546/ijcmas.2017.602.148

Kundu, S., Chawdhury, R. R., Ghosh, S. N., & Das, A. (2006). Research on underutilized fruits in West Bengal. *Acta Horticulturae*, *752*, 85–88. https://doi.org/10.17660/ActaHortic.2007.752.10

Mazumder, M., & Sarkar, A. K. (2019). Ethnobotanical survey of indigenous leafy vegetables consumed in rural areas of Terai-Dooars region of West Bengal, India. *Journal of Threatened Taxa*, *11*(12), 14612-14618. https://doi.org/10.11609/jott.5039.11.12.14612-14618

Meena, V. S., Gora, J. S., Singh, A., Ram, C., Meena, N. K., Pratibha, Rouphael, Y., Basile, B., & Kumar, P. (2022). Underutilized Fruit Crops of Indian Arid and Semi-Arid Regions: Importance, Conservation and Utilization Strategies. *Horticulturae*, *8*(2), 171. https://doi.org/10.3390/horticulturae8020171

Mishra, A., Swamy, S. L., Thakur, T. K., Bhat, R., Bijalwan, A., & Kumar, A. (2021). Use of wild edible plants: Can they meet the dietary and nutritional needs of indigenous communities in Central India. *Foods*, *10*(7), 1453. https://doi.org/10.3390/foods10071453

Naskar, K., & Mandal, R. (1999). Ecology and biodiversity of Indian mangroves (Vol. 1). *Daya Books.*: https://agris.fao.org/search/en/providers/122535/records/65dddfb54c5aef494fd6348d

Padulosi, S., Thompson, J., & Rudebjer, P. (2013). Fighting poverty, hunger and malnutrition with neglected and underutilized species (NUS): needs, challenges and the way forward. Bioversity International. http://dx.doi.org/10.13140/RG.2.1.3494.3842

Sarkar, B., Basak, M., Chowdhury, M., & Das, A. (2018). Importance of Diplazium esculentum (Retz.) Sw (Athyriaceae) on the lives of local ethnic communities in Terai and Duars of West Bengal-A report. *Plant Archives*, *18*(1), 439-442. https://www.cabidigitallibrary.org/doi/pdf/10.5555/20183312334

Sarkar, D., Jha, P. K., Balasani, R., Kar, S. K., Seth, V., Rakshit, A., ... & Ercişli, S. (2024). Underutilized edible fruit species of the Indo-Gangetic Plains: A systematic review for food security and land degradation neutrality. *Turkish Journal of Agriculture and Forestry*, *48*(3), 443-469. https://doi.org/10.55730/1300-011X.3193

Talucder, M. S. A., Ruba, U. B., & Robi, M. A. S. (2024). Potentiality of Neglected and Underutilized Species (NUS) as a future resilient food: A systematic review. *Journal of Agriculture and Food Research*, *16*, 101116. https://doi.org/10.1016/j.jafr.2024.101116.

Terangpi, H., Maibangsa, M., Baruah, N., Bathari, M., & Bharadwaj, K. (2024). Exploring the Value and Potential to Commercialize Underutilized Leafy Vegetables Found in Karbi Anglong District, Assam, India. *International Journal of Environment and Climate Change*, *14(3)*, 743-754. https://doi.org/10.9734/ijecc/2024/v14i34082