

Indigenous processing practices for reducing anti-nutritional factors in wild edible foods of India

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DOI: <https://doi.org/10.5281/zenodo.18099099>

Article Details: Received: 2025-12-03 | Accepted: 2025-12-30 | Available online: 2025-12-30



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Abstract: Wild edible plants constitute an important component of traditional food systems among indigenous communities in India. However, many wild foods contain anti-nutritional or toxic compounds that necessitate specific processing techniques before consumption. The present study documented indigenous practices employed to remove anti-nutritional factors from selected wild edible plants based on field surveys conducted in Odisha and Jharkhand. A total of nine wild food species belonging to six families were recorded, with Dioscoreaceae being the most represented family. Traditional detoxification methods included successive boiling with repeated discarding of water, soaking and roasting. Tubers, corms, rhizomes, fruit coats, flowers and bulbils were processed using species-specific techniques to ensure safety and palatability. These practices reflected deep ecological knowledge and played a crucial role in food security and health among indigenous communities. The current study highlighted the scientific relevance of traditional processing methods and highlighted the need to conserve indigenous knowledge systems.

Keywords: Anti-nutritional factors, detoxification, traditional food processing, wild edible plants

Introduction

Wild edible plants play a significant role in the subsistence, nutrition and cultural traditions of indigenous communities across India (Mishra et al., 2021). In forested and tribal-dominated regions, these plants contribute substantially to household food security, especially during lean agricultural periods, droughts and times of economic hardship (Morrow et al., 2024). Tubers, rhizomes, corms, fruits, flowers and bulbils harvested from wild plant species are commonly consumed either as staple foods or supplementary resources (Bajgai et al., 2023). Despite their nutritional importance, many wild edible plants contain anti-nutritional factors or toxic compounds, such as oxalates, tannins, alkaloids, saponins, cyanogenic glycosides and calcium oxalate crystals (Wassie, 2025). These compounds can cause bitterness, irritation, reduced nutrient bioavailability or acute toxicity if consumed without appropriate processing. Species belonging to families such as Dioscoreaceae and Araceae are particularly known for their toxic or acrid nature in raw form (Adamu et al., 2022). Over generations, indigenous communities have developed species-specific processing techniques to detoxify wild foods, rendering them safe and palatable (Heaney et al., 2024). These practices include repeated boiling with discarding of water, soaking, roasting, fermentation and drying. Such methods are based on empirical knowledge, careful observation and long-term interaction with the local environment (Sathya and Siddhuraju, 2015; Kumar et al., 2017; Yiblet, 2024). However, rapid socio-economic changes, declining dependence on forest resources and the erosion of traditional knowledge systems have resulted in a gradual loss of these practices (Tran et al., 2025). Systematic documentation of indigenous food processing knowledge is therefore essential not only for cultural preservation but also for understanding their scientific basis and potential applications in sustainable food systems (Kuyu and Bereka, 2019). The present study aims to document and analyze indigenous practices employed to remove anti-nutritional factors from selected wild edible plants based on field surveys conducted in Odisha and Jharkhand, two states rich in both biological and cultural diversity.

Materials and Methods

The present study was conducted in selected forest-adjacent and tribal-inhabited regions of Odisha and Jharkhand, eastern India, during September to November, 2025. These regions are characterized by tropical deciduous forests, undulating topography, seasonal streams and diverse agro-ecological conditions. Indigenous communities in these areas maintain a close relationship with forest ecosystems and rely extensively on wild plant resources for food, medicine and livelihood. Field surveys were carried out through repeated visits to villages and forest sites. Data were collected using semi-structured interviews, informal discussions and participant observation involving knowledgeable elders, women and local foragers who are primarily responsible for food preparation (Jena et al., 2025).

Information recorded included:

- a) Botanical name and local/common name of the species
- b) Plant family
- c) Edible plant part(s)

- d) Presence of bitterness, irritation or toxicity
- e) Indigenous processing methods used to remove anti-nutritional factors

Traditional knowledge was cross-verified through repeated interactions and consensus among informants to ensure reliability. Plant specimens were collected and identified using standard floras and taxonomic keys.

Results and discussion

A total of nine species of wild edible plants, representing six different families, were documented (Table 1). The family Dioscoreaceae was dominant, represented by five species, followed by Araceae, Fabaceae and Sapotaceae. The edible parts included tubers, bulbils, rhizomes, corms, fruit coats and flowers. The most frequently recorded detoxification method was successive boiling with repeated discarding of water, particularly for tubers and corms. This method was consistently applied to species such as *Dioscorea bulbifera*, *Dioscorea pubera*, *Dioscorea pentaphylla*, *Dioscorea hispida*, *Dioscorea oppositifolia* and *Amorphophallus paeoniifolius* (Plate 1). In several cases, boiling was carried out two to three times until bitterness or acidity was completely removed. Bulbils of certain *Dioscorea* species were roasted over fire before consumption, a practice believed to neutralize toxic compounds and improve taste. Flowers of *Indigofera cassioides* and fruit coats of *Madhuca longifolia* were boiled, followed by discarding the water and soaking before cooking, indicating targeted removal of water-soluble anti-nutritional substances. These practices demonstrate careful differentiation of processing techniques based on plant species and edible parts. The indigenous practices documented in this study reflect a sophisticated understanding of plant toxicity and food safety. Successive boiling with discarding of water is a widely recognized method for removing water-soluble anti-nutritional compounds such as tannins, alkaloids, oxalates and cyanogenic glycosides. The repeated replacement of water enhances leaching of these compounds, reducing bitterness and toxicity. Roasting of bulbils serves as an effective thermal treatment that likely deactivates heat-labile toxins and reduces moisture content, thereby improving digestibility and shelf life. Soaking after boiling further aids in removing residual bitterness and undesirable compounds.

Table 1: Indigenous practices to remove anti-nutritional factors from selected wild foods of India

Name	Common name	Family	Method to remove
<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson (Plate 1a)	Elephant Foot Yam	Araceae	The corm undergoes successive boiling, and the final water is discarded before cooking.
<i>Colocasia esculenta</i> (L.) Schott (Plate 1b)	Taro	Araceae	The rhizome is boiled and the water is discarded. The boiled rhizome is

			then used for cooking.
<i>Dioscorea bulbifera</i> L.	Air Yam	Dioscoreaceae	The tuber is subjected to successive boiling and the final water is discarded before cooking. Bulbils are roasted and then consumed.
<i>Dioscorea hispida</i> Dennst.	Asiatic Bitter Yam	Dioscoreaceae	The tuber undergoes successive boiling and the final water is discarded before cooking.
<i>Dioscorea oppositifolia</i> L.	Cinnamon Vine	Dioscoreaceae	The tuber undergoes successive boiling and the final water is discarded before cooking.
<i>Dioscorea pentaphylla</i> L.	Five leaf Yam	Dioscoreaceae	The tuber undergoes successive boiling and the final water is discarded before cooking. Bulbils are roasted and then consumed.
<i>Dioscorea pubera</i> Blume	Wild Yam	Dioscoreaceae	The tuber is subjected to successive boiling and the final water is discarded before cooking. Bulbils are roasted and then consumed.
<i>Indigofera cassioides</i> Rottler ex DC.	Birdsville Indigo	Fabaceae	Flowers are boiled in water and the water

(Plate 1c)			is discarded. The boiled leaves are then soaked and used for cooking.
<i>Madhuca longifolia</i> (L.) J.F.Macbr. (Plate 1e)	Indian Butter Tree	Sapotaceae	The fruit coats are boiled and the water is discarded. The boiled fruit coats are then used for cooking.

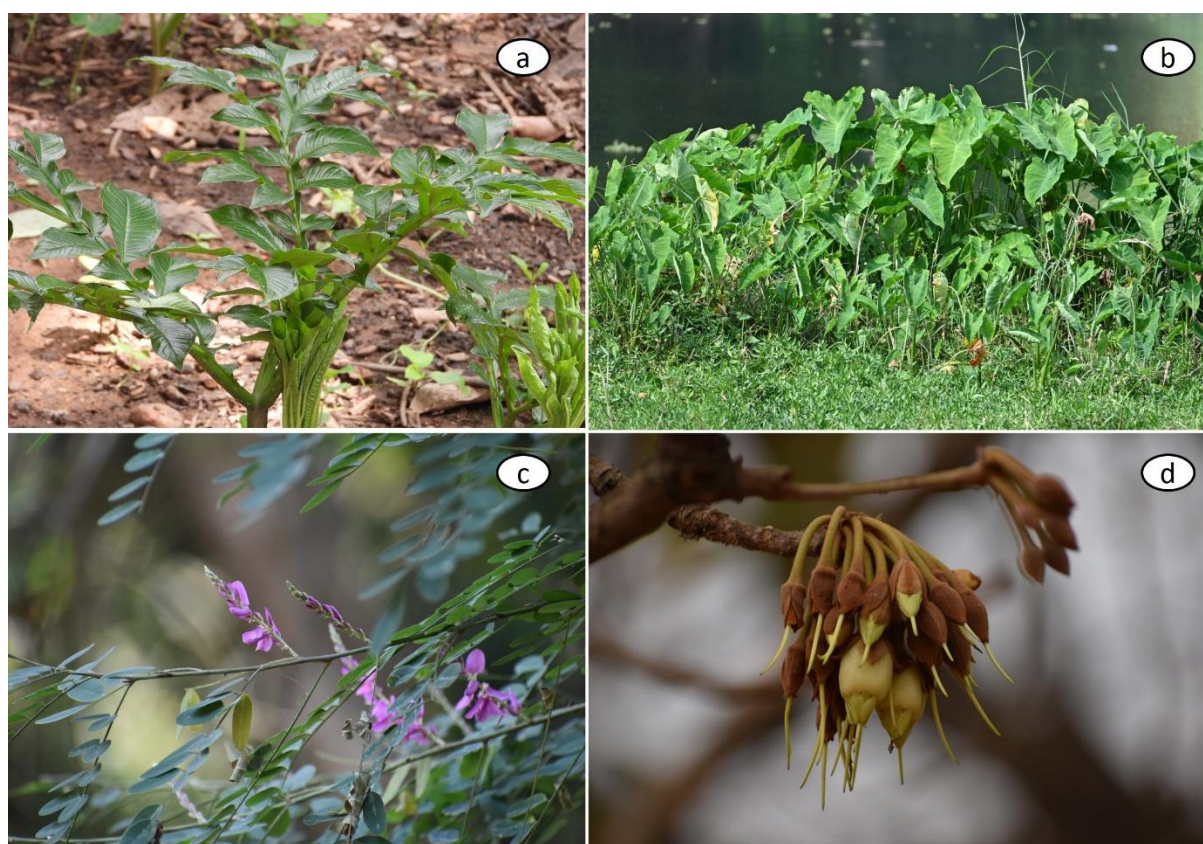


Plate 1: Some common wild edible species; a) *Amorphophallus paeoniifolius*, b) *Colocasia esculenta*, c) *Indigofera cassioides* and d) *Madhuca longifolia*

The dominance of *Dioscorea* species in the documented list highlighted both their nutritional importance and inherent toxicity. Indigenous communities possess detailed knowledge of which species require extensive processing and which plant parts are safer to consume. This knowledge is crucial for preventing food poisoning and ensuring sustainable utilization of forest resources. Scientifically, many of these traditional techniques align with modern food processing principles. However, they remain largely undervalued and underutilized in contemporary food systems. Recognizing and validating

indigenous detoxification methods can contribute to food security, nutritional diversity and the promotion of underutilized wild food resources.

Conclusion

The present study documents indigenous practices employed to remove anti-nutritional factors from selected wild edible plants in Odisha and Jharkhand. Techniques such as successive boiling, soaking and roasting are species-specific, effective and deeply rooted in traditional ecological knowledge. These practices play a vital role in ensuring food safety, enhancing palatability and sustaining dietary diversity among indigenous communities. Systematic documentation and scientific evaluation of such knowledge are essential for its conservation and potential integration into sustainable food and nutrition strategies.

Acknowledgements

The authors sincerely acknowledge the indigenous communities of Odisha and Jharkhand for generously sharing their traditional knowledge and experiences. Their cooperation and hospitality during field surveys are gratefully appreciated.

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