TRENDS IN CURRENT BIOLOGY
ISSN 2584-2080 (online)
Vol 2(4): 05–09
https://doi.org/10.14719/tcb.4634

HORIZON e-Publishing Group
in association with atom e-Publishing

RESEARCH COMMUNICATIONS

Underutilised wild edible plants (future smart food): A review on its diversity, nutritional properties and importance

Prachi Baliyan & Afroz Alam*

Department of Bioscience and Biotechnology, Banasthali Vidyapith, Tonk, Rajasthan - 304022, India

*Email: aafroj@banasthali.in

OPEN ACCESS

ARTICLE HISTORY

Received: 12 August 2024
Accepted: 20 September 2024

Available online
Version 1.0 : 01 October 2024

Additional information

Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

Reprints & permissions information is available at https://horizonepublishing.com/journals/index.php/TCB/open_access_policy

Publisher's Note: The article processing was done by atom e-Publishing, Thiruvananthapuram, India. Horizon e-Publishing Group remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

CITE THIS ARTICLE

Baliyan P, Alam A. Underutilised wild edible plants (future smart food): A review on its diversity, nutritional properties and importance. Trends in Current Biology. 2024; 2(4): 05-09. https://doi.org/10.14719/tcb.4634

Abstract

Underutilised wild edible plants (UWEPs) have great nutritional values. Researchers are becoming more and more aware of these plants because of their susceptibility to adverse climatic and environmental conditions. The documentation of the diversity of UWEP species and their potential role in socio-economic activities, as well as Traditional knowledge related to them and threats to them, were highlighted in this review. Additionally, the neglect of UWEPs, which is closely linked to a lack of knowledge about their nutritional and economic value, was also highlighted.

Keywords

Underutilised; diversity; tribal; disease; biofortification

Introduction

The provision of wholesome, nutritional food to hungry and undernourished populations has been a significant challenge, particularly in developing countries (1). Today, the consumption of nutrient-poor and highly processed foods is rising whereas the consumption of healthful foods is well below the reference dietary intake (2). There has been a significant global worsening of food insecurity due to the coronavirus 2019 (SARS CoV-2) pandemic, which poses a risk of long-term malnutrition and adverse health effects (2). Future nutrient-rich food sources need to be found through the development of new, alternative and somewhat ignored plants (3). Crops that "are neither cultivated commercially on a large scale nor widely traded" are referred to as underutilised crops (1). These crops are known as location-specific. Researchers, farmers, policymakers, decision-makers, technology providers and extension services paid these wild crops a little amount of attention (3).

The term "underutilised wild edible plants" refers to overlooked, minor, orphan, local and promising species that have been exploited for food, fibre, fodder, oil or medicinal uses for many years (4). UWEPs show that despite being abundant in a variety of functional characteristics, some underutilised herbs, roots, fruits, vegetables, flowers, yams, tubers, leaves and other plant parts are still unexplored (4). Underutilised Wild Edible Plants (UWEPs) contain beneficial nutrients and bioactive substances like quercetin, rutin, vitamins, kaempferol, minerals, chicoric acid, caftaric acid, rosavins, salidrosides and anthraquinones (2). There have been demands for a paradigm shift in agriculture to consider unconventional routes such as NUCS (neglected and underused crops) to serve as prospective crops (5). NUCS are nutrient-dense, environmentally resilient, economically feasible and regionally accessible or adaptable, they might be referred to as Future Smart Food (5). Wild fruits can be used to treat a variety of ailments including cardiovascular problems, diabetes, inflammations, etc, due to their high fibre and antioxidant content (6).

Genetic degradation of these vegetables has been caused by the use of high-yield hybrid varieties, changes in dietary preferences, overharvesting, habitat degradation, population pressure and climatic change. In rural places, the existence of underutilised plants is dwindling at a rapid rate, leading to significant religious, cultural and genetic degradation (7). Groundwater depletion, desertification and climate change all draw attention to crops that are adapted to harsh environmental conditions. By concentrating on neglected and underutilised crops, we can fight micronutrient shortages, maintain diversity and provide a balanced diet (1).

Diversity of Underutilised Wild Edible Plants in the World

There are millions of known plant species worldwide. Nine species account for more than 75% of the world's plant-derived energy out of the about 120 known plant species that are farmed for food. Over a hundred UWEP species are still underappreciated globally, even though some of them may be able to mitigate the world food crisis. Therefore, the emphasis should be shifted from staple food crops to a diet based on UWEPs. According to reports, UWEPs are heavily used in Malaysia, India, Philippines and Nepal; considerable use of UWEPs for food and medicine is found in Sri Lanka, Papua New Guinea and Indonesia (8). The distribution of these edible plants is shown in Fig.1.

Numerous researchers have investigated various UWEPs, with an emphasis on food herbs and wild woody plants in Nigeria, Pakistan and northwest Ethiopia. They have verified and thoroughly assessed about one hundred plant species. Among them, plants rich in bioactive chemicals were identified such as *Artemisia scoparia* Waldst. & Kit., *Amaranthus viridis* L., *Justicia adhatoda* L., *Hedera nepalensis* K. Koch, *Galium aparine* L. and *Urtica dioica* L. In contrast, a review of documented traditional knowledge of these plants in Kenya's western and Nyaza provinces led to the identification of *Cleome gynandra* L. (spider plant) as a UWEP species (6). The results show that the spider plant is highly consumed as a vegetable. Wild barbada or *Indigofera glandulosa* J. C. Wendl., grows throughout, Indonesia, North Australia and India. Another leafy spice herb that grows in tropical areas of India is called spiny coriander or *Eryngium foetidum* L., which is also eaten as a vegetable (10). Grass pea, Adzuki bean, rice bean, bambara groundnut [*Vigna subterranea* (L.) Verdc.] and itchy bean [*Mucuna pruriens* (L.) DC.] are among the other grain legumes that are still underutilised (6). Among UWEP several oil seeds contain hydrocarbons, triterpene alcohols and sterols, like *Moanodora tenuifolia* Benth., *Antiaris africana* Engl., and *Telfairia occidentalis* Hook.f. (9).

Diversity of UWEPs in different states of India

About 800 plant species are thought to be used as food in India, primarily by the tribal people. In the Indian subcontinent, 9500 wild plants are used by over 53 million tribes from 550 different cultures for medicine, food, fodder, fibre, fire, essence and other purposes (10). Only 19% of the documented underused edible plant species are regularly used compared to 81% of them remaining unused (8). The tribal communities utilise Indigenous medicinal plants to address their everyday medical requirements. These plants have gained recognition as a valuable resource for discovering new pharmacological and nutraceutical sources, as they provide an affordable substitute for costly pharmaceuticals (11). The distribution of UWEPs in India is shown in Table 1.

Functional Properties and Importance of UWEP

By utilising the untapped potential of UWEPs (Underutilized Wild Edible Plants), we can offer a significant answer to food insecurity (4). Regular consumption of starchy plants, particularly roots and grains are common in rural regions where it can lead to vitamin (micronutrient) deficiencies and protein-energy malnutrition (9). It is essential to diversify and use WEP (wild edible plants) to resolve the problem.

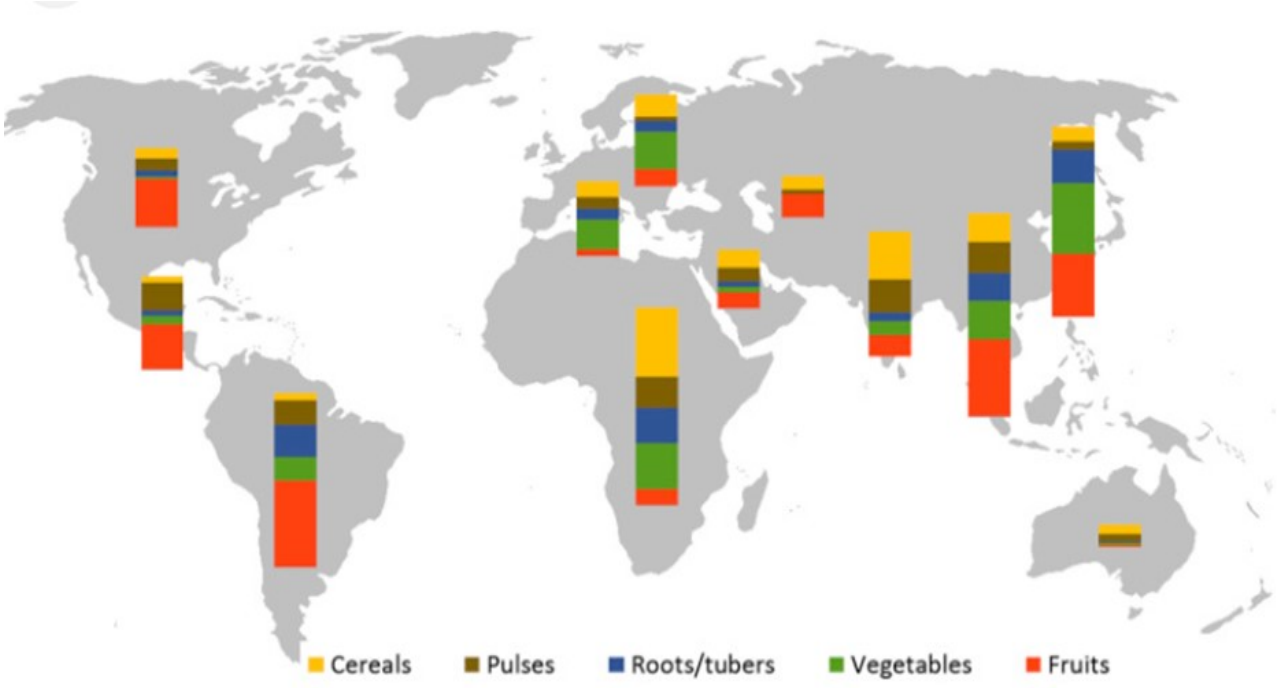

Figure 1. Distribution of neglected and underutilised plants in the world (20).

Table 1: Neglected and Underutilised plants found in the different regions of India

S. No.	Scientific name	Regions	Family	Common name	Method of consumption or part consumed	Beneficial effects	References
1	*Cordia dichotoma* G. Forst.	**North Indian region**	Boraginaceae	Indian cherry	Fruit	Anticancer, wound healing, antiulcer and anticancer	(12)
2	*Acacia modesta* Wall.	**North Indian region**	Leguminosae	Phulai	Gum (Fried with ghee and eaten)	Leprosy, cough, venereal diseases and backache	(12)
3	*Artocarpus hirsutus* Lam.	**South Indian region**	Moraceae	Kattupala	Ripe fruits	Diabetes, anaemia, malarial fever, asthma, pimples and ulcers.	(13)
4	*Physalis minima* L.	**South Indian region**	Solanaceae	Sotakku thakkali	Ripe fruits	Tonic diuretic, laxative and applied in inflammations,	(13)
5	*Azadirachta indica* A.Juss.	**Central India region**	Meliaceae	Neem	Fresh leaves	Act as exfoliant, treat arthritis.	(14)
6	*Moringa oleifera* Lam.	**Central India region**	Moringaceae	Munga sag	Leaves frying or roasting	Cardiovascular health, heal body and build muscle	(14)
7	*Lobelia alsinoides* Lam.	**Central India region**	Companulaceae	Bari ara	Leaves and shoots	Treat Jaundice	(14)
8	*Caralluma adscendens* (Roxb.) R.Br.	**West India**	Apocynaceae	Carrluma	Vegetables	Increase endurance and quench thirst, antidiabetic and analgesic.	(15)
9	*Semecarpus anacardium* L.f.	**West India**	Anacardiaceae	Bibba	Roasted fruit	Fruits are used in Ayurveda medicine for improving sexual power and cough dosha.	(15)
10	*Setaria italica* (L.) P.Beauv.	**Northeast India**	Poaceae	Foxtail Millet	Cereal crops	Astringent and diuretic agents	(16)
11	*Clerodendrum glandulosum* Lindl.	**Northeast India**	Lamiaceae	Glory Hill Bower	Leafy vegetable	Hypertension, insulin resistance.	(16)
12	*Bauhinia vahlii* Wight & Arn.	**East India**	Leguminosae	Sialpatra	Edible seeds	Seeds are tonic and aphrodisiac.	(17)
13	*Callicarpa tomentosa* (L.) L.	**East India**	Lamiaceae	Badopatri	Leafy vegetable	Antiseptic and its extract are used to treat wounds, boils and itches.	(17)
14	*Bomabax ceiba* L.	**Union territory (Jammu and Kashmir)**	Malvaceae	Simbal	Vegetable	Dysentery, skin eruptions, wounds	(18)
15	*Ficus palmata* Forssk.	**Union territory (Jammu and Kashmir)**	Moraceae	Fakwara	Eaten raw (leaves or fruits	Leukoderma and skin eruptions	(18)

The main element in fully utilising the available resources is the number of antinutrients in wild edible components (9). Since they are abundant in vital amino acids, energy values proteins and minerals, they were used as sources of bio-fortification (12). Additionally, these plants were screened for myristic, arachidic, palmitic, lauric lignoceric, elaidic, myristoleic and heneicosanoic acids. Research has identified several functional properties like the ability to foam, gel and contain bioactive compounds such as phenols, antioxidants, saponins, trypsin inhibitors and oligosaccharides that act as anti-nutrients. These properties can be detoxified through processing techniques like cooking, thermal treatments and soaking, transforming them into an edible form (19).

Wild underutilized plants are pharmacologically used as a role in antipyretic, antiaging, antioxidant, antimicrobial, anticancer, antidepressant, anti-inflammatory, antihepatotoxic, antiulcer, antihyperlipidemic, antidiabetic, anti-artherosclerosis activity, *etc.* (19, 17). These plants can be used to fortify staple foods to increase their bioactive ingredients and micronutrient content (2). Since underutilised fruit crops do not require outside inputs like fertiliser or irrigation, they can be employed for sustainable land use. Undomesticated landraces can occasionally withstand situations that high-bred cultivars cannot because they have adapted to a variety of environments (9). Growing underutilised crops on marginal and wastelands is one strategy to exploit these sites for agriculture and to satisfy the increasing demand for food (4). Most of the identified UWEP species are highly adaptive to salinity, drought, mineral toxicity, extreme temperatures and acidity. They also exhibit strong tolerance to pests and diseases as well (9).

With all of these factors taken into account, there is a great chance to create a novel market trend by utilising UWEP species. Around the world, UWEP species are currently being used to develop commercialised new products and value-added products such as dried fruits or vegetables, fruit juice, confectionaries, preserved products, frozen puree, cane products, heat-processed products (sauce, jelly, jam, candy and dehydrated products), etc. (19). Another possible market strategy for UWEF is the development of nutraceuticals (4). Therefore, in the ever-changing world where unfavourable climatic and human conditions harm natural flora around the planet, it is imperative to find and investigate underutilised plants (9).

Conclusion

Underutilized species can significantly contribute to sustainable agriculture in four major areas: food security and better nutrition, ecosystem stability, increased income for the rural poor and cultural diversity associated with local food habits and religious and social rituals. To persuade academics to investigate UWEP, this review aims to compile and share that expertise. However, there is still a wide knowledge gap about examining the gene pool to assess the phytochemicals, other nutritional characteristics and advantageous secondary metabolites found in these UWEP resources. Therefore, it is necessary to raise community awareness through education and do additional research on the nutritional content analysis and economic valuation of promising UWEPs.

Acknowledgements

The authors of this article would like to thank Prof. Ina Aditya Shastri, Vice-Chancellor of Banasthali Vidyapith in Rajasthan, for her encouragement and assistance. We thank DBT for funding the Bioinformatics Centre, Banasthali Vidyapith, and the Department of Bioscience and Biotechnology, Banasthali, through the FIST program, which enabled DST to assist in networking (Grant Number: BT/HRD/01/28/2020).

Authors' contributions

AA: Supervision, Critical review and Validation of draft

PB: Conceptualization, Data curation, Writing-Original draft preparation, reviewing and editing of draft.

Both the authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: The authors have no conflict of Interest.

Ethical issues: None.

References

1. Imathiu S. (2021). Neglected and underutilized cultivated crops with respect to indigenous African leafy vegetables for food and nutrition security. Journal of Food Security. 2021;9(3):115-25. https://doi.org/10.12691/jfs-9-3-4
2. Nirmala C, Shahar B, Dolma N. Santosh O. Promising underutilised wild plants of cold desert Ladakh, India for nutritional security and health benefits. Applied Food Research. 2022; 2(3): 100145. http://dx.doi.org/10.1016/j.afres.2022.100145
3. Bhatti RC, Kaur R, Kumar A, Kumar V, Singh S, Kumar P, et al. Nutrient component analyses of selected plants from Hamirpur district of Himachal Pradesh, India: An evaluation for future food. Vegetos. 2021; 35(2):545-50. http://dx.doi.org/10.21203/rs.3.rs-143807/v1
4. Peduruhewa PS, Jayathunge KGLR, Liyanage R. Potential of underutilised wild edible plants as the food for the future - A Review. Journal of Food Security. 2021; 9(4):136-47. http://dx.doi.org/10.12691/jfs-9-4-1
5. Chandra MS, Naresh RK, Thenua OVS, Singh R, Geethanjali D. Improving resource conservation, productivity and profitability of neglected and underutilised crops in the breadbasket of India: A review. The Pharma Innovation Journal. 2020; 9(3):685-96.
6. Jiru NA, Gemede HF, Keyata EO. Nutritional composition and antioxidant properties of selected underutilised wild edible fruits in East Wollega Zone, Western Ethopia. International Journal of Fruit Science. 2023; 23(1):34-45. http://dx.doi.org/10.1080/15538362.2023.2166649
7. Regmi M, Shrestha A, Paudel HR. Documentation of wild and underutilised vegetables: potential for conservation and

utilisation. Banko Janakari. 2022; 32(2):77-86. http://dx.doi.org/10.3126/banko.v32i2.50898

8. Mayes S, Massawe FJ, Alderson PG, Roberts JA, Azam-Ali SN, Hermann. The potential for underutilized crops to improve security of food production. Experimental Botany.2011; 63 (3):1075-79. http://dx.doi.org/10.1093/jxb/err396
9. Keyata EO, Tola YB, Bultosa G, Forsido SF. Proximate, mineral, and anti-nutrient compositions of underutilized plants of Ethiopia: Figl (*Raphanus sativus* L.), Girgir (*Eruca sativa* L.) and Karkade (*Hibiscus sabdariffa*): Implications for in-vitro mineral bioavailability. Food Research International. 2020; 137(1). http://dx.doi.org/10.1016/j.foodres.2020.109724
10. Bhatt R, Karim, AA. Exploring the nutritional potential of wild and underutilized legumes. Comprehensive Reviews in Food Science and Food Safety. 2009; 8(4):305-31. http://dx.doi.org/10.1111/j.1541-4337.2009.00084.x
11. Sharma SK, Alam A. Ethnobotanical importance of families Apocynaceae, Asteraceae and Fabaceae (Angiosperms) among Rajasthan tribes, India. Plant Science Today. 2024. 11(sp1). https://doi.org/10.14719/pst.3354
12. Sharma A, Batish DR, Sharma A, Singh HP. Survey of some underutilized edible plants in outskirts areas of Chandigarh. In Biological Forum. 2015; 7(2):405-10.
13. Radhakrishnan M. A survey of the wild edible plants Nilgiri district, Tamil Nadu. International Journal of Ethnomedicine and Pharmacological Research journal. 2015;1(1):44-54.
14. Kumari B, Solanki H. The traditional knowledge of wild edible leaf used by tribal people in Chhattisgarh. International Journal of Plant and Environment. 2019; 5(4):284-92. http://dx.doi.org/10.18811/ijpen.v5i04.9
15. Mahadkar D, Patil BY. Role of wild edible fruits used by the tribals from Shahpur taluka of Thane District. Asian J Pharm Clin Res. 2023; 16(7):96-98. http://dx.doi.org/10.22159/ajpcr.2023.v16i7.47534
16. Deb CR, Khruomo N, Paul A. Underutilized edible plants of Nagaland: a survey and documentation from Kohima, Phek and Tuensang District of Nagaland, India. American Journal of Plant Sciences. 2019; 10(1):162-78. http://dx.doi.org/10.4236/ajps.2019.101014
17. Saravanan R, Kannan D, Panda SP, Datta S. (2020). Traditionally used wild edible plants of Kuldiha Wildlife Sanctuary (KWLS), Odisha, India. Journal of Pharmacognosy and Phytochemistry. 2020; 9(6):482-88.
18. Manhas RK, Bhagat N, Upadhyay H, Gupta SK. Wild Edible Plants of Purmandal block of District Samba, J&K (UT), India. Ethnobotany Research and Applications. 2022; 24(12):1-19. http://dx.doi.org/10.32859/era.24.12.1-19
19. Fathima KR, Tresina, Soris P, Mohan VR. Nutritional and antinutritional assessment of *Mucuna pruriens* (L.) DC var. *pruriens* an underutilized tribal pulse. Advances in Bioresearch. 2010; 1(2):79-89.