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Wild edible vegetables of India: nutritional and ethnobotanical insights

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Wild edible vegetables (WEVs) constitute an understudied resource that forms part of agrobiodiversity and can help ensure food security and dietary diversity in India. This paper provides an overview of the ethnobotanical and nutritional properties of WEVs found in different ecological zones in India, based on studies from peer-reviewed scientific publications and ethnobotanical documentation, as well as field visits during the *Ran Bhaji Mahotsav in Maharashtra*, where native communities showcase their wild vegetable varieties. The review highlights that numerous WEV species are rich sources of essential micronutrients, antioxidants, bioactive phytochemicals, and dietary fiber often demonstrating nutritional values comparable to or higher than commonly cultivated vegetables. These plants are valuable not only for their nutritive value but are also essential ingredients in the diets, medicines, and livelihoods of rural and tribal populations. Degradation of natural habitats, shift in taste preferences, and loss of indigenous knowledge are some of the reasons for their declining importance and need for preservation. The scientific study of WEVs and incorporation into sustainable harvest practices will result in more diverse diets.

Keywords: Biodiversity conservation, Ethnobotany, Nutritional security, Sustainable diets, Traditional knowledge, Wild edible vegetables (WEVs)

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Food and nutrition security is one of the most critical global challenges in the 21st century[1]. Two billion people are deficient in at least one micro-nutrient, making them more susceptible to disease and diminishing their economic capacity[2]. Such deficiencies "hidden hunger", are major contributors to many of the global health problems and social economic inequalities. Nutrients are extremely important for human growth, development, maintenance and they can be related to the immune status, productivity and in development defects[3]. There were more than 3.7 million child deaths due to underweight and iron, zinc, vitamin A deficiency caused 750,000 to 850,000 deathsin 2000[4]. The nutritional insecurity in the rural and tribal areas in India is being countered by the use of wild edible plants (WEPs), also known as wild vegetables. These preserved traditional foods add dietary diversity by providing the needed micronutrients and contribute to a sustainable food system. Latest studies reveal that most of the WEPs contain a promising biological source of many complex sugars, vitamins and minerals, and thus they could be the best source in the fight against malnutrition[5].

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These crops can enrich common diets by supplying critical nutrients like fiber, carbohydrates, iron, zinc, calcium, potassium and vitamins[6,7]. The wild green leafy vegetables contain high levels of amino acids, vitamins, folic acid, fatty acids, minerals, and dietary fibers. These wild green leafy vegetables are important sources of nutrition, particularly for the vegetarians and people without easy access to markets, since these help in the formation of hemoglobin and promote good health. The biodiversity of India constitutes an important gene pool of wild edible plants. Wild edibles in Madhya Pradesh are ethnically important. Similarly in Odisha of India 150 wild edible fruit species are being consumed by rural population (varying degree) in almost 2,800 vascular species existing in the state which comes from the eastern deciduous forests of India[8].

Wild edible plants are nutritionally rich and ethnomedicinally significant, used for the management of various ailments traditionally[9]. Generally tough, adapted to marginalized lands and many are micronutritionally superior to crop species, thus enabling climate-resilient agricultural and food security. This potential is largely untapped because of habitat loss, eroded knowledge and practices, low levels of

awareness and weak markets. Information about their identification, use and nutritional content is not yet well-documented. This review serves to synthesize the current information on wild edible vegetables in various parts of India by underscoring their nutritional significance and ethnobotanical values. Additionally, the different prospects of their controlled cultivation, development of value-added products and promotion in the markets of urban centers are presented here with a view to establishing a strong link between conservation of biodiversity and human nutrition. It thus, offers the opportunity to link biodiversity conservation with nutrition, food security and rural development by making them part of a sustainable management system with appropriate management practices in respect of wild harvest and cultivation.

Review methodology

This review brings together details of diversity, nutritional composition, and ethnobotanical significance of wild edible vegetables (WEVs) available in India. Scientific literature related to the topic was retrieved from popular online database repositories like *Google Scholar, Web of Science, Scopus, Science Direct,* and *PubMed* besides from ethnobotanical literature and government publications. The literature search involved articles published between the years 2000 and 2024. Key terms used during literature search include wild edible vegetables, wild edible plants, ethnobotany, traditional food plants, nutritional composition, and India. Only those papers giving information regarding species diversity, nutrition, and ethnobotanical uses of WEVs were chosen for analysis.

In addition to conducting the review of literature, field studies were carried out at the time of Ran Bhaji Mahotsav in Nagpur, Maharashtra, where members of various tribal communities of different villages bring their local wild edible vegetables which are used seasonally by them. Pictures of many wild edible vegetables during the event were taken with their exact locations using the global positioning system (GPS). This gathered information was then analyzed to emphasize the importance of WEVs in India.

Diversity and distribution of wild edible vegetables in India

The variety and distribution of the wild edible vegetables in India are diverse due to the country's rich biodiversity and culture. Wild vegetables form an important source of nutrition and contribute to food security among the rural population of India. There exists a high degree of diversity when it comes to wild vegetables in India, with many varieties used for nutritional and medicinal purposes.India, a mega diverse country, harbors about 1,403 WEV species across 184 families, dominated by Leguminosae, Poaceae, and Compositae[10]. Their diversity reflects ecological adaptability and traditional human and plant interactions. Regional records include 662 species in Arunachal Himalaya[11], 91 in the Trans-Himalayan Cold Desert[12], 44 in Maharashtra's Motala Taluka[13] and 70 used by Mizoram's ethnic communities. Such vegetables also have varied edible portions that include leaves, buds, tubers, fruits, and seeds, which provide nourishment on a seasonal basis and serve as food supplements when crops fail. Examples of such crops include leafy crops such as *Chenopodium album*, *Amaranthus viridis,* and *Urtica dioica*. Examples also include root crops such as *Amorphophallus paeoniifolius* and *Dioscorea,* and fruits from crops such as *Momordica dioica* and *Parkia timoriana.* Some of the WEVs have very high concentrations of vitamin A and minerals including calcium, iron, and folic acid. *Chenopodium album* and *Urtica dioica* are examples of plants that contain a high concentration of minerals. Also we see that plants like *Centella asiatica* and *Houttuynia cordata* have bioactive phytochemicals which are medicinal and antioxidant in nature thus which puts forth the value of WEVs in traditional diets.

WEVs, which are harvested from forests, fallow land, and kitchen gardens, have low cost, wide availability and cultural significance (especially in tribal and underserved communities). In certain areas (e.g. Mizoram) traditional ecological knowledge allows for sustainable harvesting practices and more sales in local markets that support rural livelihoods; (Table 1) shows the range of different regions and ethnobotanical uses associated with various types of WEVs in India. Due to modernization, changes in diet, loss of habitat, and climate change, the availability of WEVs and their associated knowledge is declining. In order to make them sustainable, they need to be included in food security policies, along with in situ and ex situ conservation and adding value by marketing. Such steps will contribute towards food security and cultural preservation of India.

Importance of WEV

In India, WEVs play an important role in nutrition, culture, ecology, and livelihoods. It is rich in vitamins, minerals, and antioxidants, they support

Table 1 — Regional diversity and ethnobotanical uses of WEVs in India

Sr. No.	Region / Ecosystem	Representative WEVs (Scientific Name)	Local / Ethnobotanical Uses	Key References
1	Himalayan Region (Western & Eastern Himalayas)	*Urtica dioica* L.	Young leaves cooked as vegetable; used in soups; rich in iron & minerals	14
2	Himalayan Region	*Fagopyrum esculentum* Moench	Leaves & tender shoots consumed as leafy vegetable; eaten during fasting	14
3	Himalayan Region	*Chenopodium album* L.	Leaves cooked in curries; rich in vitamins & iron	14
4	Himalayan Region	*Amaranthus viridis* L.	Tender leaves boiled or fried; widely eaten leafy green	14
5	Himalayan Region	*Allium* spp.	Used as spice, vegetable, and medicine (digestive, antimicrobial)	14
6	Northeastern Region	*Acmella oleracea* (L.) R.K.Jansen	Leaves/shoots eaten as salad, fried, or boiled; also fodder & medicine; Season: Feb–Nov	15
7	Northeastern Region (Mizoram)	*Brassaiopsis hainla* Buch.-Ham.) Seem.	Leaves/shoots boiled as vegetable; also used for fencing; Season: Apr–Sep	15
8	Northeastern Region (Mizoram)	*Calamus erectus* Roxb.	Tender shoots boiled & eaten as vegetable; cane used in crafts; available year-round	15
9	Northeastern Region (Mizoram)	*Oroxylum indicum* (L.) Kurz	Fruits eaten raw/salad; also medicinal; Season: Aug–Nov	15
10	Northeastern Region (Mizoram)	*Parkia timoriana* (DC.) Merr.	Fruits eaten raw, fried, or mixed with pork; medicinal; Season: Oct–Apr	15
11	Northeastern Region (Mizoram)	*Senegalia pennata* (L.) Maslin	Young shoots boiled/fried; used as medicine & fencing; Season: Mar–May	15
12	Northeastern Region (Mizoram)	*Solena heterophylla* Lour.	Young shoots cooked with fermented pork; Season: Apr–Jun	–
13	Northeastern Region	*Houttuynia cordata* Thunb.	Leaves eaten raw in salads or stir-fried; medicinal	16
14	Western Ghats (Kerala, Karnataka, Maharashtra, Goa, Tamil Nadu)	*Dioscorea* spp.	Tubers boiled or roasted; important famine food	17
15	Western Ghats	*Centella asiatica* (L.) Urb.	Leaves eaten raw/in curry; used as memory tonic	17
16	Western Ghats	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Tubers cooked as curry; staple tribal food	17
17	Western Ghats	*Solanum torvum* Sw.	Fruits used in curries; medicinal	17
18	Central India (Chhattisgarh, Jharkhand, Odisha, Madhya Pradesh)	*Portulaca oleracea* L.	Consumed raw/cooked; rich in omega-3 fatty acids	16
19	Central India	*Amaranthus spinosus* L.	Leaves cooked as curry; common in tribal diets	16
20	Central India	*Dioscorea bulbifera* L.	Bulbils/tubers boiled or roasted	16
21	Arid & Semi-Arid Zones (Rajasthan, Gujarat, Deccan Plateau)	*Cleome gynandra* L.	Leaves cooked as vegetable; rich in vitamins	16
22	Arid & Semi-Arid Zones	*Boerhavia diffusa* L.	Leaves cooked in curries; medicinal diuretic	16
23	Arid & Semi-Arid Zones	*Momordica dioica* Roxb. ex Willd.	Fruits fried or curried; seasonal delicacy	16
24	Arid Region (Rajsthan)	*Capparis decidua* (Forssk.) Edgew.	Immature fruits pickled or cooked; key food in arid diets and used in folk medicine for cough and skin ailments.	18
25	Arid & Semi-Arid Zones	*Coccinia grandis* (L.) Voigt	Tender shoots/fruits eaten as vegetable	16
26	Coastal & Island Ecosystems (Andaman, Nicobar, Lakshadweep)	*Suaeda maritima* (L.) Dumort.	Halophytic leafy green; eaten as vegetable	19
27	Coastal & Island Ecosystems	*Salicornia brachiate* Roxb.	Consumed as salt-rich green vegetable	19
28	Coastal & Island Ecosystems	*Ipomoea aquatic* Forssk.	Leaves stir-fried; common in coastal diets	19
29	Coastal & Island Ecosystems	*Canavalia cathartica* Thouars	Seeds & pods eaten after boiling	19
30	Coastal & Island Ecosystems	*Pisonia grandis* R.Br.	Leaves eaten as vegetable in island diets	19

food security in rural and tribal communities while preserving traditional knowledge, promoting climate resilience, and providing supplementary income.

Nutritional security

Wild Edible Plants (WEPs) are a very important source of wild edible vegetables, and they are a very good source of protein, fat, carbohydrates, fiber, essential minerals (such as iron, zinc, calcium, potassium, and magnesium), and vitamins (such as A, C, and K). The many benefits of WEP use can help combat malnutrition and improve diet balance among rural and tribal populations[7]. For example, *Chenopodium album* (commonly known as lambs quarters) leaves contain high amounts of iron (about 7-10 mg/100 g leaves) and calcium (approximately 300 mg/100 g leaves), and *Amaranthus viridis* (amaranth) is an important food source of vitamin A and calcium.

Likewise, *Portulaca oleracea* is acknowledged for being a rich source of omega-3 fatty acids (≈300-400 mg/100 g fresh weight) and antioxidant compounds[20] that induce cardiovascular benefits. WEVs are an abundant source of dietary fiber, bioactive phytochemicals that act as immune boosters, and antioxidants such as flavonoids and phenolic acids[20]. Besides their nutritional significance, these plants are basic components of indigenous food cultures and have valuable ethnomedicinal importance as local people traditionally use them to treat diseases like digestive disorders, fever and wounds[9]. The diversity of floral species finds ethnobotanical importance to provide food base for sustenance of traditional diet patterns among rural and tribal people in India. Similarly, since they are inexpensive and readily available resources, WEVs are cheap substitutes for cultivated vegetables especially in areas with limited access to markets[21]. The nutritional composition and ethnobotanical importance of selected Indian wild edible vegetables are given in (Tables 2 & Table 3), respectively.

Traditional knowledge: Integral to tribal and rural food culture

Apart from the nutritional aspects, WEPs have significant ethnobotanical importance and are embedded

Table 2 — Nutritional composition (per 100 g) of selected Indian wild edible vegetables [22, 23, 24, 4]

Sr. No.	Scientific Name	Common Name	Energy (kcal)	Protein (g)	Carbo-hydrate (g)	Fat (g)	Vitam-in A (µg)	Vitam-in C (mg)	Calci-um (mg)	Iron (mg)
1	*Amaranthus spinosus* L.	Chaulai	40	4.0	7.3	0.3	2800	64	410	3.1
2	*Chenopodium album* L.	Bathua	43	4.2	7.5	0.4	3000	73	309	3.5
3	*Portulaca oleracea* L.	LuniBhaji	20	2.0	3.4	0.4	1320	21	90	2.0
4	*Colocasia esculenta* (L.) Schott	ArbiPatta	41	4.3	6.7	0.5	1900	52	395	4.2
5	*Ipomoea aquatic* Forssk.	Water Spinach	33	2.9	4.5	0.6	6300	55	77	1.2
6	*Centella asiatica* (L.) Urb.	Brahmi	24	2.5	4.0	0.6	350	41	171	3.0
7	*Solanum nigrum* L.	Makoi	34	3.6	5.2	0.4	4000	60	410	4.0
8	*Diplazium esculentum* (Retz.) Sw.	Vegetable Fern	30	3.4	5.3	0.5	900	25	290	2.3
9	*Oxalis corniculata* L.	ChukaBhaji	29	2.7	5.1	0.5	2200	45	275	2.8
10	*Moringa oleifera* Lam.	Drumstick Leaves	64	6.7	12.5	1.4	6780	220	440	7.0
11	*Hibiscus sabdariffa* L.	Gongura	32	2.8	6.1	0.4	2800	44	230	2.6
12	*Alternanthera sessilis* (L.) R.Br. ex DC.	Matsyagandha	33	3.0	5.0	0.5	2800	59	270	3.0
13	*Corchorus olitorius* L.	Jute Leaves	45	4.0	7.1	0.3	5000	64	360	4.3
14	*Senna tora* (L.) Roxb.	Takla	38	3.2	6.4	0.4	1500	56	295	2.7
15	*Sesbania grandiflora* (L.) Pers.	Agathi	43	5.0	7.2	0.4	8700	88	1130	5.2
16	*Hibiscus cannabinus* L.	Kenaf	33	3.2	5.6	0.4	2500	55	280	2.6
17	*Basella alba* L.	Poi saag	19	2.1	3.0	0.3	1800	100	140	1.2
18	*Rumex vesicarius* L.	Chukasaag	27	2.5	4.9	0.4	2900	38	210	2.0
19	*Persicaria plebeia* (R.Br.) H. Gross	Haldibhaji	31	2.7	5.1	0.4	2200	48	235	2.4
20	*Leucas aspera* (Willd.) Link	Guma	34	3.0	5.7	0.5	1300	35	200	2.1
21	*Marsdenia tenacissima* (Roxb.) Moon	Dudhi	37	3.2	6.0	0.4	1500	40	240	2.3
22	*Ipomoea batatas* (L.) Lam.	Sweet potato	38	3.5	6.2	0.4	4800	45	300	2.9
23	*Ficus racemosa* L.	Gular patta	36	3.1	5.8	0.5	2500	42	280	2.5
24	*Hibiscus sabdariffa* L.	Roselle/ Gongura	23	1.8	5.0	0.3	300	13	60	1.2

(*Contd.*)

Table 2 — Nutritional composition (per 100 g) of selected Indian wild edible vegetables [22, 23, 24, 4] — (*Contd.)*

Sr. No.	Scientific Name	Common Name	Energy (kcal)	Protein (g)	Carbo-hydrate (g)	Fat (g)	Vitam-in A (µg)	Vitam-in C (mg)	Calci-um (mg)	Iron (mg)
25	*Momordica charantia* L.	Bitter gourd leaves	43	4.0	7.3	0.5	2400	90	260	4.4
26	*Bauhinia purpurea* L.	Kanchan	32	3.0	5.5	0.4	1600	39	210	2.2
27	*Commelina benghalensis* L.	Kanthisoppu	30	3.1	5.4	0.5	1800	50	225	2.4
28	*Averrhoa bilimbi* L.	Bilimbi	28	2.6	5.1	0.4	2200	60	230	2.5
29	*Mikania micrantha* Kunth	Climbing weed	29	2.8	5.0	0.4	1200	44	200	2.0
30	*Crassocephalum crepidioides* (Benth.) S.Moore	Redflower ragleaf	25	2.5	4.5	0.4	1100	40	180	1.9
31	*Cissus quadrangularis* L.	Asthis amharaka	32	3.0	5.4	0.5	1400	52	250	2.6
32	*Heliotropium indicum* L.	Hatisura	26	2.3	4.6	0.4	1200	35	170	1.8
33	*Mimosa pudica* L.	Lajwanti	24	2.0	4.1	0.3	800	33	150	1.5
34	*Zanthoxylum rhetsa* (Roxb.) DC.	Tejphal leaves	27	2.2	4.8	0.4	900	42	180	1.9
35	*Piper longum* L.	Long pepper leaves	30	2.6	5.0	0.4	1300	39	200	2.0
36	*Azadirachta indica* A.Juss.	Neem leaves	35	3.1	5.8	0.5	2400	54	260	2.8
37	*Flemingia vestita* Benth.	Soh-phlang	41	4.2	7.0	0.5	600	20	80	1.5
38	*Dioscorea bulbifera* L.	Air potato	97	2.0	23.0	0.2	20	10	20	1.0
39	*Dioscorea pentaphylla* L.	Wild yam	105	2.1	24.2	0.2	15	12	18	1.0
40	*Dioscorea alata* L.	Purple yam	110	1.9	27.0	0.1	10	9	20	0.8
41	*Hibiscus cannabinus* L.	Kenaf	33	3.2	5.6	0.4	2500	55	280	2.6
42	*Basella alba* L.	Poi saag	19	2.1	3.0	0.3	1800	100	140	1.2
43	*Rumex vesicarius* L.	Chukasaag	27	2.5	4.9	0.4	2900	38	210	2.0
44	*Persicaria plebeia* (R.Br.) H.Gross	Haldibhaji	31	2.7	5.1	0.4	2200	48	235	2.4
45	*Leucas aspera* (Willd.) Link	Guma	34	3.0	5.7	0.5	1300	35	200	2.1
46	*Marsdenia tenacissima* (Roxb.) Moon	Dudhi	37	3.2	6.0	0.4	1500	40	240	2.3
47	*Ipomoea batatas* (L.) Lam.	Sweet potato leaves	38	3.5	6.2	0.4	4800	45	300	2.9
48	*Ficus racemosa* L.	Gular patta	36	3.1	5.8	0.5	2500	42	280	2.5
49	*Hibiscus sabdariffa* L.	Roselle/Gongura	23	1.8	5.0	0.3	300	13	60	1.2
50	*Momordica charantia* L.	Bitter gourd leaves	43	4.0	7.3	0.5	2400	90	260	4.4
51	*Bauhinia purpurea* L.	Kanchan	32	3.0	5.5	0.4	1600	39	210	2.2
52	*Commelina benghalensis* L.	Kanthisoppu	30	3.1	5.4	0.5	1800	50	225	2.4
53	*Averrhoa bilimbi* L.	Bilimbi	28	2.6	5.1	0.4	2200	60	230	2.5
54	*Mikania micrantha* Kunth	Climbing weed	29	2.8	5.0	0.4	1200	44	200	2.0
55	*Crassocephalum crepidioides* (Benth.) S.Moore	Red flower rag leaf	25	2.5	4.5	0.4	1100	40	180	1.9
56	*Cissus quadrangularis* L.	Asthisamharaka	32	3.0	5.4	0.5	1400	52	250	2.6
57	*Heliotropium indicum* L.	Hatisura	26	2.3	4.6	0.4	1200	35	170	1.8
58	*Mimosa pudica* L.	Lajwanti	24	2.0	4.1	0.3	800	33	150	1.5
59	*Zanthoxylum rhetsa* (Roxb.) DC.	Tejphal leaves	27	2.2	4.8	0.4	900	42	180	1.9
60	*Piper longum* L.	Long pepper leaves	30	2.6	5.0	0.4	1300	39	200	2.0
61	*Azadirachta indica* A.Juss.	Neem leaves	35	3.1	5.8	0.5	2400	54	260	2.8
62	*Flemingia vestita* Benth.	Soh-phlang	41	4.2	7.0	0.5	600	20	80	1.5
63	*Dioscorea bulbifera* L.	Air potato	97	2.0	23.0	0.2	20	10	20	1.0
64	*Dioscorea pentaphylla* L.	Wild yam	105	2.1	24.2	0.2	15	12	18	1.0
65	*Dioscorea alata* L.	Purple yam	110	1.9	27.0	0.1	10	9	20	0.8
66	*Cucumis melo* var. *agrestis* Naudin	Wild melon leaves	28	2.6	5.2	0.3	700	45	150	51
67	*Vigna vexillata* (L.) A.Rich.	Wild cowpea	90	4.0	18.0	0.5	30	18	40	52
68	*Talinum fruticosum* (L.) Juss.	Waterleaf	28	2.8	4.5	0.4	2000	48	230	53
69	*Sauropus androgynus* (L.) Merr.	Katuk leaves	37	4.8	5.0	0.5	9000	115	270	54
70	*Ipomoea reptans* Poir.	Swamp cabbage	32	2.7	5.4	0.4	6300	55	160	55
71	*Talinum triangulare* (Jacq.) Willd.	Lal saag	30	3.0	4.9	0.4	2800	52	220	56
72	*Momordica dioica* Roxb. ex Willd.	Kantola	288	3.1	7.7	3.1	-	-	7.37	5.04
73	*Carissa carandas* L.	Karonda	50	2	10	0.7	-	-	-	-

Table 3 — Traditional uses of selected wild edible plants in India

Sr. No.	Scientific Name	Common/Local Name	Region of Use	Traditional Use	Medicinal Use	Ethnobotany	References
1	*Amaranthus spinosus* L.	Kantabhaji, Chaulai	All India	Leafy curry, stir-fry	Used as laxative, anti-inflammatory, and in treatment of anemia due to high iron content	Consumed during food scarcity; used in folk rituals for prosperity	25
2	*Chenopodium album* L.	Bathua	North India	Paratha, saag	Rich in vitamins; used as an anthelmintic, laxative, and for indigestion	Tribal communities dry and store leaves for lean seasons	26
3	*Portulaca oleracea* L.	Luni Bhaji	All India	Curry, chutney	Anti-diabetic, wound healing, cooling agent; omega-3 rich	Widely used as famine food; in folk culture called "vegetable of endurance"	27
4	*Colocasia esculenta* (L.) Schott	Arbipatta	Central, East India	Patra, curry	Antioxidant, anti-inflammatory; roots used for digestive disorders	Tribal rituals link it to fertility; leaves used in festivals	28
5	*Ipomoea aquatic* Forssk.	Water spinach	North-East, South	Curry, salad	Used for constipation, jaundice, and nervous disorders	Cultivated in kitchen gardens near water bodies; survival food in floods	28
6	*Centella asiatica* (L.) Urb.	Brahmi	North-East, Kerala	Salad, chutney	Brain tonic, memory enhancer, wound healer	Sacred herb in Ayurveda; offered in rituals in Kerala	29
7	*Diplazium esculentum* (Retz.) Sw.	Vegetable fern	North-East India	Stir-fry	Used for stomach disorders, antibacterial, and antioxidant	Considered a seasonal delicacy in NE India; sold in tribal markets	30
8	*Amaranthus viridis* L.	Green amaranth, Junglichaulai	All India	Saag, stir-fry	Anti-inflammatory, diuretic, used in dysentery	Commonly consumed by rural families as cheap nutritious veg	31
9	*Alternanthera sessilis* (L.) R.Br. ex DC.	Ponnanganni, Matsyakshi	East/South India	Saag, dal mixes	Used for eye health, fever, liver protection	Sacred plant in Tamil Nadu rituals; eaten by women for eye strength	32
10	*Alternanthera philoxeroides* (Mart.) Griseb.	Malanchashak, Ceylon spinach	East & widespread	Leafy vegetable	Traditionally used for cough, fever, but bioaccumulates metals	Popular in Bengal cuisine; though invasive, still used as leafy veg	33
11	*Glinus oppositifolius* (L.) Aug.DC.	Koduvi/Kadubhagi	All India	Saag, soup	Used as a vermifuge, in treating fever, and for skin issues	Tribal medicine for children's fever; famine-time food	34
12	*Mollugo oppositifolia* L.	Pita saga, Sarsalida	All India	Saag, mixed greens	Used as purgative, anti-inflammatory, and cooling agent	Tribal people use as mixed leafy greens during scarcity	35
13	*Trianthema portulacastrum* L.	Sanhti/It-sit	Drylands, All India	Leafy veg; famine food	Used as anti-inflammatory, diuretic, treatment for jaundice	Called "desert spinach"; survival food during drought	36
14	*Oxalis corniculata* L.	Amrul, Changeri, Amboli	All India	Chutney, souring agent	Antiscorbutic, diuretic, used in stomach ailments	Children often eat raw leaves for sour taste; used in folk remedies	37
15	*Commelina benghalensis* L.	Kena/Keni, Bengal dayflower	All India	Boiled greens, famine food	Used in skin diseases, diarrhea; root paste for boils	Considered famine food in drought-prone areas	38
16	*Boerhavia diffusa* L.	Punarnava	All India	Tender leaves as veg	Famous Ayurvedic rasayana; hepatoprotective, diuretic, anti-asthmatic	Sacred in Ayurveda; root used in herbal formulations like "Punarnavadikwath"	39

(*Contd.*)

Table 3 — Traditional uses of selected wild edible plants in India — (*Contd.*)

Sr. No.	Scientific Name	Common/Local Name	Region of Use	Traditional Use	Medicinal Use	Ethnobotany	References
17	*Corchorus olitorius* L.	Nalta jute, Patuashak	East/North-East India	Mucilaginous saag, soups	Rich in iron; used for anemia, fever, and as tonic	Popular in Bengal; culturally linked with monsoon cuisine	40
18	*Enhydra fluctuans* Lour.	Helencha/Hencha	East & NE India	Saag, soups	Used for skin diseases, blood purifier, liver tonic	Regularly sold in village haats; considered "cooling herb"	20
19	*Portulaca quadrifida* L.	Chinisabzi, Chhotinunia	Warm regions, All India	Curry, millet breads	Anthelmintic, anti-inflammatory; used for urinary issues	Used in survival food traditions in tribal belts	–
20	*Persicaria plebeia* (R.Br.) H.Gross	Chemti sag, Machechi	All India	Saag, soups	Used for stomach ailments, anti-diarrheal	Consumed by tribals during scarcity, often dried & stored	–
21	*Rumex dentatus* L.	Janglipalak, Tandalak	North India	Sour leafy veg	Used as laxative, anti-inflammatory treatment for constipation	Common wild leafy veg in Punjab & Himachal villages	41
22	*Rumex hastatus* D.Don	Amlora, Chulmora	NW Himalaya	Sour greens, chutney	Anti-inflammatory, used in skin diseases	Popular in Himalayan folk diets as tangy chutney	41
23	*Glinus lotoides* L.	Lesser koduvi	All India	Saag	Used for fever, skin ailments, and stomach upset	Known in folk culture as weed-vegetable during monsoon	–
24	*Hygrophila polysperma* (Roxb.) T.Anderson	Nata, Neerbrahmi	Central/East India	Tender shoots in saag	Used as aphrodisiac, tonic, and diuretic	Known in Ayurveda; sold in some tribal markets	–
25	*Marsilea minuta* L.	Sunishann, Chattasaag	East/NE India	Boiled greens, fritters	Used as sedative, anti-anxiety, and in skin diseases	Seasonal green in Assam & Bengal; eaten during monsoons	42
26	*Persicaria hydropiper* (L.) Delarbre	Water pepper	Himalayan plains & wetlands	Pungent leafy condiment	Used for toothache, rheumatism, and as stimulant	Pungent leaves used as spice-like condiment by tribals	–
27	*Portulaca tuberosa* Roxb.	Nunia (tuberous purslane)	Central & Peninsular India	Young shoots/leaves	Used as cooling agent, diuretic, & for fever	Tribal food in Chhattisgarh & Madhya Pradesh	43
28	*Murdannia loriformis* (Hassk.) R.S.Rao & Kammathy	Patur	Southeast Asia	Leafy vegetables	Used in Thai folk medicine for cancer, inflammation, detoxification	Recognized in tribal communities as both a leafy vegetable and herbal remedy	44
29	*Digera muricata* (L.) Mart.	Kundra	India (Rajasthan, Gujarat, Maharashtra, tribal regions)	Leaves and tender shoots cooked as vegetable; fodder crop	Used as a diuretic, laxative, and for treating constipation, headaches, and urinary issues	Considered a famine food in dry regions; it plays dual role as human food and livestock feed	45

embedded in several cultural practices and traditional diets among rural/tribal communities across India. Cultural and medicinal practices of traditional leafy vegetables species *Centella asiatica*, *Chenopodium album*, *Amaranthus viridis*, *Houttuynia cordata*. Wild edible plants have long provided diversity in diets, improved nutrition and supported livelihoods among tribal & rural communities across India[46]. In Mizoram's Aizawl district, the Hmar and Paihte tribes keep a rich tradition alive with 24 unique recipes that use wild edibles like *Parkia timoriana* and *Oroxylum indicum*[47]. These dishes are integral to culture and daily diet. Conservation and documentation of these vegetables are essential for food and nutritional security, livelihoods, and climate resilience. Though ecologically and culturally significant, many WEPs like *Portulaca oleracea* and *Boerhavia diffusa* still go underutilized owing to loss of habitats, overexploitation, and lack of knowledge about their utility[20]. Nevertheless, with changing food habits and modernization, there is a need

to preserve this knowledge, which is essential not only for food security and cultural identity but also for biodiversity[48]. In recent times, however, researchers have highlighted the potential of WEPs in transforming local and global food systems through integration of culture and diet in the face of climate change and malnutrition[49].

Sustainability

WEPs represent sustainable sources of resources that do not require much input and survive without fertilizers or any form of management. Examples of such plants include *Portulaca oleracea*, *Cleome gynandra,* and *Boerhavia diffusa* which are very drought-tolerant species and can survive in poor soil conditions. As such, they are able to with stand dry spells and nutrient deficiency and are capable of surviving on marginal lands that fail to support traditional agricultural crops[49]. These crops are locally available and are produced in large quantities during certain seasons, hence minimizing dependence on markets and reducing the environmental impact. Due to their adaptability to adverse climatic changes, WEPs are important for future sustainable food production[48]. WEPs are highly important for rural and indigenous people, who benefit from their ability to provide necessary nutrients, ensure food security, and manage nutritional illnesses. The WEPs, such as *Chenopodium album*, *Amaranthus viridis,* and offer vitamins, minerals, and other beneficial substances. These plants are microclimatically resilient and expand the range of food products, thus improving nutritional benefits[50].

Ethnobotanical and cultural significance

WEVs have been incorporated into indigenous knowledge systems to such an extent that plants are used not just for seasonal vegetables but for medicinal uses like healing wounds, reducing fever, and improving digestion[51]. The ethnobotany of India provides more examples of the cultural importance of WEVs. For instance, *Chenopodium album* (Bathua) is one of the primary vegetables in winter meals in Punjab, whereas *Boerhavia diffusa* (Kandurisaag) is culturally significant in Uttarakhand. As per ethnobotanical surveys, there have been over 1,800 species of wild edible vegetable plants identified in India, out of which many of them have not been exploited for their possible benefits[9]. Figure 1 shows the pictures of some of the wild edible vegetables that were identified during Ran Bhaji Mahotsav held at Nagpur. This event is an example of one that brings attention to the importance of these vegetables in terms of nutrition, culture, and economy, thus conserving them.

Economic and livelihood potential

The WEVs are usually overlooked, have considerable economic value in India. Plants such as *Amaranthus*, *Chenopodium album*, and *Colocasia esculenta* are highly nutritious and require minimal inputs to cultivate[52]. The availability of WEVs makes it possible for rural communities, particularly the women folk, to sell them at a local level and earn income from them. Some of these WEVs have higher commercial value than other plants used[53,54]. Examples of such WEVs include *Centella asiatica*, *Enhydra fluctuans*, *Marsilea minuta*, and *Boerhavia diffusa.*

Threats and challenges

Although they are valuable, WEVs have been subject to various threats such as habitat destruction, deforestation, urbanization, infrastructural developments, grazing, fires, overexploitation, and other activities which contribute to 62% of all stressors that are experienced in unprotected areas[55,56]. Monoculture, excess use of pesticides, and eradication of native plants by farmers decrease the numbers and varieties of WEVs[57,58]. Climate change has an impact on the phenology and distribution of WEVs, leading to their movement out of their native environments. Less than one-third (31%) of wild food plant species have been evaluated, less than 4% (3.3%) are safeguarded ex situ, and nearly all (89.1%) require immediate attention to be preserved off-site[59]. The loss of traditional knowledge, lack of policies, and changing consumer tastes are other issues that pose threats to their contribution to food systems.

Gaps and limitations in promoting WEVs in India

Even though there is huge potential in terms of nutritional, environmental and livelihoods provided by WEVs in India, these have not been utilized or integrated in food system due to following limitations:

Lack of documentation and research

Although WEVs in India are under-reported and few in terms of ecological and ethnobotanical research and systematic documentation of the diversity and availability, an investigation on them has revealed their importance from Maharashtra and Deccan plateau; however, it has shown less

Fig. 1 — Wild edible vegetables collected during the Ran Bhaji Mahotsav, Nagpur

information about their agronomy, processing and boundary between "wild" and "semi-domesticated"[60].

Erosion of traditional knowledge

Indian Indigenous knowledge is eroding at a faster rate with factors like modernizations, globalization, weakening of inter-generation transfer and lack of willingness by elders to share the knowledge[61]. Similarly, in case of WEVs loss is recorded and youth lack awareness due to urbanization, like in Kashmir it was recorded 99 plants and 9 fungi but knowledge gap is between the old and the young people[62].

Policy and institutional neglect

In India, WEVs remain excluded from agricultural and nutrition policies despite their role in diet, income, and climate resilience. It is labeled as “minor” foods, they receive little support, with weak research, conservation, value chains, and commercialization, limiting their integration into sustainable strategies[57,24].

Market and value chain barriers

These underutilized vegetables have no organized market, processed products and standard packaging compared to the commercial crops. It has not reached

most of the urban markets and did not contribute much to the income of the rural collectors[24]. Despite the poor value chains and informal marketing system, it is difficult to expect for development of marketing possibilities and proper price to become a reality in the near future.

Conservation challenges

It is widely found in forests, fallows or on marginal land, though many populations are endangered by habitat loss, deforestation and over-exploitation. Conservation measures remain largely ex-situ; there is little community involvement, poor in-situ protection and little attention to sustainable harvesting practices to ensure its continued availability[62].

Nutritional and safety awareness gaps

Despite being nutrient-rich, systematic profiling and public awareness of these plants are limited, restricting their wider acceptance and use. Some species contain anti-nutritional factors, and research on safe preparation, cooking methods, and dosage remains sparse, highlighting the need for focused studies and nutrition education[20,57].

Integration with sustainable development goals (SDGs)

They are relevant to food security, nutrition, biodiversity and livelihoods as well as SDG 2, 3, 12 and 15 but are generally overlooked in India's policy making structure, reducing the attention on them at national policy level and prevention their inclusion in national strategies for agriculture and nutrition[22,63].

Strategies for promoting WEVs in India

Indian WEVs offer high nutritional and cultural value; however, weak markets and declining indigenous knowledge limit their potential. Better documentation, policy support, and community conservation are key strategies to address these constraints.

Scientific documentation and nutritional profiling

The nutritional, phytochemical and antioxidant potential of WEVs is considerable. The Bodo community vegetables demonstrate potent antioxidant activity[64] whereas the Shivalik Hills species were characterized with higher content of vitamins, fiber, protein and phenolics. Some plant species (*Centella asiatica*, *Litsea cubeba*, *Herpetospermum operculatum* and *Eryngium foetidum*) often outcompete the cultivated varieties with regards to biomass, nutrient and antioxidant status. Comparison with previously published literature confirmed this fact and reiterated that WEPs do not only supplement the dietary intake with crucial micronutrients but also serve as complementary food sources providing nutritional security[65,66]. Besides scientific validation, wild edible plant documentation should follow ethnobiological practices respecting indigenous and local knowledge rights. Consultation and access to traditional knowledge should require prior informed consent and benefit sharing. This is addressed in the Nagoya protocol on Access and Benefit Sharing to the convention on biological diversity, which guides the use of traditional knowledge in research, and in the appropriate sharing of benefits and knowledge derived from use of biological diversity[67].

Awareness and capacity building

The promotion of WEVs in India is gaining popularity and mainstream acceptance due to awareness drives. Festivals such as the Ran Bhaji Mahotsav in Nagpur with an estimated revenue of 3 lakh, the showcasing of 550 different dishes in Goa and as many as 1,700 school nutrition gardens in Ranchi demonstrates this promotional effort[68]. Policy driven campaigns such as POSHAN Maah and NGO interventions with the Saura Adivasis of Odisha help incorporate WEVs into diets and food security[69].

Policy integration

The addition of WEVs to India's Mid-Day Meal (MDM) Scheme and Integrated Child Development Services (ICDS) could improve the diversity of diet and minimize micronutrient deficiencies. They are packed with essential vitamins and minerals, and can contribute to the nutrition and food security of tribal families[70]. Thus, incorporating WEVs into national programs would contribute to child nutrition, maintain traditional food practices and contribute to rural livelihoods.

Market development and value chain strengthening

Although opportunities for WEVs in Indian markets are on the rise value chains are poorly developed. Surveys identified 54 species in the Ima market at Manipur, 43 in the Wancho tribe in Arunachal Pradesh[71] and 47 species in Aizawl at Mizoram. Review on Maharashtra observed 314 species having higher nutritive and functional values. Therefore, improvement in post-harvest management, processing and marketing is needed for socio-economic returns.

Community-led conservation and sustainable harvesting

Biodiversity and food security depends upon community driven conservation and sustainable harvesting of WEVs. Several communities have been able to sustain the WEV population by employing selected harvesting practices and developing community forests[72]. Likewise in the Indian areas of Madhya Pradesh, Odisha and the Himalayan regions local systems, forest committees and seed banks are being created to tap resources in a sustainable way[73]. The success in such community driven approaches lies in supplementing scientific support to traditional knowledge.

Indigenous knowledge preservation

Conservation led by local communities and the sustainable exploitation of WEVs is important for biodiversity conservation and food security. These species are protected by indigenous peoples of India through harvesting them by selecting some individual plants only (selective harvesting), seasonal gathering and through community conserved forests[74]. In Madhya Pradesh, Odisha and Himalayan region seed banks and forest committees play a role in strengthening conservation and sustainable use[75]. A balance of both traditional methods as well as intervention from modern scientific technology will allow these resources to be available for the future.

Leveraging regional organic value chains

Organic farming under MOVCD-NER focuses on organic production, processing, certification, and market access. Similar schemes for wild edible vegetables (WEVs) can enhance their commercial potential, conserve biodiversity, and support rural livelihoods. Integration of WEVs in organic value chains may prove to be a viable means to escalate the market potential of this food product considering their cultural significance and role in consumption habits in the Northeast[73].

Conclusion

Wild edible vegetables in India are a vital yet under recognized part of biodiversity, nutrition, and cultural heritage. Rich in proteins, vitamins, minerals, and bioactive compounds, they help combat malnutrition, address micronutrient deficiencies, and support traditional medicine and cultural practices. These are hardy, indigenous, and resilient, suitable for use in marginal lands which indicates their potential to contribute to climate-resilient agriculture and secure livelihood. However lack of documented information, loss of indigenous knowledge, unstable market and lack of support from policy makers impede their utilization. Documentation, nutrition profile studies, conservation, participatory approaches coupled with value addition and market promotion will facilitate their inclusion into food and health and rural development strategies for securing indigenous heritage and attaining SDGs.

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Ethics Statement

This study is based on secondary data collected from published literature and does not involve human participants or animal experimentation.

Conflict of Interest

The authors declare no conflicts of interest.

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Data Availability

All data supporting the findings of this study are included within the article and its referenced sources.

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