Wild Edible Plants of Paddar Valley, Jammu division, Jammu and Kashmir, India

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Ethnobotany Research & Applications 22:29 (2021)

Research

Abstract

Background: The present study has been designed to document the wild edible plants used by the local populace of the Paddar Valley, district Kishtwar, Union Territory of Jammu and Kashmir, India.

Methods: A total of 50 informants between the age group of 18-74 years were interviewed. Semi-structured questionnaires, participatory observations, and interviews were conducted to extract information. The present study's objectives were clearly defined to the participants, and Prior Informed Consent (PIC) was taken from all the participants as per guidelines set forth by the Convention on Biological Diversity (CBD).

Results: A total of 42 wild edible plant species (40 Angiosperms, 1 Pteridophyte, and 1 Gymnosperm) belonging to 38 genera and 26 families were consumed by the indigenous people of Paddar valley. The maximum wild edible plants consumed in the region belonged to the family Rosaceae (7 species), followed by Polygonaceae (4 species), Compositae (3 species), and Apiaceae (3 species). Fruits and leaves were the most commonly used plant parts. The highest numbers of wild species were used as a vegetable (19 species), followed by raw fruits (15 species), chutney (11 species), beverage (6 species), seeds (4 species), edible seed oil (3 species), spices (2 species), and so on. Wild vegetables were mostly consumed in cooked form, whereas wild fruits were exclusively eaten in raw form. The highest and lowest cultural importance index values were recorded for *Taraxacum campylodes* G.E. Haglund and *Rubus niveus* Thunb, while *Vitis vinifera* L., *Elaeagnus umbellata* Thunb. and *Viburnum grandiflorum* Wall. ex DC. were the most preferred fruit species.

Conclusions: The study revealed that the traditional consumption of wild plants as food is still viable in Paddar valley and plays a vital role in fulfilling the residents' nutritional requirements, especially during winters. The information revealed in this study can be considered as a baseline for conservation and sustainable utilization of the valley's wild edible plants, as well as contributing to the preservation of cultural and genetic diversity. Further studies are required to assess the nutritional, agricultural, and economic potential of the reported plant species for the upliftment of the socio-economic conditions of the people of this biodiversity-rich region.

Keywords: Jammu and Kashmir, Paddar valley, Traditional knowledge, Wild edibles

Manuscript received: 18/08/2021 – Revised manuscript received: 10/10/2021 - Published: 23/10/2021
http://dx.doi.org/10.32859/era.22.29.1-21

Background

Due to the increasing population and limited resources, food security has become a major global challenge. To meet the ever-growing demand for food to feed the increasing population, we need to continuously upgrade and enrich our food basket by exploring and utilizing novel and nutritious food options. Here wild edibles may come to the rescue. In this context, constant explorations and studying utilization patterns of wild edibles by indigenous communities of different regions is a must. Globally, about one billion people avail the nutritional benefit from wild plants (Aberoumand 2009). Besides being delicious, wild edible plants are also rich sources of proteins, vitamins, and minerals (Kumar *et al.* 2009). Many times, the consumption of wild edibles at a local scale is minimal, but the potential of these plants in food security at the regional level cannot be ignored.

The ethnobotanical studies on the use of the plants by the indigenous communities are advantageous for conserving traditional customs, biodiversity, and the development of novel drugs and the community's health (Farooq *et al.* 2014). The complex topography, varied climatic and ecological conditions in India form a basis for its rich biodiversity and ethnic diversity. Many studies on the medicinal and wild edible plants have been carried out in different parts of India (Sawian *et al.* 2007; Sharma *et al.* 2012; Sharma *et al.* 2014; Gairola *et al.* 2013; Gairola *et al.* 2014; Singh *et al.* 2019). In the rural areas of Himalaya, wild plants are being used as food and medicine by the indigenous communities since time immemorial. About 1532 wild edible plant species have been reported from India, of which 675 species are found to exist in the Himalayan region alone (Reddy *et al.* 2007; Kala 2007). Jammu and Kashmir (J&K) 's union territory is a rich repository of biodiversity, including indigenous herbal resources. Various workers have conducted many ethnobotanical studies from the different regions of J&K in the past (Kaul *et al.* 1982; Kumar *et al.* 2009; Gupta *et al.* 2013). A total of 948 plant species have been reported to be used as medicine by the local inhabitants of Jammu, Kashmir, and Ladakh (Gairola *et al.* 2014). However, so far, not even a single study has been conducted on the wild edible plants of the Paddar Valley.
This valley boasts a rich abundance of plant species that serve as a food source for the natives. The locals prepare different delicacies for everyday consumption and derive a significant share of their plants' food and energy requirements. The wild food sources are directly procured from the forest, and the local populace has adopted no cultivation practices. The traditional knowledge about the study area's wild edible plant species is continuously diminishing due to various reasons like changing socio-economic conditions, immigration of villagers to towns, availability of high-value foodstuff in the market, and, most significantly, the lack of documentation of traditional knowledge. Therefore, this work is the first attempt to document the wild edible plants the Paddar Valley of the district Kishtwar, Union Territory of Jammu and Kashmir, India.

Materials and Methods

Study area

The Paddar Valley, also known as 'Sapphire valley,' is situated in the northeast part of the Kishtwar district of J&K, India (Fig. 1). It shares a border with Zanskar valley (Ladakh) on the north, Pangi Valley, Himachal Pradesh on the East, and Marwah-Wadwan on the West. The study area is located at around 65 Kms from Kishtwar district headquarter. Paddar valley has 32 villages having a population of 21,548 spread over an area of 55,152 hectares. The literacy rate of the valley is 47.3%. Valley lies between 33˚15'10"N to 33˚30'10"N and 76˚02'10"E to 76˚25'15" E with an elevation of 1500 to 4500 m a.s.l. There are many sub-valleys in Paddar valley like Machail, Ghandari, Kabban, Ongayee, Bhuzunu, Barnaz, Bhuzas, and Dharlang, among others. The entire tract is highly mountainous, with very steep slopes and deep valleys. The Chenab River enters into the study area at Sansari locality from Himachal Pradesh, named "Chandrabhaga" up to Bhandarkoot and finally as "Chenab" from Bhandarkoot onwards. The Paddar Valley is world-famous for its sapphire mines. Coniferous forests are the dominant forest type in the region. Rich alluvial soils accommodate the river terraces and valley flats, while the Morainic soils formed by glaciers and snow avalanches support the rich Fir forests in the higher ranges.

On account of its diverse landscapes and varied microclimatic conditions, Paddar valley harbors a wide variety of herbs, shrubs, and trees. The average temperature in the area ranges between 20˚C and 27˚C from July to September during the day and 5˚C to 10˚C during the night. 100% of the study area stays covered with snow during the winter season. The bulk of the snowfall occurs between January and March. The Valley usually remains cut off from the rest of the country for more than two months due to heavy snowfall. The average temperature drops down to -2˚C to -10˚C in winters.

Male and female literacy rates in the valley are 58.17 percent and 35.36 percent, respectively. Locals in the valley are known as '**Paddari**,' and they speak a dialect known as 'Paddari.' The Paddari dialect is well-spoken and understood by all of the region's residents. Different dialects are also spoken in the area, including Paddari, Bodhi,

Kashmiri, and Pangwali. The Gaddi and Bakkarwal communities follow the age-old practice of rearing their herd of sheep from one pasture to another from June to September. The main occupation of the people in the valley is agriculture. However, due to small landholding, they are also engaged in other livestock rearing activities and a small orchard setting. Currently, illegal extraction of medicinal plants like *Trillium govanianum* Wall. ex D. Don and *Fritillaria cirrhosa* D. Don and minerals such as sapphire has become a significant source of income for some villagers.

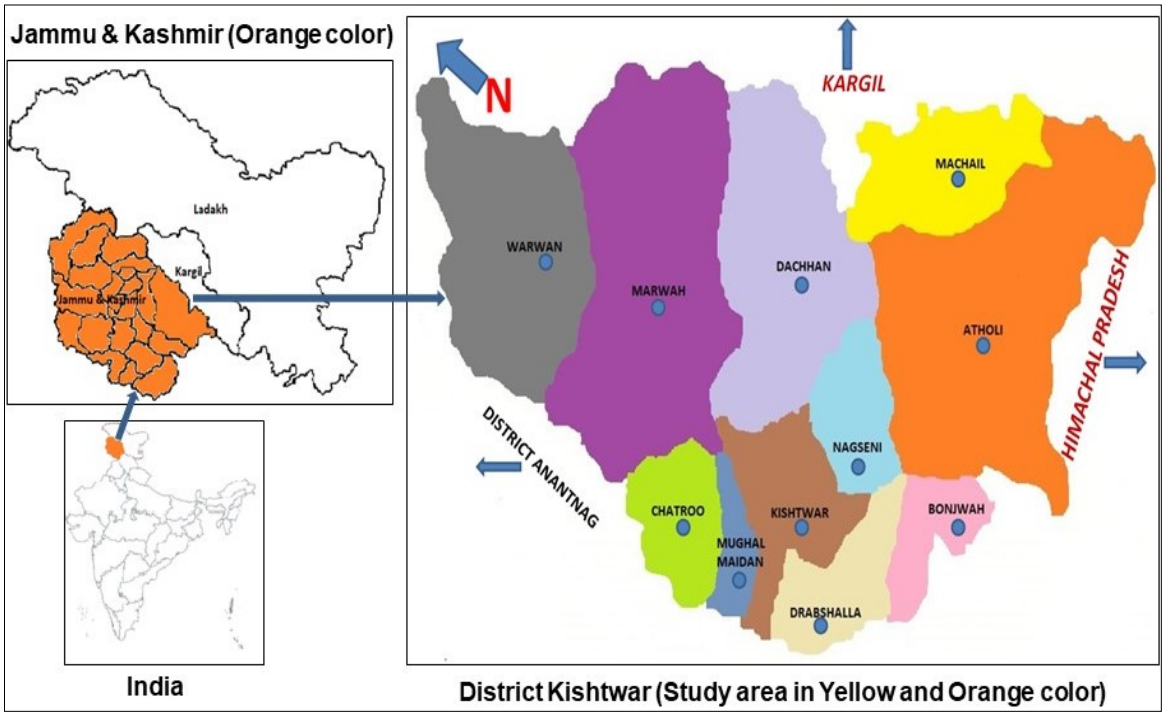

Figure 1. Map of the study area.

Data collection

The present study was carried out between 2017 and 2019. Extensive ethnobotanical surveys were conducted in different localities of the region, and a total of 50 informants between the age group of 18-74 years were interviewed (Table 1). A total of 14 villages covering 85.15% of the area's total population were covered during the study (Table 2). As the first author is a local inhabitant of the study area, interviews were conducted in the local language. Efficient communication and understanding of the local populace aided in the collection of vital information. Semi-structured questionnaires, participatory observations, and interviews were conducted to extract information. The present study's objectives were clearly defined to the participants, and Prior Informed Consent (PIC) was taken from all the participants. as per guidelines set forth by the Convention on Biological Diversity (CBD). Information regarding the plant's local name, edible plant part, preparation, and consumption mode was recorded.

Table 1. Demographic details of the informants.

Demographic details		No. of informants	Percentage
Gender	Male	30	60
	Female	20	40
Educational level	Illiterate	10	20
	Primary level (1-5 classes)	19	38
	Secondary level (5-12 classes)	15	30
	Graduate	6	12
Age groups	18-27 yrs (Average=24.63 yrs)	8	16
	28-35 yrs (Average=32.50 yrs)	14	28
	Above 35 yrs (Average=53.96 yrs)	28	56
Occupation	Shephard	10	20
	Farmer	28	56
	Govt Employee	5	10
	Retired	7	14

Table 2. Villages surveyed and village wise distribution of the informants.

Village name	Number of informants		
	Male	Female	Total
Afani	3	1	4
Atholi	3	2	5
Garh	2	1	3
Gulabgarh	2	2	4
Ishtiyari	3	2	5
Jar	1	1	2
Kadail	2	1	3
Ladar	1	0	1
Layee	1	1	2
Ligri	2	2	4
Machail	2	1	3
Massu	2	1	3
Mati	1	1	2
Sazzar	1	1	2
Sohal	2	1	3
Kundal	2	2	4
Total	**30**	**20**	**50**

Plant specimens in flowering or fruiting stages were collected from different localities of the study area, covering diverse habitats ranging from lower altitudes (1754 m a.s.l.) to alpine meadows (3483 m a.s.l.). Photographs of some edible plant species are presented in the Fig. 2. All the associated information, like GPS coordinates, altitude, habit, and habitat, were also collected. Herbarium sheets of the collected plant specimens were prepared as per standard taxonomic procedure (Jain and Rao 1977), identified by consulting various regional floras (Sharma and Kachroo 1981; Polunin and Stainton 1984; Sharma and Jamwal 1988) and submitted to the internationally recognized Janaki Ammal Herbarium (RRLH) at CSIR-IIIM, Jammu. APG IV (Chase *et al.* 2016) classification was used, and currently accepted botanical names of the recorded species were confirmed using The Plant list Version 1.1 (http://www.theplantlist.org.).

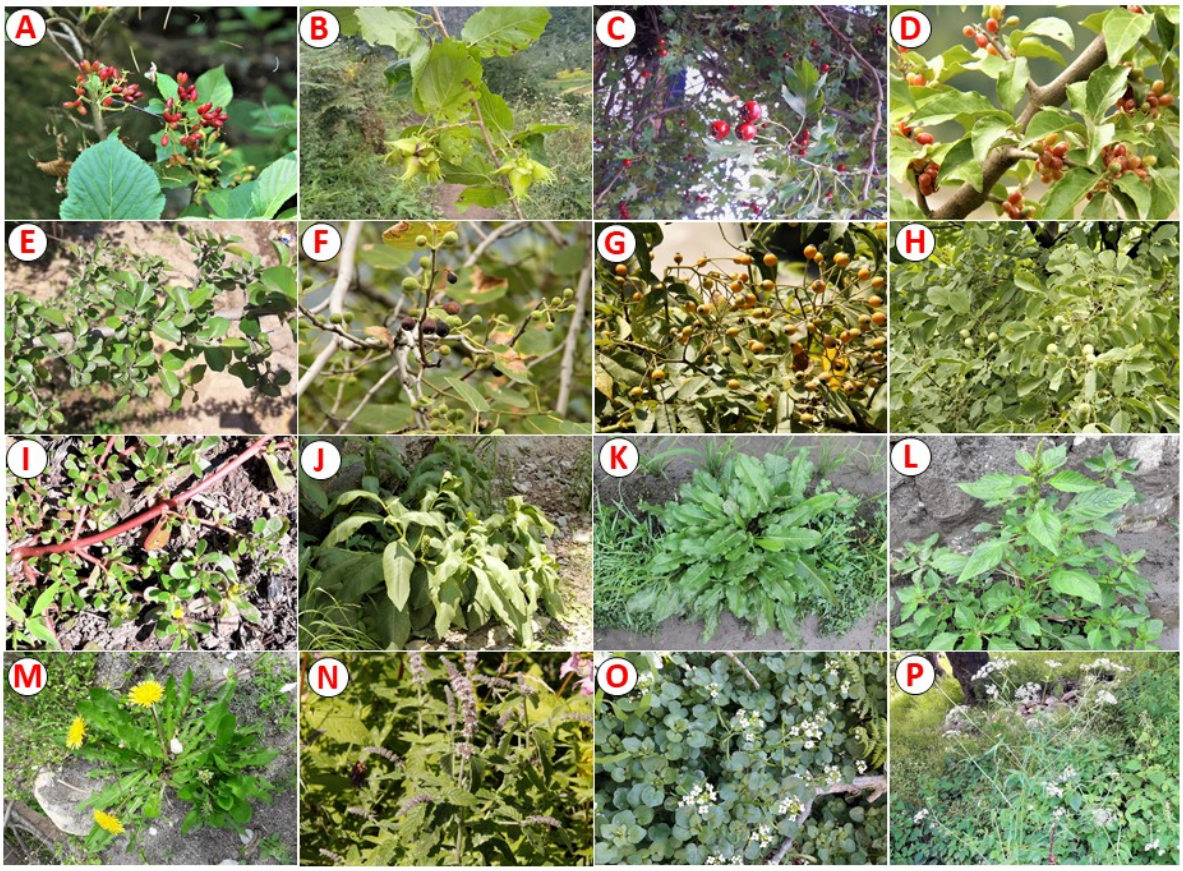

Figure 2. Photographs of the collected wild edible plants from the study area: (A) *Viburnum grandiflorum* Wall. ex DC.; (B) *Corylus jacquemontii* Decne; (C) *Crataegus songarica* L. Koch; (D) *Elaegnus umbellata* Thunb.; (E) *Flacourtia indica* (Burm.f.) Merr.; (F) *Ficus palmata* (Forssk); (G) *Rosa moschata* Herrm.; (H) *Juglans regia* L.; (I) *Portulaca oleracea* L.; (J) *Phytolaca acinosa* Roxb.; (K) *Rumex mepalensis* Spreng.; (L) *Amaranthus viridis* L.; (M) *Taraxacum campylodes* G.E. Haglund; (N) *Mentha longifolia* L.; (O) *Nasturtium officinale* R.Br.; (P) *Sium latijugum* C.B. Clarke

Data analysis

The field data collected through interviews and questionnaires were analyzed quantitatively. To test the evenness of knowledge on the usage of wild edible plants in the study area, the Factor Informant Consensus (Fic) was calculated (Heinrich *et al.* 1998). The Fic was calculated as

$$F_{\mathrm{ic}} = \frac{n_{\mathrm{ur}} - n_{\mathrm{t}}}{n_{\mathrm{ur}} - 1}$$

Where 'nur' implied the number of use-reports for a specific use category and 'nt' means the number of species used for explicit use category by all the respondents. 'Fic' values are near zero if the plant species are chosen randomly or if the exchange of useful information about plant species is absent among the informants, and approaches to one in case there is a well-specified selection criterion in the community and/or if the use of information is exchanged between the respondents (Gazzaneo *et al.* 2005; Sharma *et al.* 2012). The cultural importance index (CI) was also calculated using the following formula prescribed earlier (Tardio and Pardo-de-Santayana 2008).

$$\mathrm{CI}_{\mathrm{s}} = \left\{ \sum_{u=u_1}^{\mathrm{u}_{NC}} \sum_{i=i_1}^{u_N} UR_{ui/_N} \right\}$$

CI index is the sum of the proportion of informants that acknowledges each species use. The index's theoretical highest value is the different use-categories (NC) in total and attained in the unlikely case that all the respondents would acknowledge the species use in all the use-categories contemplated in a survey.

Results and Discussion

Diversity of wild edible plant taxa

Data collected during the current study shows that traditional knowledge of the use of plants in the Padder Valley is still operational and is an integral part of culture. A total of 42 wild edible plant species (40 Angiosperms, 1 Pteridophyte, and 1 Gymnosperm) belonging to 38 genera and 26 families were consumed by the indigenous communities of Paddar valley, J&K (Table 3). Out of the reported 26 families, the maximum number of edible species belonged to the family Rosaceae (7 species), followed by Polygonaceae (4 species), Compositae (3 species), and Apiaceae (3 species). Out of the other remaining 22 families, 19 families were represented by one species only. Previous reports stated the presence of 1532 edible wild food species in India (Reddy *et al.* 2007). The Gaddi tribe in the Western Himalaya have reportedly used 49 wild plants for consumption (Thakur *et al.* 2020). In Jammu and Kashmir, Guyjar and Bakerwal tribes of District Rajouri consume 58 wild plants (Dangwal 2014), while in Kishtwar and Udhampur districts there are recorded consumption of 50 and 90 wild edible plants (Kumar and Hamal 2009; Bhatia *et al.* 2018). The widespread usage of the Rosaceae family as an edible source of food by the indigenous communities in India and other parts of the world was also reported earlier (Menendez-Baceta *et al.* 2015; Geng *et al.* 2016; Singh *et al.* 2016; Thakur *et al.* 2017). Members of the Rosaceae family are rich in phenolics, which are excellent radical scavengers and play an essential role in the human diet (Miller *et al.* 2002).

In the present study, approximately 31.88 wild edible species were utilized per informant, indicating the high dependency on wild edible resources. Only 20.7 species per respondent were reported in a previous study by Bhatia *et al.* (2018) conducted in the Udhampur district of J&K. The most used wild edible plant species were herbs (57.14%, 24 species), followed by shrubs (28.57%, 12 species), trees (11.90%, five species), and climber (2.38%, one species). Fruits and leaves of the 62% species were used, followed by seeds (16.7%), leaves and stem (7.1%), roots (4.8%). The consumed plant parts viz., stem, stem and fruits, leaves and fruits, leaves, and inflorescence constitute 2.4% each of the total species. Previous research reports also documented herbs as the major proportion of wild edibles (Reddy *et al.* 2007; Bhatia *et al.* 2018; Thakur *et al.* 2020).

Use reports (UR), cultural index (CI) and Informant consensus index (Fic)

The highest wild species were used as a vegetable (19 species), followed by raw fruit (15 species) which concurs with earlier report from Bandipore, Kashmir (J&K) (Singh *et al.* 2016). Previous studies in the Western Himalayan region have also reported that vegetables are a primary component of wild edible plants (Reddy *et al.* 2007; Singh *et al.* 2016; Thakur *et al.* 2017), but some studies in the same region have also reported that fruits and vegetables are almost equally consumed (Jhamta *et al.* 2019).

Table 3. Wild edible plants consumed by the people of the study area.

Family Plant species	Voucher number RRLH	Growth form	Locality/ Altitude m (a.s.l.)	Latitude N	Longitude E	Local name	Edible part	Preparation and mode of consumption	Cultural importance (CI)
Adoxaceae									
Viburnum grandiflorum Wall. ex DC.	23921	Shrub	Tatapani/ 2058	33˚15.45'	76˚07.83'	Tilanch	Fruits	Fruits are eaten raw	0.62
Amaranthaceae									
Amaranthus viridis L.	23934	Herb	Tatapani/ 1892	33˚15.75'	76˚07.81'	Bau	Leaves	Young leaves are cooked as a vegetable	0.58
Chenopodium album L.	23924	Herb	Jar/ 1994	33˚16.77'	76˚06.87'	Kumaa	Seeds	Seeds cooked along with milk to form 'Kheer'	0.36
Apiaceae									
Bunium persicum (Boiss.) B. Fedtsch.	23930	Herb	Atholi/ 1888	33˚15.72'	76˚09.92'	Zeera	Seeds	Seeds used as spices	1.16
Foeniculum vulgare Mill.	23920	Herb	Atholi/ 1884	33˚15.75'	76˚10.05'	Soonp	Seeds	Seeds used as spices	0.48
Sium latijugum C.B. Clarke	23942	Herb	Tatapani/ 1898	33˚15.75'	76˚07.62'	Shoosh	Roots	Roots are eaten raw as vegetable	0.38
Athyriaceae									
Diplazium esculentum (Retz.) Sw.	23954	Herb	Hanswar/ 1925	33˚15.82'	76˚07.40'	Khichrood	Leaves and stem	Cooked leaves and stem are eaten as a vegetable	0.68
Berberidaceae									
Berberis aristata DC.	23945	Shrub	Lunari/ 1817	33˚15.72'	76˚08.15'	Keemal	Fruits	Fruits are eaten raw	0.26
Berberis lycium Royle	23947	Shrub	Tatapani/ 1909	33˚15.85'	76˚07.65'	Keemal	Fruit and fleshy stem	Fruits are eaten raw and fleshy shoots are eaten as raw vegetable	1.34
Betulaceae									
Corylus jacquemontii Decne	23950	Tree	Machail/ 2823	33˚25.50'	76˚20.08'	Thangyal	Seeds	Seeds are eaten raw, or edible oil is obtained from it	0.66

Brassicaceae									
Capsella brusa-pastoris (L.) Medik	23918	Herb	Layee/ 1823	33˚17.13'	76˚07.10'	Kheerud	Leaves	Leaves and shoots are eaten raw	0.48
Nasturtium officinale R.Br.	23929	Herb	Sohal/ 2030	33˚13.08'	76˚12.62'	Shoosh	Leaves	Leaves are cooked as vegetable	0.48
Cannabaceae									
Cannabis sativa L.	23944	Herb	Ishtiyari/ 2371	33˚09.80'	76˚15.10'	Bhang	Leaves and young inflorescence	Leaves are eaten as 'Pakoda' (Leaves mixed with besan flour) and juice of young inflorescence as 'Ghota' (juice mixed with milk)	1.16
Compositae									
Cirsium arvense (L.) Scop.	23939	Herb	Sohal/ 1928	33˚12.72'	76˚13.20'	Kanda	Fleshy stem	The stem is eaten raw as vegetable	0.20
Galinsoga parviflora Cav.	23935	Herb	Kundal/ 1864	33˚15.53'	76˚08.88'	Jangli	Leaves	Young leaves are cooked and eaten as vegetable	0.20
Taraxacum campylodes G.E. Haglund	23927	Herb	Layee/ 1853	33˚17.25'	76˚07.12'	Chippad	Leaves	Leaves are cooked as vegetable	0.62
Elaeagnaceae									
Elaeagnus umbellata Thunb.	23926	Shrub	Ishtiyari/ 2424	33˚09.53'	76˚15.37'	Chandheer	Fruits	Fruits are eaten raw	0.68
Fabaceae									
Trifolium pratense L.	23938	Herb	Sohal/ 1992	33˚12.83'	76˚13.32'	Amul	Leaves	Fresh leaves are eaten as cooked vegetable	0.32
Juglandaceae									
Juglans regia L.	24001	Tree	Ladar/ 2062	33˚15.33'	76˚09.37'	Tharoo	Seeds	Seeds are eaten raw, or 'chutney' is made from it	0.84
Lamiaceae									
Mentha longifolia (L) L.	23937	Herb	Sohal/ 1912	33˚12.65'	76˚13.22'	Padina	Leaves	Leaves eaten as 'Chutney' (an amalgamation	0.60

								formed by grinding of the leaf, salt, capsicum, and little water	
Lythraceae									
Punica granatum L.	23922	Shrub	Mati/ 1826	33˚16.43'	76˚10.33'	Dadiyun	Seeds	Seeds are eaten raw as 'Chutney'	1.08
Malvaceae									
Malva parviflora L.	23936	Herb	Tatapani/ 1978	33˚15.55'	76˚07.92'	Sochal	Leaves	Leaves are cooked as vegetables	0.50
Moraceae									
Ficus palmata Forssk.	23933	Tree	Mati/ 1862	33˚16.37'	76˚10.31'	Fagood	Fruits	Fruits are eaten raw	0.42
Oxalidaceae									
Oxalis corniculata L.	23916	Herb	Sazar/ 2290	33˚20.35'	76˚01.82'	Amul	Leaves	Leaves are eaten raw as vegetable	0.6
Phytolaccaceae									
Phytolacca acinosa Roxb.	23923	Herb	Layee/ 1754	33˚17.40'	76˚06.60'	Ashroon	Leaves	Leaves are cooked as vegetable	0.54
Pinaceae									
Pinus gerardiana Wall. ex D. Don	23951	Tree	Gulabgarh/ 1826	33˚15.75'	76˚10.58'	Mir, Fita	Seeds	Seeds are eaten raw after removing the outer shell	0.88
Polygonaceae									
Fagopyrum acutatum (Lehm.) Mansf. ex K. Hammer	23943	Herb	Tatapani/ 1986	33˚15.58'	76˚07.75'	Hannel	Leaves and stem	Stem either eaten raw or as vegetable along with leaves	0.74
Oxyria digyna (L.) Hill	23931	Herb	Bheda Dhar/ 2910	33˚14.33'	76˚07.08'	Amul	Leaves	Leaves and stem cooked as a vegetable	0.54
Persicaria amplexicaulis (D. Don) Ronse Decr.	23932	Herb	Machail Dhar/ 3483	33˚27.37'	76˚20.65'	Chah	Roots	Roots used as a tea substitute	0.48
Rumex nepalensis Spreng.	23953	Herb	Afani/ 1936	33˚16.37'	76˚07.17'	Jangipalak	Leaves	Leaves are cooked as vegetable	0.42
Portulaceae									

Portulaca oleracea L.	23928	Herb	Tatapani/ 2001	33˚15.75'	76˚07.55'	Lohan	Leaves and stem	Leaves and stem cooked as a vegetable	0.66
Rhamnaceae									
Ziziphus jujuba Mill.	23952	Shrub	Tatapani/ 1998	33˚15.75'	76˚07.57'	Ber	Fruits	Fruits are eaten raw	0.44
Rosaceae									
Crataegus songarica K. Koch	23940	Tree	Haloti/ 2832	33˚25.65'	76˚19.95'	Pindakh	Fruits	Fruits are eaten raw	0.44
Fragaria nubicola (Lindl. ex Hook. f.) Lacaita	23919	Herb	Karthai/ 1812	33˚16.75'	76˚07.15'	Bhawanch	Fruits	Fruits are eaten raw and roots used as a tea substitute	0.58
Rosa macrophylla Lindl.	23628	Shrub	Machail/ 2938	33˚35.68'	76˚38.32'	Gulab	Fruits	Fruits are eaten raw	0.26
Rosa moschata Herrm.	23530	Shrub	Atholi/ 1837	33˚16.10'	76˚10.25'	Krailgud	Fruits	Fruits are eaten raw	0.50
Rosa webbiana Wall. ex Royle	23554	Shrub	Ligri/ 2775	33˚18.03'	76˚01.44'	Gulaab	Fruits	Fruits are eaten raw	0.30
Rubus ellipticus Sm.	23948	Shrub	Dhoondi/ 2127	33˚16.90'	76˚11.20'	Kandanch	Fruits	Fruits are eaten raw	0.42
Rubus niveus Thunb.	23946	Shrub	Tatapani/ 1981	33˚15.47'	76˚07.98'	Kandanch	Fruits	Fruits are eaten raw	0.20
Salicaeae									
Flacourtia indica (Burm. f.) Merr.	23925	Shrub	Karthai/ 1773	33˚17.28'	76˚06.75'	Kakadanch	Fruits	Fruits are eaten raw	0.32
Urticaceae									
Urtica dioica L.	23949	Herb	Ladar/ 1976	33˚15.40'	76˚09.03'	Aandh	Leaves	Leaves cooked as a vegetable along with stem and leaves of *Portulaca oleracea*	0.24
Vitaceae									
Vitis vinifera L.	23941	Climber	Massu/ 2037	33˚19.00'	76˚11.62'	Jangli Daach	Leaves and fruits	Fruits and leaves are eaten raw	1.10

The highest use-report (304) was recorded for vegetables, whereas the maximum mean use-report (30.00) was recorded for spices (Table 4). The cultural index value obtained for vegetables was 34.18% of the total CI, followed by fruits (25.59%). Based on CI value, culturally, the most important species was *Berberis lycium* Royle (CI, 1.36) and the least *Cirsium arvense* (L.) Scop., *Galinsuga parviflora* Cav. and *Rubus niveus* Thunb. with CI of 0.20 each (Table 3). Informant consensus index (Fic) varied between 0.93 for beverage and 1.00 for Pakoda (fried snack) and presented in Table 4. High Fic values were also reported in previous studies from different regions of J&K (Rao *et al.* 2015; Kumar *et al.* 2015; Bhatia *et al.* 2015). These high values indicate that the passing of the ethnobotanical knowledge from ancestors to their descendants in the study area is relatively high which results in the intense use of wild edible plants.

Table 4. Species richness, F_{ic}, and cultural importance of various use-categories and subcategories of wild edible plants.

	Number of species	**Use report**	**Mean use report**	**F_{ic}**	**CI**
Fruits	15	304	20.27	0.95	6.08
Seeds	4	118	29.5	0.97	2.36
Smoking	1	24	24	1.00	0.48
Pakoda	1	18	18	1.00	0.36
Chutney	11	151	13.73	0.93	3.02
Spices	2	60	30	0.98	1.2
Beverage	6	71	11.83	0.93	1.42
Edible seed oil	3	36	12	0.94	0.72
Vegetable	19	406	21.37	0.96	8.12
9A. Vegetable (Cooked)	14	296	21.14	0.96	5.92
9B. Vegetable (Raw)	5	101	16.83	0.95	2.02
9C. Vegetable (Raw or cooked)	1	9	9	1.00	0.18

Wild edible fruits

Wild fruits of 15 species were exclusively consumed in raw form. The most preferred fruits consumed by the local inhabitants as per their CI value was *B. lycium* followed by *V. vinifera*, *Elaeagnus umbellata Thunb.*, *Viburnum grandiflorum* Wall ex DC., *Fragaria nubicola* (Lindl. ex Hook.f.) Lacaita, *Rosa moschata Herrm.*, *Zizyphus jujuba* Mill., *Crataegus songarica* K. Koch, *Rubus ellipticus* Sm., *Ficus palmata* Forssk. *Flacourtia indica* (Burm.f.) Merr., *Rosa webbiana* Wall. ex Royle, *Rosa macrophylla* Lindl., *Berberis aristata* DC. and *R. niveus* (Table 3). The fruits of *V. vinifera*, *E. umbellata*, *V. grandiflorum*, and *F. indica* were the most abundant wild fruits in the study area, which were readily relished by the local people.

Adding scientific evidence related to the health benefits and nutritional evaluation of these wild edible fruits would be a worthwhile addition to the region's wild plants. Therefore, the present study results were compared with the previous ethnobotanical, phytochemical, and pharmacological studies.

The fruits of *B. lycium* have been used by tribal communities residing in Jammu and Kashmir and Himachal Pradesh since ancient times as a food source and sauce (Kaur and Miani 2001; Tiwari et al., 2010) and is reported to contain proteins, carbohydrates, fats, and vitamin C and minerals such as Na, K, Fe, Ca, and P (Gulfraz *et al.* 2004; Sood *et al.* 2010). Besides being eaten in fresh ripened form by the local people of the study area, the fruits of *V. vinifera* were dried in the sunlight and stored for consumption during the winter season. The fruit juice of *V. vinifera* has been reported to be useful for diabetic and cardiac patients (Arya *et al.* 2014). The use of the fruits of this plant for smallpox and chickenpox is recently recorded from Tamil Nadu (Sheeja and Lohidas 2020). Fruits of *V. vinifera* are rich in insoluble fiber, vitamin C, anthocyanins (Sousa *et al.* 2014) and contain all the essential amino acids (Chikwanha *et al.* 2018). Bioactive compounds such as lutein (0.9 and 2.0 mg/kg FW) and beta-carotene (0.6 to 1.0 mg/kg FW) have been reported in *V. vinifera* (Aubert and Chalo 2018). Beta-carotene is reported essentially for vision, reproduction, and proper immune functions, including reactive oxygen species (Chytil 1999).

The fruits of *E. umbellata* have also been consumed by the Monpa community of Arunachal Pradesh (Tsering *et al.* 2017). In addition to fruits, this plant's seeds are used to treat cough (Chauhan *et al.* 2016). Owing to the availably of a substantial quantity of vitamin C, phenolics, carotenoids, flavonoids, and minerals like calcium, zinc, iron, manganese, and magnesium, the fruits of *E. umbellata* may be used as a dietary supplement. The nutritive values of the fresh berry of *E. umbellata* were 90.8 kcal/100 g and have 27.8 mg/100 g of vitamin C (Khattak 2012). Combining multiple phytochemical antioxidants, including lycopene, ascorbic acid, polyphenols, and tocopherols, makes *E. umbellata* an attractive source of functional ingredients for foods and beverages. Different antioxidant bioactive compounds in the fruits of target species can be a natural source of health-promoting antioxidants.

The fruits of *V. grandiflorum* were reported to be used against typhoid and whooping cough, while the twig powder in skin infections (Kaul 1997; Ajaz and Ahmed 2017). Aqueous fruit extract of this species possessed strong (75.85%) OH^- scavenging capacity (Shan *et al.* 2019), while methanolic extract has been shown to inhibit lung cancer cell growth (Han *et al.* 2020). The fruits of *F. nubicola* are eaten raw, whereas the roots are used as tea substitute by the villagers in the study area and concur with the earlier reports in J&K (Singh and Bedi 2018; Kumar and Hamal 2009). A broad concentration range of polyphenolics, flavonoids, flavonols tannins, proanthocyanidins, and vital antioxidant activities have been reported for this plant species in different assays such as DPPH, FRAP, ABTS, etc. (Bahukhandi *et al.* 2020). The fruits of *R. webbiana* are consumed to treat indigestion, and gastrointestinal disorders (Balodi *et al.* 2018), whereas the fruit powder of *R. moschata* is consumed along with honey for treating leucorrhea, bleeding, and pregnancy termination (Topwal and Uniyal 2018). Recently Sadia (2020) reported a protein content of 9.01% in *R. moschata*. Carbohydrates of 80.73% and 80.74% were reported for *R. webbiana* and *R. moschata*, respectively, from Pakistan (Sadia 2020). Some informants have emphasized the usefulness of wild plants in the daily diet, especially during the famine periods, like those occurring during the Second World War and Spanish Civil War (Carvalho 2005).

The people in the study area consume the fruits of *Zizyphus jujuba*. The fruits have been reported to rich in carbohydrates (69.12%), total sugars (27.75%), phosphorus (133 mg/100g), calcium (199.19 mg/100g), magnesium (84.69 mg/100g), and iron (4.15 mg/100g) (Sehgal and Sood 2013). Phytochemical studies revealed the presence of phenolics, flavonoids, and carotenoids in the fruits of *Z. jujuba*, which can improve human health (Wojdylo *et al.* 2016). The villagers in the study area cherish the fruits of *C. songarica*. Previous studies in J&K reported the cardioprotective and anti-hypertensive uses of this plant's fruits (Kumar *et al.* 2009; Lone et al., 2014). The fruits are also reported to be edible in Himachal Pradesh and used locally to prepare wine (Dutt *et al.* 2014). The methanol extract of *C. songarica* has been shown to exhibit protective action against kidney CCl_4-induced toxicity in the heart and kidney tissue (Ganie *et al.* 2016). The consumption of raw fruits of *R. ellipticus* in the study area corresponds to the report of Rana *et al.* (2019) from Chamba, Himachal Pradesh. Previous studies reported low concentration of heavy metals such as Cu, Pb, and Cr, high quantity of carbohydrates (83.62 g/100 g), and energy density (403.29 Kcal) in the fruits of *R. ellipticus* (Ahmad *et al.* 2015); therefore, their intake should be encouraged for the particular reason of fulfilling starvation and hunger.

In addition to the raw consumption of fruits of *F. palmata* documented in the present study, Bhatia et al. (2018) also reported the edible use of leaves. The fruits of *F. palmata* have an energy value of 565.67 (Kcal/100 g FW) and contain a fair amount of minerals like K, P, and Ca in the concentration of 208.67, 32.67, and 65.00 mg/100g FW (Hegazy *et al.* 2013). Fruits of *F. indica* were cherished by the local people in the study area. The fruits, bark, and seeds of this plant have been reported to act as a digestive, diuretic, appetizer, and effective against jaundice (Kumar and Chander 2019). The fruits *F. indica* were reported to be a rich source of carbohydrates (80.7%), potassium (24281 µg g-1) and phosphorus (1057 µg g-1), with high energy value (1290kJ 100 g-1) (Kalenga and Msonthi 1994). The fruits of *R. macrophylla* are sour and consumed by the people as a source of nutrition. Similar use also has been documented in Kashmir and Uttarakhand (Singh *et al.* 2016; Joshi *et al.* 2018). Nutritional evaluation studies have not been reported hitherto for this plant; therefore, such studies are warranted.

The edible use of *B. aristata* fruits recorded in the present study is also reported in previous studies from Western Himalaya (Thakur *et al.* 2017). Berberine, an active compound of this species, has been used in Ayurvedic and Chinese medicine for its anti-diarrhoeal, anti-microbial, anti-protozoan, and anti-trachoma activity (Chander *et al.* 2017). The fruits of *R. niveus* are eaten as a carbohydrate source in Western Himalaya (Sharma *et al.* 2009; Radha *et al.* 2013). In addition to fruits, the roots of *R. niveus* are employed during menses (Uniyal *et al.* 2006). The methanolic fruit extract of *R. niveus* has been shown to possess antioxidant and gastroprotective activity (Nesello *et al.* 2017).

Wild vegetables

A total of 19 species were used as a vegetable in the region. The most preferred wild vegetable was *B. lycium*, *Fagopyrum acutatum* (Lehm.) Mansf. ex K. Hammer, *Diplazium esculentum* (Retz.) Sw., *Portulaca oleracea* L., *Taraxacum campylodes* G.E.Haglund, *Oxalis corniculata* L., *Amaranthus viridis* L., *Oxyria digyna* (L.) Hill, *Phytolacca acinosa* Roxb., *Malva parviflora* L., *Capsella brusa-pastoris* (L.) Medik., *Nasturtium officinale* R.Br., *Rumex nepalensis* Spreng., *Sium latijugum* C.B. Clarke, *Chenopodium album* L., *Trifolium pretense* L., *Urtica dioica* L., *C. arvense*, and *G. parviflora*. Most of these vegetables were consumed after cooking (use report, 296), but few were used in a raw form as a green salad. Some wild vegetables like *T. campylodes*, *D. esculentum*, *A. viridis*, *P. oleracea*, and *N. officinale* were cooked and eaten during breakfast and lunch in the summer season. Besides being consumed in raw form, these five plants' edible parts were also dried and stored for their consumption during the winter season when many food options are not available.

The present study documented the edible use of roots and fleshy stem of *B. lycium* and is in line with the earlier reports (Singh and Bedi 2018; Bhatia *et al.* 2018). The presence of a fair amount of proteins, carbohydrates, lipids, and vitamins and minerals such as zinc, copper, sulfur, sodium, iron, calcium (Gulfraz *et al.* 2004; Sood *et al.* 2010) makes this critical from a health perspective. In addition to the edible use of leaves and stem, as mentioned in the present study, seeds of *F. acutatum* were also reported to be edible (Bhatia *et al.* 2018). *D. esculentum*, a highly preferred vegetable of the study area, is reported to contain an adequate nutritional value (3413.2 kcal kg−1) and essential protein quality (143.8 g kg−1) (Seal 2012). Being rich in beta-carotene, folic acid micronutrients, and minerals like Fe, P, and Ca (Archana *et al.* 2012), *D. esculentum* can be possibly included in the diet or nutritional replacement programs. Besides being eaten as food in the present study, the leaves of *P. oleracea* have also been used against skin ailments by the Kani tribes of Pechiparai Hills in Western Ghats (Sukumaran *et al.* 2020). *P. oleracea* is reported to be rich in minerals and omega-3 fatty acids (Oliveira *et al.* 2009; Mohamed and Hussein 1994).

T. campylodes is consumed in summers by the local populace and is a crucial nutritive addition in diets. The leaves of *T. campylodes* has been reported to be a rich source of proteins, calcium, phosphorus, and dietary fiber (Escudero *et al.* 2003). In addition, roots of this plant species were reported to be used to treat CNS-related ailments in the Ladakh region (Singh *et al.* 2020). *O. corniculata* is sour and cherished by the people during hot summers in the study area. The leaves of this plant species are an essential source of antioxidants and possessed anti-diabetic and anti-cancer properties as well (Kathiriya *et al.* 2010; Sharma and Kumari 2014). The edible use of leaves reported in the present study was previously reported from different parts of India (Bhatia *et al.* 2018; Tsering *et al.* 2017). Studies carried out by Sarker and Oba (2019) reported significant amount of total phenolics, protein, carbohydrates, vitamin C, dietary fiber, and minerals such as Ca, K, Mg, and P from the leaves of *A. viridis*, which substantiated its edible use by the locals. The leaves of *O. digyna* were procured by the locals from high altitudes and cooked as a vegetable. The edible use was also reported from the Kashmir region (Singh *et al.* 2017). Leaves of *P. acinosa* are eaten as a vegetable by the local inhabitants. Phytochemical evaluation studies revealed an energy content of 325.83 kcal/100g in the leaves of *P. acinosa* (Seal *et al.* 2017) and rich in ω-3 fatty acids, particularly α-linolenic acid and antioxidants like vitamin C and vitamin E (Nemzer *et al.* 2020).

The leaves of *M. parviflora* are cooked like spinach in the study area and previously reported to be consumed in Himachal, J&K, and other parts of India (Bhatia *et al.* 2018; Prakash *et al.* 2020). Traditionally, the leaves were also used to treat the cold, cough, and pyrexia (Gairola et al., 2014). Phytochemical analysis showed a significant concentration of total phenolics (204.4 mg GAE/100g) and proteins (23%) in the leaves of *M. parviflora* (Ereifej *et al.* 2015), which are essential from a health perspective. *C. brusa-pastoris* is cooked as a vegetable by the villagers, and the leaves (100 g) were reported to contain a substantial amount of carbohydrate (44.1 g), protein (35.6 g), fat (4.2 g), fiber (10.2 g), and vitamins (Duke and Ayensu 1985). *N. officinale* as a vegetable is very popular in the study area and has been reported to be eaten in other Indian states (Sharma *et al.* 2018; Bhujel *et al.* 2018). The leaves of this species were reported to contain a considerable amount of protein (33.8%DM), carbohydrate (31.7%DM) and have a food value of 348.4 Kcal/100g DM (Pradhan *et al.* 2015) and also possessed excellent nutritional property and antioxidant activity (Khan *et al.* 2016) which justifies its use as food in the study area.

The leaves of *R. nepalensis* are eaten in cooked form by the local populace. Previous studies reported leaf and root powder to treat skin burns, cuts, and wounds in the Western Himalayan region (Singh *et al.* 2017). *R. nepalensis* is considered a high-value medicinal herb in North-Western Himalaya owing to its high anthraquinone content (Wahid *et al.* 2013) and also reported to have antioxidant and anti-microbial activity (Shrestha and Timilsina 2017). The roots of *S. latijugum* are eaten raw as reported in the present study. No edible reports were found in the

literature regarding its edible use; therefore, they should be evaluated for their nutritional composition. Similarly, the seeds of *C. album* were consumed in the form of a traditional recipe known as 'Kheer,' especially during festivals, but the edible reports are scanty. However, this plant's leaves have been reported to contain amino acids such as lycine, leucine, isoleucine, and ascorbic acid as main active components (Pande and Pathak 2010).

The fresh leaves of *T. pretense* are consumed in cooked form as per the respondents; however, previous studies reported the leaves and shoot to be edible (Bhatia *et al.* 2018). The whole plant's traditional utility for several health-related issues like asthma, bronchitis, whooping cough, ulcers, and memory enhancer has been put on record (Gairola *et al.* 2014). The leaves and flowers of *T. pretense* have been reported to possess antioxidant and antibacterial activities (Hanganu *et al.* 2017). *U. dioica*, commonly known as 'stinging nettle' is consumed in cooked form along with the leaves and stem of *P. oleracea* (Table 3). The young leaves and shoots are a rich source of polysaccharides, β-carotene, iron, potassium, manganese, calcium protein, silicon, phosphate, and vitamin C to absorb iron (Jan and Singh 2017). The reported edible use of fresh tender stem of *C. arvense* has not been recorded earlier in the present study. However, the traditional therapeutic use of leaves of this plant in headache, indigestion, and vomiting has been put on record (Gairola *et al.* 2014). The methanolic and hexanoic extract of leaf, flower, and stem of *C. arvense* exhibited activity against *Escherichia coli*, *Klebsiella pneumonia*, and *Staphylococcus epidermidis* (Dehjurian *et al.* 2017). Reports on a nutritional profile were not found for this plant. The young leaves of *G. parviflora* are consumed in cooked form in the study area. The leaves and aerial parts have been previously documented for their usefulness in digestion, liver problem, wound, inflammation in Uttaranchal and Tripura states of India (Pande *et al.* 2006; Sen *et al.* 2011).

Wild plants for the traditional sauce *'Chutney'* making

The three species viz. *Punica granatum* L., *Mentha longifolia* (L.) L and *Juglans regia* L. were used to make traditional sauces. A special sauce, locally known as '**Chutney**,' was prepared during summer days by grinding leaves of *M. longifolia*, seeds of *P. granatum*, and kernels (seeds) of *J. regia* in mortar and pestle with the subsequent addition of salt and capsicum. Chutney is included in daily meals in the study area, particularly in summer. It is reported as an appetizer, improves digestion, and has anti gastric and antispasmodic activities (Rao *et al.* 2015; Bhatia *et al.* 2014). At some places viz., Tatapani, Atholi, and Sohal, the curd was also added to the '**Chutney**' prepared from seeds of *P. granatum*, whereas fruits of *Solanum lycopersicum* were added to the '**Chutney**' prepared from leaves of *M. longifolia*. The 'Chutney' prepared from the seeds of *P. granatum* was claimed to act as a cooling agent and as an appetizer as per the informants. The seeds of this plant were also reported to be consumed in the cold arid region of Indian Himalaya (Rana *et al.* 2012). The fruit of *P. granatum* has been reported to rich in phenolics and have rich nutraceutical potential (Di Stefano *et al.* 2019). The anti-diabetic potential of this plant's aqueous fruit extract has been recently explored in alloxan-induced diabetic rats (Gharib and Kouhsari 2019). In addition to its cooling property, the raw kernels of *J. regia* were claimed to increase sperm count and considered suitable for memory and health. It is widespread and valued globally for its nutritional and health benefits (Popovici 2013).

The fruits of *J. regia* are valuable and edible, and their oil is rich in polyunsaturated fatty acids, tocopherols, and phytosterols (Zhao *et al.* 2014). Protein hydrolysate from *J. regia* showed neuroprotective and memory-enhancing effects (Liu *et al.* 2019). In vitro, anti-cancer, and antifungal activities of different solvent extracts of wild *M. longifolia* against MCF7 human breast cancer cell line has been worked out recently (Yassin *et al.* 2020).

Wild seeds for edible oil and spices

The edible oil was extracted from the seeds of *Corylus jacquemontii* Decne., *J. regia*, and *Pinus gerardiana* Wall. ex D.Don. The edible seed oils of all three species were claimed to be good for health. The edible seed oils of J. regia and *C. jacquemontii* were consumed mostly during the winter season. The kernels of *C. jacquemontii* are rich in polyphenols, which attributes to their antioxidant nature (Kumar *et al.* 2016), whereas walnuts are considerably rich in omega-6 and omega-3 polyunsaturated fatty acids among the nuts mostly containing monounsaturated fatty acids (Amaral *et al.* 2003). In India, *P. gerardiana* is distributed in Jammu and Kashmir, Himachal Pradesh, and Uttarakhand, and the kernels, like other edible pine nuts, are a rich source of carbohydrates, proteins, and fats without cholesterol (Thakur et al., 2009). Besides, some antioxidant compounds such as carotenoids and tocopherols, catechin, gallocatechin, lutein, and lycopene have also been extracted and quantified from the *P. gerardiana* nuts (Hoon *et al.* 2015).

The dry seeds of *Bunium persicum*, *P. granatum*, and *P. gerardiana* were very famous among the local populace and eaten raw. The local people sold seeds of these three species at reasonable prices in the market. The aromatic seeds of *B. persicum* and *F. vulgare* were routinely used as a spice in all the vegetable and pulse preparations

cooked in the study area. In some earlier studies, it has been reported that indigenous communities of Jammu, Kashmir, and Ladakh, traditionally use seeds of *B. persicum* to treat bronchitis, leprosy, depression, digestive ailments, convulsions. In contrast, the seeds of *Foeniculum vulgare* are used as a diuretic, antispasmodic, and blood purifier (Gairola *et al.* 2014). The fresh inflorescences of *F. vulgare* have been reported to be rich in carbohydrates (22.82 g/100g), energy (108.23 Kcal/100), total polyunsaturated fatty acids (PUFA) (Barros *et al.* 2010). The seeds of *P. granatum* are reported to have high amounts of polyphenols (458-3299mg GAE/L) and flavonoids (145-636mg QE/L) (El Kar *et al.* 2011).

Wild plants for recreational uses

In the study area, besides being eaten raw, the *V. vinifera* fruits were used for preparing crude alcohol either from fresh or dried fruits. A local drink known as '**Ghota**' is prepared by mixing the crude extract of the young inflorescence of *Cannabis sativa* L.with milk and consumed during the night in a local religious festival known as "**Athein.**" The active principle of *C. sativa* is the cannabinoids. Recently, some randomized trials have been conducted displaying the positive effects of cannabidiol in treating epilepsy (Devinsky *et al.* 2017; Schoedel *et al.* 2018). Tea prepared from the roots of *F. nubicola* was widely used in the study area for its protective effects against cold and throat irritation. The dried resin of *C. sativa* was inhaled along with the other tobacco products to have hallucinating effects. A local fried snack recipe, known as **'Bhang-Pakoda**,' prepared by frying the young inflorescence and leaves of *C. sativa* combined with white flour, is consumed for recreational uses during local festivals.

Income from wild edible plants

Most of the WEPs were gathered for home consumption by most households therefore income generation from sale of WEPs was very less. However, few economically important plants such as of *B. persicum* (seeds), *P. gerardiana* (seeds), and *J. regia* (fruits) have good market potential, as they can easily be sold at rates of Rs. 3000-4000, Rs. 1000-2000, and Rs. 200-600 per kg, respectively. The plant-like *M. longifolia* grows very well in the wild in the study area. In addition to the edible plant species, the extraction of some medicinal plants such as *T. govanianum* and *F. cirrhosa* was found very high in the study area and had a local market rate of Rs. 10,000-18,000 and Rs. 12,000-20000 respectively. Most of the people in the study area are unaware of the economic potential of other plant species which can have the potential of uplifting the local people's economic conditions.

Threats to wild edible plants

The lack of awareness among the young generation about the nutritional value of wild fruits is a serious concern in the study area. Furthermore, the field study revealed that the many human activities such as the expansion of horticultural land, timber harvesting, infrastructure development, forest land overgrazing, and fuelwood collection and frequent forest fires rendered wild edible species under constant pressure in their natural habitat and threatening their diversity. Of all the reported wild plant species, the cultivation of very few plant species such as *A. viridis*, *C. album*, *F. vulgare*, *J. regia*, and *M. longifolia* is done in the study area. It is, therefore, posing extra pressure on the other wild edible plant species.

Gaps identified in the study

Edibles use for *S. latijugum* (roots) *C. arvense* (tender stem) were reported for the first time. The literature review also revealed the absence or presence of very few studies on the nutraceutical potential of *P. gerardiana* (fruits), *V. grandiflorum* (fruits), and *C. jacquemontii* (fruits), *O. digyna* (leaves), *R. webbiana* (fruits), *R. moschata* (fruits), *Berberis aristata* (fruits), *G. parviflora* (leaves).

Conclusions

For the first time, the present study has reported wild edible plant species consumed in Paddar valley. The study revealed that the traditional consumption of wild plants as food is still viable in this valley and plays a vital role in fulfilling the residents' nutritional requirements, especially during winters. The most commonly used plant parts were fruits and leaves. Some of the plant species might be a source of cash income for local people with low cash income if properly harvested because they are highly valued by local people and regularly traded in markets. Edibles use for *Sium latijugum* (roots) *C. arvense* (tender stem) were reported for the first time. The commonality found in the literature review between the plant consumed in the study area and the other Western Himalaya regions showed that the Himalayan range residents have similarities in their traditions. The most culturally important species are *Berberis lycium*, *Bunium persicum*, *Cannabis sativa*, *Vitis vinifera*, *Punica granatum*, *Pinus gerardiana*, *Juglans regia*, *Fagopyrum acutatum*, *Diplazium esculentum*, *Elaeagnus umbellata*, *Corylus jacquemontii*, *Portulaca oleracea*, *Taraxacum campylodes*, *Viburnum grandiflorum*, and *Mentha longifolia*. As an

aspect of ecotourism, wild edible plants in local restaurants can conserve this valuable knowledge and maintain local livelihoods. The scantiness of literature on the nutraceutical aspects of *Pinus gerardiana* (fruits), *Viburnum grandiflorum* (fruits), and *Corylus jacquemontii* (fruits), *Oxyria digyna* (leaves), *Rosa webbiana* (fruits), *Rosa moschata* (fruits), *Berberis aristata* (fruits), *Galinsoga parviflora* Cav. (leaves) required researcher attention. The information revealed in this study can be considered as a baseline for conservation and sustainable utilization of the valley's wild edible plants, as well as contributing to the preservation of cultural and genetic diversity. Further studies are required to assess the nutritional, agricultural, and economic potential of the reported plant species for the upliftment of the socio-economic conditions of the people of this biodiversity-rich region. For the sustainable use of edible resources, a largescale plantation in forest/wasteland is also required in the region.

Declarations

Ethics approval and consent to participate: Not applicable.
Consent for publication: All authors read the final manuscript and approved it for publication.
Availability of data and materials: All data related to the manuscript is present within the paper.
Funding: This research was funded by Council of Scientific and Industrial Research (CSIR), Government of India under the Major Lab Project titled "Collection of plant resources from selected ecological niches for novel bioactivities" (MLP 1007).
Authors' contributions: SG and KS designed the work; KS wrote the manuscript and analyzes the results; KS, PK and BK were involved in collecting ethnomedicinal data; SG and YP restructured and revised the manuscript.

Acknowledgments

Authors thank Director, IIIM Jammu, for providing necessary facilities to carry out the study. Authors are thankful to the Council of Scientific and Industrial Research (CSIR), Government of India, for financial assistance under the Major Lab Project titled "Collection of plant resources from selected ecological niches for novel bioactivities" (MLP 1007). KS & PK acknowledges the financial support provided by CSIR in the form of a JRF/SRF fellowship.

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