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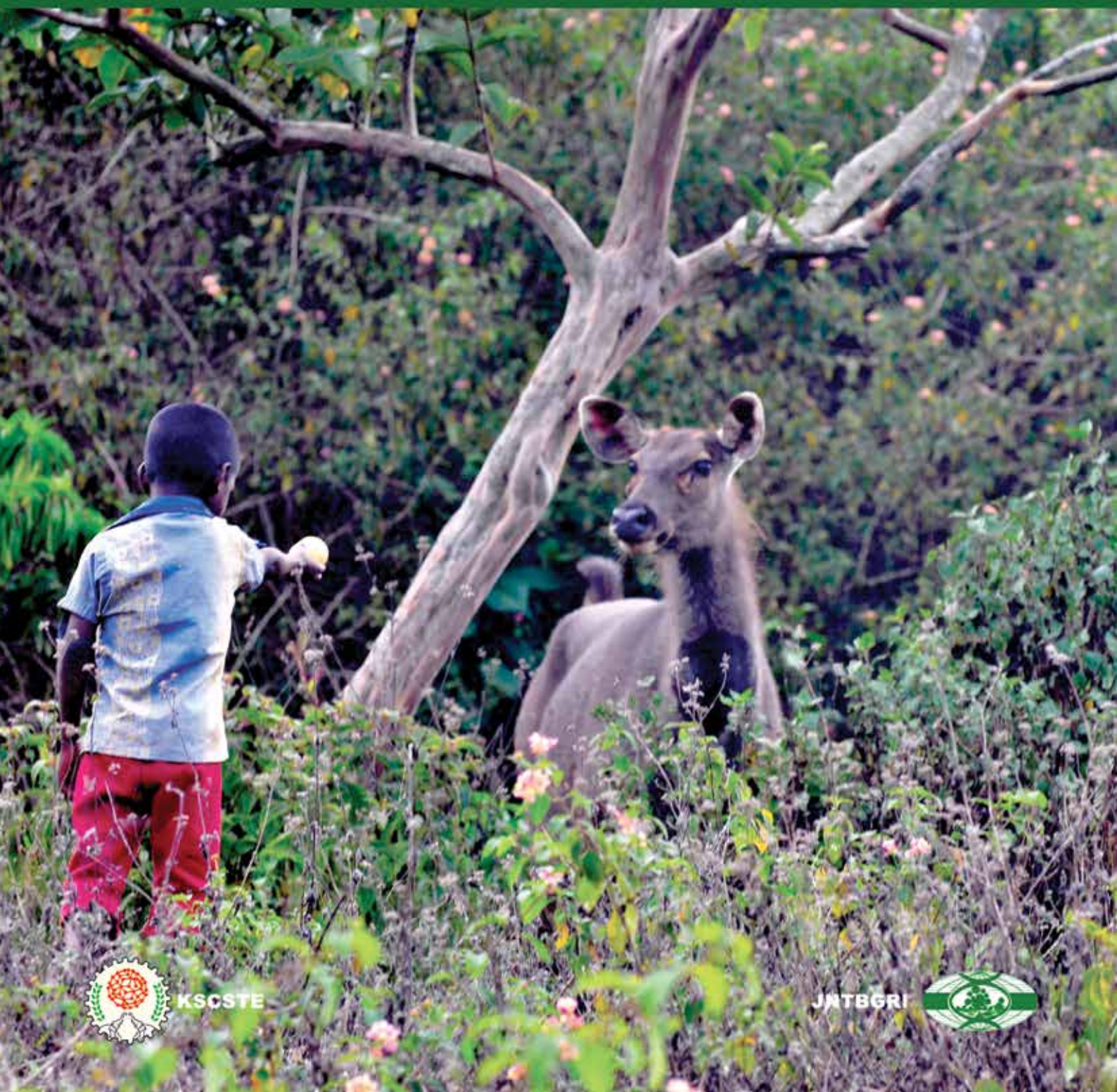

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Wild edible plants as invaluable ethnomedicine among mountainous people of Bhaderwah, Jammu and Kashmir, India

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Abstract

Villagers depend on the forest resources for wood, timber, non-timber forest products, medicines, food, etc. The knowledge on usage of plants has been accumulated from centuries through hit and trial practices. The wild edible plants are collected from forests and consumed in many ways using diverse recipes according to local traditions. These species are the best resources of ethnomedicine among the mountainous people. Current study has been undertaken to assess the extent of Traditional Knowledge (TK) on wild edible plants among villagers in one of the forest sub-divisions i.e. Bhaderwah, Jammu and Kashmir, India. Data on wild edible plants has been collected through direct interview of 49 informants (all women) in Bhaderwah forest sub-division, Jammu and Kashmir, India and analyzed using quantitative parameters like *Use Value* (*UV*), *Family Use Value* (*FUV*) and *Factor Informant Consensus* (F_{ic}). Further, about 18 different plant parts of 18 plant species are also reported to be used to generate economy by womenfolk of the region. Among marketed plants, 10 species are of high commercial value. The information gathered during the investigation indicates that traditional knowledge on ethnomedicine under the disguise of wild edible plants can be useful for drug discovery, once divulged.

Keywords: Wild edible plants, Medicinal food, Economy, Northwest Himalaya, India

1. Introduction

Ethnic people use wild plant species as food either for dietary purpose or for medicinal requirements. A research conducted about 40 decades ago, has recorded that about 800 plant species are consumed by tribal people as vegetables in India (Singh and Arora, 1978). Collection and use of wild plants for food materials is observed mostly among the poor people (Girach and Aminuddin, 1988). Poor households in Zimbabwe, rely on wild fruits as an alternative to cultivated food for a quarter of all dry season's meals (Wilson, 1990). However, the role of wild edible plants in developing countries has been ignored and underestimated for many years (Guinand and Lemessa, 2000; Sajem and Gosai, 2006]. India has also ventured very slowly in the study of wild medicinal food (Arora, 1991; Bhandari, 2010; Bharucha and Pretty, 2010; Gour, 1977; Kar and Borthakur, 2008; Mohanty, 2010; Pal and Banarjee, 1971; Patole and Jain, 2002; Saxena *et al.*, 1981). On the other hand, some wild edible plants are marketed to generate economy by the poor people in eastern part of India (Borthakur, 1996; Chakraborty *et al.,* 2003).

Jammu and Kashmir State, because of its geographical position is known for amalgam of heritages with respect

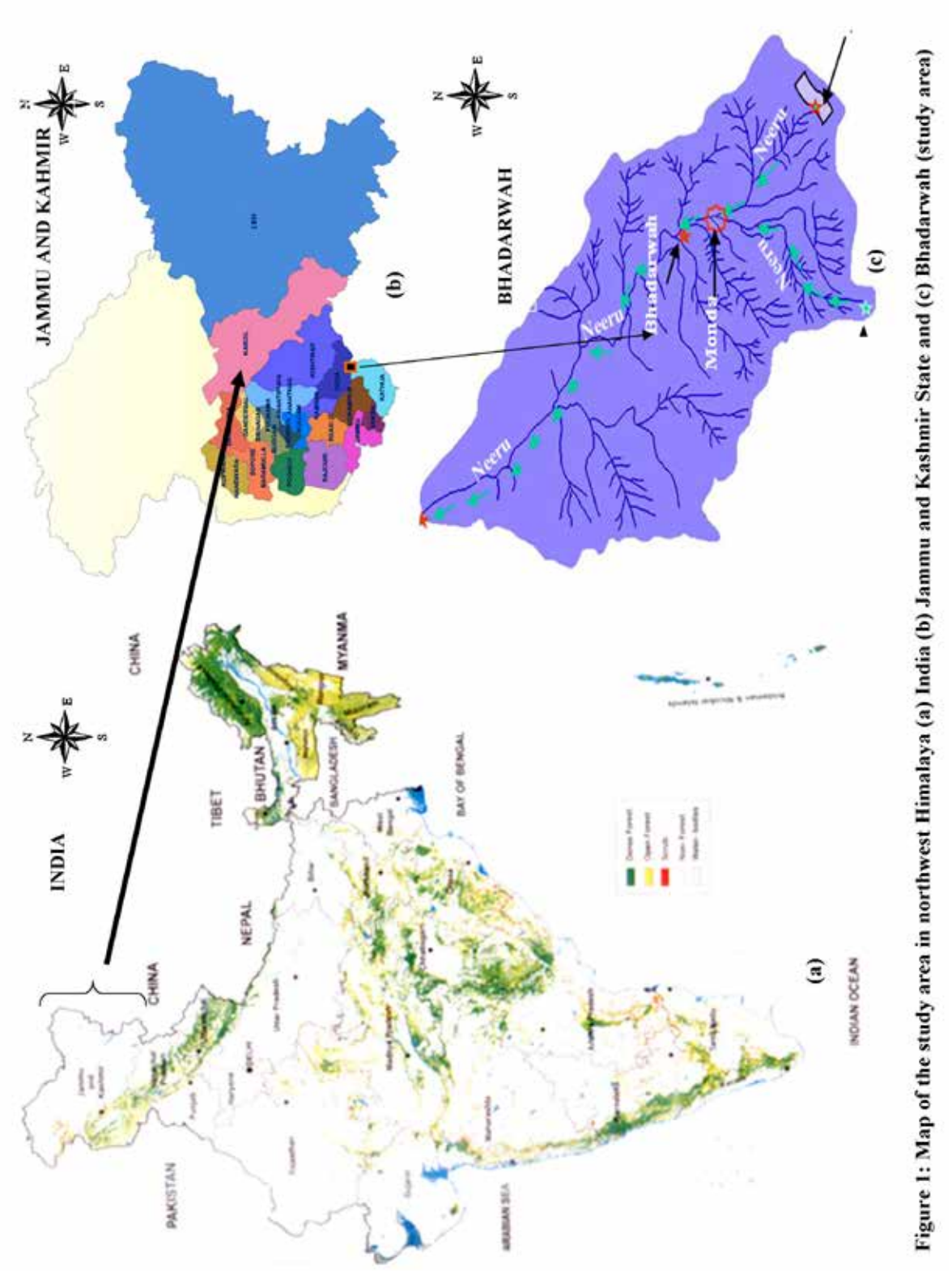

Figure 1: Map of the study area in northwest Himalaya (a) India (b) Jammu and Kashmir State and (c) Bhadarwah (study area)

to culture, shelter, clothing and food. In addition to the cultivated crops, mountainous people particularly womenfolk also collect the wild plant species for dietary purposes. The rationale behind the use of the wild plant species in Himalayan mountains may be the remoteness of the region as well as medicinal enormity of the species. Various ethno-botanical surveys are already conducted in Jammu and Kashmir, India (Bhatia *et al.,* 2014a, 2014b, 2015; Dhar, 1980; Dutt *et al.,* 2015; Gairola *et al.,* 2014; Kant and Sharma 2000; Kaul *et al.,* 1995; Nawchoo and Buth, 1989; Raghunathan, 1976; Sarin and Kapur, 1984; Sharma and Kachroo, 1983; Sundryal *et al.,* 1998; Verma *et al.,* 1999; Virjee *et al.,* 1984). However, data on the wild edible plants with respect to their medicinal/ pharmacological importance remained untouched by the ethnobotanists in this region. During the botanical explorations in North Western part of Himalaya, few women collecting leaves of *Fagopyrum tataricum* (L.) Gaertn. in Bhaderwah forest sub-division were spotted. Womenfolk collect and cook the leaves of the species in fresh as well as in dry form. This generated a quest on exploration of Traditional Knowledge (TK) on wild food materials usage. During the study, data on usage of ethnobotany on wild edible plants among the villagers particularly womenfolk of northwest Himalaya has been collected and analyzed using various quantitative indices.

2. Materials and Methods

2.1. Study area

The study is conducted in a bowl shaped valley – Bhaderwah (N 32^0 $59^/$ $00.42^{//}$ and E 75^0 $42^/$ $41.90^{//}$) in northwest Himalaya comprised of subtropical to alpine vegetation (Fig. 1). The study area at a distance of 160 km away from nearest railway station (Udhampur) is the remotest area predominated by conifer forests. The most prevalent tribes (Gaddi & Shippi) and other inhabitants of the area have maintained their ethnicity through continuous practices on ethno-medicine, ethnoagriculture and ethno-food. The traditional food materials used by the people in the study area also include wild plant species growing in the region.

2.2 Data collection

During the various surveys conducted, a total of 49 informants (women) belonging to 7 mountainous villages were interviewed using a semi-structured questionnaire. The information gathered through questionnaire study included, name of the species, habit and altitudinal range of habitat, plant part used, method of preparation of food and medicinal importance thereof. The species spelled out by the informants were collected and identified using field guide and other taxonomic keys provided in various floras (Hooker 1875-97; Polunin & Stainton 1984; Stainton 1998; Sharma & Kachroo 1983). Species which were difficult to identify in field were taken to the herbarium of Department of Botany, University of Jammu (HBJU) for identification.

2.3. Data analysis

Data obtained using semi-structured questionnaire resulted in documentation of wild edible plant species, collected, preserved and utilized by the womenfolk of Bhaderwah in North West Himalaya. Data were arranged on Microsoft Excel Spread Sheet and analyzed using three quantitative indices given below:

2.3.1. Use Value (UV): A quantitative measure for the relative importance of species was obtained by calculating the use-value using the formula (Phillips *et al.,* 1994):

$UV = \Sigma U/n$ {where U is the number of use reports cited by each informant for a given species and n refers to the total number of informants}.

High *Use Values* of the species approaching 1 (= many use-reports), indicate the importance of the species and its frequent use, it approaches zero (0), when there are few reports related to its use. The use value, however, does not distinguish whether a plant is used for single or multiple purposes.

2.3.2. Family Use Value (FUV): This parameter is calculated using below given formula to distinguish plant families that have more uses than would be expected by random chance (Phillips and Gentry, 1993):

$FUV = UV_s/n_s$ { where UV_s is the sum of the use values for all the species within a given family and n_s is the total number of species within a given family }.

2.3.3. Factor Informant Consensus (F_{ic}): This parameter tests the homogeneity of traditional knowledge among the informants (Heinrich et al. 1998):

$F_{ic} = n_{ur}\text{-}nt / n_{ur}\text{-}1$ { where F_{ic} is factor informant consensus, n_{ur} is number of use- reports, nt is number of taxa used}.

High value approaching 1 indicates that the knowledge is relatively more homogenous for ailment than other mentioned in the list. Moreover, low F_{ic} values (near 0) also, indicates that plants are chosen randomly or there is no exchange of information about their use among informants, and it approaches one (1) when there is a well defined selection criterion in the community and/or information is exchanged between informants (Gazzaneo *et al.,* 2005).

3. Results and Discussion

3.1. Demography and sociology: Himalayan womenfolk are considered a prime section of society in collecting and processing of wild edible plant species. A total of 49 informants, all females, from 07 villages were interviewed to understand the extent of ethnobotany on wild edible plants. Out of 49 informants 7 (14.28%) were between 20-30 years, 12 (12.48%) were between 31-40 years, 13 (26.53%) were between 41-50 years and 17 (34.69%) were between 51-60 years (Table 1). Individuals of womenfolk with age more than 61 years were not involved in collection or cooking process in the study area, therefore excluded in the current study. Only 28 (7 + 16 + 05) informants, accounting 57.14% of the total were literate who could understand the English dialogue (Table 1).

Although the Liquid Petroleum Gas (LPG) is available in every household for cooking purpose, the least usage of the LPG is very attention-grabbing in the study area. Data reveals that young womenfolk have given first preference for use of modern energy system like LPG, electricity, etc. However, use of kerosene for cooking purpose is the 2nd preference among young informants between age group 20-40 years. Womenfolk from age group 41-60 years do not prefer modern energy systems (LPG/electricity) for cooking purpose. Their preferences are clear about the use of either semi-modern system (kerosene) or traditional system (fuel wood/cow dung). The food preferences

Table 1. Demography and literacy among the informants (womenfolk)

Informants				
Females	49			
Males	00			
Age group				
20-30 years	07 (14.28%)			
31-40 years	12 (24.48%)			
41-50 years	13 (26.53%)			
51-60 years	17 (34.69%)			
Education and literacy	**Age groups**			
	(20-30)	**(31-40)**	**(41-50)**	**(51-60)**
Never attended school	Nil	Nil	06	14
Attended school for 1-5 classes (primary level)	Nil	Nil	04	03
Attended school for 6-8 classes (middle level)	05	09	02	Nil
Attended school for 9-10 classes (metric level)	02	03	Nil	Nil
Cooking practice (Preferences)	**Age groups**			
	(20-30)	**(31-40)**	**(41-50)**	**(51-60)**
Modern System (LPG/Electricity)	1st	1st	Nil	Nil
Semi modern system (Kerosene)	2nd	2nd	Nil	Nil
Traditional system (Fuel wood / cow dung)	3rd	3rd	2nd	1st
Food materials (Preferences)	**Age groups**			
	(20-30)	**(31-40)**	**(41-50)**	**(51-60)**
Traditional	2nd	1st	1st	1st
Modern	1st	2nd	3rd	3rd
Sun dried	2nd	1st	1st	1st
Ready to use (frozen)	Nil	Nil	Nil	Nil

are also different for each age group *i.e.* informants between 20-30 years have second preference towards traditional food whereas it is the first choice for rest of the three age groups (31-40, 41-50 & 51-60). Similarly, sun dried food materials are preferred by the informants who belong to the age above 30 years

3.2. Wild edible plant species: A total of 43 species of angiosperms belonging to 43 genera of 29 families are used as wild vegetable species by villagers in Bhadarwah forest subdivision, Jammu and Kashmir, India. Further, 01 pteriodophyte i.e. *Diplazium esculentum* (Retz.) Sw., 01 gymnosperm i.e. *Taxus baccata* Zucc. and 02 macrofungi i.e. *Geopora arenicola* (Lev.) Kers and *Morchella esculenta* Fr. are also reported as wild vegetables or wild food materials from the study area. Depending upon their habitat, these species are distributed from low to high elevations in Bhaderwah forest (Table 2).

Among the wild vegetable plant species available in the area, Polygonaceae contributes maximum species, i.e. 05 (10.6%) followed by Apiaceae 04 (8.51%) species. Other 27 families contribute only 01 species each as wild vegetable to the villagers (Table 3). Among plant parts used as wild vegetables, 19 (36.53%) species contribute leaves, 09 (17.30%) species contribute fruits, 04 (7.69%) species contribute seeds, 3 (5.76%) species contribute flowers, 2 (3.84%) species each contribute roots and seeds, 2 (3.84%) macrofungi contribute their fructifications, 1 (1.9%) species each contribute rhizomes, corms, bark, stem and all underground parts. More than two plant parts of a plant are obtained from many plant species e.g. stem-underground parts, leaves-stem, leaves-seeds and fruit-seeds are contributed by 1 (2.1%) species each. Whole plant parts of 06 (11.53%) species are used as wild vegetables in the study area (Table 2).

Each species used as vegetables has one or other medicinal property. Data reveals that a total of 23 (48.9%) wild plant species are consumed as vegetables to treat various gastrointestinal and liver ailments like appetite, oral ulcers, constipation, gastroenteritis, dyspepsia, dysentery, diarrhea, acidity, flatulence

Table 2. Therapeutic use, use value along with the altitudinal distribution of wild vegetables of Bhaderwah in NW Himalaya

S. No.	Name of the plant	Vernacular name	Habit	Elevation (masl)	Plant parts	Indigenous Knowledge (Number of Individual reports)	Use value
1	*Acorus calamus* L. Family : Acoraceae	Naglach	Herb	1400-2000	Rhizomes	Small pieces of rhizomes are cooked with the vegetables to cure digestive problems like indigestion, worm etc. (19).	0.38
2	*Allium stracheyii* Baker Family: Aliaceae	Kiyar	Herb	Above 3000	Leaves † (L) α	The powdered leaves are roasted to black colour and dusted on the pulao rice as digestive ingredient of clarified butter (35).	0.71
3	*Amaranthus spinosus* L. Family: Amaranthaceae	Siol	Herb	1100-2200	Leaves and seeds	Leaves are cooked as vegetable and eaten during diarrhoea however, seeds are roasted and mixed with jaggery and eaten during fast as anti-appetizer (41).	0.83
4	*Anethum sowa* Roxb. Family: Apiaceae	Soay	Herb	1100-2200	Seeds † (L)	Seeds are used as condiment and considered as good appetizer (24).	0.48
5	*Angelica glauca* Edgew. Family :Apiaceae	Chorai	Herb	Above 3000	Roots † α	The roots are used as spice during winter for their expectorant properties (11).	0.22

6	*Arisaema triphyllum* (L.) Schott Family: Arecaceae	Shingola	Herb	2400-3300	Corm	Pickles of the neutralised corm of the species are eaten during winters and rainy seasons to keep body warm (20).	0.40
7	*Arnebia euchroma* I.M.Johnst. Family: Boraginaceae	Ratanjot	Herb	Above 3000	Stem and underground parts	The dark red part of the stem and roots is used as a colouring agent to the food. This colour is considered as blood purifier (14).	0.28
8	*Artemisia absinthium* L. Family : Asteraceae	Tathyan	Herb	1400-2000	Leaves	The leaves of the species are pounded with tamarind and salt to change it to a acceptable taste and eaten to expel worms from the stomach (26).	0.53
9	*Avena fatua* L. Family :Poaceae	Ban jov	Herb	1400-1700	Seeds	The seeds are crushed to granules and boiled and consumed during constipations especially in dinner (08) .	0.16
10	*Bergenia ciliata* (Hew.) Sternb. Family : Saxifragaceae	Piprol	Herb	1500-2500	Leaves	The leaves are used as one of the ingredient of food and given to the patients suffering from kidney stone (06).	0.12
11	*Persicaria amplexicaulis* (D.Don) Ronse Decr. Family : Polygonaceae	Piplo	Herb	1400-2000	Leaves	The tea prepared from leaves of the species is considered as a remedy for cold and cough. The tea is also given to check the menstrual bleeding (18).	0.36
12	*Bunium persicum* (Boiss) B. Fedtsch. Family : Apiaceae	Kala zira	Herb	1600-2000	Seeds † (L) α	The seeds of the species are boiled with rice and consumed to cure indigestion, dyspepsia and diarrhoea (31).	0.63
13	*Capsella bursa – pastoris* (L.) Medik. Family : Brassicaceae	Tichi	Herb	1200-2600	Leaves, Whole Plant	The whole plant is cooked as vegetables to cure dysentery (09).	0.18
14	*Dactylorhiza hatagirea* (D. Don) Soo Family: Orchidaceae	Salam panja	Herb	Above 2500	Roots † α	The roots of the species are eaten raw to cure the general body weakness (17).	0.34
15	*Diplazium esculentum* (Retz.) Sw.* Family: Athyriaceae	Kasror	Fern	1300-2000	Leaves † (L)	The circinated leaves of the species are cooked as vegetable and consumed as a tonic by women (27).	0.55
16	*Dipsacus inermis* Wall. Family: Caprifoliaceae	Goluu	Herb	1600-1800	Leaves	The leaves of the species are dried and cooked along with other vegetables to cure sore throat and as a cure of stomach ache (13).	0.26
17	*Fagopyrum tataricum* (L.) Gaertn. Family: Polygonaceae	Fafru	Herb	1400-2000	Leaves †	The leaves of the species are cooked to vegetable during the famine like condition. The leaves are considered as anti-appetizer (21).	0.42

18	*Fragaria vesca* L. Family : Rosaceae	Achoo	Herb	1600-3000	Fruit	The fruits of the species are used as salad and considered as refrigerant (27).	0.55
19	*Gagea elegans* Wall. Family: Liliaceae	Tara	Herb	1400-2000	Whole plant	Whole plant of the species is cooked as vegetables and consumed as laxative (05).	0.10
20	*Geopora arenicola* (Lev.) Kers** Family: Pizazaiaceae	Kundi	Mush-room	1300-3000	Fructification † (L)	The mushroom is cooked as vegetable to cure constipations (42).	0.85
21	*Lathyrus aphaca* L. Famiy: Fabaceae	Ban ri matter	Herb	900-2000	Fruits and seeds	The fruits and seeds are cooked as vegetables and consumed to cure general body weakness (03).	0.06
22	*Lepidium latifolium* L. Family: Brassicaceae	Ban sariyo	Herb	1200-3000	Whole plant	The whole plant is cooked and consumed as a cure to scurvy (29).	0.59
23	*Micromeria biflora* (Buch-Ham.) Benth. Family : Lamiaceae	Ban jawan	Herb	1400-2200	Whole plant	Whole plant is used as a condiment in the vegetables and eaten as a cure to the stomach ailments like dysentery, diarrhoea and stomachic (25).	0.51
24	*Morchella esculata* Fr. ** Family: Morchellaceae	Ththuon	Mush-room	1600-3300	Fructification †α	Whole fructification is cooked as a general body tonic (22).	0.44
25	*Origanum normale* Don. Family : Lamiaceae	Ban masala	Herb	1800-3000	Leaves	The leaves of the species are used as an ingredient of salad and eaten as a cure to indigestion (03).	0.06
26	*Oxalis corniculata* L. Family : Oxalidaceae	Aamllii	Herb	1200-2000	Leaves	The leaves of the species are pounded to paste along with onion and salt and eaten to cure scurvy (29).	0.59
27	*Oxyria digyna* (L.) Hill. Family : Polygonaceae	Amalii	Herb	Above 2600	Leaves	The leaves of the species are pounded to paste along with onion and salt and eaten to cure scurvy. This a substitute to *Oxalis corniculata* (29).	0.59
28	*Phytolacca acinosa* Roxb. Family : Phytolaccaceae	Belladona	Herb	1800- 2800	Leaves	The young leaves of the species are cooked as vegetable and consumed to expel the worms from the stomach (12).	0.24
29	*Podophyllum hexandrum* (Royle) T.S. Ying Family : Podophyllaceae	Ban Kakroo	Herb	2800-3500	Fruit †(L) α	The fruit is eaten raw or cooked to cure liver problems (09).	0.19
30	*Prunus armeniaca* L. Family: Rosaceae	Khubani	Tree	1400-2200	Fruit † (L)	The fruits are cooked with rice to cure dysentery (08).	0.16
31	*Punica granatum* L. Family : Punicaceae	Dhayruun	Tree	1200-2000	Seeds † (L) α	The seeds are pounded and used in salad to cure scurvy (38).	0.77

32	*Quercus baloot* Griff. Family: Fagaceae	Maruu	Tree	1200-2000	Fruit	The fruit is roasted and eaten as an anti-appetizer (04).	0.08
33	*Ranunculus laetus* Salisb. Family: Ranunculaceae	Chabari	Herb	1200-2500	Leaves	The leaves are cooked to cure liver and spleen ailments (03).	0.06
34	*Rheum emodi* Wall. Family: Polygonaceae	Amalii	Herb	3000-3500	Leaves †	The leaves are cooked to cure scurvy and liver ailments (09).	0.18
35	*Rhododendron arboretum* Sm. Family : Ericaceae	Cheeun	Tree	3000-3500	Flowers	The flowers are cooked as vegetable for treatment of anaemia (14).	0.28
36	*Rosa webbiana* Wall. ex Royle. Family : Rosaceae	Ban rose	Shrub	3000- 3500	Flowers	Petals of the species are mixed with sugar solution to obtain jam to cure constipations (31).	0.63
37	*Rumex hastatus* D. Don. Family : Polygonaceae	Halbaloo	Herb	1400-2000	Whole plant	Whole plant is cooked as vegetable for curing skin ailments (04).	0.08
38	*Scandix pecten-veneris* L. Family: Apiaceae	Shilri	Herb	1200-2200	Whole plant, leaves	Whole plant is cooked as vegetables and given during the heart related ailments (03).	0.06
39	*Skimmia laureola* (DC.) Decne. Family: Rutaceae	Shingoli	Shrub	2800-3500	Leaves † α	The leaves of the species are cooked with rice to cure stomach ailments like dysentery and diarrhoea (32).	0.65
40	*Solanum nigrum* L. Family : Solanaceae	Ban tamatar	Herb	1200-2500	Fruits	Fruits are used as an ingredient of vegetable to cure scurvy (07).	0.14
41	*Taraxacum officinale* Wigg. Family : Asteraceae	Buddi	Herb	1200-2200	Leaves	The underground parts of the species are cooked as vegetable to cure liver and spleen ailments (21).	0.42
42	*Taxus baccata* Zucc. *** Family : Taxaceae	Bisindhru	Tree	2500- 3000	Bark † α	Bark of the species is used a tea substitute to keep body warm during winter (16).	0.32
43	*Urtica dioica* Linn. Family : Urticaceae	Sheldh	Herb	1400-2200	Leaves	Young leaves of the species are cooked to cure obesity (11).	0.22
44	*Viburnum grandiflorum* Wall. ex DC. Family : Caprifoliaceae	Teundh	Shrub	1300- 2200	Fruits † (L)	Fruits of the species are pounded to paste used in salad for curing anaemia (18).	0.36
45	*Viola odorata* L. Family : Violaceae	Bankshah	Herb	1400-2500	Flowers † (L) α	Flowers of the species are used as substitute to tea used to cure cold and cough (41).	0.83
46	*Vitis adnata* Wall. Family: Vitaceae	Dach	Climber	1300-2200	Fruits	Fruits of the species are used as salad to cure scurvy (07).	0.14
47	*Zanthoxylum armatum* DC. Family : Rutaceae	Timroo	Shrub	900-1200	Fruits † (L)	Dried fruits are pounded to powder, mixed to curd and consumed to treat dysentery (13).	0.26

*= Pteridophyte; ** = macrofungi; *** = gymnosperm; † = marketed; (L)= local market; α = high market value

and jaundice. Dermatological ailments (scurvy) and respiratory diseases (cough, cold and nose blockade) are treated by consuming vegetables from 08 different species. Very few wild plant species are consumed as medicinal food to expel the endo-parasites, control obesity and treat fever (Table 4).

3.3. Use Value (UV)

On the basis of *Use Value* (*UV*), the most commonly used species as wild vegetables or wild food materials are *Geopora arenicola* (Lev.) Kers, *Viola odorata* L. and *Amaranthus spinosus* L. (*UV*= 0.83), followed by *Punica granatum* L.(*UV*= 0.77). However, four species, namely *Scandix pecten-veneris* L.*, Lathyrus aphaca* L.*, Origanum normale* Don. and *Ranunculus laetus* Salisb. (*UV* = 0.06) are consumed rarely. Analysis reveals that other plant species accounts a range of *UV* from 0.71 to 0.08 (Table 2).

Table 4. Ailment category and their Factor Informant Consensus **(F_{ic})**

Ailment categories	Number of species	Number of use reports	Factor informant consensus (F_{ic})
Cardiological and blood related (blood purifier, anemia)	3	46	0.95
Dermatology (scurvy)	8	152	0.95
Gastrointestinal & liver (appetizer, oral ulcers, constipation, gastroenteritis, dyspepsia, dysentery, diarrhea, acidity, flatulence, jaundice)	23	397	0.94
General body weakness	3	69	0.97
Gynecology & andrology (menstrual cycle, aphrodisiac)	2	38	0.97
Parasitic and other infections (endo-parasites)	2	31	0.96
Respiratory/ Lungs (cough, cold, nose blockade)	8	103	0.93
Urology & renal (diuretic, stone)	2	6	0.80
Other (obesity, refrigerant)	2	54	0.98

3.4. Family Use Value (FUV)

A total of 33 families (29 angiospermic, 01 gymnospermic, 01 pteridophytic and 02 macrofungi) are used as wild medicinal food in the study area. Most of the families are reported to provide only 01 species for the purpose by the villagers in the study area. Investigation reveals that other families vis-à-vis Polygonaceae with 05 species, Apiaceae with 04 species, Rosaceae with 03 species and Asteraceae, Brassicaceae, Caprifoliaceae, Lamiaceae, Rutaceae each with 02 species are used as wild medicinal food by the mountainous people in Bhaderwah, J&K. While calculating Family Use Value, maximum FUV is obtained for Polygonaceae (*FUV*=2.08) and minimum for Liliaceae (*FUV*=0.01). Few families are reported to have same Family Use Value like *FUV* = 0.06 (Fabaceae and Ranunculaceae), *FUV* = 0.14 (Solanaceae and Vitaceae), *FUV* = 0.28 (Boraginaceae, Ericaceae and Lamiaceae), *FUV* = 0.34 (Apiaceae and Orchidaceae), *FUV* = 0.38 (Acoraceae and Brassicaceae), *FUV* = 0.44 (Morchellaceae and Rosaceae) and *FUV* = 0.88 (Amaranthaceae and Violaceae) by the mountainous people in Bhaderwah, Jammu and Kashmir, India (Table 3).

3.5. Factor Informant Consensus (F_{ic})

The maximum number of species i.e. 23 (48.9%) were reported to be consumed as medicinal food to treat gastrointestinal and liver disorders. Factor Informant Consensus reveals that informants have strong opinion towards treatment of obesity and fever (F_{ic} = 0.98) using wild food materials (Table 4). The F_{ic} value ranging from 0.80 to 0.98 also indicates that the selection of the wild food species among the informants is non-random. High value of F_{ic} also reveals that there is a proper exchange of the information among there informants regarding the use

of wild medicinal food species (Table 4).

The study of ethnobotany is classified in two broad categories (i) basic or information based ethnobotany and (ii) applied ethnobotany. It is very interesting to note that under first category, ethno-botanists in India have conducted number of studies on regional (Bhatia *et al.,* 2014a, 2014b, 2015; Sinha, 2002; Tsakalidi, 2014), use specific (Bhatia *et al.,* 2014b; Jain, 1964; Shah, 2012), cross cultural inventorization (Gairola *et al.,* 2014; Jain, 2004) and dynamism in ethnobotany (Jain, 2005a, 2005b). However, under second category *i.e*. applied ethnobotany, main focus is given on ethno-phytomedicine, socio-economic welfare, prospects of cottage industries etc., (Jain, 2013). Wild medicinal food materials are the precious gift of nature and most of the ethnic communities are largely dependent on it for their day-to-day life (Mahishi, 2005; Reyes-Garcia, *et al.,* 2005; Tantray *et al.,* 2010). Wild food plants are not only excellent supplements to the food quantity, but also act as an important option during famine. Therefore, these plants species makes significant contribution to the human nutrition throughout the year (Guy-Alain, 2003; Jain, 2013). There are about 550 tribal communities in India, out of which more than 50% (225 ethnic communities) are inhabitant in northeastern part of India (Sajem and Gosai, 2006). The ethnic communities of northeast India have immense traditional knowledge on the utilization of forest and plant parts especially as food products (Hamilton, 1995). Reports on the use of wild plant species as medicinal food are very scanty from north west Himalaya. Use of *Caralluma tuberculata* N. E. Br. in Jammu and Kashmir is a testimony to the knowledge that people in North West Himalaya has about the wild medicinal foods (Dutt *et al.,* 2012). Unfortunately, the century old traditional knowledge on wild plants is depleting very fast (Kiremire, 2001). In the present study, 49 informants revealed that 47 species (43 angiosperms + 1 gymnosperm + 2 macrofungi + 1 pteridophyte) are collected from wild and used as medicinal food. The enumeration during the study also suggests that the family Polygonaceae accounts maximum number of plant species (n=5) for medicinal food recipes. Other families contribute single species as wild medicinal food. Using selective plant species by the informants also indicate that this TK is acquired through regular practice.

During the current investigation it is revealed that modern system of cooking is well accepted by younger womenfolk between the age group of 20-40, although, the traditional system of cooking is acceptable for all the age group of the womenfolk (Table 1). In addition to other reasons of erosion of TK, non-utilization of experiences of old age peoples can be one of the reasons for diminishing of TK (Visvanath and Mankad, 1984).

Leaves are the most preferred plant part and accounts 34.04% of the all the plant parts being collected by the womenfolk from mountains of Bhaderwah forest division. This observation is in consonance with the reports already published, wherein, maximum use of leaves is justified because of their easy procurement and easy usage (Castillón *et al.,* 2014; Dutt *et al.,* 2015). Moreover, leafy vegetables as the richest source of ascorbic acid, antioxidants and other dietary compounds also justify the maximum use of the leafy vegetables (Chauhan *et al.,* 2014; Tantray *et al.,* 2010; Tiruneh and Herbert, 2008).

Dependency of human populace on wild food plants is rare in developed nations but collection of selective species is very common (Bharucha and Pretty, 2010; Reyes-Garcia *et al.,* 2005; Schulp *et al.,* 2014). Literature reveals that gathering of specific plant species has gained the popularity over the period of time, wherein some wild food plants are becoming local delicacies and markers of cultural identity (Aceituno-Mata, 2010; Kalle and Soukand, 2013). This study identified *Geopora arenicola* (Lev.) Kers (*UV*=0.85), *Allium stracheyii* Baker (*UV*= 0.71), *Bunium persicum* (Boiss) B. Fedtsch. (*UV*=0.63), *Diplazium esculentum* (Retz.) Sw.(*UV*=0.55), and *Morchella esculata* Fr. (*UV*=0.44) as the prime species in terms of their delicacy and as also as the best markers of the cultural heritage of the region. The high *Use Value* of *Geopora arenicola* (Lev.) Kers determines its frequent use. The species is cosmopolitan and is the easily available fungal species during March- April in the area. *M. esculata* another fungal species known for its delicacy has low *Use Value*. This species is a rarely available species in the study area. Interestingly, both the delicacies at two extreme ends of *Use Value* (cosmopolitan and rare) are from macrofungi. Further, Family Use Value (*FUV*) indicates that Polygonaceae (*FUV*=2.08) accounts the

major family which contributes maximum number of the species (n=5) as wild medicinal food (Table 4).

In terms of the use of wild medicinal food species, about 23 (48.9%) wild taxa are consumed as vegetables to cure gastrointestinal /liver ailments. Gastrointestinal track is a vulnerable system in human body, but consumption of 48.9% wild species as medicinal food discloses that selection of the species is done very meticulously by the inhabitants (womenfolk).

Low F_{ic} value around zero (0), indicates that there is less exchange of indigenous knowledge and collection of species is done randomly. During the study the wild medicinal food materials are classified in various classes on the basis of their pharmacological properties and F_{ic} calculated indicates that womenfolk use select a defined criteria for selecting the species and exchange the traditional knowledge frequently.

Interestingly, it is also found that womenfolk also generate economy by selling about 18 parts belonging of 18 different species, out of which 10 parts of 10 species are of high market value. Further, 11 parts belonging to 11 species are available in the local market from wild sources only.

4. Conclusion

The ethno-botanical use of medicinal plants to treat different ailments dates back to Vedic period (Sinha, 2002). The Indian Systems of Medicine collects about 80% of the medicinal plants from wild resources. However, the role of wild edible plant species used for medicinal purposes in developing countries including India has been ignored by the researchers (Guinand and Lemessa, 2000; Tantray *et al.,* 2010). Therefore, literature on such species is scanty. Wild edible plants are basically the part of the cultural heritage of different regions of the world. During famine and food scarcity, these sources of food have received high importance. As womenfolk takes care of food stock of the family particular in the mountainous regions of NW Himalaya, therefore, 49 females belonging to 07 different villages of Bhadarwah forest sub-division in Jammu and Kashmir were interviewed to document the TK on wild edible plants. The young womenfolk have also learned the advanced methods of cooking like use of LPG etc. Data reveals that a total of 43 angiosperms, 2 macrofungi, 1 gymnosperm and 1 pteridophyte are collected from wild and consumed as food in the study area. The use of these species is a time tested experience which exists because of its success through hit and trial method. Womenfolk mostly collect members of family Polygonaceae (n=05; FUV=2.08) for the purpose, while leaves of maximum plant species are consumed as food. According to the informants these species also have the medicinal importance. Most of these plant species are consumed to treat gastrointestinal and liver ailments in the study area. High *Use Value* of three species (01 macrofungi and 02 angiosperms) indicates their importance as medicinal food among the hilly people in Bhaderwah, Jammu and Kashmir. In addition to the Use Value (UV), the Factor Informant Consensus (F_{ic}) obtained during the present study (0.8-0.98) indicates that the people have well defined criterion for the selection of the plants. The TK regarding the wild medicinal vegetables also gets exchanged among the womenfolk in the study area. Beside the use of the wild species as food, womenfolk also sell some species in the market to uplift their economy.

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Conflicts of interest

All contributing authors declare no conflicts of interest.

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