An ethnobotanical study of commonly growing weeds in wheat fields of District Chitral Lower, Pakistan

Hasin Sahar and Fayaz Ali

Correspondence

Hasin Sahar[1] and Fayaz Ali[2*]

[1]Department of Botany, University of Chitral, P.O. Box 17200, Chitral, Pakistan
[2]Department of Botany, Shaheed Benazir Bhutto University Sheringal, P. O. Box 18050, Dir Upper, Pakistan

*Corresponding Author: fayazali@sbbu.edu.pk

Ethnobotany Research and Applications 27:34 (2024) - http://dx.doi.org/10.32859/era.27.34.1-14
Manuscript received: 26/03/2024 – Revised manuscript received: 29/08/2024 - Published: 30/08/2024

Research

Abstract

Background: Native people of Chitral, located in the North of Pakistan, largely depends on food plants for medicines and other livelihood. The current study intended to document weed plant species frequently found in wheat fields and used by local community in traditional ways as food and ethno-medicines.

Methods: An open ended and semi-structured questionnaire, group interviews and discussions were conducted from April 2022 to September 2023. A total of 153 local participants were interviewed for gathering information's on the traditional uses of weeds species from wheat fields. Ethnobotanical data were analyzed using quantitative indices i.e. Use Value (UV), Informant Agreement Ratio (IAR), Relative Frequency of Citation (RFC).

Results: We reported a total of 75 weed species belonging to 58 genera and 29 families, commonly consumed by the local communities. Floristic composition reveals Asteraceae as the dominant family having contribution of 14 species to the total, followed by family Lamiaceae (8 plant species) and Solanaceae. Interestingly, all the reported weed species in the wheat field were herbs. Leaf was the most consuming part of the reported weeds followed by flowers. Similarly, 25 plant species was used in making herbal tea. According to use value, *Cichorium intybus* L. was ranked on top having use value of 0.8 followed by *Carum carvi* and others.

Conclusions: We concluded that wheat fields provide habitat to several important weed plant species. These important plant species may serve to guide developmental initiatives aimed at sustainable and culturally local projects. The results emphasizing the need for phytochemical studies to further validate their efficacy

Keywords: Ethnobotany; Weeds; Medicinal uses; Chitral, Quantitative indices

Background

Plant collection and storage for a number of purposes is deeply rooted and essential part of human tradition. Millions of the people in mountain communities, depend directly on plants for food, fuel, medicines, shelter, construction, fodder, as well as for religious rituals (Ali *et al.* 2023). Plant species both cultivated and wild (i.e. weeds) are playing crucial role in uplifting the living condition of peoples (Gulzar *et al.* 2019). Weeds flora commonly grow in such places where they are not wanted,

therefore known as unwanted plants. The adaptability of weeds, competitive nature and unusual characteristics make them different from other plants (Ali and Khan 2022). Being not native, weeds adversely affect soil physiochemical properties and hence put a serious pressure on local plants populations (Ali *et al.* 2024; Vilà *et al.* 2021).

Weeds are one of the restraining factors reducing production of cash crops and leads to huge economic losses of agriculture in comparison to effect of all other harmful pathogens and pests (Rao *et al.* 2020). For resources like space and nutrients, these undesirable plants compete with the crops and decrease the production approximately from 12% to 51% (Gharde *et al.* 2018). Weeds cause changes in gene pools of non-native species of animals and microbes by harboring them and give the opportunity of hybridization (Jhala *et al.* 2021). These unwanted species of plants exert pressure on food chain and food web of the ecosystem by altering the composition and structure of native flora in the environment (Jhariya *et al.* 2022).

A number of weed plant species in Pakistan includes *Phalaris minor* Retz, *Anagallis arvensis* L., *Poa annua* L., *Cirsium arvense* L., *Convolvulus arvensis* L., *Ammi visnaga* L., *Chenopodium album* L., *Fumaria indica* Hauskn, *Carthamus oxycantha* M. Bieb, *Euphorbia helioscopia* L., *Medicago denticulata* L., *Melilotus indica* L., *Silybum marianum* L., *Rumex crispus* L., and *Galium aparine* L., etc. are commonly reported from wheat fields (Matloob *et al.* 2020; Usman *et al.* 2020). Weed clarify the whole relationship of the most prevailing weed species to their locality and with the associated species in their environment.

Weeds massively grow in open areas and unfortunately people are not aware of its medicinal importance and other daily usage like forage, food and olericulture importance (Kajidu *et al.* 2019). There are useful weeds; this was confirmed, most of the weed have one or several uses (Ali *et al.* 2021). Ethno-botanists have documented the uses of weed plant species as food, folk medicines and even as an income source (Sahrawat *et al.* 2020). It has been reported that from the ancient period, man has been using several different plants to cure all body pain and different diseases. Now-a-days throughout the world several thousands of plants mostly weed plants are medicinal but very few drug plants are cultivated (McGaw *et al.* 2022). Irrespective of the adverse impact, some weeds species are very important and are being consumed by local inhabitants in traditional ways. However, weeds growing in the wheat field of Chitral district gets less attention and needs exploration. Counting all these facts, the current study was design in such a way to document prominent weeds growing in the wheat fields. It is also an important aim of the current work to evaluate ethno-botanically important weeds by calculating quantitative indices. The results of the current work would be helpful for future ethno-botanical endeavors.

Materials and Methods

Study area

The current study was carried out in Chitral, located towards the northern parts of Malakand division, Khyber Pakhtunkhwa, Pakistan (Figure 1). District Chitral is spinning between 35.51 °N latitude and 71.50 °E longitude, covering an area of 14800 Km2 and surrounded by Swat in the east, Gilgit on North, Afghanistan from West and Dir from south (Birjees *et al.* 2022). According to census population report, 2023, total population of the area is 320,407 individuals (Qasim *et al.* 2023). Climate of the study area is cold and dry as it is located in dry temperate zone. Precipitation mostly occurs in the form of rain (451mm) and snow from December to March. Mean annual temperature of the area is 16 °C, minimum average temperature reaches to 8 °C and maximum mean temperature is 24 °C (Syed *et al.* 2022).

Soil of Chitral is generally shallow while in lower areas it is comparatively deep with moderate to median in texture, good drainage and hence needs organic matter to bind the soil particles (Aslam *et al.* 2021). Due to soil physiochemical properties, diverse elevation gradient and climatic condition, study area is rich in biodiversity including flora and fauna (Ali *et al.* 2023). Maiz (*Zea mays* L.) wheat (*Triticum aestivum* L.) and rice (*Oryza sativa* L.) are the most important cash crops while other crops of the valley include common beans (*Phaseolus vulgaris* L.), Potato (*Solanum tuberosum* L.), Shaftal (*Trifolium repens* L.) and Peas (*Pisum sativam* L.). People of the area earn their livelihood through trade of various orchard fruits i.e. grapes (*Vitis vinifera* L.), apple (*Pyrus malus* L.), pomegranate (*Punica granatum* L.) and walnuts (*Juglans regia* L.) (Khan *et al.* 2024; Wali *et al.* 2021). Other wild fruiting trees includes species of Morus, Ficus, Prunus, and Prunus etc. (Birjees *et al.* 2022; Abdul Aziz *et al.* 2020).

Ethnobotanical investigation

Prior to the field work, informed consent was obtained from all participants, after explaining the aim of the research work. A number of field visits were made to different wheat fields of the study area from April 2021 to September 2022. We interviewed 153 participants using an open ended and a semi-structured questionnaire (Hussain *et al.* 2023). The interviews lasted between 15 and 25 minutes per respondent, inquiring about local names of the plants, parts used, uses, and economic importance following (Ahmad *et al.* 2021).

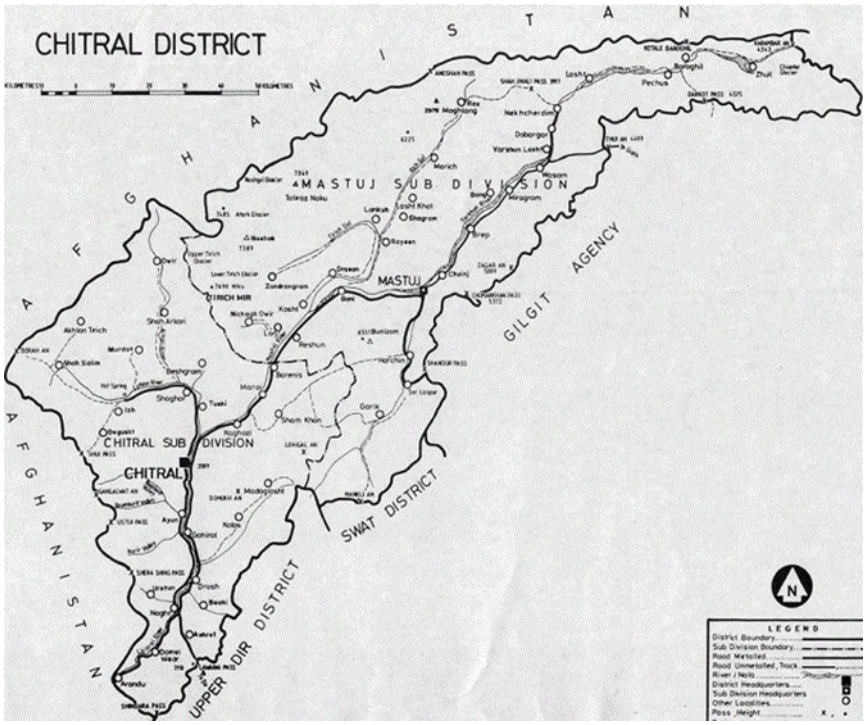

Figure 1. Detail Map of district Chitral located in Hindukush ranges of Pakistan

Plants collection and identification

For collection of weeds, several visits to study area with special emphasis to wheat fields were conducted in different seasons like autumn, spring, and summer i.e. covering complete life cycle of wheat plants. The photograph of plants were also taken for further confirmation of identification. Collected specimens were identified and then verified by the help of local taxonomist, "the plant list" (http://www.theplantlist.org), "flora of Pakistan" (http://www.tropicos.org/Project/Pakistan) and International Plant Names Index (IPNI) (https://www.ipni.org) as suggested by (Ali *et al.* 2022). Collected plant species were pressed with a plant presser, dried and mounted on the standard size herbarium sheets and arranged family wise in alphabetical order (Khan *et al.* 2023).

Informant interviews, data collection and documentation

The information about medicinal values of weeds growing in the wheat fields were collected from the residents via personal interviews, discussion and questionnaire surveys using the snowball method (Silva *et al.* 2022). An open ended and semi-structured questionnaire was designed that contained information about the demography of local informants such as gender, age and occupation. It also contains the local name of the plant, part used, method of preparation, folk recipes, mode of utilization and treatment of ailment with medicinal plants. A total of 153 informants including 131 men, 16 women and 6 hakims (traditional herbal medicines practitioners) were randomly interviewed from six localities of the valley namely Muldeh, Zargarandeh, Chewodok, Balach, Singoor and Seenlasht. The interviewed informants experienced having better traditional knowledge about medicinal plants for the treatment of different diseases and with good approaches of preparing remedies. The ages of informants were in the range of 25–100 years with 137 men (89.54%) and 16 women (10.46%).

Quantitative data analysis

The collected data were quantitatively analyzed using following formulas.

Used value

In ethnobotany, Use Value is employed to check the relative importance of single species. The values of UV range from 0 to 1, and UV equal or near to 1 indicated high use in a region. If the UV approaches 0, it means the species is less important. The used value (UV) of each reported species was calculated using the given formula proposed in the literature (Prasetyo *et al.* 2024; Sõukand *et al.* 2024).

$$"UV"=(\sum Ui)/n$$

where ‘U' stands for the total number of reports used for a given species and ‘n' is the total number of informants asked about a given plant species.

Frequency of Citation (FC)

The below mentioned formula was used to determine the frequency of citation (Alemu *et al.* 2024).

"FC"= (Number of times a given species reported)/(total number of times all species reported) ×100

Relative frequency citation (RFC)

The value of relative frequency citation (RFC) was determined using the following formula (Prasetyo *et al.* 2024; Sõukand *et al.* 2024).

"RFC"= (Frequency of citation)/(total number of informant)

where, FC is the number of informants who reported the use of plant species and n is the number of informants who participated in the survey.

Informant Agreement Ratio (IAR)

Quantitative index i.e. informant agreement ratio (IAR), was used to estimate the variability in the use of reported plants. IAR value ranges from 0 to 1, values close to 1 are considered a high value and indicates that are used by a large proportion of the respondents. While a low value i.e. close to 0 indicates less agreement of the respondents regarding the consumption of that very plant (Ahmad *et al.* 2021).

IAR= (Nur-Nt)/Nur-1

Where Nur = number of use-reports in each category, Nt = number of taxa used in each category

Family importance Value (FIV)

To determine family importance value the following given formula is used.

FIV=RFC / N

FIV = denote the family importance value, RFC = Relative family frequency of citation, N = number of species within the family.

Results

Socio-demographic of participants

In the present study, a total of 153 local participants were interviewed. Most participants belonged to the age group ≥ 65 years which counts for 39.8% of the total, followed by age group ranging from 25 to 40 (i.e. 26.14%), while a contribution of more than 24% was made by informants having age from 40 to 65 years as shown in figure 2. Majority of the respondents were men (i.e. about 90%), and only 10% were women, due to cultural, social and religious restrictions. Mostly participants in the study area had received little formal education. It was noted that women had more knowledge about wild edible plants being consumed as food and herbal medicines etc.

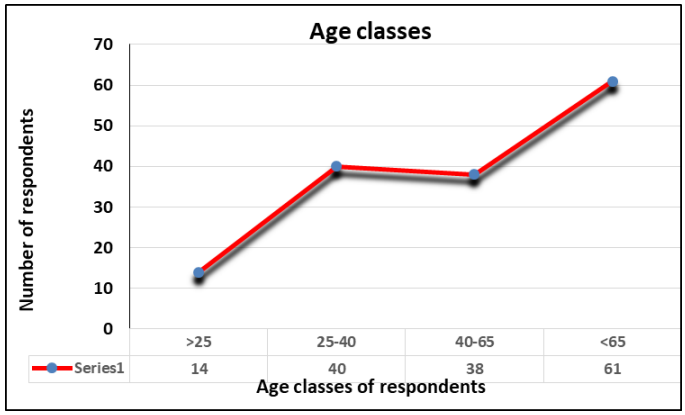

Figure 2. Number of respondents belonging to different age classes.

Floristic composition of weed

The current study reported a total of 75 weed species (both native and invasive) belonging to 58 genera and 29 families actively growing in the wheat fields of the current study. Family Asteraceae was documented the dominant family with a total of 14 species which account for 9.15% followed by Polygonaceae (6 species), Solanaceae and Apiaceae (5 species each). Family Ranunculaceae contributes 2.61% to the total, while the rest of the families shares less than 2% as shown in figure 3. Similarly, all the documented weed species were herbs, as they were inhabitants to wheat fields and these fields are seasonal.

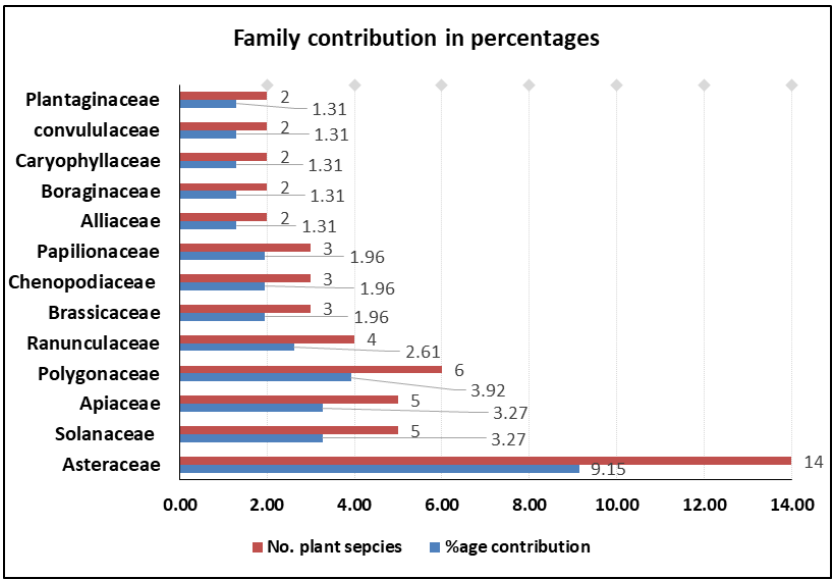

Figure 3. Number of reported plant species and its relative contribution in different families.

Part used, and Use Categories

The current study reported that different parts of the weeds growing in the wheat fields are consumed for a number of aliments. Leaf was the dominant part being utilized (Figure 4) and it is due to the nature of reported plant species (i.e. Herbs). After leaf, the second positioned was occupied by flower which contributes 18.67% to the total. However, the least shares were added by seeds having only 6.67%, because collection of seeds from herbs are comparatively tough job due to small size. Based on the use reports by local inhabitants of Chitral valley, herbal tea was the most used category from weeds (i.e. 25 plant species) followed by cooked vegetables (20 species), applied externally (16 species), eaten as raw food (11 species) and spices (08 species) (Figure 5). Different plant parts of the reported weed species are used for a number of ailments i.e. laxative, carminative, abdominal pain, dyspepsia anthelmintic, diarrhea, dysentery, stomachic, purgative, intestinal pain, and other respiratory disorders like cough suppressant, throat infection etc. There are some weed species which have analgesic activity and used for backache, earache, headache, and for other diseases like anti-malarial, antispasmodic, for jaundice, typhoid, aphrodisiac, dandruff problem, hair tonic, natural dye and used to prevent boils (Table 1). Some species are used for the treatment of urinary tract problems, aphrodisiac, scorpion bite, weakness, antidote, and to remove pimples. Additionally, weeds are also reported good as ophthalmintic, anthelmintic, diuretic, leucorrhoea, antipyretic (cold spong), heart depressant, regulation of blood pressure and for joints pain while others are used as emmenagogue, for Rheumatism, astringent, antioxidant, antiseptic and anti-cancer, aperients, diuretic and for bleeding gums.

To elucidate the importance of weeds in the study area, use category values were applied. Wild edible vegetables played an important role in the daily food of the local population, especially *Allium carolinianum* DC., *Sisymbrium brassiciforme* C.A. Mey., *Portulaca oleraceae* L., *Silene conoidea* L., *Chenopodium foliosum Aschers*, *C. murale* L., *Convolvulus arvensis* L. and Trigonella foenum-graecum L. etc. Likewise native people also used other wild edible plants as salads e.g. Lactuca dissecta D.Don, *L. orientalis* Boiss., *Lepidium sativum* L., *Nasturtium officinale* R.Br., *Ocimum basilicum* L., *Solanum nigrum* L. The species which are used as spices includes *Carum carvi* L., *Foeniculum vulgare* Miller, *Prongus publaria* L., *Trachyspermum ammi* L., *Zataria multiflora* Boiss., *Salvia aegyptiaca* L. While plant used for making herbal tea includes *Matricaria chamomilla* L., *Cichorium intybus* L., *Anthemis cotula* L. and *Mentha longifolia*. A total of 73 wild edible fruit plant species belonging to 37 genera and 26 families were recorded in the study area

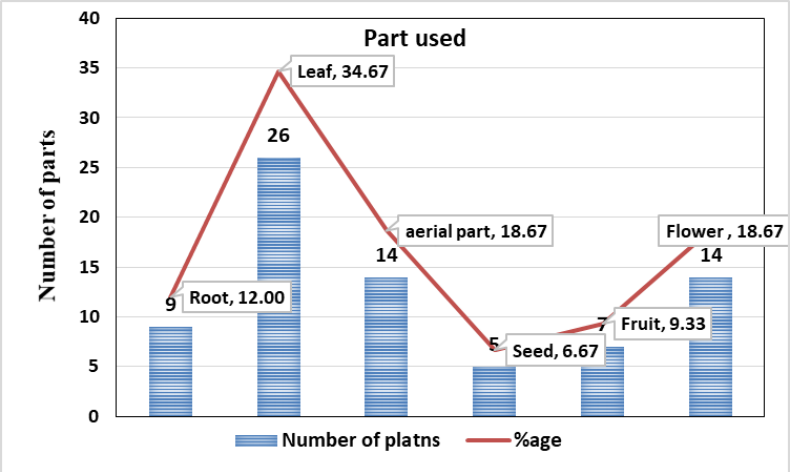

Figure 4. Part of the weed plant used consumed in traditional way for different purposes.

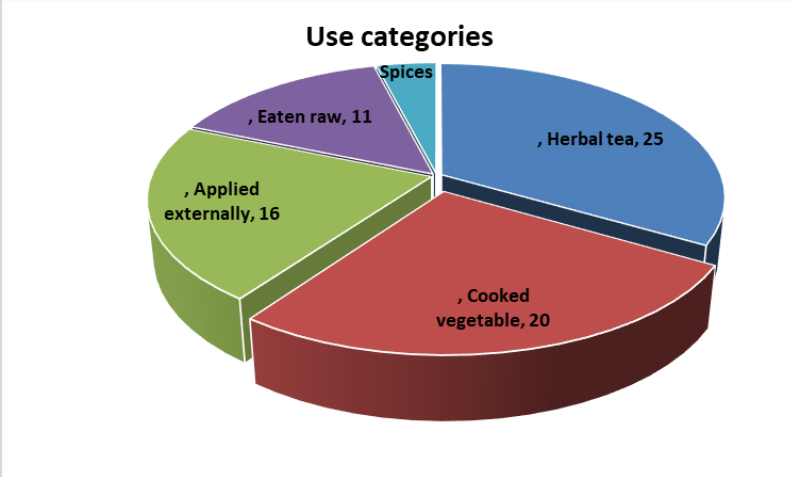

Figure 5. Use categories for the reported weed species from wheat field of Chitral.

Use Value (UV) and Relative Frequency of Citation (RFC)

Results of the current study indicates that UV of the reported plants species ranges from 0.07 (*Lactuca dissecta* D.Don) to 0.85 (*Cichorium intybus* L.). The highest UV were recorded for *Cichorium intybus* L., *Carum carvi* L., *Foeniculum vulgare* Miller, *Matricaria chamomilla* L., *Nasturtium officinale* R.Br., *Mentha longifolia* (Table 1). Relative Frequency of Citation is used to determine the most commonly occurring spices in an area. In current study its values ranged from 0.06 to 0.87. The plants with highest RFC were *Cichorium intybus* L., *Artemisia maritima* L., *Foeniculum vulgare* Miller, *Carum carvi* L. and *Matricaria chamomilla* L. The most possible reasons for the high RFC of these species include abundance, accessibility and medicinal importance in the study area.

Family importance value

Table 1 shows family importance values (FIV) of the families under study. As (FIV) shows the significance of a family among the community. This study explored few families which have the highest (FIV) value. In this order family Brassicaceae ranked at the top (FIV= 0.81), next was Caryophyllaceae (FIV = 0.69), followed by Apiaceae and Chenopodiaceae each at 0.62 FIV. The high FIV values for particular families highlight their prominent significance among community and all those families having low FIA values show less acceptance among the people of specific culture. As Oxalidaceae and Malvaceae achieve low FIVs, from the range of 0.08 to 0.11. The fluctuations in FIV values describe the cultural significance of a specific family at various levels in the area.

Informant Agreement Ratio

The informant agreement ratio (IAR) provides information about the uniformity or agreement of the interviewed respondents in certain Use-categories. In this study, we compared the number of use reports, and IARs in the three different sites of Chitral Valley (Table 2). The results showed that the consumption of the weeds in the form of ripened fruit, cooked vegetables and spices was higher in Muldeh region of the study area. However, inhabitants of Zargarandeh prefers to use the reported weeds as herbal tea and salad with food.

Table 1. A detailed list of reported weed species from wheat fields of Chitral.

S.No	Name	LN	LF	PU	Used categories	Therapeutic uses	UV	FC	RFC	FIV
Family Alliaceae										0.39
1	*Allium carolinianum* DC.	Latruk	H	LV	Vegetable	Lumbago	0.2	40	0.53	
2	*Allium barszczewskii* Lipsky	Kach	H	LV	Vegetable	Laxative	0.3	20	0.25	
Family Amaranthaceae										0.17
3	*Amaranthus viridis* L.		H	LV	Vegetable	Laxative	0.1	14	0.17	
Family Apiaceae										0.62
4	*Ferula narthex* Boiss.	Raw	H	ST	Eaten raw	Stomachic, Anti-heart depressant	0.7	56	0.74	
5	*Carum carvi* L.	Hojoj	H	FR	Herbal tea	Carminative	0.7	60	0.77	
6	*Foeniculum vulgare* Miller.	Bodiyong	H	FR	Herbal tea	Carminative, cough	0.7	63	0.78	
7	*Prongus publaria* L.	Shorum	H	LV	Used as spice	Stomachic	0.5	55	0.68	
8	*Trachyspermum ammi* L.	Ajwain	H	FR	Used as spices	Carminative	0.1	14	0.17	
Family Araceae										0.17
9	*Arisaema jacquemontii* Blume	Marjarai	H	LV	Vegetable	Analgesic, sedative	0.1	12	0.17	
Family Asphodelaceae										0.17
10	*Eremurus stenophyllus* Boiss. Baker subsp	Sheresh	H	FL	Herbal tea	Carminative, Stomachic	0.1	14	0.17	
Family Asteraceae										0.55
11	*Xanthium strumarium* L.	Chaspak	H	RT	Herbal tea	Toothache, curving ear disease.	0.2	14	0.2	
12	*Matricaria chamomilla* L.	Aano Sherisht	H	FL	Herbal tea	Carminative, toothachae	0.7	61	0.76	
13	*Artemisia perviflora* Wall ex DC	Kharkhalich	H	FL	Herbal tea	Stomachic and for malaria	0.2	42	0.56	
14	*Matricaria disciformis* DC.	Sherishtu	H	FL	Herbal tea	Carminative, used for stomach	0.5	45	0.56	
15	*Lactuca dissecta* D.Don	Kelim joshu	H	LF	Cooked vegetable	Antispasmodic and Digestive	0.1	8	0.10	
16	*Cichorium intybus Linn*	Khasti	H	FL	Herbal tea	For jaundice, typhoid	0.8	68	0.85	
17	*Anthemis cotula L.*	Sherisht	H	FL	Herbal tea	gastrointestinal disorders	0.6	54	0.67	
18	*Artemisia scoparia Waldst. & Kit.*	Zhaa	H	FL	Herbal tea	Anthelmintic, antimalarial	0.4	42	0.52	
19	*Lactuca orientalis (Boiss.) Boiss.*	Salad	H	AP	Eaten raw	For leg pain	0.6	56	0.7	
20	*Calendula officinalis L.*	Budoki	H	FL	Applied externally	Antispasmodic	0.6	50	0.62	
21	*Artemisia maritima* L.	Dron	H	FL	Herbal tea	Anthelmintic, antimalarial, stomachic	0.6	66	0.82	
22	*Arisaema jacquemontii* Blume	Marjarai	H	LF	Herbal tea	Analgesic in small quantity	0.4	42	0.52	
23	*Cousinia thomsonii* C. B. Clarke	Khar	H	RT	Herbal tea	Aphrodisiac	0.3	33	0.41	
24	*Achillea wilhelmsii C. Koch*	Boi baro	H	LF	Herbal tea	For stomach disorder and diarrhea.	0.5	42	0.52	

Family Boraginaceae										0.37
25	*Arnebia hispidissima (Lehm.) DC.*	Krui phusuk	H	RT	Herbal tea	Dandruff problem, headache	0.3	27	0.33	
26	*Arnebia euchroma* (Royle ex Benth.)	Phusuk	H	RT	Applied externally	Hair tonic, natural dy	0.3	33	0.41	
Family Brassicaceae										0.81
27	*Lepidium sativum* L.	Trouq khardachi	H	SE	Eaten raw	Blood purifier	0.5	58	0.72	
28	*Sisymbrium brassiciforme C.A. Mey*	Kheli kheli	H	AP	Herbal tea	For throat infection	0.6	68	0.85	
29	*Nasturtium officinale R.Br.*	Shiaqoshakh	H	AP	Eaten raw	Stomachic	0.7	70	0.87	
Family Campanulaceae										0.41
30	*Codonopsis clematidea* (Schrenk) C. B. Clarke	Ganda Mazakh, Danu	H	AP	Herbal tea	Urinary tract problems, aphrodisiac	0.3	33	0.41	
Family Cannabinaceae										0.52
30	*Cannabis sativa* L.	Jangali bong	H	FL	Applied externally	Anti scorpion bite, and abdominal Pain	0.5	42	0.52	
31	*Silene conoidea* L.		H	SE	Applied externally	Used to remove pimples	0.7	61	0.76	
32	*Silene moorcroftiana* Wall	Apopar	H	SE	Applied externally	Used to remove pimples	0.6	50	0.62	
Family Chenopodiaceae										
33	*Chenopodium foliosum* Aschers.	Pelilio mrach	H	AP	Cooked vegetable	Ophthalmintic	0.4	38	0.47	0.62
34	*Chenopodium botrys* Linn.	Kunakh	H	AP	Cooked vegetable	For catarrh, anthelmintic.	0.3	34	0.42	
35	*Chenopodium murale* Linn.	Darkunakh	H	AP	Cooked vegetable	Abdominal pains, Diuretic, anthelmintic	0.2	28	0.35	
Family Convolvulaceae										0.28
36	*Convolvulus arvensis Linn.*	Mishk	H	AP	Cooked vegetable	Purgative	0.4	32	0.4	
37	*Convulvulus pluricaulis*	Meshek	H	AP	Cooked vegetable	Laxative	0.1	14	0.17	
Family Guttiferae (Clusiceae)										0.15
38	*Hypericum perforatum* L.	Zerbali	H	FL	Cooked vegetable	Abdominal pain and backache	0.07	12	0.15	
Family Fumariaceae										0.47
39	*Fumaria indica* (Hausskn.) Pugsley	Shahtara	H	AP	Cooked vegetable	Laxative	0.3	38	0.47	
Family Geraniaceae										0.28
40	*Geranium wallichinum D. Don ex Sweet.*	Ratanjothe	H	AP	Cooked vegetable	Leucorrhoea, backache and tonic	0.4	42	0.52	
Family Iridaceae										0.50
41	*Iris germanica L.*	Saosan	H	RT	Applied externally	Used for skin diseases	0.3	40	0.5	
Family Juncaceae										0.16
42	*Juncus thomsonii* Buchenau	Gawag	H	LF	Vegetable	Laxative	0.1	13	0.16	
Family Lamiaceae										0.43
43	*Zataria multiflora* Boiss.	Thrushnaghooli	H	AP	Spice	Stomachic and for Intestinal pain.	0.3	36	0.45	
44	*Salvia aegyptiaca L.*	Koroch	H	LF	Eaten raw	Heart depressant	0.1	15	0.18	
45	*Perovskia abrotanoides Benth.*	Pharbek josho	H	LF	Applied externally	Antipyretic(cold spong)	0.2	20	0.25	

46	*Mentha longifolia L.*	Baen	H	LF	Herbal tea	Headache, Blood pressure	0.7	60	0.77	
47	*Ajuga bracteosa* Wall. ex Benth.	Boti	H	LF	Herbal tea	Antipyretic ,for throat infection	0.1	6	0.3	
48	*Marrubium vulgare* L.	Istore Zokho	H	LF	Herbal tea	Used to cure cough	0.1	7	0.08	
49	*Nepeta cataria L.*	Sosambar	H	AP	Herbal tea	Toothache	0.4	56	0.7	
50	*Ocimum basilicum L.*	Suspru	H	LF	Herbal tea	Stomachic, fever	0.6	63	0.78	
Family Malvaceae										0.11
51	*Malva neglecta Wall.*	Yoru Paghuzu	H	LF	Applied externally	To treat blisters	0.1	9	0.11	
Family Oxalidaceae										0.08
52	*Oxalis corniculata*	Mayoono gamburi	H	FL	Cooked vegetable	Anthelmintic, diuretic	0.1	7	0.08	
Family Paeoniaceae										0.51
53	*Paeonia emodi* Wall. ex Royle var. *emodi*	Mamekhi	H	RT	Applied externally	Used for backache and joints pain	0.6	57	0.71	
Family Papilionaceae										0.67
54	*Astragalus psilocentros Fisch.*	Garmenzu	H	RT	Eaten raw	Gum in root Tonic, laxative	0.4	54	0.67	
55	*Astragalus gilgitensis Ali*	Garmenzu	H	RT	Eaten raw	Tonic, laxative	0.5	61	0.76	
56	*Trigonella foenum-graecum* L.	Sugon	H	LF	Cooked vegetable	Stop loose motions and emmenagogue	0.3	48	0.6	
Family Plantaginaceae										0.68
57	*Plantago major Linn.*	Brono achar	H	SE	Eaten raw	Purgative, stomachic	0.7	60	0.75	
58	*Plantago lanceolata* L	Boyeko ligini	H	SE	Eaten raw	Purgative, stomachic	0.6	49	0.61	
Family Polygonaceae										0.24
59	*Polygonum glabrum* Willd.	Basirjoush	H	LF	Cooked vegetable	Rheumatism	0.1	22	0.27	
60	*Polygonum dumetorum*	Pindoro mish	H	FL	Cooked vegetable	Laxative	0.3	27	0.33	
61	*Rumex longifolius* DC.	Chirkonzur	H	LF	Cooked vegetable	Purgative, astringent, diuretic,	0.3	26	0.32	
62	*Rheum spiciforme Royle*	Rewand	H	ST	Eaten raw	Purgative	0.1	18	0.23	
63	*Rheum emodii*	Eshpar	H	ST	Eaten raw	For dyspepsia	0.1	14	0.17	
64	*Rheum wittrockii Lundstr.*	Khamar	H	LV	Applied externally	Antioxidant, antiseptic and anti-cancer	0.1	12	0.15	
Family Portulacaceae										0.28
65	*Portulaca oleraceae* L.	Pecheli	H	LF	Cooked vegetable	Stomachic, Laxative	0.2	23	0.28	
Family Ranunculaceae										0.44
66	*Delphinium nordhagenii.*	Zaagh joshu	H	AP	Applied externally	Hair tonic	0.1	10	0.12	
67	*Clematis orientalis L.*	Chontruk	H	AP	Herbal tea	For diarrhea and dysentery	0.1	12	0.15	
68	*Galium asperifolium Wall.*		H	LF	Herbal tea	Diuretic	0.1	8	0.1	
69	*Galium elegans* Wall	Mattar	H	LF	Herbal tea	aperients and diuretic	0.1	6	0.07	
Family Saxifragaceae										0.42
70	*Bergenia stracheyi* (Hook.f. & Thorns.) Engl.	Bisabur	H	RT	Applied externally	Toothache, bleeding gums	0.3	34	0.42	

Family Solanaceae										0.29
71	*Datura stramonium L.*	Phorol	H	LF	Applied externally	Rheumatism	0.1	16	0.2	
72	*Datura fastosa*	Porol	H	LF	Applied externally	For joint pain	0.1	12	0.15	
73	*Solanum nigrum L.*	Pirmilik	H	FR	Applied externally	For fever, ophthalmintic	0.6	57	0.71	
74	*Hyoscyamus niger L.*	Bange diwana	H	LF	Herbal tea	For asthma and woofing cough	0.3	28	0.35	
75	*Tribulus terestris L.*	Koluzoakh	H	LF	Herbal tea	Spermatosis	0.1	5	0.06	

LN=Local name, LF=Life form, PU=Part used, UV=Used value, FC=Frequency citation, FIV = Family importance value, H = Herb, LV= Leaves, ST = Stem, FR = Fruit,

Table 2. Informant agreement ratio (IAR) for three regions of the study area.

Use Categories	Informant agreement ratio (IAR)		
	Zargarandeh	Muldeh	Balach
Ripe fruits	0.6	0.7	0.5
Cooked Vegetables	0.74	0.9	0.8
Spices	0.4	0.5	0.4
Herbal Teas	0.5	0.4	0.5
Salads	0.3	0.2	0.3

Discussion

Consumption of plants in traditional ways is deep rooted and playing an important role in uplifting the living condition. According to World Health Organization (WHO), around 80% of the Asian inhabitants are unable to afford basic health facilities, therefore heavily dependent on medicinal plants owing to their cultural familiarity, easy access, simple use and effectiveness (Birjees *et al.* 2022). The use of medicinal flora is comparatively higher in far flung areas which are often lack of life facilities like hospitals and employment etc. (Ali *et al.* 2017). The current study reported a total of 75 weed plant species growing in wheat fields, comprised of 58 genera and 29 families. Weeds are basically unwanted plants and often having adverse impacts (competition) on cultivated pants. Irrespective of its adverse impacts, these plants possess huge importance and are being utilized for medicinal and other purposes in traditional ways (Jan *et al.* 2012).

In current study, family Asteraceae was reported the dominant family in the area having 8 species. In similar pattern Dastagir *et al.* (2022) also reported Asteraceae family as the top ranked consumed family in other parts of district Chitral. According to the current results, leaf was the most consumed part in traditional ways for a number of purposes. Studies also suggested that majority of the active chemicals are inhabited to leaves. The findings of the current results are also supported by Haq *et al.* (2022), who finds the most consumed part as leaves while working on medicinal plants of mountainous region of the Hindu Kush Range, Bajaur, along Pak–Afghan border. Most of the documented weed species (25 species) in the current study are used for making herbal tea followed by food. The importance of wild plants as food items in daily life is significantly highlighted by Ahmad *et al.* (2021), while working on local uses of wild edible plants in the Kumrat valley.

Advance Ethnobotanical survey includes assessment of various indices like use value, relative frequency citation and informant agreement ratio etc. These indices actually ranked the importance of particularly species by measuring its frequency of usage (Vitalini *et al.* 2013). The findings of the current works reported *Cichorium intybus* L. as the most used weed species in the region having 0.85 use value due to high medicinal importance. Similarly, least consumed species was *Lactuca dissecta* D.Don (UV= 0.07). Among the other weed species *Carum carvi* L., *Foeniculum vulgare* Miller, *Matricaria chamomilla* L., *Nasturtium officinale*, and *Mentha longifolia* were common. The consumption of these weed plants are also reported by Ekwealor *et al.* (2019); Spence and Spence (2023) and Vercellino *et al.* (2023). In this study, we also compared the number of use reports, and IARs in the three different sites of Chitral Valley. The results show that weeds obtained a high IAR with 0.81. The local people mostly use the weeds *Allium carolinianum* DC., *Sisymbrium brassiciforme*, *Portulaca oleraceae* L., *Silene conoidea* L. *Chenopodium foliosum*, and *C. murale* L. etc. Parallel value of UV and RFC for the cited species have also been commonly documented among other wide-ranging mountain populations in the Hindukush as well as other parts of the western belt from Pakistan. Furthermore, comparative literature analysis showed that the highest diversity of ethno botanically important plants (83 species) was documented from Garam chashma, district Lower Chitral (Birjees *et al.* 2022), whereas the lowest diversity (42) was reported from Zewar Valley Upper Chitral, (Ullah *et al.* 2016).

Conclusion and Suggestions

During present research work, we recorded the useful traditional knowledge related to weeds species from wheat fields. The reported 75 weed species are normally consumed by local inhabitants for a number of purposes like food, and medicines. Weeds plant of high medicinal importance should be cultivated and encouraged which will be beneficial to livelihoods of rural communities. It will also boost the economic condition and will give advantage to the local farmers for high valued and rare medicinal weed species to produce quality seed and planting stock for pilot scale cultivation. The local people should be trained for proper collection, drying, storage and preservation of medicinal weed species.

Declarations

List of abbreviations: N/A

Ethics approval and consent to participate: This study was approved by the ethical committees of the Department of Botany, University of Chitral, Pakistan and Biodiversity Action Plan (BAP-2015-25) for Pakistan. Before conducting interviews, consent was obtained from all participants. The right to use and authorship of any traditional knowledge of all participants is maintained, and any use of this information, other than for scientific publication, does require additional prior consent of the traditional owners, as well as a consensus on access to benefits resulting from subsequent use.

Consent for publication: Not applicable

Availability of data and materials: Not applicable

Competing interests: Not applicable

Funding: Not applicable

Author contributions: H.S collected the data, analyzed, and wrote the text. F.A participated in the theoretical background, monitoring data collection and analysis, helping with discussions, and wrote the final version of the text.

Acknowledgements

The authors thank the local people of the study area for providing relevant information about wild food plant usage.

Literature cited

Abdul Aziz M, Ullah Z, Pieroni A. 2020. Wild food plant gathering among Kalasha, Yidgha, Nuristani and Khowar speakers in Chitral, NW Pakistan. Sustainability 12(21), 9176. doi: 10.3390/su12219176

Ahmad L, Riaz M, Jan HA, Semotiuk AJ, Ahmad I, Khan I, Ali F, Bussmann RW. 2021. An ethnobotanical survey of wild food plants used by the local communities of Kumrat Valley in District Upper Dir, Pakistan. Ethnobotany Research and Applications 22, 1-13. http://dx.doi.org/10.32859/era.22.20.1-13

Alemu M, Asfaw Z, Lulekal E, Warkineh B, Debella A, Sisay B, Debebe E. 2024. Ethnobotanical study of traditional medicinal plants used by the local people in Habru District, North Wollo Zone, Ethiopia. Journal of Ethnobiology and Ethnomedicine 20(1), 4. doi: 10.1186/s13002-023-00642-z

Ali F, Zeb M, Amin M, Rajpar MN, Hidayat S, Khan WR. 2024. Vegetation–edaphic correlation and importance value index in himalayan 'ecotone'temperate conifer forest using the multivariate technique. Saudi Journal of Biological Sciences, 31(5), 103983. doi: 10.1016/j.sjbs.2024.103983

Ali F, Khan N. 2022. Do environmental variables and overstory communities affect the spatial pattern of understory vegetation? Lessons from *Monotheca buxifolia* (Falc.) A. DC. forests in Pakistan. Acta Botanica Brasilica 36. doi: 10.1590/0102-33062021abb0210

Ali F, Khan I, Ullah S, Ihsan M, Abdullah A. 2017. Traditional uses of wild medicinally important plants of Batkhela, Khyber Pakhtunhkwa, Pakistan. International Journal of Phytomedicine 9(3), 471-78.

Ali F, Khan N, Rahmonov O. 2022. Ecosystem services and linkages of naturally managed *Monotheca buxifolia* (Falc.) A. DC. Forests with local communities across contiguous mountainous ranges in Pakistan. Biology 11(10), 1469. doi: 10.3390/biology11101469

Ali F, Khan N, Ali K, Amin M, Khan MEH, Jones DA. 2023. Assessment of variability in nutritional quality of wild edible fruit of *Monotheca buxifolia* (Falc.) A. DC. Along the altitudinal gradient in Pakistan. Saudi Journal of Biological Sciences 30(1), 103489. doi: 10.1016/j.sjbs.2022.103489

Ali MF, Jamil MA, Adnan M, Sulaman M. 2021. Bio-medical importance of agronomic weeds: An overview. Int. J. Phar. & Biomedi. Research 8(1), 1-8. http://dx.doi.org/10.18782/2394-3726.1108

Aslam B, Maqsoom A, Alaloul WS, Musarat MA, Jabbar T, Zafar A. 2021. Soil erosion susceptibility mapping using a GIS-based multi-criteria decision approach: Case of district Chitral, Pakistan. Ain Shams Engineering Journal 12(2), 1637-1649. doi: 10.1016/j.asej.2020.09.015

Birjees M, Ahmad M, Zafar M, Nawaz S, Jehanzeb S, Ullah F, Zaman W. 2022. Traditional knowledge of wild medicinal plants used by the inhabitants of Garam Chashma valley, district Chitral, Pakistan. Acta Ecologica Sinica 42(2), 19-33. doi: 10.1016/j.chnaes.2020.12.006

Ekwealor KU, Echereme CB, Ofobeze TN, Okereke CN. 2019. Economic importance of weeds: A review. Asian J Plant Sci, 3, 1-11. doi: 10.9734/APRJ/2019/v3i230063

Gharde Y, Singh PK, Dubey RP, Gupta PK. 2018. Assessment of yield and economic losses in agriculture due to weeds in India. Crop Protection 107, 12-18. doi: 10.1016/j.cropro.2018.01.007

Dastagir G, Jan SA, Uza NU, Ahmad I, Bussmann RW (2022). Traditional knowledge and diversity of medicinal plants in Hindukush range, Tehsil Mastuj, Chitral, Pakistan: An ethnobotany survey. Ethnobotany Research and Applications 24, 1-19. https://orcid.org/0000-0002-3524-5273

Gulzar H, Hazrat A, Gulzar K, Ali F, Khan N, Nisar M, Ullah A. 2019. Medicinal plants and their traditional uses in thana village, district Malakand, Khyber Pakhtunkhwa, Pakistan. International Journal of Endorsing Health Science Research 7(1), 11-21.

Haq A, Badshah L, Ali A, Ullah A, Khan SM, Ullah I. 2022. Ethnobotanical study of medicinal plants of Pashat Valley, Bajaur, along Pakistan–Afghanistan border: a mountainous region of the Hindu Kush Range. Nordic Journal of Botany 2022(11), e03580. doi: 10.1111/njb.03580

Hussain M, Shah S, Rehman HU, Rehman F, Khan S, Nisar B, Ali F. 2023. Environmental and Socio-economic Impacts of Eucalyptus Plantation; People's Perception vis-a-vis Scientific Evidence. Journal of Xi'an Shiyou University, Natural Science Edition 19 (6), 384-402.

Jan HU, Jan A, Shinwari ZK (2012). Distribution of weeds in wheat fields of district Bannu, Khyber Pakhtunkhwa Pakistan. Pakistan Journal of Weed Science Research 18(3), 393-411.

Jhala AJ, Norsworthy JK, Ganie ZA, Sosnoskie LM, Beckie HJ, Mallory-Smith CA. Stoltenberg DE. 2021. Pollen-mediated gene flow and transfer of resistance alleles from herbicide-resistant broadleaf weeds. Weed Technology 35(2), 173-187. doi: 10.1017/wet.2020.101

Jhariya MK, Banerjee A, Raj A, Meena RS, Khan N, Kumar S, Bargali SS. 2022. Species invasion and ecological risk. In Natural resources conservation and advances for sustainability 503-531. doi: 10.1016/B978-0-12-822976-7.00014-4

Kajidu YB, Adam BK, Saleh RA, Shehu IB, Kundili YM. 2019. Ethnobotany of Weeds; Weed Flora of Ramat Polytechnic Teaching and Research Farm, Maiduguri Borno State of Nigeria. International Journal of Advances in Scientific Research and Engineering 10, 206-210. doi: 10.31695/IJASRE.2019.33441

Khan A, Bajwa GA, Yang X, Hayat M, Muhammad J, Ali F, Khan AU. 2023. Determining effect of tree on wheat growth and yield parameters at three tree-base distances in wheat/Jand (*Prosopis cineraria*) agroforestry systems. Agroforestry Systems 97(2), 187-196. doi: 10.1007/s10457-022-00797-w

Khan A, Waqas M, Nawab J, Idress M, Kamran M, Khan S. 2024. Total arsenic contamination in soil, vegetables, and fruits and its potential health risks in the Chitral Valley, Pakistan. International Journal of Sediment Research doi: 10.1016/j.ijsrc.2024.01.005

Matloob A, Safdar ME, Abbas T, Aslam F, Khaliq A, Tanveer A, Chadhar AR. 2020. Challenges and prospects for weed management in Pakistan: A review. Crop Protection 134, 104724. doi: 10.1016/j.cropro.2019.01.030

McGaw LJ, Omokhua-Uyi AG, Finnie JF, Van Staden J. 2022. Invasive alien plants and weeds in South Africa: A review of their applications in traditional medicine and potential pharmaceutical properties. Journal of Ethnopharmacology 283, 114564. doi: 10.1016/j.jep.2021.114564

Prasetyo BD, Saragih GS, Fauzi R, Hidayat MY, Septina AD. 2024. Traditional healing of Lio People in Flores, Indonesia: The source of knowledge. Ethnobotany Research and Applications 28, 1-23. http://dx.doi.org/10.32859/era.28.8.1-23

Qasim, M., Khan, M., Rashid, W. (2023). Spatial and temporal analyses of land use changes with special focus on seasonal variation in snow cover in district Chitral; a Hindu Kush mountain region of Pakistan. Remote Sensing Applications: Society and Environment, 29, 100902. doi: 10.1016/j.rsase.2022.100902

Rao AN, Singh RG, Mahajan G, Wani SP. 2020. Weed research issues, challenges, and opportunities in India. Crop Protection 134, 104451. doi: 10.1016/j.cropro.2018.02.003

Sahrawat A, Rahul SN, Singh SK, Patel S. 2020.The potential benefit of weeds: A comparative study: A review. IJCS, 8(2), 148-154. doi: 10.22271/chemi.2020.v8.i2b.10134

Silva JG, de Almeida Caetano R, Vasconcelos da Silva RR, de Medeiros PM. 2022. Sampling Bias in Ethnobotanical Studies on Medicinal Plants Conducted in Local Markets. Journal of Ethnobiology 42(1), 20-30. doi: 10.2993/0278-0771-42.1.20

Sõukand R, Kalle R, Prakofjewa J, Sartori M, Pieroni A. 2024. The importance of the continuity of practice: Ethnobotany of Kihnu island (Estonia) from 1937 to 2021. Plants, People, Planet 6(1), 186-196. doi: 10.1002/ppp3.10423

Spence C, and Spence S 2023. 'Weeds from the yard': A seasonal salad. International Journal of Gastronomy and Food Science 100776.

Syed Z, Ahmad S, Dahri ZH, Azmat M, Shoaib M, Inam A, Ahmad S. 2022. Hydroclimatology of the Chitral River in the Indus Basin under changing climate. Atmosphere 13(2), 295. doi: 10.3390/atmos13020295

Ullah A, Khan N, Ali F, Ullah R, Khan A, He M, Khan W. Vegetation Classification and Distribution Patterns in Sheikh Badin National Park, Khyber Pakhtunkhwa, Pakistan.

Usman M, Murtaza G, Ditta A, Bakht T, Asif M, Nadir M, Nawaz S. 2020. Distribution pattern of weeds in wheat crop grown in District Khanewal, Punjab, Pakistan. Pakistan Journal of Weed Science Research 26(1), 47.

Vercellino RB, Hernández F, Pandolfo C, Ureta S, Presotto A. 2023. Agricultural weeds: the contribution of domesticated species to the origin and evolution of feral weeds. Pest Management Science 79(3), 922-934. doi: 10.1002/ps.7321

Vila M, Beaury EM, Blumenthal DM, Bradley BA, Early R, Laginhas BB, Ibanez I. 2021. Understanding the combined impacts of weeds and climate change on crops. Environmental Research Letters 16(3), 034043. doi: 10.1088/1748-9326/abe14b

Vitalini S, Iriti M, Puricelli C, Ciuchi D, Segale A, Fico G. 2013. Traditional knowledge on medicinal and food plants used in Val San Giacomo (Sondrio, Italy)—An alpine ethnobotanical study. Journal of Ethnopharmacology 145(2), 517-529. doi: 10.1016/j.jep.2012.11.024

Wali S, Jan HA, Haq SM, Yaqoob U, Bussmann RW, Rahim F. 2021. The Traditional phyto-recipes used to cure various ailments by the local people of Shishi Koh valley, Chitral, Pakistan. Ethnobotany Research and Applications 22, 1-32. http://dx.doi.org/10.32859/era.22.42.1-32