A cross-cultural ethnobotanical knowledge comparison about local plants among Pashto, Punjabi and Saraiki communities living in Southwest Pakistan

Sheikh Zain Ul Abidin, Raees Khan, Mushtaq Ahmad, Hammad Ahmad Jan, Muhammad Zafar and Abdul Haleem Shah

Correspondence

Sheikh Zain Ul Abidin[1], Raees Khan[2], Mushtaq Ahmad[2], Hammad Ahmad Jan[3], Muhammad Zafar[2] and Abdul Haleem Shah[1]

[1]Institute of Biological Sciences (Botany Program), Gomal University D I Khan, 29220, Pakistan
[2]Department of Plant Sciences, Quaid- i- Azam University Islamabad, 45320, Pakistan
[3]Department of Botany, University of Buner, Swari, Pakistan

*Corresponding Author: hajmughul@yahoo.com

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Research

Abstract

Background: The current work was conducted with the aim for the documentation of the indigenous uses of medicinal plants for food purposes across the three main indigenous communities in South-west Pakistan. Field work was conducted in 21 villages belonging to the three regions of the district D.I. Khan (Saraiki Community), district Zhob (Pashto Community) and district Mianwali (Punjabi Community), located in the Southwest Pakistan.

Methods: Snowball sampling method was used to interview 93 informants (43 Pashto, 28 Punjabi and 22 Saraiki) using semi-structured questionnaire to document the uses of indigenous taxa as food, herbal tea and herbal juice/drinks purposes. Documented data was quantified by indices UV (use value) and CI (Cultural importance values).

Results: Overall, 68 Plants species belonging to the 40 families were documented to be used in food, herbal tea and herbal juice/drinks. The most important species was *Limonium cabulicum* on the basis of use reports. Major ailments include stomach problems, hair loss, wounds, fever, weight loss and others treated with traditional food /drinks. The *Phyllanthus emblica* (0.31) has the highest UV. The highest cultural value was obtained for *Zingiber officinale* (0.28).

Conclusion: The traditional communities still use medicinal plants. Cross-cultural ethnobotanical studies are fundamental among three ethnic communities in Southwest Pakistan not only for suggesting customs of using plant-based products, which could be exploited in sustainable local development projects (e.g. trade of wild medicinal herbs on small-scale, herbal products, food niche and also focusing on eco-tourism), but also for development relationship and reconciliation among diverse ethnic communities.

Keywords: Cross-Cultural Ethnobotany, food plants, herbal tea, herbal juice/drinks, Pashto, Punjabi, Saraiki

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Background

The use of plants as nutraceuticals source is a firm fact now days (Kathirvel *et al.* 2015). Medicinal plants are commonly consumed as traditional foods, herbal juice, herbal teas and herbal drinks in the ancient times by indigenous people all over the world. This is a fact that therapeutic plants serve as a major source of new drug discovery (Bibi *et al.* 2014). For a long time the local inhabitants highly consumed these foods, and the preparation methods of these foods were passed from generation to the other generation (Trichopoulou *et al.* 2007). Furthermore, ethnic foods are considered as a significant element of various cultural events like people's diet, health, and socioeconomic status. A number of factors influenced traditional foods, among which one is the raw materials availability (Musaiger, 1993). Majority of the population of ethnic groups are still reliant on medicinal plants using traditional herbal therapies to treat various disorders all over the world. Ethnobotanical surveys are valuable for the development of awareness about traditional health care system, as these have no/less side effects (Akgul *et al.* 2018). In tribal communities or ethnic communities the traditional health care system is more common (Qureshi and Ghufran, 2005). The products derived from plants are used to treat numerous ailments like diarrhea, fever, wounds, eye disease, cold, cough, jaundice etc., have no side effects (Sabeen and Ahmad, 2009). Nowadays, in the developing countries approximately twenty five percent of all medicines are plants based (Sher *et al.* 2000). Traditional herbal medicines are more important component in cultural ethnic communities and these medicines preferred by the local people with complete remedial system (Lehane, 1977). The knowledge of herbal remedies used nowadays by herbalists for the preparation of various useful medicines was transferred to them from their forefathers (Ahmad and Husain, 2008), but gradual decline in this knowledge is due to dependence on modern healthcare system (Khan *et al.* 2015). Limited literature is available about the commercially important plant species with remedial properties and its crude preparations, especially herbal juice, herbal teas, herbal drinks and socio-economic status of the study area. Therefore, the current study was carried out with th objectives to identify and document medicinal plants used as food, herbal juice, herbal teas, herbal drinks in the study area.

Materials and Methods

Study Area

Pakistan, with an area of 881913 km^2 is stretching over six-teen hundred kilometers south to north and eight hundred eighty-five kilometers west to east with unique climatic conditions and has rich ethnic as well as phonological diversity. The South-west part is comprised of Khyber Pakhtunkhwa (Dera Ismail Khan), Balochistan (Zhob) and Punjab (Mianwali). This area is resided by three main cultures i.e. Pashtuns (Zhob), Saraiki (Dera Ismail Khan) and Punjabis (Mianwali). The geographical position of Dera Ismail Khan is 31^0 49´ N and 70^0 55´ E and located at an elevation of bout 150m, while the geographical position of Mianwali is 32^0 58´ N and 54^0 36´ E and the elevation is 690m. Furthermore, Zhob is located geographically between 30°26' N to 67°48' E with elevation of 1525m (Ahmad, 2007) (Fig. 1).

Ethnobotanical data collection

This field work was carried out from February 2015 to May 2017. Information was collected by interviewing 93 indigenous people from D.I. Khan (Saraikies), Zhob (Pashtuns) and Mianwali (Punjabis). The informants were selected using snowball technique (Jan *et al.* 2020). A semi-structured questionnaire was used during interview. The data was collected from the informants through face-to-face interview and group discussion (Jan *et al.* 2021a). The identification of collected plant specimens from our field collections revealed 68 taxa belonging to 40 plant families. The specimens were identified by taxonomists at Quaid-i-Azam University, Islamabad, Pakistan and confirmed by matching their taxonomic characters with the Flora of Pakistan (Nasir and Ali, 1970). The voucher numbers were assigned to specimens and deposited in the Herbarium of Pakistan, Department of Plant Sciences, Quaid-i-Azam University, Islamabad. Plant names were verified according to the International Plant Name Index (www.theplantlist.org/), Medicinal Plant Names Services (mpns.kew.org/mpns-portal/).

Interviews with local people

Ethnoboatnical data was gathered from locals by free-listed observations, structured and semi-structured interviews of native people in fields and public areas (generally bazars, tea stall, hujras, village squares, etc.). Detailed structured interviews were mostly followed by free listing. We encouraged the local population to enlarge the free listing (Brewer, 2002). Special care was taken to avoid non-genuine information (Quinlan, 2005) and responses were cross-checked through informal methods for confirmation. Consent was always obtained verbally before conducting every interview (Jan *et al.* 2021b). The project objectives and procedures were clearly explained in the local language with the informants. Interviews were conducted in Pashto, Saraiki and Punjabi languages because studied area comprise in three regions such as Zhob where native people speak Pashto, D .I. Khan Saraiki

and in Mianwali mostly people speak Punjabi language. All work was carried out following the procedure of International Society for Ethnobiology Code of Ethics (Paniagua-Zambrana *et al.* 1994).

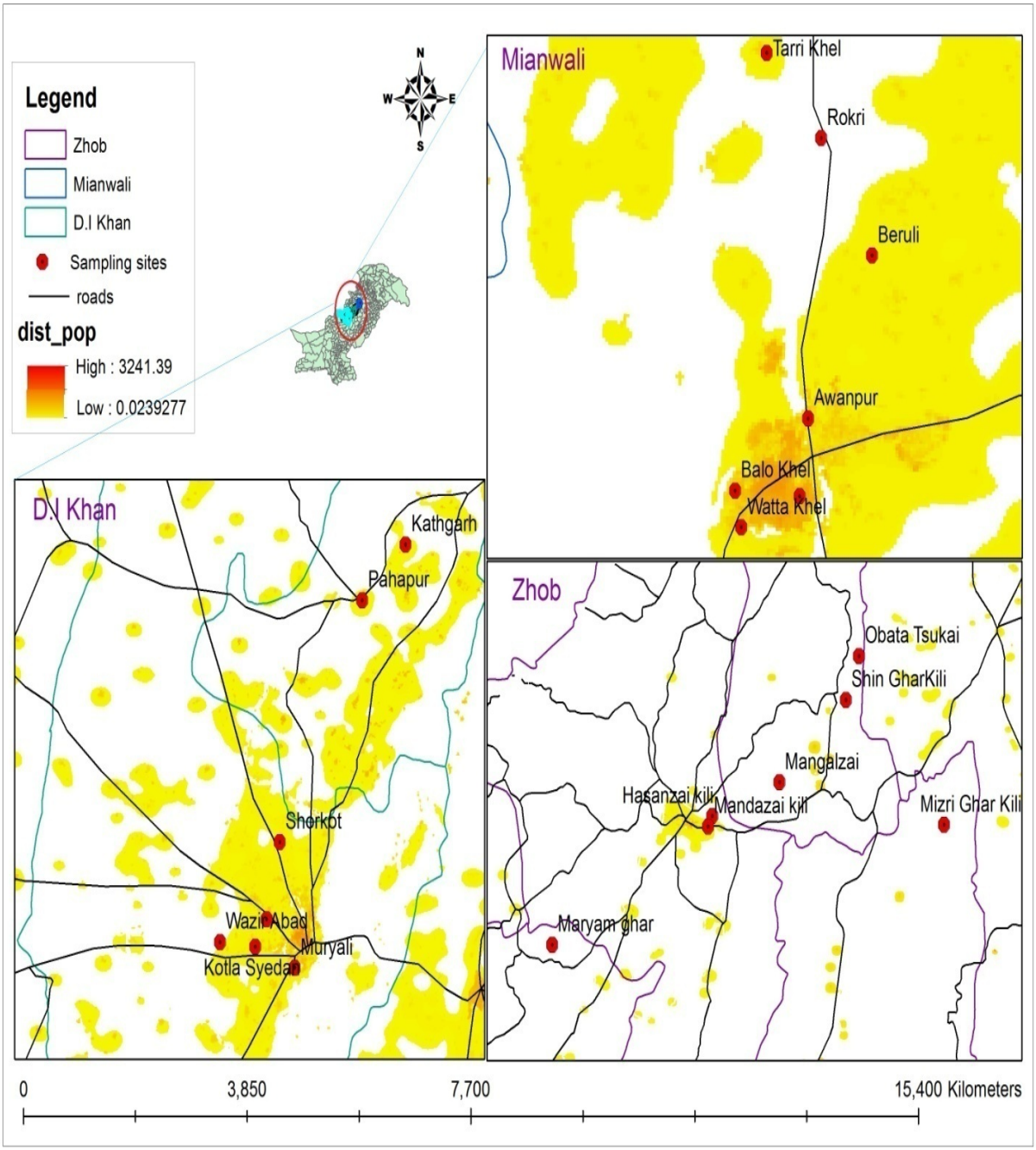

Figure 1. The map showing the three districts along with their sub-localities in Southwest Pakistan

Data analysis

Overlap analysis for cited Plants species

The ethnobotanical data of all three ethnic communities (Pashto, Punjabi and Saraiki) was compared. Data is represented in the form of a Venn diagram using PAST software to illustrate overlaps in use of taxa.

Use value (UV)

We used use value (UV) index (Phillips *et al.* 1994), as a quantitative tool to determine the relative importance of locally known taxa. It was calculated by using the following formula:

$$\mathbf{UV}_i = \frac{\mathbf{\Sigma U}_i}{\mathbf{N}}$$

Where UVi= refers to the use value of a given species, Ui is the number of citations for a particular given species, and N is the number of informants. A high UV indicates the importance of the plant species reported (Šavikin *et al.* 2013).

Cultural importance index (CI)

Cultural importance values for each species and mean cultural importance values for each family (mCIf) were calculated (Pardo-de-Santayana *et al.* 2007). Briefly, CI values of species were calculated based on previously described methods (Tardío and Pardo-de-Santayana, 2008) and express the sum of the proportion of informants that mention each species used. The CI value for each species was calculated using the following formula, with Ur_i = Use reports in each use-category and N: total number of survey participants:

$$CI = \sum Uri/N$$

To calculate the mCIf, CI values of all reported species within a family were added. Regression analysis was performed upon comparison of mCIf with the number of species in each respective family.

Results and Discussion

Demographic profile

Of the 93 informants, 11 were traditional healers, and the rest of 82 were indigenous people of three ethnic communities. Most of the informants were in the age of 50–60 years (19.35%). The median age was 74.5 years. Among the interviewed informants the percentage of illiterate informants was high (23.66%) and it is due to the limited educational facilities in the study area. Most of the informants had completed their primary level or secondary level education. The majority of informants were men (91.40%) and only 8.60% were women (Table 1). This is because of cultural norms in which only older aged women are given access at rituals, and even then, only on celebration days. The majority of females were not allowed to discuss or talk with outsider males. For these reasons, the involvement of women was less during the ethnobotanical knowledge documentation (Ullah *et al.* 2021).

Table 1. Demographic data of participants

Variable	Categories	No. of Persons	Frequency (%)
Informant category	Traditional healers	11	11.83
	Indigenous people	82	88.17
Gender	Female	8	8.60
	Male	85	91.40
Age	Less than 20 years	9	9.68
	20–30 years	12	12.90
	30–40 years	17	18.28
	40–50 years	11	11.83
	50–60 years	18	19.35
	More than 60 years	26	27.96
Educational background	Illiterate	22	23.66
	Completed five years education	15	16.13
	Completed eight years education	12	12.90
	Completed 10 years education	9	9.68
	Completed 12 years education	13	13.98
	Some under r grade degree (16 years education)	8	8.60
	Graduate (higher education)	6	6.45
Experience of the traditional healers	Less than 2 years	2	2.15
	2–5 years	3	3.23
	5–10 years	1	1.08
	10–20 years	3	3.23
	More than 20 years	2	2.15

Diversity of folk plant usage

The present study was conducted to document plants species used for medicinal purposes as well as food, herbal juice, herbal drinks and herbal teas. The current study recorded 68 plant species belonging to 40 families, most of which are used by ethnic communities as herbal tea, as food and herbal juice/drinks depending on the local conditions and kind of ailment category (Table 2). These plant species were used in different localities for preparation of different herbal food and drinks. In current study 41 species were used as traditional food, 21 in herbal teas, 13 in herbal drinks and 11 for preparation of herbal juices (Fig. 2). These herbal foods and drinks have also many medicinal uses. In Pakistan, approximately 600–700 floral species have remedial activities (Ahmad *et al.* 2016). Rosaceae is the most dominant family with twenty-nine species used in the preparation of herbal foods and drinks, followed by family Fabaceae with five species, Asteraceae and Lamiaceae with four species each (Fig. 3). Wali *et al.* (2021) also reported that Rosaceae was dominant family. Similarly other researchers also mentioned family Lamiaceae and family Asteraceae as the dominant families in terms of the number of species belonging to the two families (Bano *et al.* 2014; Bibi *et al.* 2014; Sadeghi *et al.* 2014).

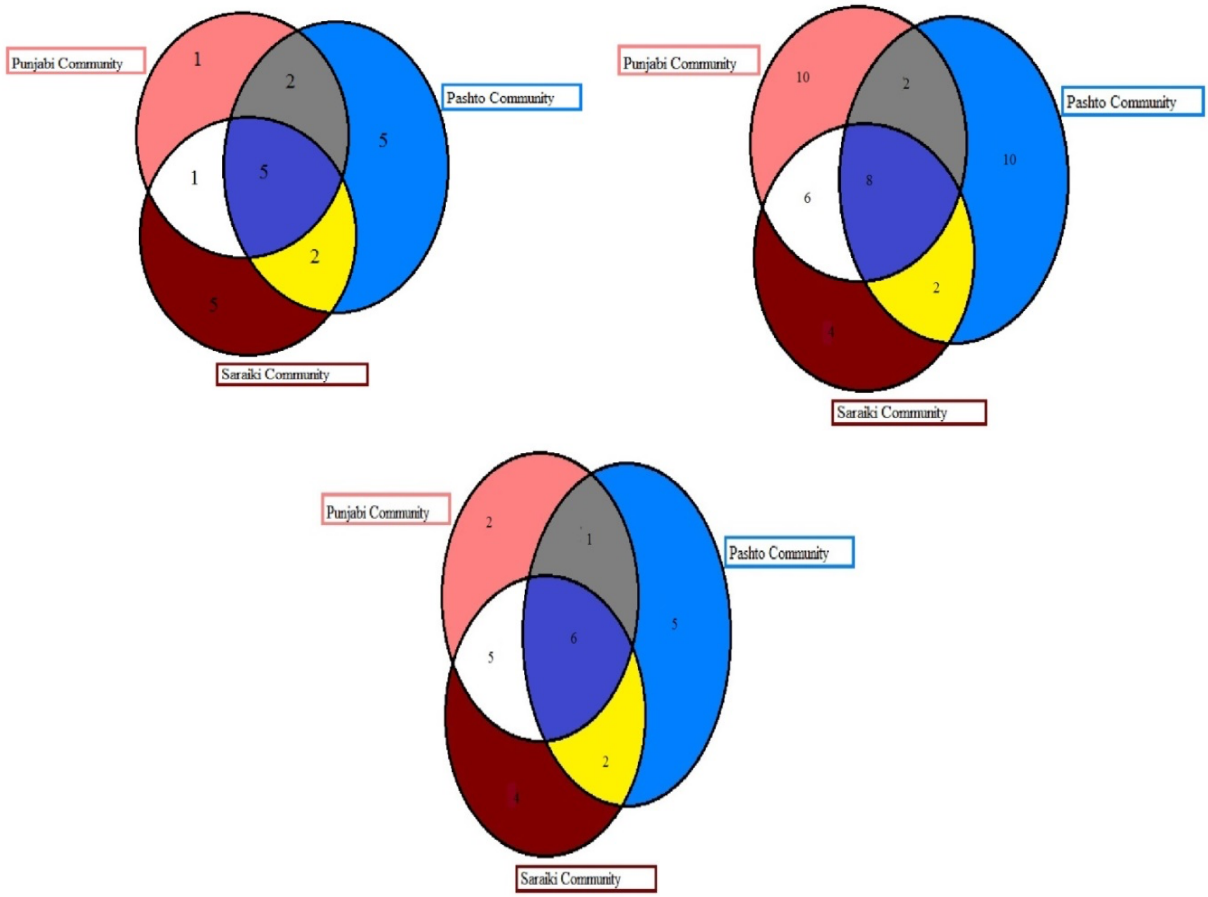

Fig. 2. Venn diagram indicating the overlap of taxa cited by Pashto, Punjabi, and Saraiki communities in the study area for: a) As Herbal tea, b) As food and c) Herbal drinks/ juice.

Plant part used in preparation (tea, food, juice and drinks)

Local people use various parts of the plants for the preparation of food, tea, herbal drinks and juice in the region (Fig. 4). The most commonly used plant part is leaves (26) followed by fruits (24), seeds (7), aerial parts (7), whole plant (7), flowers (5), rhizome (3), stem (3), bark (2), bulb (1) and latex (1) as shown in Figure 3. Our findings are similar with previously ethnobotanical studies reported in Pakistan, India and Bangladesh (Ibrar and Hussain, 2009; Singh and Singh, 2009; Islam *et al.* 2014; Ullah *et al.* 2021). Leaves are the predominantly used part due to their easy availability and collection as compared to underground parts, fruits and flowers (Jan *et al.* 2017). Moreover, leaves are dynamic in photosynthesis and production of metabolites due to physiological point of view (Ghorbani, 2005). Dominantly 48% of the plant species was administrated as decoction, followed by eaten raw (20%), paste (13%), infusion (11%) and extracts (8%) (Fig. 5).

Table 2. Cross cultural usage of plants species for medicinal and traditional food preparation in Southwest in Pakistan.

Botanical Name	Voucher number	Family	Vernacular name			Use recorded among three ethnic communities			Part used	Traditional food and herbal drinks preparation	Medicinal use	Use value (UV)	Cultural index (CI)
			Pashto	Punjabi	Saraiki	Pashto	Punjabi	Saraiki					
Acacia modesta Wall.	ISI-H - 78534	Fabaceae	Palosa	Palosa	Phali	×	×	×	Leaves, bark	As tea	Wounds	0.07	0.16
Acorus calamus L.	ISI-H-78964	Acoraceae	Bach	-	-	×	-	-	Leaves, rhizome	As tea, As food	Epilepsy, stomach problems	0.13	0.16
Allium cepa L.	ISI-H-78967	Amaryllidaceae	Piyaz	Piaz	Vassal	×	×	×	Bulb	As food	Diabetes, hair loss	0.08	0.28
Aloe vera (L.) Burm.f	ISI-H-78968	Xanthorrhoeaceae		Aloevera		-	×	-	Leaves, latex	As herbal juice	Wounds	0.05	0.2
Berberis aristata DC.	ISI-H - 78553	Berberidaceae	Zareshk	-	-	×	-	-	Leaves	As herbal drinks	Jaundice	0.08	0.14
Berberis lycium Royle	ISI-H - 78577	Berberidaceae	Sumbal	-	-	×	-	-	Leaves, stem	As food, As herbal juice	Diabetes, eye disease	0.18	0.12
Calendula arvens is M.Bieb	ISI-H - 78572	Asteraceae	-	Zarhgul	-		×	-	Leaves, flowers	As food	Wounds, eye disease	0.1	0.23
Camellia sinensis (L.) Kuntze	ISI-H-78972	Theaceae	Sheen chai	qehwa	Savi cha	×	×	×	Leaves	As tea, As food	Throat infection, weight loss	0.15	0.14
Caralluma tuberculata N.E.Br.	ISI-H-78457	Apocynaceae	Chunga n	Chungan	Chungan	×	×	×	Fruits	As food, As herbal juice	Diabetes, rheumatism, leprosy	0.13	0.25
Carum carvi L.	ISI-H-78974	Apiaceae	Zeera	-	Zerah	×	-	×	Seeds	As food	Diarrhea	0.05	0.22
Cicer arietinum L.	ISI-H-78977	Fabaceae	-	Chanra	-	-	×	-	Seeds	As food	Jaundice	0.04	0.25
Cichorium intybus L	ISI-H-78978	Asteraceae	-	-	Kasni	-	-	×	Aerial parts	As tea	Diarrhea, wounds	0.12	0.18
Citrullus colocynthis (L.) Schrad	ISI-H-78979	Cucurbitaceae	-	Karthuma	-	-	×	-	Fruits	As food	Diabetes	0.06	0.19
Citrus maxima (Burm.) Merr.	ISI-HS-73	Rutaceae	Tarkh hidwana	-	Chakotra	×	-	×	Fruits	As herbal juice	Weight lost	0.08	0.16
Citrus limon (L.) Osbeck	ISI-H-78980	Rutaceae	-	Lembo	Lemo	-	×	×	Fruits	As herbal juice	Fever, cold	0.13	0.13
Citrus medica L	ISI-H - 78423	Rutaceae	-	-	Nimbo	-	-	×	Fruits	As herbal drinks	Cold, cough	0.14	0.15
Convolvulus arvensis L.	ISI-H-78981	Convolvulaceae	Prewaty	Prewaty	Prewaty	×	×	×	Whole plant	As herbal juice, As tea	Fever, wounds, women disease	0.14	0.23
Curcuma longa L.	ISI-H-78983	Zingiberaceae	Curkam an	Turmeric	Haldi	×	×	×	Rhizome	As food	Blood circulation	0.04	0.27
Cydonia oblonga Mill.	ISI-HS-31	Rosaceae	Phei	-	-	×	-	-	Fruits	As food, As herbal juice	Diabetes, ulcer, hepatitis	0.27	0.12

Cymbopogon jwarancusa (Jones) Schult	ISI-H-78984	Poaceae	Sargary	Khavi	Khavi	×	×	×	Leaves	As tea	Skin disease	0.05	0.23
Cynodon dactylon (L.) Pers.	ISI-H-78985	Poaceae	Kabal	-	Gaah	×	-	×	Whole plant	As herbal juice	Diarrhea, allergy	0.12	0.18
Daphne mucronata Royle	ISI-HS-72	Thymelaeaceae	Luni	-	-	×	-	-	Aerial parts	As food	Analgesic, wounds	0.14	0.15
Ephedra intermedia Schrenk & C.A.Mey	ISI-H -78446	Ephedraceae	غث اومان	-	-	×	-	-	Aerial parts	As tea	Analgesic, joint pain	0.15	0.13
Ephedra major subsp. *procera* (C.A.Mey.) Bornm.	ISI-H -78447	Ephedraceae	نرئ اومان	-	-	×	-	-	Aerial parts	As tea	Analgesic, joint pain	0.17	0.14
Fagonia indica Burm.f.	ISI-H-78986	Zygophyllaceae	Azghaky	-	Dhaman		×	×	Whole plant	As herbal drinks	Body pain, stomach problems	0.13	0.17
Ferula oopoda (Boiss. & Buhse) Boiss.	ISI-H -78566	Apiaceae	Hing	-	-	×	-	-	Aerial parts	As herbal drinks	Stomach problems, skin disease	0.17	0.13
Glycyrrhiza glabra L.	ISI-H-78988	Fabaceae	Khwga zaba,	Melathi	Melathi	×	×	×	Whole plant	As herbal juice	Indigestion, Stomach problems	0.13	0.16
Hordeum vulgare L	ISI-H-78990	Poaceae	Warbasy	Warbasy	Warbasy	×	×	×	Whole plant	As food, As herbal drinks	Stomach problems, skin disease, brest infection	0.14	0.23
Hypericum perforatum L.	ISI-H-78991	Hypericaceae	Balsany	-	-	×	-	-	Flowers	As tea	Weight lost, wounds	0.17	0.13
Juglans regia L.	ISI-HS-60	Juglandaceae	Akhoet	-	-	×	-	-	Fruits	As food	Vomiting, diarrhoea	0.11	0.2
Justicia adhatoda L.	ISI-H -78589	Acanthaceae	-	Baikarh	Bhaiker	-	×	×	Leaves, roots, flower	As herbal juice	Asthma, cold, cough, Fever, Throat infection	0.21	0.26
Lamium amplexicaule L.	ISI-H -78533	Lamiaceae	Not known	-	-	-	-	×	Leaves, flowers	As food	Skin disease, wounds	0.25	0.09
Limonium cabulicum (Boiss.) Kuntze	ISI-H -78541	Plumbaginaceae	Ghwagai	-	Mashnawaro	×	-	×	Leaves, fruits	As tea, As food	Wounds, eye disease, throat infection	0.3	0.11
Linum usitatissimum L.	ISI-H-78993	Linaceae	-	-	Alsi	-	-	×	Leaves, stem	As food	Eczema, menstrual problems	0.15	0.14
Malva sylvestris L.	ISI-H-78994	Malvaceae	Parinak	Parinak	-	×	×	-	Leaves, flowers	As tea, As food	Cough, cold, fever	0.14	0.24
Mangifera indica L.		Anacardiaceae	Aam	Aamb	-	×	×	-	Leaves, fruits	As herbal drinks	Diarrhea, dysentery, tonic	0.17	0.19
Matricaria chamomilla L.	ISI-H-78995	Asteraceae	-	-	Babo dana	-	-	×	Whole plant	As tea, As food	Menstrual infection, skin disease, stomach problems	0.13	0.26

Mentha arvensis L.	ISI-H-78996	Lamiaceae	Pudina	Poodna	-	×	×	-	Leaves	As tea	Fever, headaches, stomach problems	0.15	0.22
Mentha longifolia (L.) L.	ISI-H -78567	Lamiaceae	-	-	Shinshobi	-	-	×	Leaves	As tea, As food	Stomach problems, fever, headaches	0.19	0.17
Momordica charantia L.	ISI-H-78997	Cucurbitaceae	-	Karela	Karela	-	×	×	Fruits, leaves	As herbal drinks, As food	Skin diseases, diabetes, wounds	0.14	0.23
Musa paradisiaca L.	ISI-H-78426	Musaceae	Kela	Kela	-	×	×	-	Fruits	As food	Constipation, dysentery	0.07	0.29
Myrsine africana L.	ISI-HS-27	Primulaceae	Khukan	-	-	×	-	-	Leaves, fruits	As tea	Diarrhoea, rheumatism	0.13	0.16
Nepeta bracteata Benth.	ISI-H-78425	Lamiaceae	-	-	Zofa	-	-	×	Leaves	As herbal drinks	Asthma, cough, cold	0.23	0.14
Nigella sativa L.	ISI-H-79000	Ranunculaceae	Kalwangi	Kalwangi	Kalwangi	×	×	×	Seeds	As herbal drinks, As food, As tea	Constipation, Asthma, cough, stomach problems, dysentery	0.18	0.28
Olea ferruginea Wall. ex Aitch.	ISI-H-78427	Oleaceae	زیتون	-	Zaitoon	×	-	×	Leaves	As tea	Asthma, cough	0.14	0.15
Oxalis corniculata L.	ISI-H-79001	Oxalidaceae	-	Taroki	Taroki	-	×	×	Leaves	As food	diarrhoea, Fever	0.11	0.19
Phoenix dactylifera L.	ISI-HS-19	Arecaceae	-	Khajoor	Khajoor	-	×	×	Fruits	As food	Aphrodiasc	0.06	0.18
Phyllanthus emblica L.	ISI-H-78428	Phyllanthaceae	-	Aamla	Amla	-	×	×	Leaves, fruits	As food, As herbal drinks	Eye problems, joint pain, diarrhoea, dysentery	0.31	0.14
Pinus gerardiana Wall. ex D.Don	ISI-HS-58	Pinaceae	Zanghozai,	-	-	×	-	-	Seeds	As food	Weight loss	0.08	0.13
Plantago ovata Forssk	ISI-H-78429	Plantaginaceae	-	Ispighol	-	-	×	-	Seeds	As herbal drinks	Constipation,diarrhoea	0.11	0.19
Portulaca oleracea L	ISI-H-78430	Portulacaceae	-	Lunrak	Lunrak	-	×	×	Leaves, stem	As food	Diarrhoea, Fever wounds	0.2	0.16
Prunus amygdalus Stokes	ISI-HS-65	Rosaceae	-	Badam	Badam	-	×	×	Seeds	As food	Aphrodiasc, heart problems	0.11	0.2
Prunus armeniaca L.	ISI-HS-11	Rosaceae	-	-	Haare	-	-	×	Fruits	As food	Cough, constipation, Asthma	0.27	0.12
Prunus avium (L.) L.	ISI-HS-7	Rosaceae	-	-	Kala kathi	-	-	×	Fruits	As food	Weight lose	0.11	0.1
Prunus dulcis (Mill.) D.A.Webb	ISI-H-78432	Rosaceae	Aloocha	-	-	×	-	-	Fruits	As food	Eye problems, joint pain,	0.29	0.08
Prunus cornuta (Wall. ex Royle) Steud.	ISI-HS-57	Rosaceae	Kala kath	-	-	×	-	-	Fruits	As food	Diarrhoea, dysentery	0.15	0.14
Prunus persica (L.) Batsch	ISI-HS-28	Rosaceae	-	-	Aaru	-	-	×	Fruits	As food	Constipation,diarrhoea,	0.12	0.18
Psidium guajava L.	ISI-H-79004	Myrtaceae	Amrood	Amrood	Amrood	×	×	×	Fruits	As food	Diarrhoea, constipation	0.08	0.26

Punica granatum L.	ISI-H-79005	Lythraceae	Daruna	-	-	×	-	-	Fruits	As food	Rheumatism, weakness	0.09	0.24
Pyrus communis L.	ISI-HS-13	Rosaceae	Batang	Batangi	Batangi	×	×	×	Fruits	As food	Cough, constipation	0.13	0.17
Sideroxylon mascatense (A.DC.) T.D.Penn.	ISI-HS-58456	Sapotaceae	-	-	Gurgura	-	-	×	Fruits	As food	Body pain, stomach problems	0.18	0.12
Syzygium cumini (L.) Skeels	ISI-H-79011	Myrtaceae	-	Jamun	-	-	×	-	Leaves, fruits	As food, As herbal juice	Diabetes	0.04	0.27
Tamarindus indica L.	ISI-HS-48	Fabaceae	-	-	Imli	-	-	×	Leaves, flowers, seeds, bark	As food, As tea	Constipation	0.07	0.15
Trachyspermum ammi (L.) Sprague	ISI-H-79013	Apiaceae	سپرکئ	-	-	×	-	-	Aerial parts	As food, As herbal drinks	Diarrhea, cold, flu	0.17	0.19
Trigonella foenum-graecum L.	ISI-H -78456	Fabaceae	-	-	Methi	-	-	×	Leaves, seeds	As tea	Stomach problems, ulcer	0.13	0.17
Varthemia persica DC.	ISI-H -78439	Asteraceae	Not known	-	-	×	-	-	Whole plant	As tea	Cough, cold, fever	0.21	0.15
Withania coagulans (Stocks) Dunal	ISI-H-78435	Solanaceae	خمازوره	Panirbad,	Panir	×	×	×	Aerial parts	As herbal drinks	Stomach problems, diabetes	0.1	0.22
Zingiber officinale Roscoe	ISI-H-78436	Zingiberaceae	-	Adrak	-	-	×	-	Rhizome	As tea	Cough, cold, fever, stomach problems	0.15	0.28

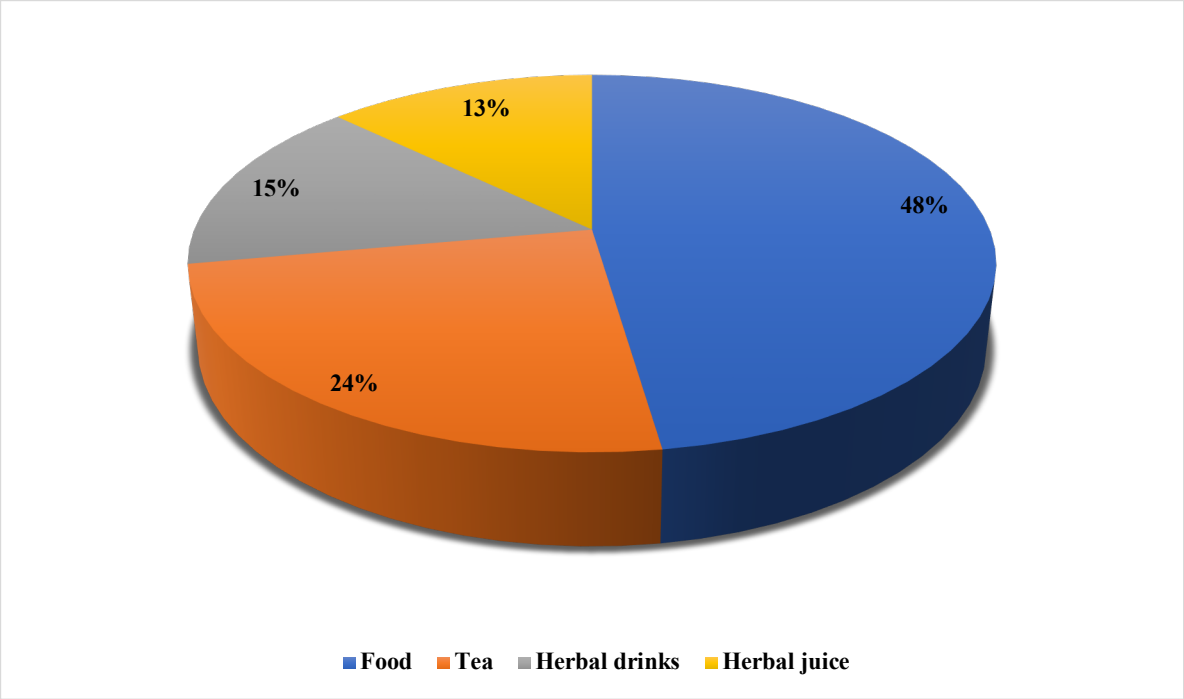

Figure 3. Percentage (%) use of plants for traditional foods and drinks

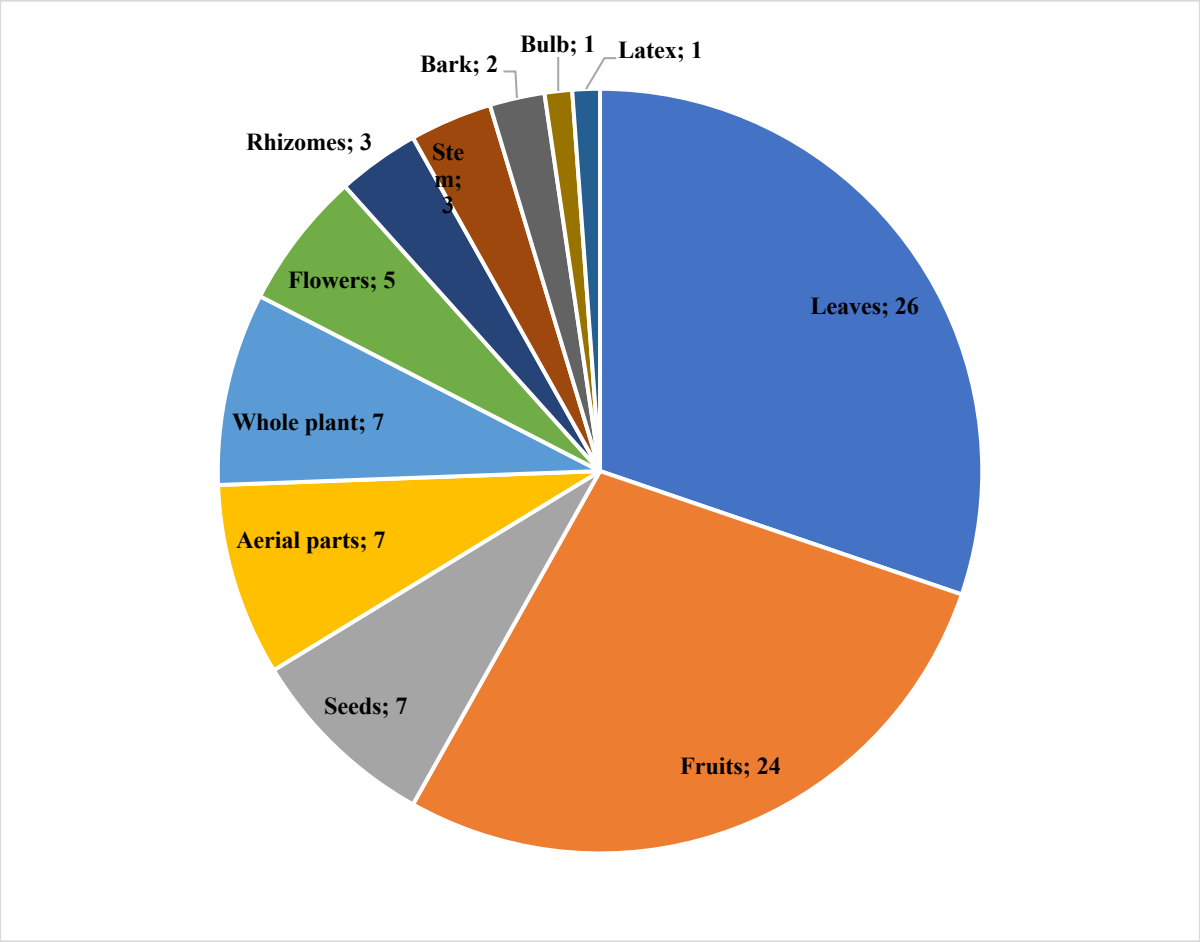

Figure 4. Use of different plant parts in traditional foods and herbal drinks

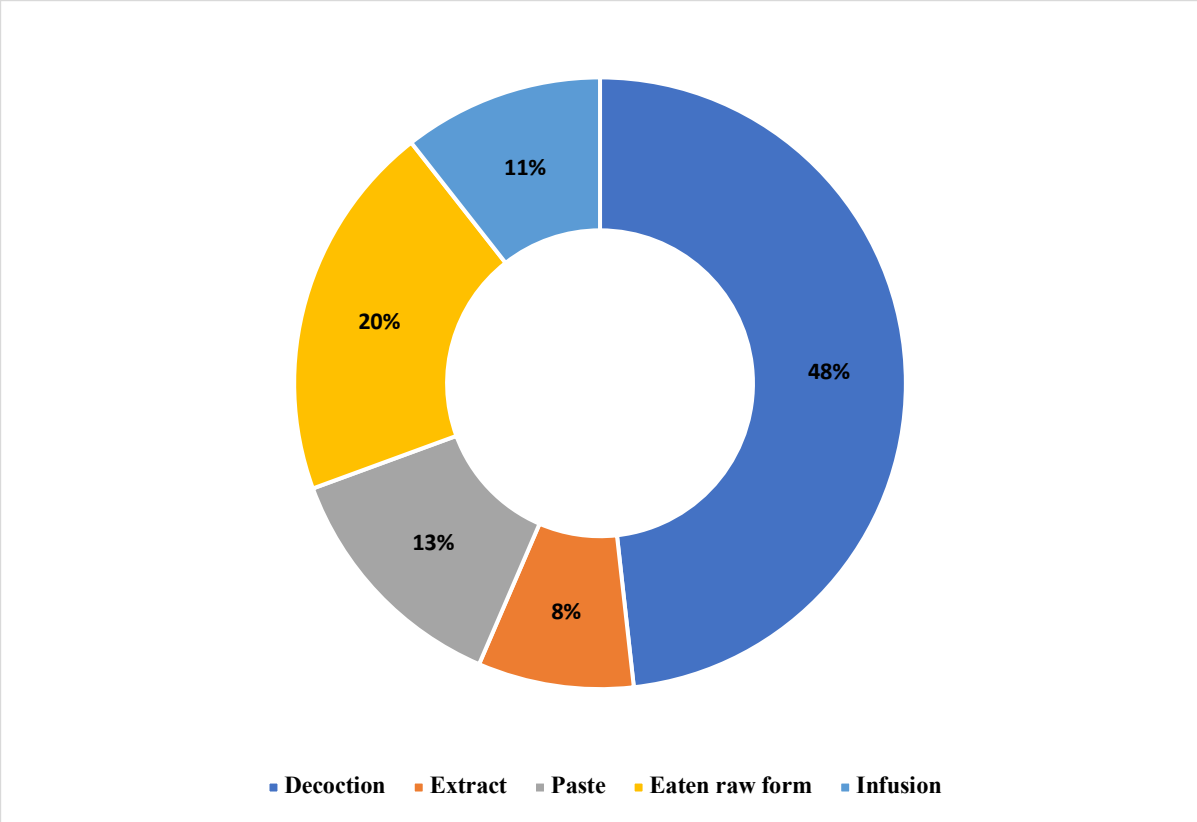

Figure 5. Administration methods of traditional foods and drinks

Quantitative analysis

Use value (UV)

UV is an important quantitative index for representing the relative importance of medicinal plant species of the study area. Based on our analysis, Use Values of the species ranges from 0.31 to 0.04 which reveals that local people use these plants commonly in their daily life. The UV values are categorized into different classes. Class one ranges from 0.31 to 0.15 includes 25 plant species, class two ranges from 0.14 to 0.1 includes 26 plants, class three ranges from 0.09 to 0.05 containing 14 plants and the lowest values of UV was obtained for class four that is 0.04 having 03 species of medicinal plants (Table 2). Highest use value is recorded for *Phyllanthus emblica* L. (0.31) with 4 use reports (UR) used for eye problems, joint pain, diarrhoea and dysentery in the form of herbal drinks and food. *Phyllanthus emblica* is a very important food plant and its fruits are used as food in different parts of the world due to its medicinal value followed by *Limonium cabulicum* (Boiss.) Kuntze. (0.30) with 3 use reports (used for wounds, eye disease and throat infection) in the form of tea and food, *Prunus dulcis* (Mill.) D.A. Webb (0.29) and *Cydonia oblonga* Mill., and *Prunus armeniaca* L. (0.27) with same use value. Other important plants in terms of UV are *Lamium amplexicaule*, *Nepeta bracteata*, *Varthemia persica*, *Justicia adhatoda*, *Portulaca oleracea*, *Mentha longifolia*, *Berberis lycium*, *Nigella sativa*, *Ephedra major* subsp. *procera*, *Ferula oopoda*, *Mangifera indica*, *Trachyspermum ammi*, *Camellia sinensis*, *Ephedra intermedia*, *Zingiber officinale*, *Mentha arvensis*, *Convolvulus arvensis*, *Momordica charantia*, *Acorus calamus*, *Citrus limon*, *Myrsine Africana*, *Caralluma tuberculata* and *Cichorium intybus*. Our result of UV agrees with previously published research works of Ahmad *et al.* (2016), and Bano *et al.* (2014). The medicinal plants with high use values suggest that these have high number of active constituents and needs to be further studied for natural products.

Cross cultural importance of plant species among three ethnic communities

Cultural importance (CI) is used interchangeably in the literature and refers to the relative importance of a particular plant species to a given culture (Albuquerque *et al.* 2005). This index elucidates not only the spread of the uses (FC=number of informants) for each plant species, but also its versatility (Tardío and Pardo-de-Santayana, 2008). It can be estimated that the CI index is a useful index for prominence those species with a high-consensus for the cultural survey and so to recognize the shared traditional knowledge of the peoples. During current study, CI index and mean cultural importance index were used to measure the cultural values of each plant species in three regions, to assess the awareness about plants between multi cultures (Pardo-de-Santayana *et al.* 2007) and to study the

intra cultural variations. On the bases of use reports (UR) the cultural importance index (CI) and mean cultural index (mCI) of plant species within the three regions (Zhob, D. I. Khan and Mianwali) of the southwest Pakistan were intended. Among the 68 plant species recorded, 13 plant species were commonly used among all three ethnic (Pashto, Saraiki and Punjabi) communities, 9 species recorded only in two communities Punjabi and Saraiki, 5 plant species used in two Pashto and Saraiki communities, while 4 in Pashto and Punjabi communities. Similarly, the plant species used in only one community, the most plant species (17) were recorded in Pashto community, 13 species recorded in Saraiki community while 7 plant species were recorded in Punjabi community (Fig. 6). All these species were used as medicine, food, herbal drinks, herbal juice and herbal teas (Table 2). The highest CI value was recorded for *Allium cepa* and *Nigella sativa* (0.28), followed by *Curcuma longa* (0.27), *Psidium guajava* (0.26), *Caralluma tuberculata* (0.25), *Convolvulus arvensis* and *Hordeum vulgare* (0.23) in the three ethnic communities (Pashtoon, Saraiki and Punjabi). Seventeen plant species were only used in Zhob, the highest CI value is recorded for *Punica granatum* (0.24), followed by *Juglans regia* (0.20), *Trachyspermum ammi* (0.19) and *Acorus calamus* (0.16). Thirteen plant species were solely reported from D.I. Khan with highest CI values for *Matricaria chamomilla* (0.26), *Cichorium intybus* and (0.18) *Mentha longifolia* (0.17). Six plants species were only used by the inhabitants of Mianwali with high CI values *Zingiber officinale* (0.28), *Syzygium cumini* (0.27), *Cicer arietinum* (0.25) and *Calendula arvensis* (0.23). In both Zhob and Mianwali 4 species were reported to be used in common i.e. *Musa paradisiaca* (0.29), *Malva sylvestris* (0.24), *Mentha arvensis* (0.22) and *Mangifera indica* (0.19). Five plant species i.e. *Carum carvi* (0.22) *Cynodon dactylon* (0.18) *Olea ferruginea* (0.15), *Citrus maxima* (0.13) and *Limonium cabulicum* (0.11) were commonly used by the two cultural groups in Zhob and D.I. Khan. Similarly, in D.I. Khan and Mianwali 10 plant species with highest CI values *Justicia adhatoda* (0.26), *Momordica charantia* (0.23), Prunus *amygdalus* (0.20) and *Oxalis corniculata* (0.19) were shared in preparation of traditional foods and drinks. All these species are used as food, herbal drinks, herbal juice, herbal teas and as herbal medicines. This index shows a great traditional knowledge of plants used as medicine, food, herbal drinks and herbal teas among three ethnic communities. Abbasi *et al.* (2013) also reported the utilization of plants as traditional food within the five study localities, (Margalla Hills, Haripur, Abbottabad, Murree and Mansehra) of Lesser Himalayas.

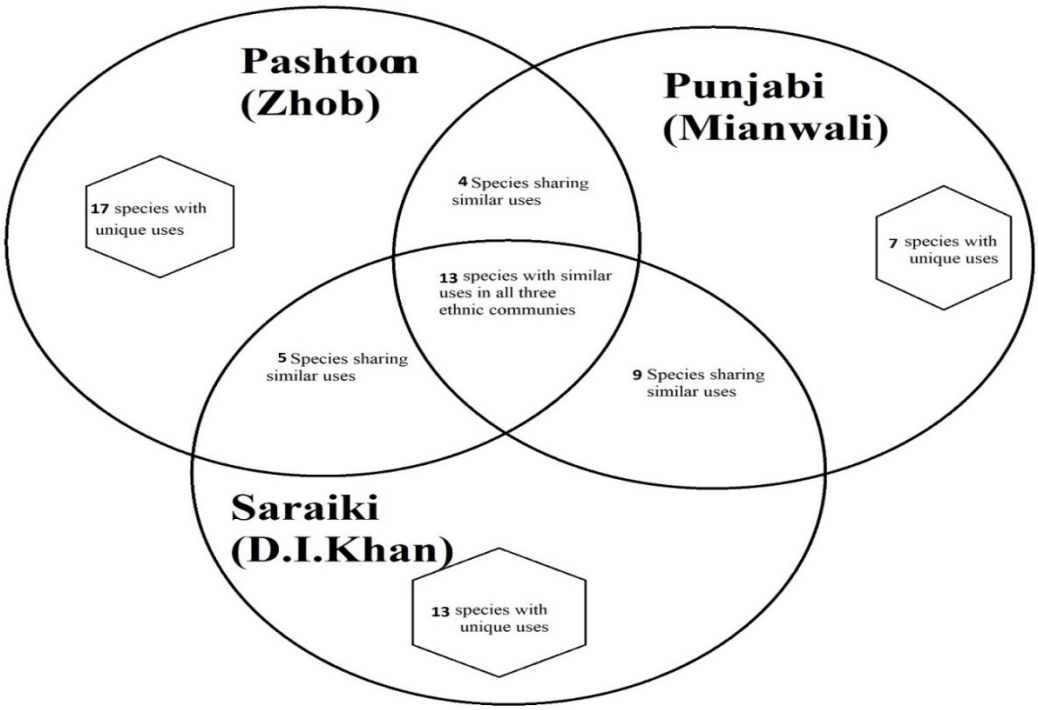

Figure 6. Plant utilization among the three ethnic communities for the preparation of traditional food and drinks

Cultural importance of the families

A comparison between the cultural indexes of most cited plant families (CIf) mentioned in Figure 7 revealed that Rosaceae with 8 species was found most quoted botanical family because members of this family were consumed as food, herbal teas and drinks. Other noteworthy families were Fabaceae and Lamiaceae with 5 species each, being consumed as herbal teas, followed by Asteraceae (4 species), Apiaceae, Poaceae and Rutaceae (3 species each), Berberidaceae, Cucurbitaceae, Ephedraceae, Myrtaceae and Zingiberaceae (2 species each), Acanthaceae,

Acoraceae, Amaryllidaceae, Anacardiaceae, Apocynaceae, Arecaceae, Convolvulaceae, Hypericaceae, Juglandaceae, Lythraceae, Malvaceae, Musaceae, Oleaceae, Oxalidaceae, Phyllanthaceae, Pinaceae, Plantaginaceae, Plumbaginaceae, Portulacaceae, Primulaceae, Ranunculaceae, Sapotaceae, Solanaceae, Theaceae, Thymelaeaceae, Xanthorrhoeaceae and Zygophyllaceae (1 species each) (Fig. 7). Present findings agree with those of Hadjichambis *et al.* (2008, who recognized that Asteraceae, Rosaceae and Umbelliferae were among the most significant families of wild edible plants in the Mediterranean regions. Hence present results confirm that local people tend to use preferably the plants that are accessible to them. These observations corroborated with other workers (Bonet *et al.* 1999; Stepp and Moerman, 2001; Bonet and Valles, 2002).

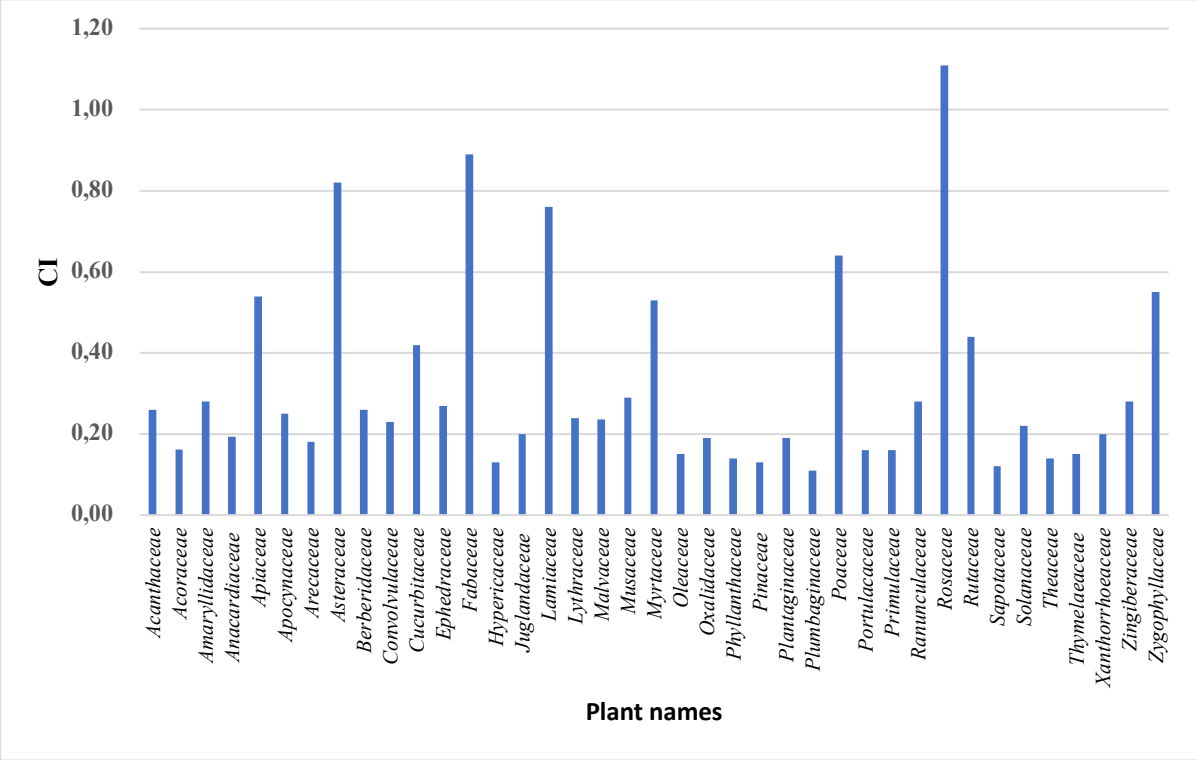

Figure 7. Cultural Index of families used for herbal drinks and foods

Conclusion and recommendations

The present study is the first one of its own kind to report cross-cultural uses of the medicinal and food plants among three ethnic communities (Punjabi, Saraiki, and Pakhtoon) in Southwest Pakistan (Mianwali, D.I. Khan and Zhob). These ethnic communities mostly rely on local flora for their primary health care. The traditional knowledge of the study area is in the custody of traditional healers, shepherds, hilly people, religious scholars and elder people. The present work will serve as baseline data for further pharmacological, phytochemical and scientific validation, subsidizing the development of new, low-cost medications. The current study highlights the significance of traditional uses of plants in different cultures and its conservation due to modernization; the younger generation does not take interest in the utilization of traditional remedies. The similar usage of medicinal plants in different ethnic communities with multiple consumptions of single plant for therapeutic preparations approves the presence of active chemical constituents which further particularizes pharmacological investigation of these plants. A total of 68 plant species used for traditional food and herbal drinks by the local inhabitants of D.I. Khan (Saraikies), Zhob (Pashtoons) and Mianwali (Punjabis). Cross-cultural consensus showed that only 13 medicinal plants were commonly used among all three ethnic communities for food and medicinal usage.

The study recommends further investigation of these plants for phytochemical, toxicological and clinical studies to develop an improved and clear understanding of the dosage safety and effectiveness. Heavy metal analysis is also significant as these plants have the ability to uptake some particular heavy metals, toxic for the health. To conserve and preserve the indigenous folk knowledge of medicinal plants and its usage, the awareness of the people about the significance of these plants is the need of time. Furthermore, it is necessary to motivate the local people towards the conservation and sustainable use of these plants. Moreover, conservational studies are needed as the population of some medicinal plants i.e. *Ephedra major* are decreasing very rapidly.

Declarations

Ethics approval: All participants provided oral prior informed consent.
Consent to publish: The paper does not show any personal data or photographs.
Availability of data and materials: The authors will provide the raw data on request without the names of informants.
Competing interests and conflict of interest: The authors declare that they have no competing interests and conflict of interest.
Funding: Not applicable.
Authors' contribution: SZA and MA deliberate this work; the field work was conducted by SZA. SZA, MZ and RK conducted the main statistical analysis. SZA and HAJ wrote the manuscript, the revision of the data analysis and manuscript was done by HAJ; all authors read, corrected and approved the manuscript.

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