Pak. J. Bot., 56(5): 1945-1962, 2024. DOI: http://dx.doi.org/10.30848/PJB2024-5(18)

CROSS-REGIONAL ETHNOMEDICINAL STUDY OF PLANTS-BASED HERBAL TEA USED TO CURE VARIOUS DISEASES IN SIX TEHSILS OF DISTRICT BUNER, NORTHERN PAKISTAN

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Abstract

To highlight the importance of medicinal plants used by the local communities, ethnomedicinal research is significant. This research aimed to collect data about the plants that local populations in six Tehsils of the District Buner utilized to prepare herbal teas that were used for treating different ailments. Through a semi-structured questionnaire, face-to-face interviews and group interviews with the informant were conducted. The quantification of the data was done using the informant consensus factor (ICF). From 2018 to 2021, ethnomedicinal information was collected about 125 plant species after interviewing 853 informants. Most of the ethnomedical information came from people with an age range from 50 to 59. With 15 species, the Lamiaceae family was the dominant one. Out of 125 plant species, medicinal uses of 45 species were reported from all six tehsils. Furthermore, the medicinal uses of six species were reported from one-one tehsil. Moreover, for 78 species new medicinal uses are reported. Similarly, for the first time, this study reports six medicinal plants used for the treatment of corona disease from the study area. The highest ICF value is calculated for Urological diseases (0.94). Based on the results, it can be speculated that the native community still regularly uses medicinal plants to treat a range of illnesses.

Keywords: Cross-regional, Ethnomedicine, Herbal teas, Medicinal uses, Traditional knowledge.

List of abbreviations: Ur= Use reports; **FC**= Frequency of Citation; ♥ = Different/new medicinal use; ♠= Medicinal use reported; **Bold font medicinal uses=** Reported in the literature; Normal font medicinal uses = New medicinal uses; **ICF=** Informants consensus factor

Introduction

The study of ethnobotany focuses on the complex interactions of indigenous populations with their environment and natural flora comprising cultural norms, customs and beliefs related to a variety of uses (Amjad *et al.,* 2020). The importance of plant species used by the local people can only be highlighted through ethnomedical research (Cox, 2000). Approximately 35,000–70,000 herbal plants are used as traditional remedies around the world, and they are essential to the survival of many people. The research indicates that sixty to eighty percent of people in the world are still using herbal medicines since they are inexpensive as well as secure alternatives to allopathic therapy, which is unaffordable in developing countries (Cox, 2000; Jan *et al.,* 2021). Even in developed nations, people regularly use herbal medications. For instance, between 30 and 50% of the population in China, 48% in Australia, 42% in the USA, 42% in Germany, and 49% in France reported using herbal medicine as a supplement to allopathic treatment (Bibi *et al.,* 2014). Approximately 25% of modern allopathic drugs are made from synthetic chemicals derived from plants or compounds derived from medicinal plants. Drugs made from plants are often efficient and often have fewer negative effects (Amjad *et al.,* 2020).

Even today, many rural communities have conserved their traditional knowledge of therapeutic herbs (Jan *et al.,* 2020), and transmitted it from generation to generation (Amjad *et al.,* 2020; Mir *et al.,* 2022a). By comparing and contrasting the traditional knowledge and practices of two distinct cultural groups that coexist in the same ecological region, we can gain a better understanding of how cultural reflection can alter the perspectives of people on the environment and also influence how people interact with ecosystem resources (Quave & Pieroni, 2015). However worldwide, the knowledge of plants used in traditional medicine is gradually decreasing. Older community members and hakims (traditional healers) often possess this information, which is only verbally transmitted to the coming generations (Jan *et al.,* 2020). Because of the development of the contemporary healthcare system, increased urbanization, and strained relationships between the young and elderly generations, there is a severe risk of knowledge loss (Vitalini *et al.,* 2013; Baydoun *et al.,* 2015). Conserving the traditional knowledge about medicine is the need of time since it might be used to discover new medicines. Additionally, this may aid in the management of natural resources and the conservation of indigenous culture.

Pakistan has over 6,000 distinct species of wild plants because of its varied habitats, temperature gradients, and soil types. This diversity adds to its enormous diversity of aromatic and medicinal plants. (Amjad *et al.,* 2020). It is reported in the literature that up to the 1950s, nearly 84% of the people in Pakistan used therapeutic plants for curing different illnesses; however, owing to technology and rapid lifestyle change, this is now only practised in rural parts (Bano *et al.,* 2014).

Pakistan has a local market system called "Pansara" which is dedicated to the pharmaceutical industry, with significant quantities of plant material traded locally or exported. Significant issues with the conservation of therapeutic plants have emerged in recent years due to the overuse of herbal remedies, and the adulteration of herbal medicine (Jan *et al.,* 2022a). The bulk of therapeutic plants utilized by the local population and the herbal medication market are collected from the wild. Some medicinal plants are becoming extinct because of overuse, while others are close to extinction due to improper harvesting techniques (Jan *et al.,* 2020). In addition to the conservation concern, overuse of medicinal plants may result in the detection of adulterant plants, which would compromise quality control and standardization (Shinde *et al.,* 2009). Additionally, there is still much research to be done on Pakistani ethnobotanical medicine. The most recent study of medicinal plants in Pakistan showed the information gaps about herbal medicine and urged more investigation (Rashid *et al.,* 2018).

Herbal teas are prepared by combining hot water with a variety of plant leaves, seeds, or roots, and are widely used for their restorative and energizing effects, particularly for relaxation purposes (Rahman *et al.,* 2019). Herbal teas often have purging effects and may aid with stomach-related problems in addition to boosting the immune system. Different plants may have different therapeutic effects; herbal teas, for example, are often used for their calming effects and blood pressure reduction (Ravikumar, 2014). After a thorough literature review of the ethnobotanical and ethnomedicinal research of the study area, it was found that a total of 11 ethnobotanical and ethnomedicinal studies were conducted in the study area. The first ethnomedicinal study on Buner was published by Hamayun *et al.,* (2003) followed by Hamayun *et al.,* (2006), Alam *et al.,* (2011), Sher *et al.,* (2011), Jan *et al.,* (2017), Khan *et al.,* (2019), Jan *et al.,* (2020), Sulaiman *et al.,* (2020), Jan *et al.,* (2021), Rahman *et al.,* (2022), and Jan *et al.,* (2022). The above-mentioned studies were either on general ethnobotany, ethnomedicine, or ethnoveterinary, but no single study was conducted to document the ethnomedicinal knowledge about plants used in herbal teas to cure various diseases. Therefore, this study was conducted to document ethnomedicinal uses of plant species used in the form of herbal teas to treat various diseases of the study area for the conservation of this valuable knowledge for the coming generations and to compare the traditional knowledge of all the six tehsils of the study area for highlighting the uniform distribution of the ethnomedicinal knowledge.

Material and Methods

Study area: The research area is located on the North latitude from 34.11º to 34.43º and on the East Longitude from 72.13º to 72.45º (Fig. 1). It lies in the Hindukush Mountain range with a total land cover of 1865 km^2 and a population of 0.897 million. The yearly growth rate is 3.05%, and the population density is 517.2 people per square kilometre (Jan *et al.,* 2022). Chagharzi, Daggar, Gadaizi, Gagra, Khadukhel, and Mandanr are the six tehsils (subdivisions) that make up the district. The Duma Mountain range separates the valley from Puran Valley, the Elum and Mora hills from Swat, the Sinawar mountain range from Swabi, and the Guru hills from Mardan. The elevation of the region ranges from 400m in Totalai in the south to 3500m at Dosaray Peak near the Swat border in the north. With a sizable amount of Gujjars and Syeds (Arab descendants) tribes, the region is mainly populated by several subtribes of the Pakhtun tribes Yousafzai and Mandanr. The local language is Pashto, which around 95% of people understand. However, 5% of people are multilingual, with Gujjri as their native language and Pashto as their second language (Rahman *et al.,* 2022).

The region has cold winters and warm to scorching summers due to its subtropical to temperate climate. According to Köppen's classification system the C climates in the study area is classified as temperate in the northern coniferous forests and sub-tropical in the southerly plains, The average monthly precipitation in the summer and winter is 235 mm and 116 mm, respectively, for a mean annual total of 1068 mm. The winters are cold with snowfall at higher altitudes, and the summers are moderate. In contrast to the average low temperature in January, which is below zero, the average high temperature in June is 32°C. The yearly average temperature is 19ºC with between 60 and 65 percent relative humidity. The Barandu River is a single River, that runs through the center areas and serves as the primary supply of irrigation, despite being heavily damaged by the effluent from several marble industries. The majority of people reside in rural communities, and 45.38% of them are considered to be poor. The people's major sources of income include agriculture, livestock, fuel wood, lumber, government services, and jobs abroad. The marble and tobacco industries employ the majority of the local labor force. The primary crops in the region include maize, wheat, rice, and tobacco (Rahman *et al.,* 2022).

Collection of medicinal plants: Medicinal plants were collected from 2018 to 2021 in different seasons of the year. In each season, a minimum of four to five random field trips were organized to collect the maximum number of medicinal plants. The technique of Forman & Birdson (1989), was used to preserve the collected therapeutic plants. While during fieldwork, the Fuji digital camera was used to capture the images of the different parts i.e., flowers, fruits, and leaf etc., of the medicinal plants for identification of the plants. The collected medicinal plants were identified with the help of available literature. The following databases were consulted for the accepted botanical names of the plants i.e., the International Plant Names Index, The Plant List, Tropicos Flora of Pakistan, and the medicinal plants name service. All of the plants were mounted on herbarium sheets, given voucher numbers, and submitted to the university's herbarium.

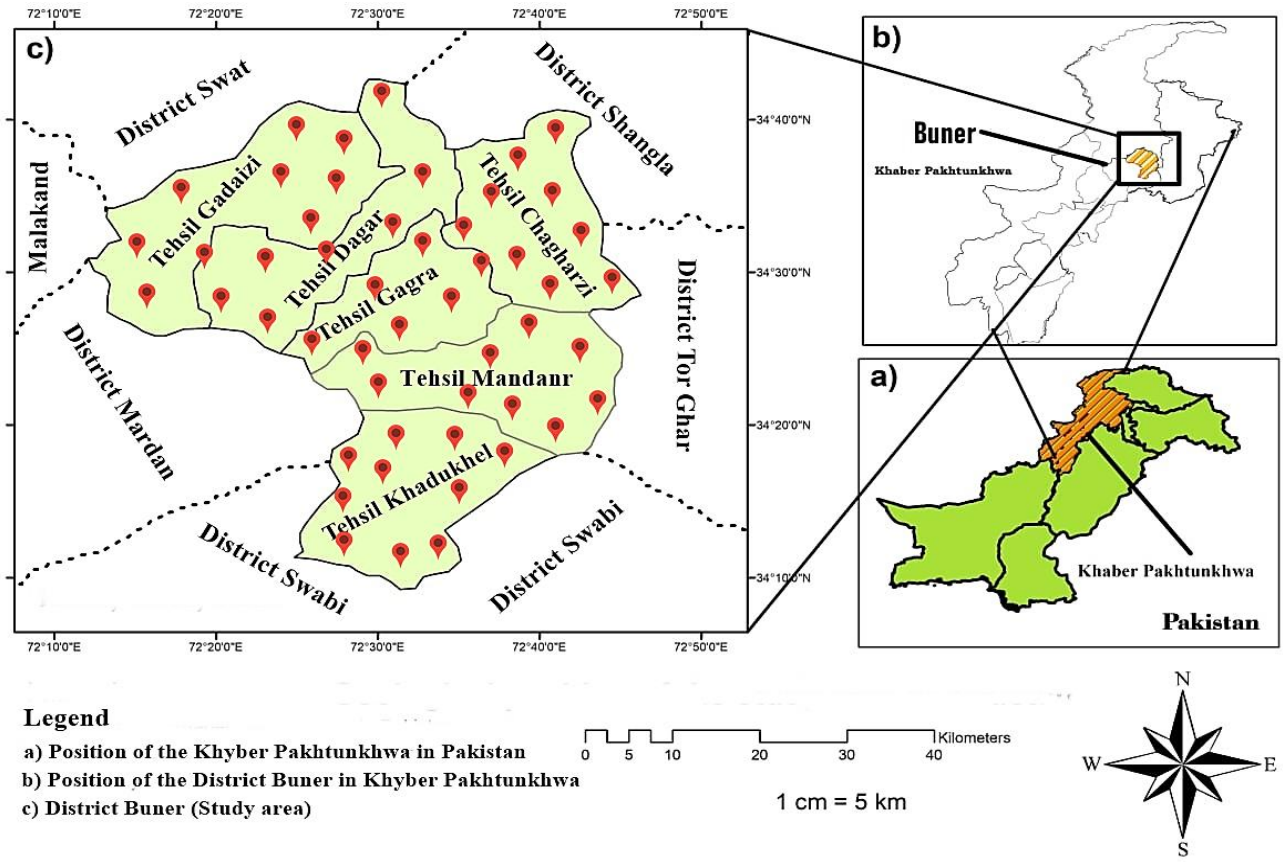

Fig. 1. Life forms of the collected medicinal plants used as herbal teas.

Ethnopharmacological data documentation: The informants were selected through the snowball method.. As a tool for collecting ethnomedical data, semi-structured questionnaires were used to conduct individual and group interviews (Ghorbani *et al.,* 2011; Mir *et al.,* 2022b). The informants assisted to authenticate the accuracy of the data by cross-checking the ethnomedical information. Before the interview with each informant, prior verbal permission was obtained (Abdin *et al.,* 2022). In this study, we interviewed a total of 853 informants of whom 214 were women (including 26 dayiahs) and 639 were male (including 19 herbalists/hakims). Every informant was interviewed in their native language (Pashto). Along with ethnomedicinal data, the informants' demographic data was also documented. Male informants were interviewed in the Masjid, Hujra, or Baithaks, as well as in the field, and female informants were interviewed at their homes (Andrade-Cetto, 2008).

For a better understanding of the information collected about the medicinal plants, informal interviews and field visits were held with key informants (170), including farmers, herders, housewives, shepherds, students, and instructors. The informants' ages ranged from 20 to 113. According to the methodology adopted by Mengistu & Hager (2008), the data from the informants was accurately recorded. The documented ethnomedicinal data was cross-checked among the indigenous peoples for authentication.

Literature review: Before beginning the fieldwork, the following internet databases were searched: Scopus MEDLINE, Science Direct, ISI Web of Science, Google Scholar, etc. The keywords to search literature were "medicinal plants," "alternative medicines," “ethnomedicine,” “ethnobotany,” "therapeutic plants," “medicinal uses of plants,” “traditional knowledge,” and "District Buner, Pakistan." The keyword "District Buner" was looked up to restrict the search about the geographic area.

Software used for data documentation and analysis: The gathered ethnomedicinal data was sorted using MS-Excel-2010 and PAST 4.10 version.

Informant consensus factor (ICF): The consensus of the local population about the plants used as herbal teas for the treatment of various diseases was determined with the help of the following formula:

$$ICF=(N_{ur}-N_t)/(N_t-1)$$

where ‘N_{ur}’ is the use reports about the specific group of diseases and ‘N_t’ is the number of plant species used for that particular group of diseases. The value of ICF varies between 0-1 (Hu *et al.,* 2020).

Result and Discussion

Characteristics of the local informants including their sociodemographic distribution: During the fieldwork, 853 informants were interviewed, including dayiahs, shepherds, drivers, farmers, housewives, labors, teachers, students

(from elementary to university), merchants, pansaries, herbalists, and hakims. The purpose of the interviews was to collect information about ethnic knowledge of medicinal plants used to prepare herbal teas to treat a variety of illnesses. There were 639 male informants and 214 female informants. In contrast to the 26 dayiahs among the female informants, there were 19 hakims, herbalists, and pansaries among the male interviewees. The ages of the local people (informants) that were interviewed varied from 20 to 113. The informants were sorted into seven groups based on age and seven groups based on literacy. The majority of the informants, who were between the age of 50-59, were found to have the highest knowledge of ethnomedicine, followed by those who were between the ages of 70-79, 60-69, and 80 and above. A decline in the ethnomedicinal knowedge was observed in the informants of age below fifty. The least ethnomedicinalknowledge was documented from the informants of age group 20–29 followed by age group 30–39 and 40–49 (Table 1). Modernization encourages younger generations to choose allopathic medicines over herbal remedies, and this is probably a factor leading to a decline in the knowledge of the younger generation (Sargin, 215). Both men and women have almost equal knowledge of ethnomedicine. Along with an increase in literacy rates, a decline in ethnomedicinal knowledge was also noticed. This may be a result of educated individuals preferring the modern healthcare system (Jan *et al.*, 2017). Similar results were reported by other studies (Bhatia *et al.*, 2014).

Diversity of plants' families and life forms: We collected 125 (Fig. 2) wild medicinal plants used in the preparation of herbal teas to treat a variety of illnesses. The plants that were collected belonged to 60 families. The dominant family was Lamiaceae (15 species), followed by the Asteraceae with 13 species, and Amaranthaceae with 7 species (Fig. 3). The main factor influencing the use of Lamiaceae species as medicines is because of having monoterpenes in the form of metabolically important secondary metabolites and volatile oils (Ullah *et al.*, 2021). Other researchers from adjacent areas also reported the dominancy of the family Lamiaceae (Shah *et al.*, 2016). The most common plant family in Pakistan is the Asteraceae, and the species of this family are common across the study area (Abbas *et al.*, 2017; Jan *et al.*, 2022a). From the adjacent areas, similar findings about the dominance of Asteraceae have been recorded (Barkatullah *et al.*, 2015; Abbas *et al.*, 2017; Haq *et al.*, 2022; Jan *et al.*, 2022). Consequently, the inhabitants of the area are well aware of the therapeutic uses of this family (Haq *et al.*, 2020; Mir *et al.*, 2021).

The therapeutic plants that were collected belonged to various life forms. Herbs were the most common life form, accounting for 90 percent of all species, then shrubs (22 percent) and trees (14 percent) (Table 2). The dominance of the herbs may be attributable to their better climatic and geographic adaptation to the study area. In addition, herbs are more potent and reproduce more quickly than trees and shrubs (Shah & Rahim, 2017). Herbs may also be collected easily (Malik *et al.*, 2019). Herbs contain a wide variety of bioactive chemicals, which allow them to easily adapt to any environment (Zahoor *et al.*, 2017). Additionally, compared to other life forms, herbs usually contain higher amounts of a variety of bioactive chemicals and are more effective as medicines than shrubs and trees (Ullah *et al.*, 2021). High-altitude areas typically have a dominant herbaceous vegetation (Amjad *et al.*, 2017). Similar findings from the region have also been reported by other studies (Amjad *et al.*, 2017; Shah & Rahim, 2017; Zahoor *et al.*, 2017).

Table 1. Demographic profile of the study area.

	Informants interviewed			
S. No.	**Gender**	**No. informants**		
1.	Male	639		
2.	Female	214		
	Traditional knowledge of medicinal plants			
	Age group	**No. informants**	**Medicinal plants reported**	**Complete recipes**
1.	20-29	67	13	9
2.	30-39	107	37	23
3.	40-49	131	54	37
4.	50-59	165	66	41
5.	60-69	215	78	59
6.	70-79	97	51	46
7.	80-Above	71	47	35
	Total informants	**853**		
	Literacy rate of informants			
	Age group	**No. informants**	**% Age**	
1.	20-29	58/67	86.56%	
2.	30-39	46/107	42.99%	
3.	40-49	35/131	26.71%	
4.	50-59	29/165	17.57%	
5.	60-69	23/215	10.69%	
6.	70-79	9/97	09.27%	
7.	80-Above	2/71	02.81%	
	Total	**202/853**	**23.68%**	

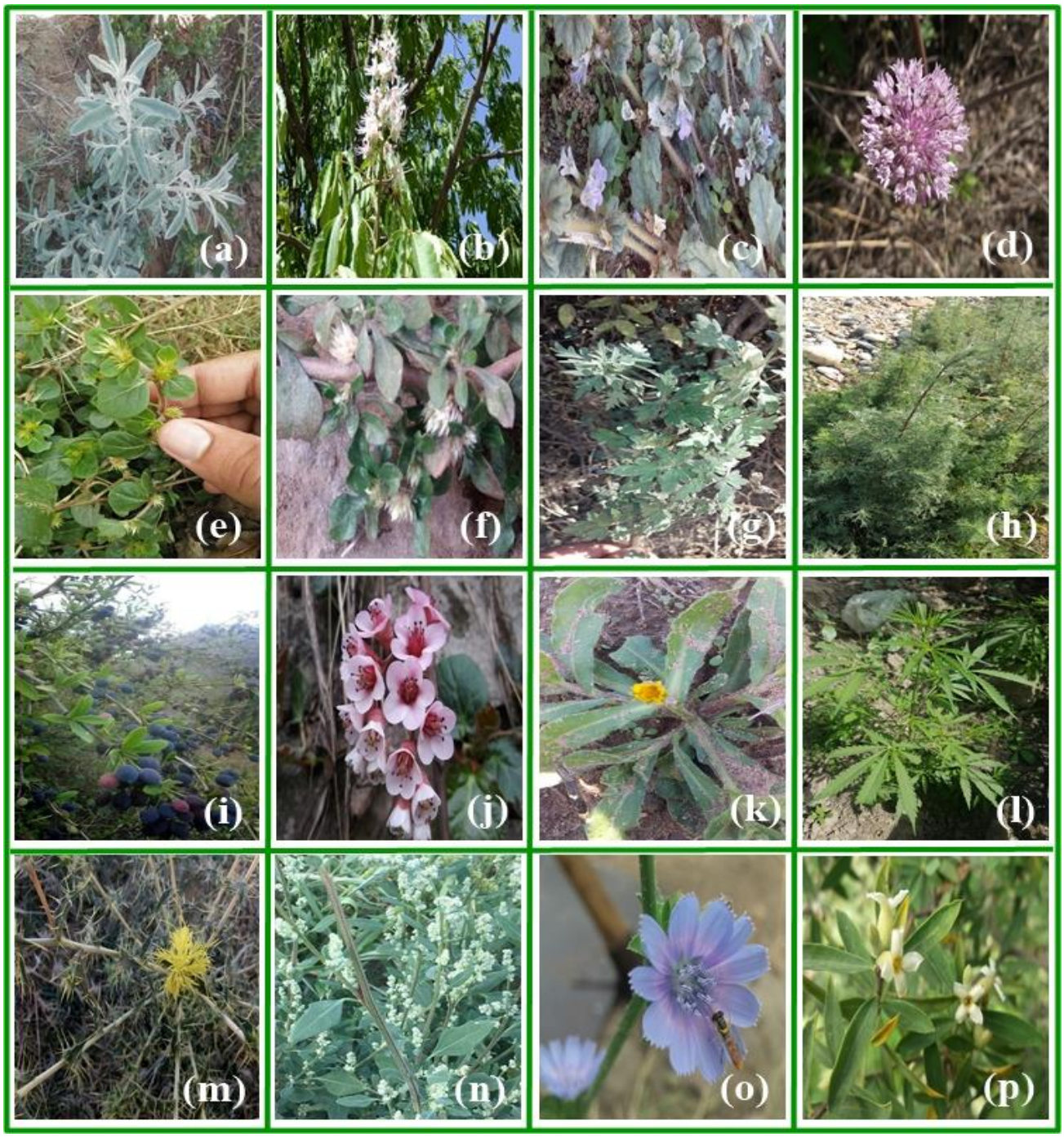

Fig. 2. Pictures of the collected medicinal plants.
(a) *Aerva javanica* (Burm. f.) Juss. ex Schult. **(b)** *Aesculus indica* (Wall. ex Cambess) Hook. **(c)** *Ajuga integrifolia* Buch.-Ham. **(d)** *Allium jacquemontii* Kunth **(e)** *Alternanthera pungens* Kunth **(f)** *Alternanthera sessilis* (L.) R.Br. ex DC. **(g)** *Artemisia annua* L. **(h)** *Artemisia scoparia* Waldst. & Kitam. **(i)** *Artemisia scoparia* Waldst. & Kitam. **(j)** *Berberis lycium* Royle **(k)** *Bergenia ciliata* (Haw.) Sternb. **(l)** *Calendula arvensis* M.Bieb. **(m)** *Cannabis sativa* L. **(n)** *Carthamus oxyacantha* M.Bieb. **(o)** *Chenopodium album* L. **(p)** *Cichorium intybus* L.

Diversity of plant parts used in medicine: According to documented data, indigenous people in the study area use twelve different plant parts in the preparation of herbal teas. The most common part of the plants utilised in the preparation of medicines was the leaf (47 species), the whole plant (19 species), and the root (18 species) (Fig. 4). The common use of leaf in herbal medicines may be explained by having a variety of metabolites that are abundant in it, as it is the primary photosynthetic organ of plants (Sargin, 2015; Jan *et al.*, 2017). In addition, the leaf is a part of the plant that is produced in large quantity and is easy to collect (Ahmad *et al.*, 2015). Uzing leaves is secure and sustainable for plant life from a conservation perspective (Jan *et al.*, 2017). The use of whole plants in herbal therapy may be influenced by their ease of harvesting, accessibility, and availability of a range of biochemicals (Hassan *et al.*, 2020). The use of roots in herbal remedies is not sustainable from a conservation point of view for the survival of plants (Malik *et al.*, 2019). The results of this research are in line with those of similar studies carried out in neighbouring areas (Adnan *et al.*, 2014; Barkatullah *et al.*, 2015; Akhtar *et al.*, 2017).

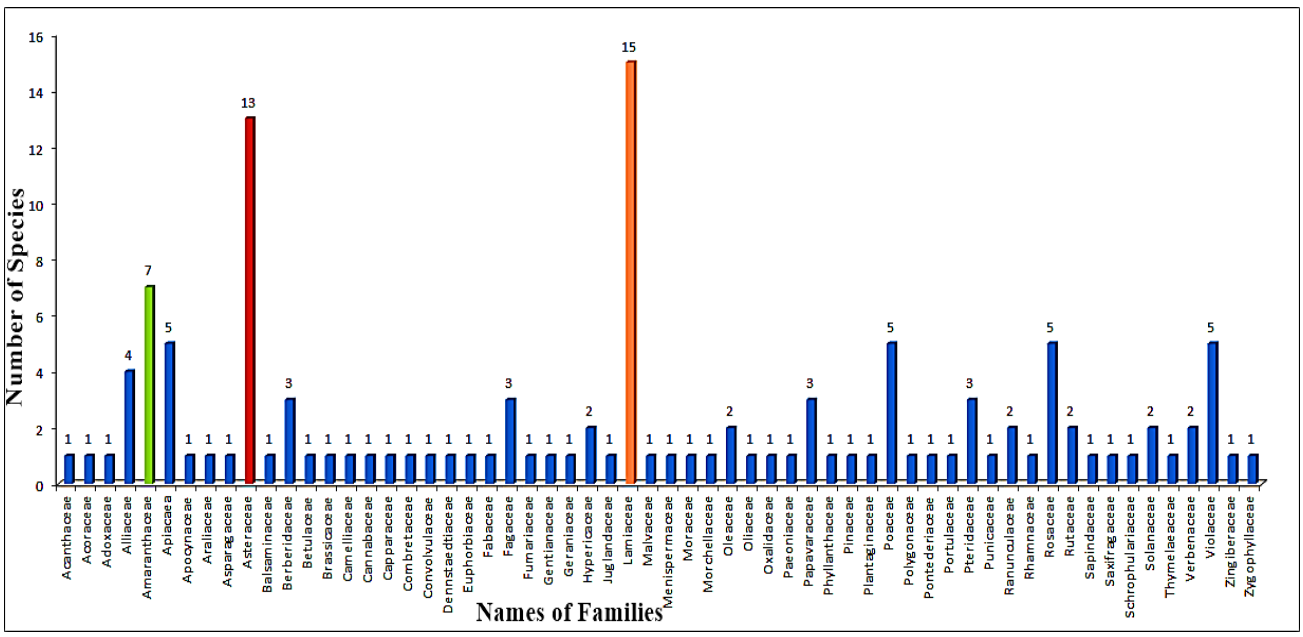

Fig. 3. Medicinal plant families used in the study area.

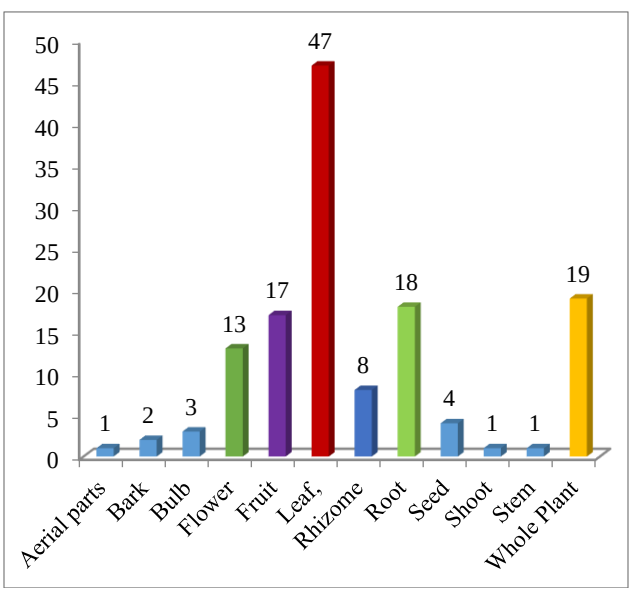

Fig. 4. Plant parts used in the preparation of herbal tea.

Cross-regional comparison of ethnopharmacological data: In the current study, the ethnomedicinal data of all six tehsils were compared. The highest ethnomedicinal data in terms of the number of plants were reported from the Tehsil Mandanr (102 species), followed by Tehsil Chagharzi (94 species), Tehsil Daggar, and Tehsil Khadukhel (90 species each) and Tehsil Gadaizi (84 species) and lowest were reported from the Tehsil Gagra (Table 2). Most of the areas of the Tehsil Mandanr and Chagharzi are far away from the district head quarter and thus limited basic health facilities are available, this may be the reason that the people are more dependent on medicinal plants. Most of the areas of the Tehsil Gagra are urban and near to the district head quarter and therefore, the basic health facilities are easily accessible. This may be the reason that the people of this area do not prefer medicinal plants for the treatment of various diseases.

Out of 125 plant species, medicinal uses of 45 species were reported from all six tehsils. Furthermore, the medicinal uses of six species were reported from one-one tehsil. The medicinal uses in the form of herbal tea for *Betula utilis* D.Don were reported only from tehsil Mandanr. The medicinal uses in the form of herbal tea for *Duchesnea chrysantha* (Zoll. & Moritzi) Miq., *Gentiana kurroo* Royle, and *Viola betonicifolia* Sm. were reported from tehsil Chagharzi only. Similarly, the medicinal uses in the form of herbal tea for *Lantana camara* L., and *Sapium sebiferum* (L.) Roxb. were reported from tehsil Khadukhel (Fig. 5). The possible reason behind this may be the limited distribution of these plants which also restricts the traditional knowledge about these plants. The cross-regional comparison has practical implications since we can handle both the consensus and variances by using this method, which may also reveal the migratory trend and interactions between the ethnic communities (Saslis-Lagoudakis *et al.,* 2011; Gairola *et al.,* 2014). The significance of these comparisons across distinct cultures is to uncover similar patterns from independent findings that might strengthen the evidence for the usefulness of specific taxa (Saslis-Lagoudakis *et al.*, 2011). Certain indigenous medical knowledge may be ethnically different, demonstrating the cultural distinctiveness of an ethnic group. Convergent usage, on the other hand, might be regarded as evidence of efficacy for plant applications shared among ethnic groups. In this situation, shared plant usage may not necessarily reflect a separate discovery since horizontal information flow may occur, resulting in widespread ethnomedicinal use across tribes living in surrounding villages. Consequently, it is impossible to separate the independent discovery from the horizontal exchange in this case (Saslis-Lagoudakis *et al.,* 2011; Srithi *et al.,* 2019).

Table 2. Medicinal used as herbal teas for the cure of various diseases and cross-cultural comparison of the ethnomedicinal data.

Botanical name/ Voucher number	Local name	Habit	Part used	Intake mode	Uses/Ur	FC	Literature Comparison	Tehsil Chagharzi	Tehsil Daggar	Tehsil Gadaizi	Tehsil Gagra	Tehsil Khadukhel	Tehsil Mandanr
					Acanthaceae								
Justicia adhatoda L. (HAJ-18)	Bekar	Shrub	Leaf	Tea	**Asthma** (27), **Cough** (17)	39	♥1, ♥2, ♠3, ♥4, ♥5, ♥6, ♥7, ♥8, ♥9, ♠10, ♠11, ♠12, ♠13, ♥14, ♠15, ♠16	Y	N	Y	Y	Y	Y
					Acoraceae								
Acorus calamus L. (HAJ-19)	Skhawaja	Herb	Rhizome	Tea	**Dysentery** (25), Cancer (9)	32	♥17, ♥18, ♥1, ♥2, ♥3, ♥19, ♥4, ♥5, ♥6, ♥7, ♠8, ♠10, ♥12, ♠13, ♥14, ♠15, ♥20,	N	N	Y	Y	Y	Y
					Adoxaceae								
Vibernum grandiflorum Wall. ex DC. (HAJ-157)	Mewa	Shrub	Flower	Tea	Regulation of Menstrual cycle (17)	17	♥20, ♥21	Y	N	N	N	N	Y
					Alliaceae								
Allium cepa L. (HAJ-22)	Piaz	Herb	Bulb	Tea	**Stop vomiting** (39)	39	♥18, ♥1, ♥2, ♥3, ♥19, ♥4, ♥6, ♠7, ♠8, ♥9, ♥20, ♥16, ♥21, ♥22, ♥23,	Y	Y	Y	Y	Y	Y
Allium humile Kunth (HAJ-23)	Orakay	Herb	Leaf	Tea	**Fever** (13)	13	♥3, ♥5, ♠8, ♥24	Y	N	Y	N	Y	Y
Allium jacquemontii Kunth (HAJ-24)	Ogakay	Herb	Bulb	Tea	**Hypertension** (9)	9	♠8	Y	N	Y	N	Y	Y
Allium sativum L. (HAJ-25)	Owga	Herb	Bulb	Tea	Obesity (41)	41	♥7, ♥8, ♥9, ♥13, ♥16, ♥20, ♥21, ♥22, ♥23	Y	Y	Y	Y	Y	Y
					Amaranthaceae								
Achyranthes aspera L. (HAJ-28)	Geshkay	Herb	Root	Tea	Laryngitis (31)	31	♥18, ♥1, ♥3, ♥5, ♥6, ♥4, ♥7, ♥8, ♥9, ♥20, ♥11, ♥12, ♥13, ♥13, ♥15	N	Y	Y	N	Y	Y
Aerva javanica (Burm. f.) Juss. ex Schult. (HAJ-29)	Sassa/ Shorakay	Herb	Leaf	Tea	Stomach problems (30)	30	♥8, ♥25	N	N	Y	N	Y	N
Alternanthera pungens Kunth (HAJ-30)	Khaki bootay	Herb	Whole plant	Tea	**Jaundice** (15)	15	♠8, ♥12	N	Y	N	N	N	Y
Alternanthera sessilis (L.) R.Br. ex DC. (HAJ-31)	Suba	Herb	Whole plant	Tea	Jaundice (8)	8	♥8	Y	Y	N	Y	N	N
Alternanthera spinosa (Hornem.) Schult. (HAJ-32)	Chlaveray	Herb	Root	Tea	Constipation (6)	6	♥8	N	N	Y	N	Y	N
Amaranthus caudatus L. (HAJ-33)	Chalveray	Herb	Root	Tea	**Fever** (18)	18	♥18, ♥2, ♠8, ♥10, ♥11, ♥12	Y	Y	Y	Y	Y	Y
Chenopodium album L. (HAJ-36)	Sarmai	Herb	Whole plant	Tea	**Intestinal worms** (17)	17	♥18, ♥2, ♥3, ♥5, ♠8, ♥21, ♥22, ♥23, ♥25, ♥10, ♥20, ♠11, ♠11, ♥12, ♥12, ♠14, ♠15, ♥16	Y	N	Y	N	Y	Y
					Apiacaea								
Ammi visnaga (L.) Lam. (HAJ-39)	Spirkay	Herb	Seed	Tea	**Stomachache** (28), **Carminative** (19)	37	♥1, ♥2, ♥7, ♠8, ♥23, ♥20, ♠16	Y	Y	Y	Y	Y	Y
Bunium persicum (Boiss.) B.Fedtsch (HAJ-40)	Tora zeera	Herb	Fruit	Tea	**Whooping cough** (27), Carminative (14)	34	♥7, ♠8, ♥20, ♥13, ♥15	Y	Y	Y	Y	Y	Y
Coriandrum sativum L. (HAJ-41)	Dhanya	Herb	Fruit	Tea	**Asthma** (18), **Carminative** (33)	40	♠1, ♠2, ♠3, ♥7, ♠8, ♥21, ♠22, ♥25, ♥10, ♠20, ♥13, ♥16	Y	Y	Y	Y	Y	N
Foeniculum vulgare Mill. (HAJ-44)	Kagu	Herb	Seed	Tea	**Carminative** (23), **Vomiting** (9), Cough (14)	42	♥17, ♥18, ♥3, ♥19, ♥6, ♥4, ♠7, ♥8, ♠9, ♥10, ♠20, ♥12, ♥13,♠14, ♥15, ♥ 16	Y	Y	Y	Y	Y	Y
Trachyspermum ammi (L.) Sprague (HAJ-46)	Sperkay	Herb	Seed	Tea	**Stomachache in children** (24), Carminative (17)	36	♠18, ♥19, ♥4, ♥7, ♠8, ♥20	Y	Y	Y	N	Y	Y

Table 2. (Cont'd.).

Botanical name/ Voucher number	Local name	Habit	Part used	Intake mode	Uses/Ur	FC	Literature Comparison	Tehsil Chagharzi	Tehsil Daggar	Tehsil Gadaizi	Tehsil Gagra	Tehsil Khadukhel	Tehsil Mandanr
							Apocynaceae						
Carissa carandas L. (HAJ-63)	Karanda	Shrub	Leaf	Tea	Appetite stimulant (4)	4	♥7	N	N	Y	N	N	Y
Hedera nepalensis K.Koch (HAJ-57)	Phalul	Herb	Leaf	Tea	Cough (17), **Antidiabetic** (11)	23	♠1, ♥7, ♥8, ♠21, ♠23, ♠20, ♠11, ♠15	Y	Y	N	N	N	Y
							Asparagaceae						
Asparagus filicinus Buch.-Ham. Ex D.Don (HAJ-58)	Shin lakhtay	Herb	Root	Tea	Cough (8)	8	♥8	Y	Y	Y	N	Y	Y
							Asteraceae						
Achillea millefolium L. (HAJ-198)	Binak botai	Herb	Whole plant	Tea	**Stomach problems** (19)	19	♥7, ♥20, ♠11, ♠12	Y	N	Y	N	N	Y
Artemisia absinthium L. (HAJ-68)	Jaokai	Herb	Whole plant	Tea	Intestinal discomfort (22)	22	♥11, ♥12, ♥13	Y	N	Y	N	N	Y
Artemisia annua L. (HAJ-65)	Terkha	Herb	Leaf	Tea	**Malaria** (13), Fever (17), Corona disease (5)	21	♥8, ♠12	Y	Y	N	N	N	Y
Artemisia scoparia Waldst. & Kitam. (HAJ-66)	Jaokai	Herb	Whole Planr	Tea	**Malaria** (17), **Fever** (14)	24	♥1, ♥2, ♠7, ♥8, ♥9, ♥25, ♥20, ♥12, ♠13, ♥16	Y	N	Y	N	Y	Y
Artemisia vulgaris L. (HAJ-67)	Tarkha	Herb	Leaf	Tea	**Malaria** (12), Fever (13)	22	♥18, ♥2, ♥3, ♥5, ♠7, ♥8, ♥20	Y	N	N	N	Y	Y
Calendula arvensis M.Bieb. (HAJ-69)	Gul-e-ashrafi/ Prevatai	Herb	Aerial parts	Tea	**Cancer** (12)	12	♥18, ♥2, ♠8, ♥23, ♥10, ♥20, ♥12	N	Y	N	Y	Y	N
Carthamus oxyacantha M.Bieb. (HAJ-71)	Kareza	Herb	Flower	Tea	**Fever** (9), Cough (6)	11	♥8, ♥9, ♠23, ♥25, ♥20, ♥11, ♥12, ♥16	N	Y	Y	Y	Y	N
Cichorium intybus L. (HAJ-73)	Han, Kansi, Qasmi	Herb	Root	Tea	**Typhoid** (31)	31	♥1, ♥2, ♥5, ♥7, ♠8, ♥9, ♥25, ♥20, ♥12, ♠12,♥13, ♥15	Y	Y	Y	Y	Y	Y
Eclipta prostrata (L.) L. (HAJ-75)	Naray panra	Herb	Leaf	Tea	Malaria (15), Cough (18)	28	♥4, ♥8, ♥11	N	Y	Y	N	Y	Y
Inula cappa (Ham. ex D. Don) DC. (HAJ-372)	Shoda gulai	Shrub	Root	Tea	**Cough** (8), Headache (6)	14	♠8	Y	N	Y	N	Y	Y
Lactuca serriola L. (HAJ-78)	Kahu	Herb	Whole plant, Leaf	Tea	**Stomachache** (11)	11	♥2, ♥4, ♠8, ♥12	Y	Y	Y	Y	Y	Y
Senecio chrysanthemoides DC. (HAJ-82)	Sra Jabay	Herb	Root	Tea	Cholera (12), Chest infection (17)	26	♥3, ♥5, ♥8	Y	Y	Y	N	Y	Y
Taraxacum officinale (L.) Weber ex F.H.Wigg. (HAJ-88)	Zyar gulay	Herb	Leaf	Tea	**Tonic** (15), **Cough** (11)	22	♠1, ♥2, ♠3, ♠5, ♥7, ♠8, ♥24, ♥22, ♥25, ♥10, ♠20, ♠11, ♥11, ♥12, ♠15, ♥16	Y	Y	Y	Y	Y	Y
							Balsaminaceae						
Impatiens balsamina L. (HAJ-100)	Narkeza	Herb	Leaf	Tea	Rheumatism (9)	9	♥2	Y	Y	N	N	N	Y
							Berberidaceae						
Berberis lycium Royle (HAJ-94)	Ziar largay, Karoskay	Shrub	Root	Tea	**Internal wounds** (23), **Sore throat** (11), Cough (13), **Acidity** (8)	38	♠17, ♠1, ♥2, ♥3, ♥5, ♥19, ♥6, ♥7, ♠8, ♥21, ♥9, ♥25, ♥10, ♠20, ♥11, ♥11, ♠12, ♥12, ♥13, ♥13, ♠14, ♥14, ♥15	Y	Y	Y	Y	Y	Y
Berberis parkeriana C.K.Schneid. (HAJ-95)	Kwaray	Shrub	Root	Tea	Fever (20)	20	♥7, ♥10	Y	N	N	N	N	Y

Table 2. (Cont'd.).

Botanical name/ Voucher number	Local name	Habit	Part used	Intake mode	Uses/Ur	FC	Literature Comparison	Tehsil Chagharzi	Tehsil Daggar	Tehsil Gadaizi	Tehsil Gagra	Tehsil Khadukhel	Tehsil Mandanr
Berberis pseudumbellata R.Parker (HAJ-93)	Kwaray Tor	Shrub	Root	Tea	Rheumatism (17)	17	♥7, ♥12	Y	N	N	N	N	Y
Betulaceae													
Betula utilis D.Don (HAJ-17)	Birch	Herb	Rhizome	Tea	Cough (6)	6	♥2, ♥7, ♥10, ♥20, ♥14	N	N	N	N	N	Y
Brassicaceae													
Descurainia sophia (L.) Webb ex Prantl (HAJ-81)	Skha Botay	Herb	Seed	Tea	Fever (7)	7	♥2, ♥7, ♥12	Y	Y	Y	N	N	Y
Camelliaceae													
Camellia sinensis (L.) Kuntze (HAJ-43)	Chai Shna	Herb	Leaf	Tea	Cough (7), Sore throat (7)	7	♥7	N	N	Y	N	Y	N
Cannabaceae													
Cannabis sativa L. (HAJ-111)	Bang	Herb	Leaf	Tea	Stomachache (10)	10	♥1, ♥2, ♥3, ♥5, ♥19, ♥7, ♥8, ♥21, ♥22, ♥9, ♥25, ♥10, ♥20, ♥11, ♥12, ♠13, ♥14, ♥15, ♠16	Y	Y	Y	Y	Y	Y
Capparaceae													
Capparis spinosa L. (HAJ-56)	Unkown	Shrub	Fruit	Tea	Flu (12), **Fever** (16)	19	♥12, ♠13	N	N	Y	N	N	Y
Combretaceae													
Terminalia chebula Retz. (HAJ-153)	Arira	Tree	Fruit	Tea	Fever (20)	20		Y	Y	Y	Y	Y	Y
Convolvulaceae													
Ipomoea pes-caprae (L.) Sweet (HAJ-109)	Jardhay	Herb	Whole Plant	Tea	Bronchitis (3)	3		N	Y	Y	N	Y	N
Dennstaedtiaceae													
Pteridium aquilinum (L.) Kuhn (HAJ-02)	Hatoye	Herb	Rhizome	Tea	Stomachache (5)	5	♥8	Y	Y	Y	N	Y	Y
Euphorbiaceae													
Sapium sebiferum (L.) Roxb. (HAJ-351)	Unkown	Tree	Leaf	Tea	Edema (9)	9	♥8	N	N	N	N	Y	N
Fabaceae													
Cassia fistula L. (HAJ-147)	Landes	Tree	Fruit	Tea	**Pneumonia** (18), **Fever** (23)	29	♠3, ♠5, ♠7, ♠8, ♥10	Y	Y	N	N	Y	Y
Fagaceae													
Quercus dilatata A.Kern. (HAJ-137)	Banj Spin	Tree	Fruit	Tea	Antidiabetics (39)	39	♥2, ♥7, ♥9, ♥20, ♥11	Y	Y	Y	Y	Y	Y
Quercus incana Bartram (HAJ-163)	Toor Banj	Tree	Leaf	Tea	Joint pain (31)	31	♥17, ♥1, ♥2, ♥3, ♥5, ♥6, ♥7, ♥8, ♥10, ♥20, ♥15	Y	Y	Y	Y	Y	Y
Quercus robur L. (HAJ-149)	Speen Banj	Tree	Fruit	Tea	Diarrhea (28)	28		Y	Y	Y	Y	Y	Y
Fumariaceae													
Fumaria indica (Hausskn.) Pugsley (HAJ-164)	Papra	Herb	Whole plant	Tea	**Fever** (37)	37	♥17, ♥2, ♠3, ♠5, ♥7, ♥8, ♠21, ♥9, ♥23, ♥10,♥20,♥11, ♥12, ♥12, ♥13, ♥14, ♠15, ♠16	Y	Y	Y	Y	Y	Y
Gentianaceae													
Gentiana kurroo Royle (HAJ-92)	Desibangara	Herb	Root	Tea	Stomachache (8)	8	♥9	Y	N	N	N	N	N
Geraniaceae													
Geranium wallichianum D.Don ex Sweet (HAJ-93)	Sra zeal	Herb	Flower	Tea	**Joint pain** (15)	15	♥4, ♥7, ♠10, ♠14, ♥15, ♥16	Y	N	Y	N	N	Y

Table 2. (Cont'd.).

Botanical name/ Voucher number	Local name	Habit	Part used	Intake mode	Uses/Ur	FC	Literature Comparison	Tehsil Chagharzi	Tehsil Daggar	Tehsil Gadaizi	Tehsil Gagra	Tehsil Khadukhel	Tehsil Mandanr
					Hypericaceae								
Hypericum perforatum L. (HAJ-95)	Shen chay	Shrub	Leaf	Tea	Cough (10), Stomachache (18)	26	♥18, ♥7, ♥20, ♥14, , ♥16	Y	N	N	N	N	Y
Hypericum oblongifolium Choisy (HAJ-168)	Shin panra	Shrub	Flower, Leaf	Tea	Asthma (15), Cough (22)	34	♥2, ♥3, ♥8, ♥20	Y	Y	Y	N	Y	Y
					Juglandaceae								
Juglans regia L. (HAJ-113)	Ghuz	Tree	Bark	Tea	**Intestinal worms** (30)	30	♥17, ♥2, ♥5, ♥6, ♥7, ♠21, ♥9, ♥25, ♥10, ♠20, ♠11, ♠12, ♥12, ♥13, ♥14, ♥15, ♥16	Y	Y	Y	Y	Y	Y
					Lamiaceae								
Ajuga integrifolia Buch.-Ham. (HAJ-172)	Khwaga Boti	Herb	Whole plant	Tea	**Breathing shortness** (35)	35	♥18, ♥2, ♥6, ♥4, ♥7, ♠8, ♥9, ♥25, ♥20, ♥11, ♥12, ♥13, ♥15	Y	Y	Y	Y	Y	Y
Ajuga parviflora Benth. (HAJ-173)	Tarkha Boti	Herb	Leaf	Tea	Chest Congestion (26)	26	♥18, ♥2, ♥5, ♥7, ♥8, ♥9, ♥20, ♥11, ♥11, ♥15, ♥16	Y	Y	Y	Y	Y	Y
Lamium album L. (HAJ-176)	Speen gulay	Herb	Flower	Tea	**Cough** (22)	22	♠8	N	Y	Y	N	N	Y
Lamium amplexicaule L. (HAJ-177)	Soor gulaka	Herb	Whole plant	Tea	**Antidiabetic** (20)	20	♥3, ♠8, ♥13	Y	Y	N	Y	Y	N
Marrubium vulgare L. (HAJ-390)	Darshul	Herb	Leaf	Tea	**Cough** (8), **Diabetes** (12)	17	♥10, ♠15	N	Y	N	N	N	Y
Mentha arvensis L. (HAJ-131)	Podina	Herb	Leaf	Tea	**Carminative** (31), **Vomiting** (24)	42	♥7, ♠22, ♠20, ♥12, ♠15, ♠16	Y	Y	y	Y	Y	Y
Mentha longifolia (L.) L.(HAJ-179)	Velanay	Herb	Leaf	Tea	**Headache** (5), **Vomiting** (23), Cough (9), Flu (3), Asthma (11)	45	♥17, ♥18, ♥2, ♠3, ♠5, ♥19, ♥4, ♥7, ♠8, ♥21, ♥22, ♥9, ♥10, ♥20, ♥11, ♥11, ♥12, ♠12, ♥13, ♥14, ♠15, ♠16	Y	Y	Y	Y	Y	Y
Mentha royleana Wall. Ex Benth. (HAJ-180)	Podina	Herb	Leaf	Tea	**Stomachache** (41)	41	♥6, ♠8	Y	Y	Y	Y	Y	Y
Mentha spicata L. (HAJ-181)	Podina	Herb	Shoot	Tea	**Diarrhea** (36)	36	♥17, ♥18, ♥2, ♥3, ♥5, ♥4, ♥7, ♠8, ♥21, ♥9, ♥10	N	Y	N	N	N	Y
Micromeria biflora (Buch.-Ham. ex D.Don) Benth. (HAJ-182)	Nari shamaki	Herb	Leaf	Tea	Joint pain (9)	9	♥6, ♥7, ♥8, ♥9, ♥20, ♥11, ♥13	Y	N	Y	Y	Y	Y
Ocimum basilicum L. (HAJ-183)	Kashmalu	Herb	Leaf	Tea	Cold (18), **Fever** (23)	30	♥7, ♥8, ♠9, ♥16	N	Y	N	Y	Y	N
Origanum vulgare L. (HAJ-184)	Shamakay	Herb	Leaf	Tea	Rheumatism (19)	19	♥2, ♥19, ♥6, ♥7, ♥8, ♥9, ♥20, ♥11, ♥13, ♥16	Y	N	Y	N	N	Y
Otostegia limbata Benth Boiss. (HAJ-185)	Pishkand	Herb	Leaf	Tea	Carminative (15), **Vomiting** (11)	21	♥2, ♥3, ♥5, ♥6, ♥8, ♠22, ♥9, ♥10	N	Y	Y	Y	Y	Y
Thymus linearis Benth. (HAJ-152)	Sperkay	Herb	Leaf	Tea	**Whooping cough** (14), Asthma (19), Bronchitis (16)	37	♠7, ♥24, ♥9, ♥20, ♥12, ♠14, ♥14	Y	N	N	N	N	Y
Vitex negundo L. (HAJ-189)	Marvandai	Shrub	Leaf	Tea	Cold (13), Cough (13)	13	♥2, ♥3, ♥5, ♥6, ♥4, ♥7, ♥8, ♥21, ♥9, ♥25, ♥20, ♥13, ♥14, ♥15	N	Y	N	N	Y	N
					Malvaceae								
Abutilon indicum (L.) Sweet (HAJ-196)	Tuthi	Shrub	Whole plant	Tea	Cold (21), Fever (21), Mumps (12)	28	♥8	N	Y	N	N	Y	Y
					Menispermaceae								
Tinospora sinensis (Lour.) Merr. (HAJ-205)	Gilo	Herb	Stem	Tea	Traumatic injuries (8)	8	♥2, ♥5, ♥4, ♥8	N	Y	Y	Y	Y	Y

Table 2. (Cont'd.).

Botanical name/ Voucher number	Local name	Habit	Part used	Intake mode	Uses/Ur	FC	Literature Comparison	Tehsil Chagharzi	Tehsil Daggar	Tehsil Gadaizi	Tehsil Gagra	Tehsil Khadukhel	Tehsil Mandanr
					Moraceae								
Morus alba L. (HAJ-212)	Speen tooth	Tree	Leaf, Root	Tea	**Cough** (19)	19	♥2, ♥3, ♥5, ♥7, ♥8, ♠21, ♥22, ♥25, ♠10, ♠20, ♥11, ♥11, ♥12, ♥15, ♥16	Y	Y	Y	Y	Y	Y
					Morchellaceae								
Morchella esculenta (L.) Pers. (HAJ-01)	Gojai	Herb	Fruit	Tea	**Cold** (38), **Cough** (38)	38	♥5, ♥7, ♠8, ♥21, ♥25, ♥13, ♥14	Y	Y	Y	Y	Y	Y
					Oleaceae								
Jasminum humile (L.) Banfi (HAJ-219)	Rambil chambil	Shrub	Flower, Leaf	Tea	**Intestinal worms** (13)	13	♥2, ♥3, ♠8, ♠20,♥13	Y	N	N	N	Y	N
Jasminum officinale L. (HAJ-220)	Rambil chambil	Shrub	Leaf	Tea	Cough (21)	21	♥2, ♥8, ♥22, ♥20, ♥16	N	Y	N	Y	Y	N
Olea ferruginea Royle. (HAJ-221)	Khonu	Tree	Leaf	Tea	**Cough** (11), **Sore mouth** (7), **Sore throat** (13)	24	♥17, ♥2, ♥3, ♥5, ♥6, ♠7, ♠8, ♥9, ♠25, ♥10, ♥20, ♥11, ♥13, ♥14, ♠16	Y	Y	Y	Y	Y	Y
					Oxalidaceae								
Oxalis corniculata L. (HAJ-223)	Thrukay	Herb	Whole Plant	Tea	Sore throat (9), **Stomachache** (11)	15	♥17, ♥18, ♥2, ♠3, ♥5, ♥4, ♥7, ♥8, ♥21, ♠25, ♠20, ♠11, ♥11, ♥13, ♥14	Y	Y	Y	Y	Y	Y
					Paeoniaceae								
Paeonia emodi Royle (HAJ-132)	Mamikh	Herb	Rhizome	Tea	Sexual tonic (17)	27	♥17, ♥18, ♥2, ♥19, ♥7, ♥21, ♥24, ♥25, ♥10, ♥20, ♥13, ♥14	Y	Y	Y	Y	Y	Y
					Papavaraceae								
Papaver nudicaule L. (HAJ-227)	Zangale doda	Herb	Fruit	Tea	**Cough** (16)	16	♥2, ♠8	Y	Y	Y	N	N	Y
Papaver rhoeas L. (HAJ-228)	Zangale doda	Herb	Leaf	Tea	**Diarrhea** (18)	18	♥2, ♠3, ♥5, ♠8, ♥14	Y	Y	Y	Y	Y	Y
Papaver somniferum L. (HAJ-229)	Apim, Khaskhas, Doda	Herb	Fruit	Tea	Asthma (16), **Cold** (11), **Cough** (11)	35	♥3, ♥4, ♥7, ♠8, ♠21, ♥10, ♠20, ♥16	Y	Y	Y	Y	Y	Y
					Phyllanthaceae								
Phyllanthus emblica L. (HAJ-231)	Lashora	Tree	Fruit	Tea	**Chest pain** (27), Cough (31)	31	♥4, ♠8, ♥14	N	Y	Y	N	Y	Y
					Pinaceae								
Abies pindrow (Royle ex D.Don) Royle (HAJ-12)	Achar	Tree	Bark	Tea	Rheumatism (13)	13	♥2, ♥7, ♥25, ♥20, ♥14	Y	N	N	N	N	Y
					Plantaginaceae								
Plantago major L. (HAJ-233)	Bartang	Herb	Root	Tea	Antidibetic (6), Urinary Tract Infection (10)	14	♥18, ♥2, ♥7, ♥8, ♥21, ♥10, ♥20, ♥15	Y	Y	Y	Y	Y	Y
					Poaceae								
Cymbopogon citratus (DC.) Stapf (HAJ-240)	Shen Chay Wakha	Herb	Leaf	Tea	Cough (9), Nasal congestion (8), Carminative (17)	23	♥7, ♥8	Y	Y	Y	Y	Y	Y
Dichanthium annulatum (Forssk.) Stapf (HAJ-242)	Wakha	Herb	Leaf	Tea	Fever (6)	6	♥2, ♥8	Y	Y	N	Y	N	Y
Hordeum murinum L. (HAJ-358)	Warbashay	Herb	Fruit	Tea	**Urinary tract infection** (5)	5	♠8	Y	Y	Y	Y	Y	Y
Imperata cylindrica (L.) P. Beauv (HAJ-359)	Speen wakhu	Herb	Root	Tea	**Fever** (9), **Body pain** (5)	7	♠8	N	Y	N	Y	N	N
Zea mays L. (HAJ-248)	Juwar	Herb	Flower	Tea	**Asthma** (7)	7	♥7, ♠8, ♥12	Y	Y	Y	Y	Y	Y

Table 2. (Cont'd.).

Botanical name/ Voucher number	Local name	Habit	Part used	Intake mode	Uses/Ur	FC	Literature Comparison	Tehsil Chagharzi	Tehsil Daggar	Tehsil Gadaizi	Tehsil Gagra	Tehsil Khadukhel	Tehsil Mandanr
					Polygonaceae								
Persicaria amplexicaulis (D.Don) Ronse Decr. (HAJ-137)	Anjabar, Tarva panra	Herb	Whole plant	Tea	Flu (6), **Fever** (6), **Heavy menstrual bleeding** (16)	22	♥2, ♥8, ♥24, ♥7, ♥21, ♠10, ♥10, ♥20, ♥11, ♥13, ♠15	Y	Y	Y	N	Y	Y
					Pontederiaceae								
Eichhornia crassipes (Mart.) Solms (HAJ-89)	Azghay botai	Herb	Leaf	Tea	Fever (2), Cough (9)	10		Y	Y	Y	Y	Y	Y
					Portulaceae								
Portulaca oleracea L. (HAJ-258)	Warkharay	Herb	Whole plant	Tea	Tonsillitis (10)	10	♥18, ♥2, ♥5, ♥4, ♥7, ♥8, ♥21, ♥9, ♥25, ♥10, ♥20, ♥11,♥12, ♥13	Y	Y	Y	Y	Y	Y
					Pteridaceae								
Adiantum abscissum Schrad. (HAJ-07)	Sambal	Herb	Leaf	Tea	**Asthma** (12), **Chest congestion** (15)	21	♠8	Y	Y	Y	Y	Y	Y
Adiantum capillus-veneris L. (HAJ-14)	Boha	Herb	Whole plant	Tea	Headache (9), **Diarrhea** (23)	27	♥1, ♥5, ♥4, ♥7, ♥21, ♠22, ♥9, ♥25, ♥11, ♥12, ♥13, ♥14	Y	Y	Y	Y	Y	Y
Adiantum venustum D. Don (HAJ-10)	Mandaro	Herb	Leaf	Tea	**Fever** (11)	11	♥18, ♥1, ♥2, ♥5, ♠7, ♥8, ♥21, ♥9, ♥25	Y	Y	Y	Y	Y	Y
					Punicaceae								
Punica granatum L. (HAJ-260)	Anar	Tree	Fruit	Tea	**Stomachache** (33)	33	♥17, ♥2, ♥4, ♥7, ♠8, ♥21, ♥22, ♥9, ♥10, ♥20, ♠11, ♠11, ♥13, ♥13, ♥14, ♠15, ♥16	Y	Y	Y	Y	Y	Y
					Ranunculaceae								
Aconitum violaceum Jacquem. ex Stapf (HAJ-13)	Zahar Mora	Herb	Rhizome	Tea	**Rheumatism** (7)	7	♠18, ♠ 2, ♥5, ♥7, ♥24, ♠20	Y	N	N	N	N	Y
Caltha palustris var. alba (Cambess.) Hook.f. & Thomson (HAJ-20)	Makhan Path	Herb	Root	Tea	Diuretic (6), Cough (5)	8	♥7, ♥10, ♥20	Y	N	N	N	N	Y
					Rhamnaceae								
Ziziphus jujuba Mill. (HAJ-273)	Bera	Tree	Fruit, Leaf,	Tea	Gastric problem (14), **Antidiabetics** (19)	27	♥2, ♠3, ♥7, ♥8, ♥22, ♥13, ♠16	Y	Y	Y	Y	Y	Y
					Rosaceae								
Duchesnea chrysantha (Zoll. & Moritzi) Miq. (HAJ-279)	Zmakintooth	Herb	Whole Plant	Tea	Rheumatism (16)	16	♥18, ♥8	Y	N	N	N	N	N
Rosa alba P.Gaertn., B.Mey. & Scherb. (HAJ-285)	Gulab	Shrub	Flower	Tea	Stomach acidity (17)	17	♥8	N	Y	Y	N	Y	N
Rosa macrophylla Lindl. (HAJ-366)	Qurach	Shrub	Flower	Tea	**Cough** (23), **Cold** (20)	23	♠8	Y	Y	N	N	Y	Y
Rosa webbiana Wall. ex Royle (HAJ-288)	Zangale gulab	Shrub	Leaf	Tea	Gastric problem (26)	26	♥2, ♥3, ♥5, ♥7, ♥8, ♥20, ♥12	Y	Y	Y	Y	Y	Y
Rubus fruticosus L. (HAJ-290)	Karwara	Shrub	Leaf, Root	Tea	**Cough** (12)	12	♥2, ♥3, ♥5, ♥7, ♠8, ♥9, ♥20, ♥11, ♥16	Y	Y	Y	Y	Y	Y
					Rutaceae								
Citrus limon (L.) Osbeck (HAJ-293)	Limbu	Shrub	Fruit	Tea	**Carminative** (22), **Vomiting** (25)	36	♥7, ♥8, ♠21, ♠10, ♠14	Y	Y	Y	Y	Y	Y
Zanthoxylum armatum DC. (HAJ-295)	Dambara	Shrub	Fruit	Tea	**Cough** (16), **Carminative** (25)	28	♥2, ♥3, ♥5, ♥19, ♥6, ♠7, ♥8, ♥9, ♥10, ♥20, ♠11, ♥11, ♠13, ♥15, ♥16	Y	Y	N	N	Y	Y
					Sapindaceae								
Aesculus indica (Wall. ex Cambess) Hook. (HAJ-297)	Jawaza	Tree	Leaf	Tea	**Whooping cough** (6)	6	♥2, ♥5, ♥19, ♠7, ♠8, ♥9, ♥11, ♥13	N	Y	N	N	N	Y

Table 2. (Cont'd.).

Botanical name/ Voucher number	Local name	Habit	Part used	Intake mode	Uses/Ur	FC	Literature Comparison	Tehsil Chagharzi	Tehsil Daggar	Tehsil Gadaizi	Tehsil Gagra	Tehsil Khadukhel	Tehsil Mandanr
					Saxifragaceae								
Bergenia ciliata (Haw.) Sternb. (HAJ-300)	Kamar Panra	Herb	Rhizome	Tea	**Kidney stones** (10)	10	♥18, ♥2, ♥6, ♠7, ♥8, ♥21, ♥24, ♥25, ♥10, ♠20, ♥15	Y	N	N	N	Y	Y
					Schrophulariaceae								
Verbascum thapsus L. (HAJ-301)	Gkhar ghwag/Gedar tambaku	Herb	Leaf	Tea	**Bronchitis in cattle** (3), Cold (6), **Dysentery** (5)	11	♥18, ♥3, ♥5, ♥19, ♥6, ♥7, ♠8, ♠25, ♥10, ♥20, ♥11, ♥12, ♥13, ♥14	N	Y	N	N	Y	N
					Solanaceae								
Solanum americanum Mill. (HAJ-311)	Kachmachu	Herb	Whole Plant	Tea	Cough (6), Hypertension (3)	7	♥2, ♥3, ♥4, ♥7, ♥8, ♥22, ♥9	Y	N	Y	Y	N	N
Withania somnifera (L.) Dunal. (HAJ-314)	Kuti lal	Herb	Root	Tea	**Rheumatism** (21)	21	♥2, ♥5, ♥6, ♥4, ♠7, ♠8, ♥9, ♠25, ♥20, ♠13, ♥14	N	Y	Y	Y	Y	Y
					Thymelaeaceae								
Daphne oleoides Schreb. (HAJ-318)	Layghonai	Shrub	Leaf	Tea	Diarrhea (35)	35	♥2, ♥19, ♥8, ♥10	Y	Y	N	N	Y	Y
					Verbenaceae								
Lantana camara L. (HAJ-322)	Barepas	Shrub	Leaf, Root	Tea	**Malaria** (7), Cold (4)	9	♠8, ♥11, ♥13	N	N	N	N	Y	N
Phyla nodiflora (L.) Greene (HAJ-323)	Hapzapurai	Herb	Whole Plant	Tea	Cough (7), Tonsillitis (5)	11	♥8	Y	Y	N	N	Y	N
					Violaceae								
Viola betonicifolia Sm.(HAJ-162)	Banaqsha	Herb	Flower, Leaf	Tea	**Cough** (22), **Flu** (19), **Fever** (24), Corona disease (6)	37	♠7, ♥24, ♥25, ♥10	Y	N	N	N	N	N
Viola biflora L. (HAJ-166)	Banaqsha	Herb	Flower	Tea	**Flu** (19), **Cough** (17), **Fever** (21), Corona disease (15)	43	♥18, ♥2, ♠7, ♥24, ♥10, ♥16	Y	Y	N	N	N	Y
Viola canescens Wall. (HAJ-326)	Banafsha	Herb	Flower	Tea	**Cough** (34), Corona disease (10)	44	♥3, ♥5, ♥7, ♠8, ♥24, ♥9, ♠25, ♥10, ♥10, ♠14, ♥15, ♠16	Y	Y	Y	Y	Y	Y
Viola odorata L. (HAJ-167)	Udi Banfsha	Herb	Leaf	Tea	Headache (13), **Cough** (20), Fever (14), Corona disease (12)	38	♠3, ♥5, ♥7, ♠21, ♥11	Y	Y	N	N	N	Y
Viola pilosa Blume (HAJ-169)	Banaqsha	Herb	Flower	Tea	Cough (11), Headache (2), Fever (13)	15	♥13	Y	Y	Y	N	N	Y
					Zingiberaceae								
Zingiber officinale Roscoe (HAJ-330)	Adrak	Herb	Rhizome	Tea	**Cold** (16), **Cough** (26), Antidiabetics (21), Corona disease (9)	39	♥6, ♥7, ♠8, ♠22, ♠9	Y	Y	Y	Y	Y	Y
					Zygophyllaceae								
Tribulus terrestris L. (HAJ-332)	Markundai	Herb	Fruit	Tea	**Urinary tract infection** (24)	24	♠2, ♥3, ♥5, ♥4, ♥7, ♠8, ♥9, ♠25, ♠10, ♠20, ♥14	N	Y	Y	Y	Y	Y

Ur= Use reports; **FC**= Frequency of citation; ♥= Different/new medicinal use; ♠= Medicinal use reported; **Bold font medicinal uses=** Reported in the literature; Normal font medicinal uses= New medicinal uses

References: 1= Alam *et al.,* (2011), 2= Sher *et al.,* (2011), Jan *et al.,* (2020)= 3, Sulaiman *et al.,* (2020)= 4, Jan *et al.,* (2021)= 5, Rahman *et al.,* (2022)= 6, Jan *et al.,* (2022)= 7, Ali *et al.,* (2023)= 8, Majid *et al.,* (2020)= 9, Jamal *et al.,* (2017)= 10, Birjees *et al.,* (2022)= 11, Sher *et al.,* (2016)= 12, Shoaib *et al.,* (2017)= 13, Ullah *et al.,* (2020)= 14, Tahir *et al.,* (2023)= 15, Hamayun *et al.,* (2003)= 16, Hamayun *et al.,* (2006)= 17, Jan *et al.,* (2017)= 18, Khan *et al.,* (2019)= 19, Ali *et al.,* (2018)= 20, Shinwari *et al.,* (2017)= 21 , Nazli *et al.,* (2022)= 22, Khan *et al.,* (2018)= 23, Sher *et al.,* (2020)= 24, Shuaib *et al,* (2021)= 25

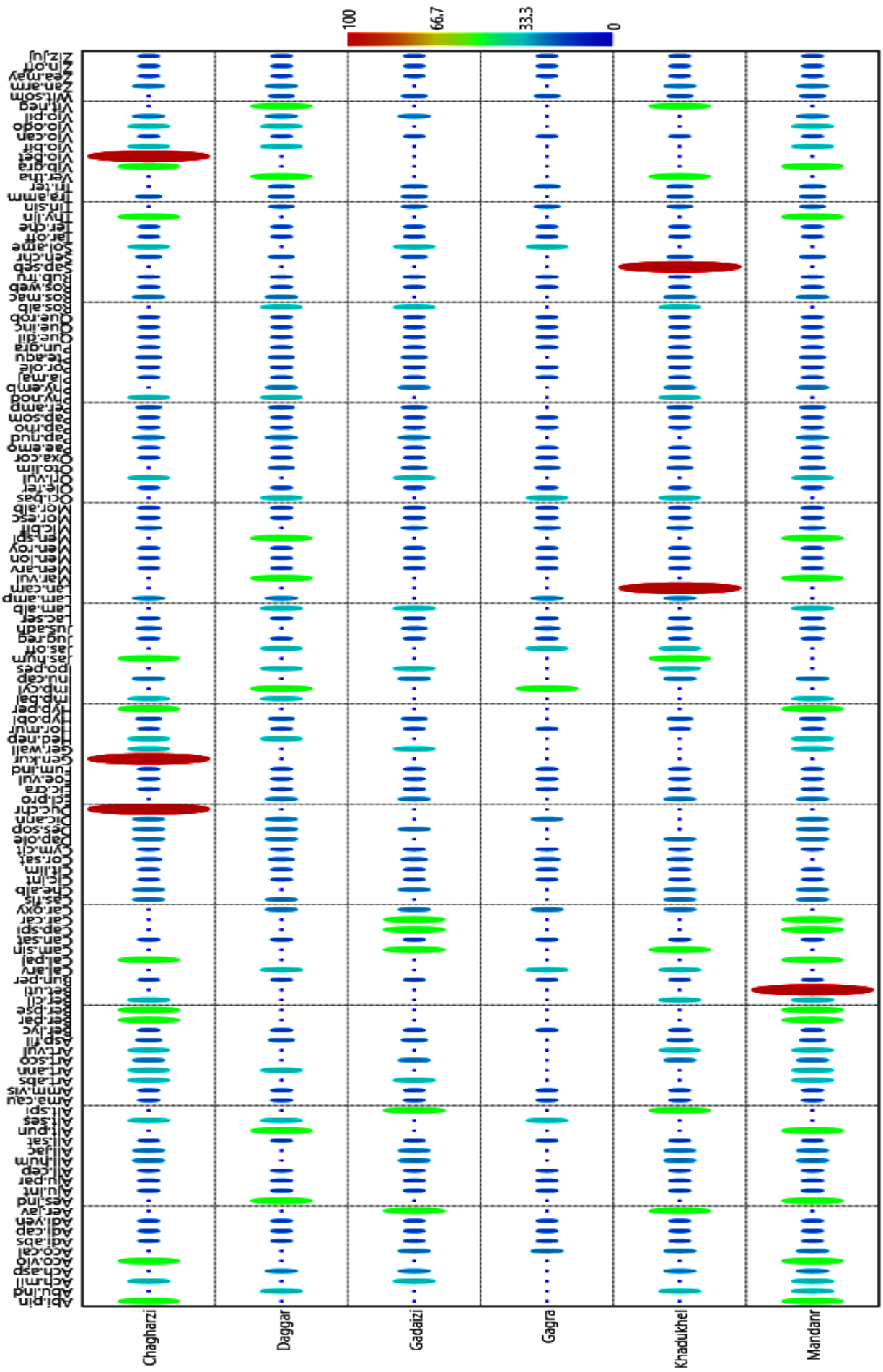

Fig. 5. Medicinal plants and their allied ethnomedicinal knowledge distribution in the study area.

Table 3. Informants consensus factor about the medicinal plants used as herbal teas.

Disease category	Nt	Nur	ICF
Fevers, malaria, Typhoid etc	27	143	0.81
Respiratory diseases	56	349	0.84
Digestive diseases	40	275	0.85
Musculoskeletal diseases	15	103	0.86
Endocrine diseases	16	160	0.90
Cardiovascular diseases	2	12	0.91
Neurological diseases	5	57	0.92
Urological diseases	5	77	0.94

Informants consensus factor and common diseases of the study area: According to the opinion of the indigenous population, all the diseases treated by herbal teas were divided into different groups to determine the informants' consensus. ICF values range from 0 to 1. The highest ICF value demonstrates the homogeneity of plant uses for different diseases, the community has well-defined selection criteria for medicinal plants, and frequent exchange of ethnomedicinal knowledge among the informants. If the ICF value is closer to zero, it means that the medicinal plants were chosen at random or that community members share their ethnomedicinal knowledge sometimes. The low ICF value also indicated that there was less consensus on the use of a certain medicinal plant to treat a particular illness category. Moreover, the low ICF value suggests that numerous plants have almost equal-high potential for treating a range of ailments and the local community has easy access to alternative medicine (Heinrich *et al.,* 2006; Ullah *et al.,* 2021). The highest ICF value was obtained for Urological diseases (0.94), followed by Neurological diseases (0.92), and Cardiovascular diseases (0.91). In the study area, most of the plants (56 species) are used for the treatment of respiratory diseases, followed by digestive diseases (40 species) and fevers, malaria typhoid, etc. (27 species) (Table 3). The use of a large number of medicinal plants for the treatment of digestive diseases and respiratory diseases may be due to the commonness of these diseases because of the poor hygiene, smoke of wood and dung inside houses, polluted water due to the marble industry, and harsh weather. Diseases related to the digestive system are common all over the world and different communities around the world use numerous plants to treat these diseases (Alzaheb & Altemani, 2018; Rashid *et al.,* 2023). Furthermore, the study area has rich floristic and fungal diversity, and the presence of pollen and spores in the air causes respiratory problems (Qaseem *et al.,* 2019). Furthermore, our results are in line with the results of other researchers (Zada *et al.,* 2015; Qaseem *et al.,* 2019; Ullah *et al.,* 2023).

Conclusions

The findings of this work demonstrate that this area is rich in both floral as well as cultural diversity and that the local community has a wealth of information about ethnomedicine. The native population depends on therapeutic plants because the study area is mostly hilly, isolated, and devoid of contemporary medical services. The focus of the current research is primarily on the significant ethnomedical knowledge connected to the indigenous medicinal flora. Since this priceless resource of information is handed down from generation to generation orally, it was noticed that the important ethnomedicinal knowledge is in danger of extinction as the younger generation lacks interest. The ethnomedicinal data was collected from about 125 medicinal plant species from 60 families that were used in the form of herbal teas in the study area. Ages 50 to 59 were the group who shared the most information. With 15 species, the Lamiaceae was the dominant family. The highest ICF value was obtained for Urological diseases (0.94). In the study area, most of the plants (56 species) are used for the treatment of respiratory diseases, followed by digestive diseases (40 species) and fevers, malaria typhoid, etc. (27 species). The traditional knowledge may be recorded for different purposes, such as its conservation for our upcoming generations, its protection by making the data available to the public, and its use as the beginning point for further research and conservation efforts. To increase the local community's understanding of the need to preserve medicinal plants, we advise that future research projects be developed. Additionally, these medicinal plants should be evaluated pharmacologically and phytochemically to find novel drug candidates.

Acknowledgement

The authors would like to extend their sincere appreciation to the Researchers Supporting Project Number (RSP2024R134), King Saud University, Riyadh, Saudi Arabia. We are thankful to all the local people who shared their valuable knowledge with us.

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(Received for publication 07 September 2023)