



Ethno-botanical and geo-referenced profiling of medicinal plants of Nawagai Valley, District Buner (Pakistan)

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The prime objective of the research was to list the important ethnomedicinal plants of Nawagai village, District Buner. During the survey, 44 plant species from 27 families were observed and collected from the targeted area of Khyber Pakhtunkhwa, Pakistan. Lamiaceae members were the most dominant (54%) followed by members of Asteraceae (30%), Poaceae (18%) and Solanaceae (12%). Relevant information such as field data, GPS coordinates family names, local names, therapeutic uses and plant habits were recorded for each species. For preservation purposes, specimens were mounted on herbarium sheets, and identified with the help of flora of Pakistan, flora of Australia and other relevant floristic records. During this research work all the collected specimens were preserved in the (BG&H, UOM) Botanical Garden and Herbarium, the data were also provided to the Department of Botany, University of Malakand Dir (Lower), Khyber Pakhtunkhwa, Pakistan.

Keywords: medicinal plants; therapeutic uses; georeferenced data; District Buner

Introduction

District Buner comes under the administrative umbrella of Malakand division. The word Buner is most probably taken from Sanskrit language which means “forest”, since the area has some old growth coniferous forests patches present. The climate of the study area is of moderate nature. Buner covers an area of 1760 km² lies between 34°09' and 34°43' N latitudes and 72°10' and 72°47' E longitudes. The village of Nawagai was chosen for the study as it provides easy access to the diverse representative vegetation of the district. Most of these plant species have medicinal value. Soil variation and diversification might be of the reason for this floristic diversity. The common types of soil found are sandy, clay and loamy textured.

Plants provide a wide range of products and services to people throughout the world. Most people of the third world countries rely on wild plants for their basic health care. The term “ethnobotany” was first introduced in 1896 by John Hershberger as the study of aromatic and wild plants used by primitive and aboriginal people. From that time, it has been defined as the traditional information of indigenous communities of the encompassing plant variety and the investigation of how the general population of a specific culture and area utilizes indigenous plants. Worldwide medicinal plants and medicines derived from them are used widely in traditional recipes and becoming popular in today's modern society. Ethnobotanical studies contribute to the knowledge of plant biodiversity, human awareness about the uses, applications, natural resources conservation and provide further social and scientific interventions for scientists (Parada et al., 2009). Ethnobotanical study helps the local community to establish the priorities for local use of plants for different ailments, this is also an effective source for conservation and cultural knowledge of the areas where these important plants occur (Ibrar et al., 2007).

Globally, over five thousand plant species belonging to the angiosperm group are used for medicinal purposes (Govaerts, 2001). Medicinal plants and their products have been used successfully for many diseases, both externally and internally. Medicinal plant material has persisted as the “treatment of choice” as it has no or few side effects

(Halberstein, 2005). Ethnobotany in Pakistan is not a highly profiled research area; however, many botanists have published research articles about medicinal plants. It has been reported that 84% of the population used traditional medicinal plants for many diseases (Shahzeb et al., 2013). Aromatic and wild medicinal plants are important tools for the treatment of different diseases (Bakoet al., 2005). Pakistan exhibit a rich history of traditional utilization of flora. Medicinal plants play a very important role in traditional health care of humans and animals. Extracts of medicinal plants are used in allopathic drugs (Hussain et al., 2010). In the national flora of Pakistan, more than 10% of medicinally important plant species were used in traditional treatments (Shinwari, 2010). Ethno-botanical information also helps ecologists, pharmacologists, taxonomists, watershed and wild life managers in their efforts for improving the economic status of the locals in remote areas (Ibrar et al., 2007).

In the study area, local peoples depend mostly upon medicinal plants, which provide a good source of primary health care material. The knowledge of use of particular medicinal plants for particular diseases is passed-on from generation after generation. Manan et al. (2007), reported an ethno-botanical review of Wari Sub-division Dir (U) with the main emphasis on the indigenous uses of the local plants. The inhabitants use medicinal plants on the advice of elders, such as wise men, herbalists, and traditional practitioners. They use them with the advice of nonqualified but professional traditional herbalists (Hakims), who have also gained some experience through apprenticeship with some registered practitioners. Medicinal plants are prescribed for a wide range of diseases and ailments by qualified registered practitioners of the Unani system of medicine. These herbal medications were made by using water as a medium and administered along with milk, ghee, oil, egg, sulphur, and butter etc. There are different steps to prepare herbal medicine, plant parts used in crushed form, in powders, in pastes, fresh, in decoctions, in juices, in extracts, as latex, in infusions, and as resin etc. (Abbasi et al., 2010). Medicinally important plants are divided into two broad types. Firstly, plants which are used by local physicians in different crude formulation to provide some relief to the local inhabitants in developing countries. Secondly, those plant which are in demand by pharmaceutical industries for

extraction of their active ingredients (Hussain et al., 2008). Medicinal plants which are still widely used have been noted in Swat district. Some species seem to be adapted to wood-pasture, but vulnerable to overcollection, and in particular to deforestation. The better idea is to develop small-scale agroforestry systems to cultivate medicinally important plants for commercial and medicinal use by locals or with the help of the government (Akhtar et al., 2013).

Materials and methods

Field survey and collection of specimens was done in the study area of Nawagai. The data of use of medicinal plants was collected predominantly from old residents. Specimens of all the available species were collected along with their relevant field data and georeferenced location data (Fig. 1, Table 1–4).

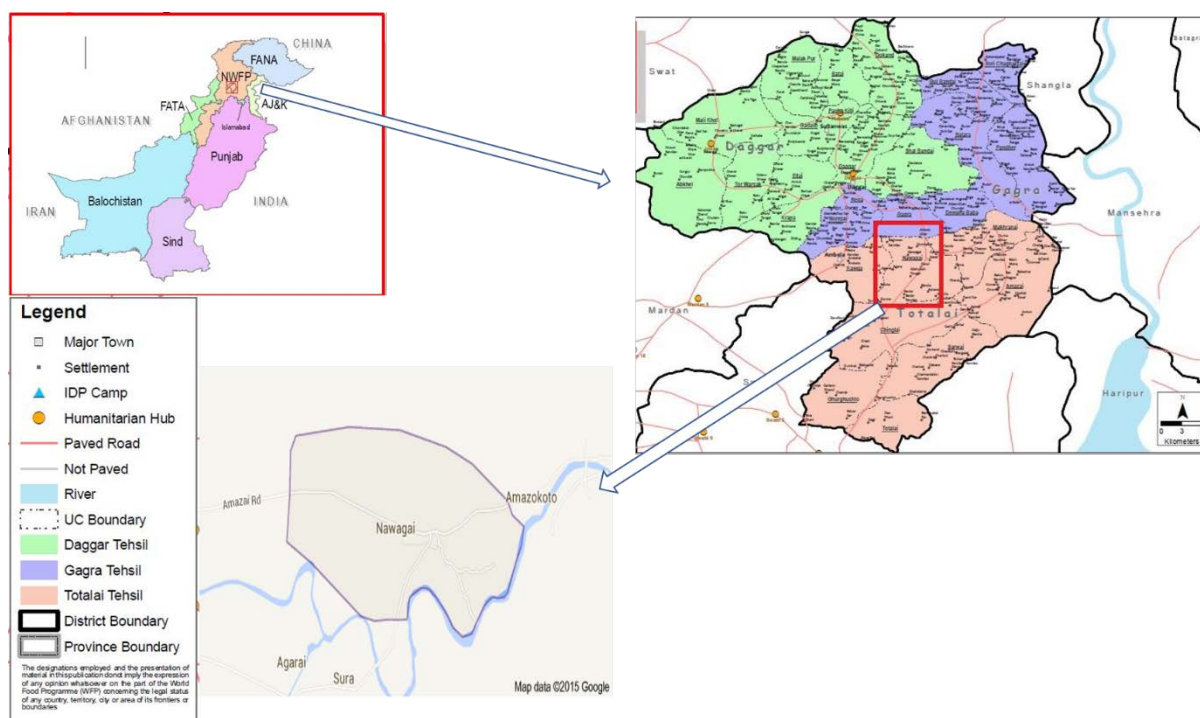


Fig. 1. Map of District Buner, Khyber Pakhtunkhwa

Table 1

List of GPS locations of selected plants

No	Species	Latitude	Longitude	Elevation
1	<i>Adiantum venustum</i> D. Don	34°24'01"	72°33'30"	665
2	<i>Narcissus tazetta</i> (L.)	34°23'52"	72°33'43"	666
3	<i>Hedera nepalensis</i> K. Koch	34°23'52"	72°33'34"	664
4	<i>Calotropis procera</i> (Aiton) W. T. Aiton	34°24'45"	72°33'32"	702
5	<i>Caralluma tuberculata</i> N. E. Brown	34°24'12"	72°33'36"	675
6	<i>Taraxacum officinale</i> Wigg.	34°34'01"	72°33'37"	667
7	<i>Xanthium strumarium</i> (L.)	34°24'06"	72°33'38"	672
8	<i>Silybum marianum</i> Gaertn.	34°24'16"	72°33'42"	672
9	<i>Carthamus oxycantha</i> M. Bieb.	34°23'55"	72°33'30"	668
10	<i>Launea procumbense</i> (Roxb.) Ramayya & Rajagopal	34°23'54"	72°33'27"	673
11	<i>Conyza canadensis</i> (L.) Corgn.	34°23'51"	72°33'33"	666
12	<i>Berberis lycium</i> Royle	34°23'54"	72°33'30"	669
13	<i>Nasturtium officinale</i> R. Br.	34°23'58"	72°33'46"	662
14	<i>Cannabis sativa</i> (L.)	34°4'03"	72°33'43"	668
15	<i>Opuntia monacantha</i> (Willd.) Haw. f. <i>variegata</i> Hort	34°24'48"	72°34'09"	703
16	<i>Euphorbia helioscopia</i> (L.)	34°24'08"	72°33'49"	671
17	<i>Trigonella foenum-graecum</i> (L.)	34°23'41"	72°33'35"	663
18	<i>Medicago sativa</i> (L.)	34°24'21"	72°33'36"	670
19	<i>Fumaria indica</i> (Hauuskn.) Pugsley	34°24'00"	72°33'39"	667
20	<i>Ajuga bracteosa</i> (Wall. ex Benth.) Codd.	34°23'54"	72°33'30"	670
21	<i>Mentha longifolia</i> (L.)	34°24'49"	72°33'42"	706
22	<i>Mentha spicata</i> (L.)	34°24'01"	72°33'31"	665
23	<i>Salvia moorcroftiana</i> (L.)	34°23'59"	72°33'06"	676
24	<i>Origanum vulgare</i> (L.)	34°24'18"	72°34'18"	671
25	<i>Isodon rugosus</i> (Wall. ex Benth.) Codd.	34°25'05"	72°34'09"	735
26	<i>Ocimum basilicum</i> (L.)	34°24'18"	72°34'22"	673
27	<i>Lathyrus aphaca</i> (L.)	34°24'01"	72°33'23"	667
28	<i>Otostegia limbata</i> (Benth.) Boiss	34°23'46"	72°33'49"	659
29	<i>Melia azedarach</i> (L.)	34°23'55"	72°33'57"	665
30	<i>Olea ferruginea</i> Royle	34°24'06"	72°33'49"	669

No	Species	Latitude	Longitude	Elevation
31	<i>Oxalis corniculata</i> (L.)	34°24'38"	72°33'12"	686
32	<i>Piper nigrum</i> (L.)	34°24'35"	72°33'23"	682
33	<i>Plantago lanceolata</i> (L.)	34°24'02"	72°33'29"	665
34	<i>Polygonum barbatum</i> (L.)	34°25'24"	72°34'14"	815
35	<i>Rumex hastatus</i> D. Don	34°25'11"	72°34'16"	698
36	<i>Desmostachya bipinnata</i> (L.) Stapf.	34°24'08"	72°33'41"	672
37	<i>Punica granatum</i> (L.)	34°24'12"	72°33'28"	680
38	<i>Rubus fruticosus</i> Agg.	34°24'01"	72°33'35"	667
39	<i>Zanthoxylum armatum</i> DC.	34°24'18"	72°34'19"	671
40	<i>Dodonaea viscosa</i> (L.) Jacq.	34°24'08"	72°34'54"	807
41	<i>Verbascum thapsus</i> (L.)	34°23'54"	72°33'23"	675
42	<i>Solanum nigrum</i> (L.)	34°23'41"	72°33'34"	666
43	<i>Vitex negundo</i> (L.)	34°24'50"	72°34'26"	674
44	<i>Verbena officinalis</i> (L.)	34°24'26"	72°33'26"	682

Table 2

List of species with their family and local name and habit

Family	Species	Local name	Habit
Adiantaceae	<i>Adiantum venustum</i> D. Don	Sumbal	herb
Amaryllidaceae	<i>Narcissus tazetta</i> (L.)	Gule-e-Nargis	herb
Araliaceae	<i>Hedera nepalensis</i> K. Koch	Ropai panra	shrub
Asclepiadaceae	<i>Calotropis procera</i> (Aiton) W.	Spalmai	shrub
Asclepiadaceae	<i>Caralluma tuberculata</i> N. E. Brown	Pamankay	herb
Asteraceae	<i>Taraxacum officinale</i> Wigg.	Ziar gulae	herb
Asteraceae	<i>Xanthium strumarium</i> (L.)	Gishkey	herb
Asteraceae	<i>Silybum marianum</i> Gaertn.	Bangi	shrub
Asteraceae	<i>Carthamus oxycantha</i> M. Bieb.	Kareeza	herb
Asteraceae	<i>Launea procumbense</i> (Roxb.)	Paiwaray	shrub
Asteraceae	<i>Conyza canadensis</i> (L.) Corgn.	Paleet	herb
Berberidaceae	<i>Berberis lycium</i> Royle	kwaray	shrub
Brassicaceae	<i>Nasturtium officinale</i> R. Br.	Talmeera	herb
Cannabaceae	<i>Cannabis sativa</i> (L.)	Bhang	shrub
Cactaceae	<i>Opuntia monacantha</i> (Willd.) Haw. f. <i>variegata</i> Hort.	Zooqam	shrub
Euphorbiaceae	<i>Euphorbia helioscopia</i> (L.)	Peryan dholay	herb

Family	Species	Local name	Habit
Fabaceae	<i>Trigonella foenum-graecum</i> (L.)	Malkhoza	herb
Fabaceae	<i>Medicago sativa</i> (L.)	Shpeshty	herb
Fumariaceae	<i>Fumaria indica</i> (Hauusskn.) Pugsley	Papra	herb
Lamiaceae	<i>Ajuga bracteosa</i> Wall. ex Benth	Booti	herb
Lamiaceae	<i>Mentha longifolia</i> (L.)	Villanay	herb
Lamiaceae	<i>Mentha spicata</i> (L.)	Podeena	herb
Lamiaceae	<i>Salvia moorcroftiana</i> (L.)	Kharghwag	herb
Lamiaceae	<i>Origanum vulgare</i> (L.)	Shamakay	shrub
Lamiaceae	<i>Isodon rugosus</i> (Wall. ex Benth.) Codd.	Sperkay	shrub
Lamiaceae	<i>Ocimum basilicum</i> (L.)	Kashmali	shrub
Lamiaceae	<i>Lathyrus aphaca</i> (L.)	Kurkamany	herb
Lamiaceae	<i>Otostegia limbata</i> (Benth.) Boiss	Spen Azghay	herb
Meliaceae	<i>Melia azedarach</i> (L.)	Tora bakyanra	tree
Oleaceae	<i>Olea ferruginea</i> Royle	Khona	tree
Oxalidaceae	<i>Oxalis corniculata</i> (L.)	Tarokay	herb
Piperaceae	<i>Piper nigrum</i> (L.)	Mirch	tree
Plantaginaceae	<i>Plantago lanceolata</i> (L.)	Jabai	herb
Polygonaceae	<i>Polygonum barbatum</i> (L.)	Palpolak	herb
Polygonaceae	<i>Rumex hastatus</i> D. Don	Tarokay	herb
Poaceae	<i>Desmostachya bipinnata</i> (L.) Stapf.	Drub	herb
Punicaceae	<i>Punica granatum</i> (L.)	Ananghori	tree
Rosaceae	<i>Rubus fruticosus</i> Agg.	Karwara	shrub
Rutaceae	<i>Zanthoxylum armatum</i> DC.	Dambara	tree
Sapindaceae	<i>Dodonaea viscosa</i> (L.)	Ghwarasky	shrub
Scrophulariaceae	<i>Verbascum thapsus</i> (L.)	Khargdag	herb
Solanaceae	<i>Solanum nigrum</i> (L.)	Kachmachu	herb
Verbenaceae	<i>Vitex negundo</i> (L.)	Marvandai	shrub
Verbenaceae	<i>Verbena officinalis</i> (L.)	Shamakay	shrub

Table 3

List of plants name and their abbreviations

No	Species	Abbreviation	No	Species	Abbreviation
1	<i>Adiantum venustum</i>	Adi ven	23	<i>Salvia moorcroftiana</i>	Sal moo
2	<i>Narcissus tazetta</i>	Nar taz	24	<i>Origanum vulgare</i>	Ori vul
3	<i>Hedera nepalensis</i>	Hed nep	25	<i>Isodon rugosus</i>	Iso rog
4	<i>Calotropis procera</i>	Cal pro	26	<i>Ocimum basilicum</i>	Oci bas
5	<i>Caralluma tuberculata</i>	Car tub	27	<i>Lathyrus aphaca</i>	Lat aph
6	<i>Taraxacum officinale</i>	Tar off	28	<i>Otostegia limbata</i>	Oto lim
7	<i>Xanthium strumarium</i>	Xan str	29	<i>Melia azedarach</i>	Mel aze
8	<i>Silybum marianum</i>	Sil mar	30	<i>Olea ferruginea</i>	Ole fer
9	<i>Carthamus oxyacantha</i>	Car oxy	31	<i>Oxalis corniculata</i>	Oxa cor
10	<i>Launea procumbens</i>	Lau pro	32	<i>Piper nigrum</i>	Pip nig
11	<i>Conyza canadensis</i>	Con can	33	<i>Plantago lanceolata</i>	Pla lan
12	<i>Berberis lycium</i>	Ber lyc	34	<i>Polygonum barbatum</i>	Pol bar
13	<i>Nasturtium officinale</i>	Nas off	35	<i>Rumex hastatus</i>	Rum has
14	<i>Cannabis sativa</i>	Can sat	36	<i>Desmostachya bipinnata</i>	Des bip
15	<i>Opuntia monacantha</i>	Opu mon	37	<i>Punica granatum</i>	Pun gra
16	<i>Euphorbia helioscopia</i>	Eup hel	38	<i>Rubus fruticosus</i>	Rub fru
17	<i>Trigonella foenum-graecum</i>	Tri foe	39	<i>Zanthoxylum armatum</i>	Zan arm
18	<i>Medicago sativa</i>	Med sat	40	<i>Dodonaea viscosa</i>	Dod vis
19	<i>Fumaria indica</i>	Fum ind	41	<i>Verbascum thapsus</i>	Ver tha
20	<i>Ajuga bracteosa</i>	Aju bra	42	<i>Solanum nigrum</i>	Sol nig
21	<i>Mentha longifolia</i>	Men lon	43	<i>Vitex negundo</i>	Vit neg
22	<i>Mentha spicata</i>	Men spi	44	<i>Verbena officinalis</i>	Ver off

After collection, the plants were pressed to obtain good herbarium specimens. They were pressed before their wilting in newspaper sheets. The newspapers were changed every 24 hours. After pressing and drying, the specimens were mounted on herbarium sheets for obtaining morphological data for their identification to species level. After their identification, all the available information about the taxa were transferred upon their respective herbarium sheet. The plant species were either identified directly in the field or after processing at the Botanical Garden and Herbarium, University of Malakand Chakdara, Dir lower, Khyber Pakhtunkhwa with the help of flora of Pakistan, flora of Australia and other relevant published sources. The voucher specimen of each species was deposited in the Herbarium and Department of Botany, University of Malakand, Pakistan.

Results

The ethnomedicinal flora of Nawagai Village consists of 44 species belonging to 27 families. Among the collected plants, 9 plants belong to

the family Lamiaceae, 6 to the family Asteraceae, 2 to Asclepiadaceae, Polygonaceae, Fabaceae and Verbenaceae. One species was recorded for Adiantaceae, Amaryllidaceae, Araliaceae, Berberidaceae, Brassicaceae, Cactaceae, Cannabaceae, Euphorbiaceae, Meliaceae, Oleaceae, Oxalidaceae, Piperaceae, Plantaginaceae, Poaceae, Punicaceae, Rosaceae, Rutaceae, Sapindaceae, Scrophulariaceae and Solanaceae (Fig. 2).

Table 4

List of therapeutic uses abbreviation

No	Full name	Abbreviation	No	Full name	Abbreviation
1	stomach-ache	sto	38	tumours	tum
2	vermifuge	ver	39	anaemia	ane
3	diuritics	diu	40	digestive	dig
4	astringent	ast	41	appetite	app
5	diarrhea	dia	42	lung infections	lun
6	expectorant	exp	43	cancer	can
7	cough	cou	44	heartburn	hea
8	tonic	ton	45	sore throat	thr
9	stimulant	sti	46	antioxidant	ant
10	purgative	pur	47	antimicrobial	ant
11	rheumatism	rhe	48	cns disorders	cns
12	toothache	too	49	ant dyspeptic	ant
13	honey formation	hon	50	cholagogue	cho
14	fever	fev	51	diaphoretic	dia
15	blood purifying	blo	52	abdominal cramps	abd
16	dysentery	dys	53	achene's	ach
17	laxative	lax	54	antiseptic	ant
18	carminative	car	55	analgesic	ana
19	sedative	sed	56	aromatic	aro
20	asthma	ast	57	ear pain	ear
21	emetic	eme	58	bums	bur
22	diabetes	dia	59	gum diseases	gum
23	pulmonary	pul	60	hysteria	hys
24	skin disease	ski	61	antiperiodic	ant
25	hypertension	hyp	62	curing of flu	cur
26	kidney	kid	63	muscle relaxation	mus
27	liver disease	liv	64	mouth diseases	mou
28	flow	flo	65	fish poison	fis
29	haemorrhage	hae	66	strangury	str
30	apparent	app	67	vaginal discharges	vag
31	sudorific	sud	68	vesicle calculi	ves
32	cnolagogue	cno	69	biliousness	bil
33	micturition	mic	70	bladder diseases	bla
34	wound	wou	71	swelling	swe
35	anti-scorbic	ant	72	ophthalmopathy	opt
36	narcotic	nor	73	odontalgia	odo
37	urinary	uri	74	verminosis	ver

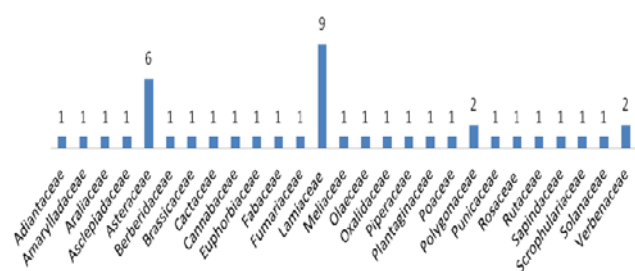


Fig. 2. Frequency distribution of selected plant families

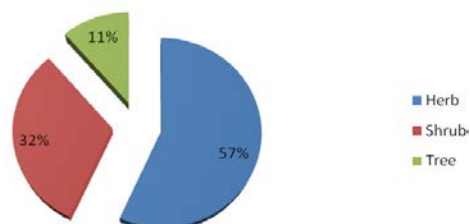


Fig. 3. Frequency distribution for habits of selected plant species

Based on their status, these plants were further divided into herbs, shrubs and trees (Fig. 3).

Table 5

List of plant uses against different ailments

Ali- ments	Adi ven	Nar taz	Hed nep	Cal pro	Car tub	Tar off	Xan str	Sil mar	Car oxy	Lau pro	Con can	Ber lyc	Nas off	Can sat	Opu mon	Eup hel	Tri foe	Med sat	Fum ind	Aju bra	Men lon	Men spi
sto	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	+	-	+	-
ver	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
diu	+	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
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Table 6

List of plant uses against different aliments

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As per medicinal use of the plants, 74 therapeutic classes as shown in Table 5, 6 were formed, in which 8 plants are used for fever, 7 as diuretics, 7 as cure for dysentery and 7 helping in wound healing, 6 as cough suppressant, 6 used as tonic, 6 plants are also used for curing diarrhea, 6 plants are used for the treatment of stomach ache and 6 species are used for curing diabetes, 5 as blood purifying, 4 as antiseptic, 4 used as laxative, 4 used for skin disease and 4 plants are used in toothache, 3 as honey bee plants, 3 as sedatives, 3 used in asthmatic situation, 3 as cure for pulmonary and liver disease, 2 plants are used as vermifuge, 2 as astringent, 2 as purgative, also 2 plants are used as anti-emetic, 2 as hypertension remedy, also 2 species used in kidney problems, 2 as haemorrhage, 2 used in abdominal cramps, 2 as analgesic, 2 as aromatic, 2 used for burns, 2 as gum disease, and 2 plants used as fish poison. And only one plant species is used for each of the following: stimulant, rheumatism, flow, apparent, sudorific, micturition, antiscorbutic, narcotic, urinary, tumors, anemia, digestive, appetite, lung infections, cancer, heartburn, sore throat sore, antioxidant, antimicrobial, CNS disorders, ant dyspeptic, cholagogue, diaphoretic, achene's, ear pain, hysteria, antiperiodic, curing of flu, muscle relaxation, mouth diseases, strangury, vaginal discharges, vesicle calculi, biliousness, bladder diseases, swelling, ophthalmopathy, odontalgia, verminosis and anti-inflammatory.

Discussion

The study indicates that the local people use various native plants for different purposes such as for fuel e.g. *Berberis lycium*, *Cannabis sativum* and as fodder for animals like *Plantago lanceolata*, *Oxalis corniculata*, *Medicago sativa*. Some people used these plants as medicine against different diseases, *Ajuga bracteosa* is used for abdominal pain, *Verbascum thapsus* for external wound healing and *Berberis lycium* for gum diseases. Extraction of leaves of *Hedera nepalensis* locally used to maintain level of diabetes. The leaves of *Mentha longifolia*, *Isodon rogius*, *Ajuga bracteosa*, *Salvia moorcroftiana* were used for the treatment of abdominal pain, digestive disorders, woundshealing. In the Indian system of medicines *Zanthoxylum armatum* is used as carminative, stomachic and treatment of toothache (Prasanta & Mukherjee, 2011).

Medicinal plants have no side effects so use of medicinal plants or their resources should be rapidly increased, and they should be easily available and this is only source of health care available to the middle-class population (Acharya et al., 2009). Ahmad et al. (2014) reported a total of 50 plant species belonging to 48 genera of 35 families from Chail valley Swat. Umair et al. (2017) listed 85 species belonging to 71 genera, and 34 families were documented along with their ethnomedicinal uses. A total of 163 plant species belonging to 73 families were reported with the help of standardized questionnaires for their traditional, medicinal and economic uses (Sher et al., 2014). A total of 200 local inhabitants were found utilizing 52 plants of 37 families for various ethnobotanical purposes, notably as timber wood, fodder and forage for cattle, condiments, for shade, usage in construction and agricultural tool making etc. (Hassan et al., 2015). Khan and Musharaf (2015) also reported 34 plant species belonging to 20 families from tehsil Thakht bhai, District: Mardan. An ethnobotanical survey was conducted in Tirat Valley, Swat District, Pakistan, reporting 65 species belonging to 35 families, from the Valley which belonged to the ethnomedicinal domain of the area (Ali et al., 2017). The author found that *Myrtus communis* is a bushy, aromatic, ever-green shrub, belonging to the family Myrtaceae, is commonly found in Bajaur Agency (FATA) Pakistan.

Our study indicated that local people of the area used different parts of medicinal plants. *Taraxacum officinale* is used in many traditional medical systems particularly in Asia, Europe, and North America, the root being primarily considered a gastrointestinal remedy supporting digestion and liver function, while the leaf is used as a diuretic and bitter digestive stimulant (Yarnell & Abascal, 2009).

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