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Medicinal plants consumption in Darmai Valley, Swat District, Pakistan

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Key words: Traditional Knowledge, Ethno medicines, Informant consensus factor, Darmai valley, Pakistan.

Abstract

The main purpose of this study was to collect information on traditional uses of medicinal plant species used by the inhabitants of Darmai valley, District Swat, Pakistan. This is the first ethno botanical survey from the study area. A total of 62 informants were questioned through interviews and group debates. Overall 60 medicinal plant species from 39 families were studied. Family Asteraceae (10%) with 6 plant species was the most prominent family. Highest Informant consensus factor (0.86) was observed for gastrointestinal while lowest (0.7) for antiseptic and aphrodisiac. High fidelity level 94.11 % was noted for *Berberis Lycium* (Stomach disorder) and lowest 29.41 % for *Caesalpinia decapetala* as purgative. For preparation of ethno medicines the residents take whole plant (39%), leaves (21%), rhizome (10%), seeds (8%), flowers, fruits, cloves (5%) and shoots (3%). Herbal medicines were used as crushed and paste (25%), decoction (22%), raw (11%), oil and powder (5%), fried, heated, Infusion and Juice (2%). The ethno medicines (88%) were used orally followed by dermal (12%). Mostly herbs (67%) were in practice for the preparation of ethno medicines. Ethno medicines were taken (88%) orally. Plants with high use reports and High Fidelity level may be subjected to further comprehensive studies for new drug discovery.

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Introduction

Ethnobotany is the interdisciplinary field of science which covers all kind of dealings regarding people and plant species. Ethnobotanical studies not only file traditional understanding about medicinal plant species of a locality but can also support bio-conservationists, and foresters for future planning (Hassan *et al.*, 2017c). History about medicinal plant species remained an important part of ancient civilizations. Due to shortage of doctors in past the people used medicinal plants for the treatment of various health disorders due to less side effects and easily accessible (Carballo *et al.*, 2002; Mann *et al.*, 2008; Ikram *et al.*, 2015). This old-style knowledge regarding medicinal plant species preserved for centuries which passed from generation to generation through trial and error base (Patwardhan *et al.*, 2004). Because of high marketability, medicinal plant business will reach to 5 trillion dollars (US) by 2050 (Shinwari and Qaiser, 2011). According to diverse studies 442000 flowering plant species have already been known, out of these total 50000 are taken as medicines while 5000 plant species have been examined for chemical constituents. Because of high price poor people utilize medicinal plants to cure different health disorders throughout the globe (Mahmood *et al.*, 2011, Mohamad *et al.*, 2011, Shrivastava and Kanungo, 2013, Bibi *et al.*, 2014). Even today twenty five percent herbal drugs are plant based which have been mentioned in modern pharmacopeia, whereas numerous synthetic drugs are contrived from plants isolates. Management and domestication of medicinal plants are in practice in many parts of the world (Mahmood *et al.*, 2013). Medicinal plants have been underuse since prehistoric throughout the globe (Elisabetsky, 1990). Even today experienced and aged peoples take herbal medicine SAS modern medicinal company depend on ingredients acquired from plant species (Hassan *et al.*, 2017c; Srithi *et al.*, 2009).

In Pakistan about 600 to 700 medicinal plants have already been observed (Shinwari, 2010; Shinwari and Qaiser, 2011). Out of total 500 plant species are used

in traditional healthcare practices while 350 species are traded at national and international markets for huge income (billions of dollars) (Ahmad, 2003). In hilly areas 84% population of Pakistan use plant species for the treatment of different health disorders (Qureshi *et al.*, 2007). Because of its easy accessibility, cheap and less side-effect, medicinal plants are taken in different parts of Pakistan even English medicines are accessible (Hassan *et al.*, 2017c) and other parts of the world (Shrivastava and Kanungo 2013). Ethno-medicinal significance of some medicinal plant of family Apiaceae and Euphorbiaceae have already been studied by (Ikram *et al.*, 2015). The important medicinal flora in some parts of Mansehra have already been documented by (Shah and Khan, 2006), Kurram flora by (Gilani *et al.*, 2003), Kotli flora by (Ajaibet *et al.*, 2010), Kalat by (Durrani and Hussain, 2005), Chitral by (Ali and Qaiser, 2009), Attock by (Noor and Kalsoom, 2011), Dir lower by (Hassan *et al.*, 2017a).

With advancement in educational facilities and communication systems the local populations are being exposed to modernism, therefore up to some extent traditional knowledge has been interchanged with modern knowledge. The aim of the study was 1. To identify and file important medicinal flora of Darmai valley in District Swat, Pakistan; 2. To observe how inhabitants use medicinal plants for the treatment of different health disorders and; 3. To verify the fact of ethnobotany in the study area.

Material and methods

Study area

Darmai is lush green valley of district Swat which lies between Latitude 35°4'53.46" Longitude 72°26'54.8". The study area is enriched with very important flora and fauna. Darmai is bounded by lush green mountains (Akhtar *et al.*, 2016). Darmai is an administrative unit, known as Union council, of Swat District situated in Khyber Pakhtunkhwa province of Pakistan. The landscape of the area is rocky with sloped stream beds. Commonly cultivated crops are maize and wheat. January and February are the

coldest while June and July are the warmest months of the year.

Ethnobotanical data collection, Identification and preservation

Ethnomedicinal data was collected through various protocols like, well organized questionnaire, interviews, field trips and group discussions from April 2009 to November 2009 following (Martin, 1995). A total of 62 local informants including male (54) and female (8) of different age class were interviewed in their local language Pashto for comprehensive data collection.

The locals were asked about local name of plant species, parts used, preparation, utilization, doze taken, recipes, and kinds of diseases treated with medicinal plant species following (Hassan *et al.*, 2017a). Plant species were confirmed through plant list (www.theplantlist.org) and international plant name index (<http://www.ipni.org>), system (Stevens, 2012). The plant specimens were classified as herbs, shrubs, and trees (Hassan *et al.* 2017b). Plant identification was conducted through flora of Pakistan and local taxonomist Prof. Mehboob Ur Rehman, Chairman Department of Botany, AKL, College Matta, Swat Pakistan. Data was systematized in Excel spread sheet 2007 and summarized by graphical statistical methods like percentage.

Quantitative analysis of ethnobotanical information

Informant consensus factor (ICF): Informant consensus factor is very useful to document consensus on uses of medicinal plant species for a specific disease (Canales *et al.*, 2005). The ICF value can be considered high if a plant species is described by more informants and vice versa. The ICF can be calculated by the formula.

$$ICF = \frac{nur - nt}{nur - 1}$$

Where “nur” is the total number of used reports for each disease category and “nt” is the species number used in that category.

Fidelity level (FL): Fidelity level (FL) can be applied to choose a best fit medicinal plant species for the treatment of a specific disease (Musa *et al.*, 2011). High FL value specifies high frequency of plant uses against a specific disease while low value shows less usage against a specific disease. Fidelity level may be calculated by the formula

$$FL = \frac{Ip}{Iu} \times 100$$

Where “Ip” is the informants numbers specified the use of plant species for a particular disease category while “Iu” is the informants number cited the use for any other disease category.

Results and discussion

Demographic data

In survey 62 informants were interviewed for data collection. Out of total 54 (87.09%) including male and 8 (12.9%) female. Informants were classified into four main categories age wise, generally informants were between 60 to 70 years (30.65%). Informants (46.66%) were mostly illiterates and more knowledgeable as compared to educated. Traditional healers (3.23%) had a good experience regarding herbal medicines (Table 1).

The study is in bargain with (Hassan *et al.* 2017c) who observed out of total informants, males were (70.14%), female (29.85%), illiterate (34.32%), teachers (13.43%) farmers (37.31%), hakeem and nomads (5.97%) and house wives (29.85%).

Taxonomic classification

A total of 60 medicinal plants from 39 families were observed and documented (Table. 2).

Family Percentage and Plant habit

Family Asteraceae (10%) with 6 plant species was the most prominent family, followed by Amaranthaceae (7%), with 4 plant species, Lamiaceae, Alliaceae, Brassicaceae, Chenopodiaceae, (5%) with 3 species, Caesalpinaceae, Liliaceae, Papilionaceae, Poaceae (3%) while rest of families contribute only one plant species.

Table 1. Different aspects of medicinal plant species used for various health disorders.

Botanical name	Family	Local name	Habit	Part use	Med. Uses	Herbal formulation	Mode of application	Dossage/ Day	V. number
<i>Achillea millefolium</i> L.	Asteraceae	Aqarqara	Herb	Leaves	Carminative	Crushed	Oral	Once	H.N.0037
<i>Achyranthes aspera</i> L.	Amaranthaceae	Buchkand	Herb	Whole plant	Antispasmodic	Paste	Oral	Thrice	H.N.0038
<i>Acorus calamus</i> L.	Araceae	Skha waja	Herb	Rhizome	Antispasmodic	Crushed	Oral	Thrice	H.N.0039
<i>Adiantum capillus-veneris</i> L.	Polypodiaceae	Sumbal	Herb	Whole plant	Expectorant	Paste	Oral	Once	H.N.0040
<i>Aillanthus altissima</i> S.	Simaroubaceae	Bakyana	Tree	Fruit	Dysenttery	Paste	Oral	Twice	H.N.0041
<i>Ajuga bracteosa</i> W.	Lamiaceae	Boti	Herb	Leaves	Dermititis	Decoction	Oral	Once	H.N.0042
<i>Ajuga parviflora</i> B.	Lamiaceae	Sra boti	Herb	Leaves	Dermititis	Decoction	Oral	Once	H.N.0043
<i>Allium cepa</i> L.	Alliaceae	Pyaz	Herb	Whole plant	Carminative	Raw	Oral	Once	H.N.0044
<i>Allium griffithianum</i> B.	Alliaceae	Ghra pyaz	Herb	Whole plant	Carminative	Raw	Oral	Once	H.N.0045
<i>Allium sativum</i> L.	Alliaceae	Oga	Herb	Cloves	antidiabetic	Fried	Oral	Twice	H.N.0046
<i>Alisma plantago</i> L.	Alismataceae	Jabai	Herb	Rhizome	Gastrointestinal	Crushed	Oral	Once	H.N.0047
<i>Alnusnitida</i> E.	Betulaceae	Geray	Tree	Leaves	Diuretic	Paste	Oral	Once	H.N.0048
<i>Aloe barbadensis</i> M.	Liliaceae	Kamala	Herb	Leaves	Gastrointestinal	Juice	Oral	Twice	H.N.0049
<i>Althea rosea</i> L.	Malvaceae	Gulekhaira	Herb	Flower	Anti-inflammatory	Crushed	Oral	Twice	H.N.0050
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Chalwayi	Herb	Whole plant	Purgative	Paste	Oral	Twice	H.N.0051
<i>Amaranthus caudatus</i> L.	Amaranthaceae	Ganher	Herb	Whole plant	Diuretic	Paste	Oral	Twice	H.N.0052
<i>Amaranthus viridis</i> L.	Amaranthaceae	Ganher	Herb	Whole plant	Gastrointestinal	Paste	Oral	Once	H.N.0053
<i>Apium graveolens</i> L.	Apiaceae	Ajmood	Herb	Seeds	Tonic	Decoction	Oral	Once	H.N.0054
<i>Arachis hypogaea</i> L.	Papilionaceae	Mongpali	Herb	Seeds	Aphrodisiac	Raw	Oral	Twice	H.N.0055
<i>Artemesia scoparia</i> W.	Asteraceae	Tharkha	Herb	Whole plant	Purgative	Infusion	Oral	Twice	H.N.0056
<i>Asparagus gracilis</i> R.	Liliaceae	Tendoray	Shrub	Shoots	Diuretic	Paste	Oral	Once	H.N.0057
<i>Avena sativa</i> L.	Poaceae	Jamdaray	Herb	Whole plant	Laxative	Crushed	Oral	Twice	H.N.0058
<i>Bauhinia variegata</i> L.	Caesalpinaceae	Kachnar	Tree	Bark	Astringent	Crushed	Oral	Twice	H.N.0059
<i>Berberis Lycium</i> R.	Berberidaceae	Kwaray	Shrub	Bark	Gastrointestinal	Crushed	Oral	Once	H.N.0060
<i>Brassica rapa</i> L.	Brassicaceae	Tepar	Herb	Roots	Diuretic	Paste	Oral	Once	H.N.0061
<i>Brassica campestris</i> L.	Brassicaceae	sharsham	Herb	Seeds	Hair Tonic	Oil	Dermal	Once	H.N.0062
<i>Caesalpinia decapetala</i> R.	Caesalpinaceae	Jara	Shrub	Roots	Purgative	Crushed	Oral	Twice	H.N.0063
<i>Canna indica</i> L.	Cannaceae	Tasbabotay	Herb	Rhizome	Gastrointestinal	Crushed	Oral	Once	H.N.0064
<i>Cannabis sativa</i> L.	Cannabinaceae	Bang	Herb	Leaves	Pain killer	Heated	Dermal	Twice	H.N.0065
<i>Capsicum frutescens</i> L.	Solanaceae	Marchakay	Herb	Fruit	Stimulant	Raw	Oral	Once	H.N.0066
<i>Carthamus oxycantha</i> L.	Asteraceae	Kareza	Herb	Seeds	Itch	Oil	Dermal	Twice	H.N.0067
<i>Cedrela serrata</i> L.	Meliaceae	Tan	Tree	Bark	Antiseptic	Powder	Dermal	Twice	H.N.0068
<i>Cedrus deodara</i> R.	Pinaceae	Ranzra	Tree	Bark	Diuretic	oil	Oral	Once	H.N.0069
<i>Chenopodium album</i> L.	Chenopodiaceae	Sarmay	Herb	Whole plant	Anthelmintic	Paste	Oral	Twice	H.N.0070
<i>Chenopodium ambrosiodes</i> L.	Chenopodiaceae	Benakai	Herb	Whole plant	Anthelmintic	Paste	Oral	Twice	H.N.0071
<i>Chenopodium botrys</i> L.	Chenopodiaceae	Kharawa	Herb	Whole plant	Antispasmodic	Decoction	Oral	Thrice	H.N.0072
<i>cichorium intybus</i> L.	Asteraceae	Han	Herb	Leaves	Antiasthmatic	Paste	Oral	Twice	H.N.0073
<i>Colchicum luteum</i> B.	Colchicaceae	Soranjan	Herb	Corms	Aphrodisiac	Crushed	Oral	Once	H.N.0074
<i>Colebebrookia oppositifolia</i> S.	Lamiaceae	Shkardana	Shrub	Leaves	Antiseptic	Crushed	Dermal	Twice	H.N.0075
<i>Conyza canadensis</i> L.	Asteraceae	Palet	Herb	Whole plant	Diuretic	Decoction	Oral	Twice	H.N.0076
<i>Crocus sativas</i> L.	Iridaceae	Zafran	Herb	Flowers	Aphrodisiac	Crushed	Oral	Once	H.N.0077

<i>Cucurbita maxima</i> D.	Cucurbitaceae	Kado	Herb	Fruit	Diuretic	Paste	Oral	Twice	H.N.0078
<i>Curcuma longa</i> L.	Zingiberaceae	Haldi	Herb	Rhizome	Antiseptic	Powder	Dermal	Twice	H.N.0079
<i>Cymbopogon citratus</i> D.	Poaceae	Lemon grass	Herb	Leaves	Tonic	Decoction	Oral	Once	H.N.0080
<i>Daphne mucronata</i> R.	Thymeleaceae	Leghonay	Shrub	Fruit	Purgative	Paste	Oral	Once	H.N.0081
<i>Fumaria indica</i> H.	Fumariaceae	Papra	Herb	Whole plant	Anthelmintic	Decoction	Oral	Once	H.N.0082
<i>Gymnosporia royleana</i> W.	Celastraceae	Spin azghay	Shrub	Seeds	Pain killer	Crushed	Oral	Twice	H.N.0083
<i>Indigofera heterantha</i> W.	Papilionaceae	Ghwareja	Shrub	Whole plant	Antiasthmatic	Decoction	Oral	Twice	H.N.0084
<i>Ipomeae purpurea</i> L.	Convolvulaceae	Prewata	Herb	Roots	Purgative	Decoction	Oral	Twice	H.N.0085
<i>Juglans regia</i> L.	Juglandaceae	Ghooz	Tree	Fruit	Aphrodisiac	Raw	oral	Once	H.N.0086
<i>Lepidium sativam</i> L.	Brassicaceae	Halam	Herb	Seeds	Stimulant	Raw	Oral	Once	H.N.0087
<i>Olea ferruginea</i> R.	Oleaceae	Khona	Tree	Leaves	Mouth ulcers	Raw	Oral	Twice	H.N.0088
<i>Platanus orientalis</i> L.	Plantanaceae	Chinar	tree	Bark	Dysenttery	Decoction	Oral	Thrice	H.N.0089
<i>Rubus sanctus</i> S.	Rosaceae	Bagana	Shrub	Fruit	Dysenttery	Paste	Oral	Twice	H.N.0090
<i>Rubus fruticosus</i> A.	Rosaceae	Karwara	Shrub	Leaves	Tonic	Decoction	Oral	Once	H.N.0091
<i>Salvadora persica</i> L.	Salvadoraceae	Miswak	tree	Leaves	Purgative	Decoction	Oral	Twice	H.N.0092
<i>Taraxacum officinale</i> W.	Asteraceae	Budabudai	Herb	Roots	Diuretic	Crushed	Oral	Once	H.N.0093
<i>Urticadioca</i> L.	Urticaceae	Sezonkay	Herb	Leaves	Diuretic	Decoction	Oral	Twice	H.N.0094
<i>Zanthoxylum armatum</i> D.	Rutcaeeae	Dambara	Shrub	Fruit	Tonic	Crushed	Oral	Once	H.N.0095
<i>Zizypus sativa</i> G.	Rhamnaceae	Markhanai	Tree	Bark	Antiseptic	Powder	Dermal	Twice	H.N.0096

The large number of plant species described from family Asteraceae is in agreement with (Umair *et al.*, 2017) and family Lamiaceae with (Hassan *et al.* 2017c), where residents used mostly plant species belongs to family Asteraceae and Lamiaceae. It may be due to its widespread distribution and high medicinal uses. Out of total habit wise, (67%) were herbs, is in

line with (Ahmad *et al.*, 2014) who observed (58%) herbs for preparation of herbal medicines. Shrubs were observed (16%) and trees (17%) (Fig.1.). Our judgments are in bargain with (Rehman *et al.*, 2017). The frequent use of herbs was due to easy collection and fruitful results, which is in line with (Uniyal *et al.*, 2006; Khan *et al.*, 2014).

Table 2. ICF values of frequently used medicinal plants as remedy in Darmai district, Swat Pakistan.

Disease	NT	NUR	ICF
Anthelmintic	5	29	0.85
Antiseptic	4	11	0.7
Antispasmodic	5	18	0.76
Aphrodisiac	4	11	0.7
Carminative	7	23	0.72
Dermatitis	6	20	0.73
Diuretic	9	37	0.77
Dysentery	4	17	0.81
Gastrointestinal	7	46	0.86
Purgative	6	33	0.84
Tonic	5	22	0.8
Pain Killer	3	12	0.81

Note: “NUR” is the number of used reports “NT” species number “ICF” Informant consensus factor.

Table 3. Fidelity level (FL) value of medicinal plants reported for given diseases.

Plant	Disease	LP	LU	FL
<i>Chenopodium album</i> L.	Anthelmintic	14	17	82.35
<i>Curcuma longa</i> L.	Antiseptic	9	12	75
<i>Acorus calamus</i> L.	Antispasmodic	7	14	50
<i>Juglans regia</i> L.	Aphrodisiac	13	19	68.42
<i>Allium cepa</i> L.	Carminative	13	25	52
<i>Ajuga bracteosa</i> W.	Dermatitis	10	21	47.61
<i>Taraxacum officinale</i> W.	Diuretic	11	18	61.11
<i>Aillanthus altissima</i> S.	Dysentery	5	16	31.25
<i>Berberis Lycium</i> R.	Gastrointestinal	16	17	94.11
<i>Caesalpinia decapetala</i> R.	Purgative	5	17	29.41
<i>Cymbopogon citratus</i> D.	Tonic	13	26	50
<i>Cannabis sativa</i> L.	Pain Killer	15	24	62.6

Part used, preparation and application

For the preparation of herbal medicines the residents take whole plant (39%), leaves (21%), rhizome (10%), seeds (8%), flowers, fruits, cloves (5%) and shoots (3%) (Fig.2) Our findings are in is agreement with (Hassan *et al.*, 2017a, Randrianarivony *et al.*, 2017)where the local healers take whole Plant (53.84%) as herbal medicines.

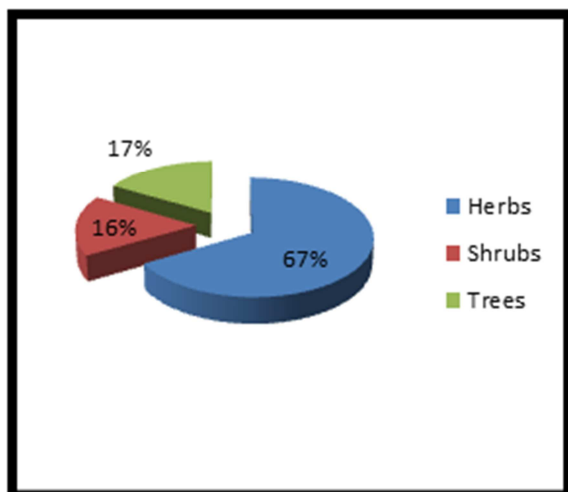


Fig. 1.Habit of medicinal plant species.

For the preparation of herbal medicines the inhabitants use crushed and paste (25%), decoction (22%), raw (11%), oil and powder (5%) while Fried, Heated, Infusion and Juice (2%) (Fig.3).The results are in line with (Eshete *et al.*, 2016) where mostly herbal medicines are taken in crushed and paste form.It may be due to make it easily digestible and

more effective.Ethno medicines are taken with additive like salt, sugar and milk as plant based medicines are bitter and unpleasant some time.

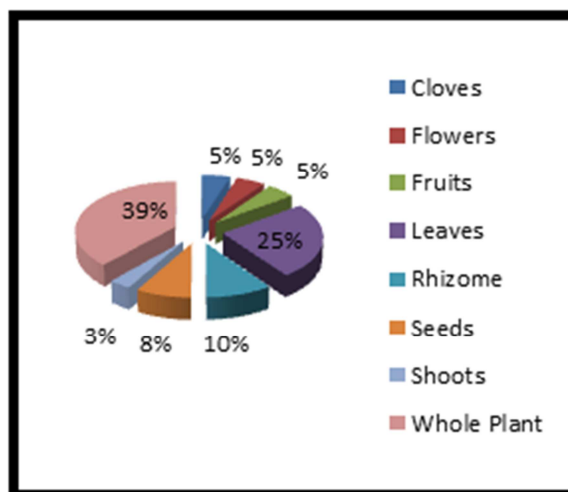


Fig. 2. Part used for preparation of ethno medicine.

The ethno medicines (88%) were used orally followed by dermal (12%). Our findings are in close agreement with (Hassan *et al.*, 2017b, Ssegawa and Kasenene, 2007; Namukobe *et al.*, 2011) who also found that, mostly herbal medicines were taken orally(Fig.4).

Informant consensus factor (ICF) and Fidelity level (FL)

Informant consensus factor can be applied to select best fit plant species for pharmacological and phytochemical analysis (Giday *et al.*, 2007). For Informant consensus factor (ICF) calculation,

diseases were classified into different disease categories based on use reports. Highest number of use reports (46) were observed for gastrointestinal and lowest (04) for aphrodisiac, antiseptic and dysentery (Table 2). Highest Informant consensus factor (0.86) was observed for gastrointestinal while lowest (0.7) for aphrodisiac.

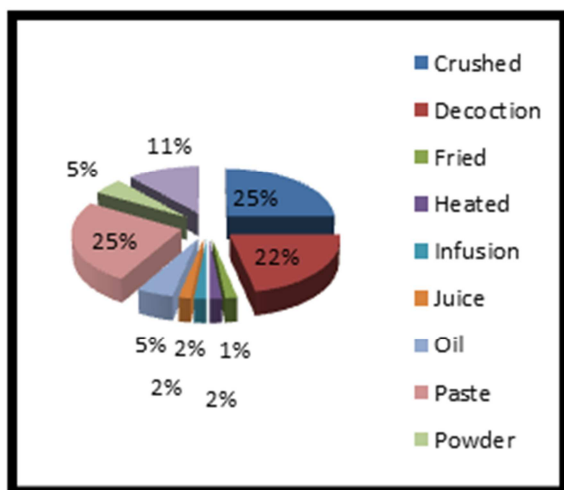


Fig. 3. Methods for preparation of ethno medicines.

In current study, majority plants were used as gastrointestinal (46) and Anthelmintic (29), which may be due to unpurified drinking water, bad hygiene and effective use of herbal medicines. Our study is in connection with (Zahoor *et al.*, 2017) who also observed high Informant consensus factor, ICF (0.89) for gastrointestinal disorders.

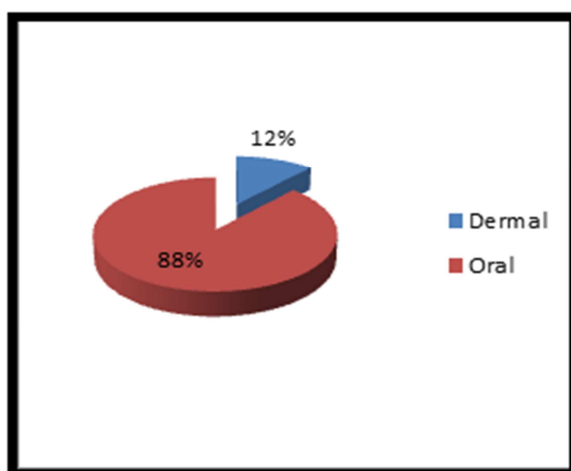


Fig. 4. Mode of application of ethno medicines.

Fidelity level shows the percentage of informants appealing the use of certain plant species for same

main purpose (Bibi *et al.*, 2014). Fidelity level has already been observed for different disorders i.e. diabetic disorders as *Achyranthes aspera* by (Ahmad and Habib, 2014), antimalarial by (Wangpan *et al.*, 2016), purgative by (Shinwari *et al.*, 2006) and pain killer by (Chevallier, 1998). Fidelity level (FL) of high valued medicinal plants was noted from 94.11 to 29.41 (Table 3). High fidelity level 94.11 % was noted for *Berberis Lycium* .(Stomach disorder) and lowest 29.41 % for *Caesalpinia decapetala* as purgative. Our study is in line with (Hassan *et al.*, 2017a) who also observed 92% fidelity level for *Berberis Lycium* R.as anti-diarrheal.

Conclusion

The people of the localities especially aged and experienced people use medicinal plant species for the treatment of different diseases even though English medicines are accessible. Harvesting of medicinal plant for different purpose was observed common in the study area.

The citizens were observed uneducated about sustainable use, conservation and preservation of medicinal plant species. The inhabitants were ready to transfer traditional knowledge to researchers. The plant species with high use reports, especially high Fidelity level (94.11) should be further subjected for phytochemical investigations. Further assessment, attentiveness and wise use of plant resources are highly recommended.

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