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Ethnomedicinal exploration of plant resources of Terich Valley, Hindukush Range Chitral, Pakistan

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Key words: Ethnobotanical, FIV, RFC, Traditional treatments, Terich Valley, Chitral, Pakistan.

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Abstract

A detailed study was carried out during 2017-2019 to record information on traditional knowledge of ethno medicinalplants used by the local community for treatment of various human disorders of Terich Valley Hindukush Range, District Chitral. Data about medicinal plants were collected from local community through open ended questionnaires, corner meetings, interviews and group discussion. A total of 64 ethnomedicinal plant species belonging to 56 genera and 31 families was documented, in which the herb species (39) dominated the list followed by trees (14) and shrubs (11). Family importance value (FIV) indicated that Asteraceae (8 species, 12.5%) was the leading family that contributed the largest number of species, followed by Apiaceae (7 species, 10.93), Rosaceae (6 species, 9.37%) and Lamiaceae (4 species, 6.25%) respectively.From the result it was recorded that leaves and fruits are the frequently used plant parts in the preparation of medicinal plantrecipes. It was concluded that over-harvesting, excessive use, habitat loss, degradation, deforestation, agriculture expansion, overpopulation, invasion of invasive alien species andover grazing are the prominentstresses to the medicinal plant biodiversity of the valley. From this study, it was recommended that community awareness and conservation strategies about medicinal flora among the local inhabitants is very necessary for sustainable livelihood security of Terich Valley.

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Introduction

Ethnobotany is the relationship between people and plants (McClatchey *et al.*, 2009).Thus, the interactions between plants and people may be very extensive, including common, spiritual, marketable, commercial, representative and inventive interactions (Ishtiaq *et al.*, 2006). John W. Harsberger was the first who have presented the term ethnobotany in 1896 (Campbell *et al.*, 2002). Ethnobotany is not a highly profiled field in Pakistan, However many botanists have done a lot of work on medicinal plants and published more research articles in various national and international journals. In Pakistan and India,use of plants as traditional medicine also has a long history and peoples have a strong relationship with plants. Ethnobotanical work is significant for the detection of new herbal recipies from local plant species (Mahmood *et al.*, 2012).In Pakistan the knowledge about plants as medicine is named as 'Unani' medicine while in India the same knowledge is called 'Ayurveda' medicine (Abbasi *et al.*, 2012). It has been investigated that about 84% population used traditional medicinal plants for variousailmentsin Pakistan (Shahzeb *et al.*, 2013). In Pakistan, the herbal remedies are still traditionally used along with recent medicines among the enormous part of population. Pakistan has a rich flora of about 5521 species belonging to 1572 genera, out of which400-600 species are medicinally important which is frequently restricted to the northwest regions due to the existence of Hindukush, Karakoram, Himalayas and Sulaimanmountainsranges of the country (Hamayun *et al.*, 2003; Ali *et al.*, 2008; Shaheen, 2011; Bibi *et al.*, 2014).WHO reported that 80% of the peoples in developed co untries depends on ethno flora for healthcare. The modern pharmacopeia contains at least 25% remedies derived from medicinal plants (Shinwari *et al.*, 2006). The native plant resources of Hindukush-Himalaya are declining more rapidly than many other areas around the biosphere (Siddiqui *et al.*, 2009). Medicinal plant species are used as foods; evaluating their nutritional significance which can help to understand the worth of the plant species (Pandey *et al.*, 2006). Wild plants were replaced with passage of time from their native habitat by the desired cultivated crops on large scale. This practice has permanently remained affected by the presence of plants in their native habitat and the way these medicinal plant resources are utilized by the folks as imperative. Medicinal plants provide a real alternative in developing countries for primary health care system (Buitron, 1999). In the world medicinal plant species is in between 35,000 and 70,000 (Lewington, 1990). Products of hundreds of medicinal plant species are collected from forests and meadows and traded to international markets (Olsen, 2005). Ethnobotanical study provides a base line for local community to establish the priorities for local use of plants for variousdiseases; this is an effective source for cultural knowledge and conservation of the important medicinal plants of the areas where these occurs (Ibrar *et al.*, 2007).From Chail valley of District Swat, Hindukush range, 50 important medicinal plant species were documented along with their local uses (Ahmad *et al.*, 2014); in Khyber Pakhtunkhwa District Tank, 205 important medicinal plant species were documented (Badshah *et al.*, 2012). Few references on ethnobotanical work on the medicinal plants of Chitral are available as Ethnobotany of fruit producing plants of Chitral (Hussain, 2003), medicinal uses in five major valleys including Birir, Bumburate, Shehekuh, Rumbur and Golin Gol (Khan *et al.*, 2010), medicinal flora of Booni and Mastuj, Chitral (Ali and Qaiser, 2009; Shah and Hussain, 2012), Recently Hadi *et al.*, (2013) studied medicinal plants of Rech valley.

The main aim of this research work is to evaluate the floristic diversity and their medicinal value of Terich valley with special reference to the following research objectives.

Collection, documentation and exploration of medicninal plants from the research area.

To preparea comprehensive inventory of medicinal plants.

To record indigenous knowledge of ethnomedicinal plants used by the local community for treatment of

various human ailments in the valley.

Material and methods

Study area

Terich Valley is located 72° 07/ to 73° 97/ E longitude and 35° 20/ to 36° 55/ N latitude in the extreme of District Chitral (Fig.1).

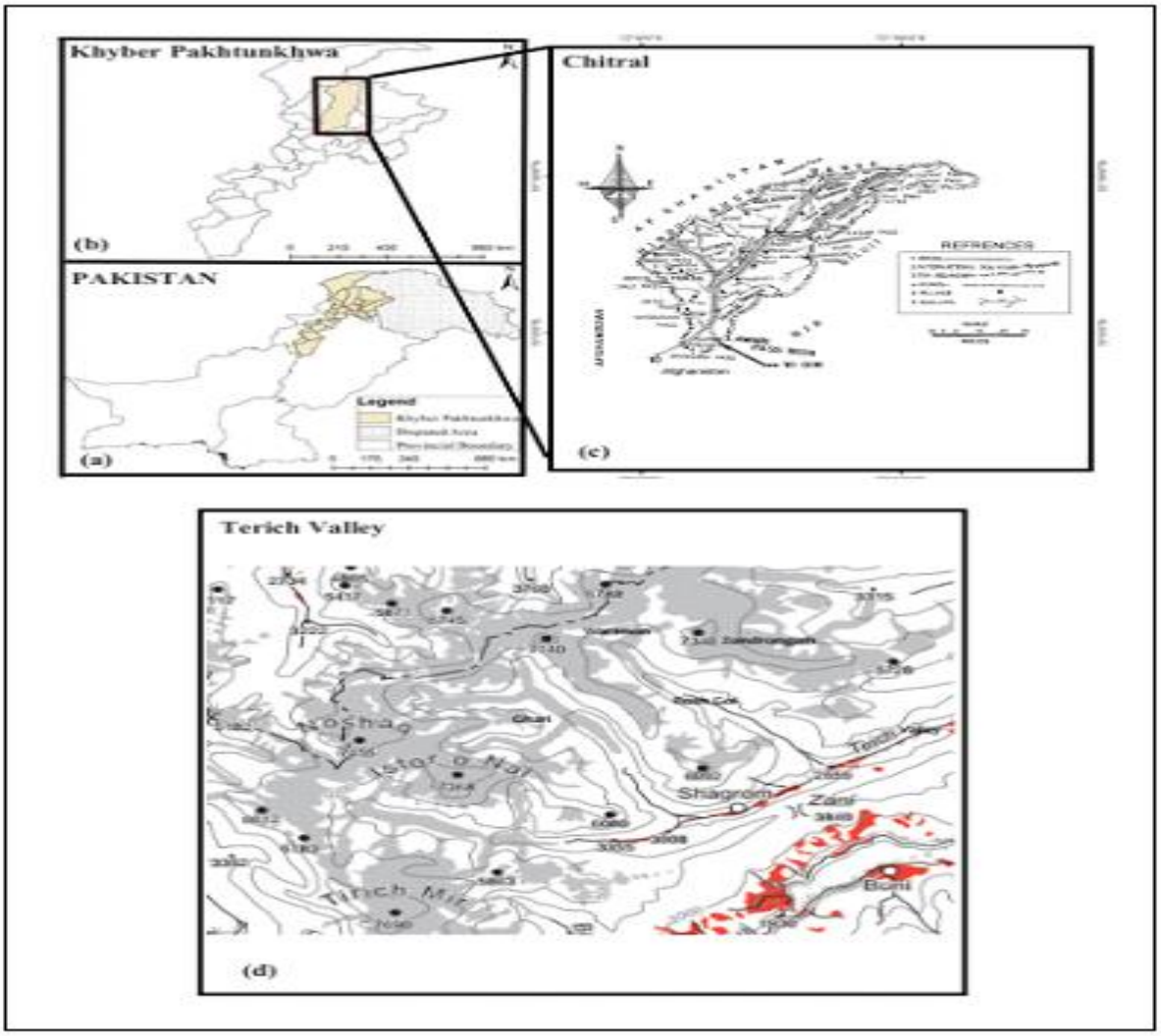

Fig. 1. Map of Terich valley.

Terich Valley altitude ranges from 2850m at Rayeen to 7685m at Terich Mir. The area of Terich Valley is 1275 km² with a total population of 32537 individuals. Rugged and uneven terrain characterizes the Valley. Temperature ranges from -12°C in winter to 30°C in summer. Phytogeographically, Terich Valley lies in Irano-Turanian floristic region. Floristically, Irano-Turanian region is luxuriant occupied 45.6% of the flora of Pakistan.Geo-climatically and ecologically, Terich Valley is characterized by dry temperate, alpine and sub-alpine type of vegetation. In the Valley, Terich Mir the highest peak (7685m) of the Hindukush range is followed by Saraghrar (7349m), Shakawar (7116m), Langar Peak (7100m) and many other peaks with low altitudes (Scott, 1986). The primary language in the valley is Khowar. There is no formal marketing of medicinal plants in this remote valley. Thus poor collectors have no share in high profit earning business.

Plant collection and identification

A detailed inventory of the ethno flora will be prepared through collection of plant specimens. Plant specimens will be hard-pressed and identified

following (Nasir and Ali, 1970-1989; Ali and Nasir, 1989-1991; Ali and Qaisar, 1993-2018). Ethnobotanical information's were collected through questionnaire and corner meetings by interviewing the local inhabitants.

The data was recorded on different ethno medicinal usage, e.g. Khowar name; parts used and use categories of individual species. The information thus obtained will be further processed for Family importance value (FIV) and Relative frequency citation (RFC) after (Ali *et al.*, 2018).The specimens will be deposited as a reference for future record in the Herbarium, Department of Botany, University of Peshawar.

Data analysis

Family Importance Value

Family importance value (FIV) was calculated as per following formula.

$$FIV = \frac{FC\,(Family)}{N} \times 100$$

FC = is the frequency of citation of the plant family while

N = is the total number of informants.

FIV = helps in the characterization of families according to the number of plants of a particular plant family utilized as medicine.

Relative Frequency of Citation (RFC)

The RFC was calculated as follows:

$$RFC = \frac{FC}{N} \qquad (0 < RFC < 1)$$

Where RFC stands for relative frequency of citation and its value is less than one and greater than zero, FC is the number of informants who declared the plant species and N is the total number of informants. RFC index reveals the indigenous status of each species.

Results

Ethnobotanical importance

During this ethnobotanical survey a total of 64 medicinal plant species belonging to 31 families and 56 genera were recorded.

Table 1. Ethnomedicinal uses of medicinally important vascular plantsof Terich Valley, Hindukush Range Chitral.

	Division/Family	Plant taxa	Habit	Voucher No.	Khowarname	Part used	C	RFC	FIV	Ethnomedicinal uses
	Gymnosperms									
	Cupperaceae	*Juniperusexelsa*M.B.	Tree	Zaman Bot.1 [PUP]	Sarooz	Fruits & leaves	16	0.110	11.03	Leaves are burnt with tobacco leaves to make snuff. Leaves and cone are used for abdominal disorders (lshkamaChomique).
	Ephedraceae	*Ephedra intermedia*Schrenk& Meyer	Shrub	Zaman Bot.2 [PUP]	Somani	Whole plant	12	0.082	8.27	The extract is made from the stem and is applied for dried skin, lips cracking, and stomach ache. Plant is extensively used in snuff preparation. Ripe fruits are boiled and used for Asthma and Tuberculosis.
	Angiosperms									
A.	Monocotyledons									
	Alliaceae	*Allium barszczewskii*Lipsky.	Herb	Zaman Bot.3 [PUP]	Kach	Leaves	8	0.055	5.51	Extract of leaves are used for gastro intestinal disorders especially stomachache.
	Poaceae	*Zea mays* L.	Herb	Zaman Bot.4 [PUP]	Juwari	Seeds	23	0.158	15.86	The seeds of maize are used as sources of food. The bread used for abdominal pain.
B.	Dicotyledons									
	Anacardiaceae	*Pistaciachinensis*Bunge subsp. *integerrima*(J.L. Stewart) Rech.f.	Tree	Zaman Bot.5 [PUP]	Kakkar	Galls	17	0.117	11.72	The galls are dried, grinded and paste is then fried in ghee and used for diarrhea, dysentery and constipation.
	Apiaceae	*Buniumpersicum*(Boiss.) Fedtsch.	Herb	Zaman Bot.6 [PUP]	Hojoj	Seeds	12	0.082	66.20	Seeds are used locally for zehch(dyspepsia), IshkamaChomique

									(abdominal pain) and gastric problems.
	Coriandrumsativum L.	Herb	Zaman Bot.7 [PUP]	Danu	Leaves & Fruits	16	0.110		Seeds are boiled and given to teenage girls with barley bread as sex suppressant. Fruits and leaves are used for cure gastric problems.
	Daucuscarota L.	Herb	Zaman Bot.8 [PUP]	Khesgoom	Roots	14	0.096		Extraction of roots given to the patient three times per day for IshkamaBandbika (abdominal obstruction) and vision problems.
	Foeniculumvulgare Mill.	Herb	Zaman Bot.9 [PUP]	Bodiyong	Leaves & Seeds	18	0.124		Leaves are used to control obesity and also used for abdominal pain and stomach burning. Seeds are used for Backache, Flues and Bronchitis.
	Ferula narthex Boiss.	Herb	Zaman Bot.10 [PUP]	Rau	Whole plant	10	0.068		Locally this species is used for cough, asthma, toothache and gastric problems.
	*Prangos pabularia*Lindl.	Herb	Zaman Bot.11 [PUP]	Moshain	Leaves & Seeds	12	0.082		Leaves and seeds are dried and powdered and are used in stomach disorders and for sting of scorpion.
	*Trachydiumroyeli*Lindi.	Herb	Zaman Bot.12 [PUP]	Mushyn	Leaves	14	0.096		Dry leaves are used for increasing production of milk and fat of cattle. While paste of crushed leaves are used for relieving sting of scorpion.
Asteraceae	*Artemisia parviflora*Roxb ex. D. Don	Herb	Zaman Bot.13 [PUP]	Kharkhalij	Seeds	18	0.124	74.48	A good recipe named kharkhalichough. It is good for abdominal pain, blood pressure, stomachache and especially for Nappy rash and anti-stutter
	*Artemisia scoparia*Waldst. & Kit.	Herb	Zaman Bot.14 [PUP]	Dron	Whole Plant	12	0.082		Extracted juice is used for intestinal worms (Ishkamogogh), face patches and abdominal pain
	Anthemiscotula L.	Herb	Zaman Bot.15 [PUP]	Sherisht	Flowers	16	0.110		Most effective for intestinal worms of children. Flowers are boiled in H_2O for 100°C and kept for half hour then used for gastrointestinal problems.
	*Cichoriunintybus*L.	Herb	Zaman Bot.16 [PUP]	Kasti	Roots	14	0.096		The roots are collected and boiled in water to make tea, which is orally taken to cure Niskamishti (typhoid), Malaria and abdominal pain.
	*Carthamustinctorus*L.	Herb	Zaman Bot.17 [PUP]	Poam	Flowers	8	0.055		The water extract of flower is aromatic and used in cough.
	Helianthus annus L.	Shrub	Zaman Bot.18 [PUP]	Yorotmokhno korak	Seeds	18	0.124		The extracted oil of seeds is used for relief of jaundice.
	*Matricariachamomilla*L.	Herb	Zaman Bot.19 [PUP]	Shirisht	Flowers	12	0.082		Flowers are boiled in water and used for various intestinal disorders.
	Seriphidiumbrevifolium (Wall. ex DC.) Ling & Y. R. Ling	Herb	Zaman Bot.20 [PUP]	Shashgeen	Shoot	10	0.068		Extraction of boiled shoot with water is used to cure gastric problems.
Berberidaceae	*Berberislycium*Royle.	Shrub	Zaman Bot.21 [PUP]	Chowenj	Fruits, roots & leaves	18	0.124	27.58	Root extraction is utilized for ulcer. While leaves and fruits used for backache, blood purifier, abdominal pain, chronic fever and urinary tract infection (UTI)
	Berberiscalliobotrys Aitch. Ex Koehne.	Shrub	Zaman Bot.22 [PUP]	Chowenj	Leaves & roots	22	0.151		Leaves are crushed and boiled in water then used for fever. Decoction of root bark is used as a gargle for pharynx problems. Juice from leaves and roots is given orally for treatment of dyspepsia, typhoid and fever.
Betulaceae	*Betulautilis*D. Don.	Tree	Zaman Bot.23 [PUP]	Bulli	Bark & leaves	14	0.096	9.65	Bark is used in the past time for making paper and leaves used as fodder for cattles which increase level of milk and also for stop bleeding.
Boraginiaceae	*Arnebiahispidisma*(Lehm.) A. DC	Herb	Zaman Bot.24 [PUP]	Phusuk	Roots	10	0.068	6.8	The roots are used as dyes for cloths and carpets made of wool. It is also used in toothache.
Brassicaceae	*Capsella bursa-pestoris* L.	Herb	Zaman Bot.25 [PUP]	Jalajali	Whole plant	15	0.103	19.3	Seeds are crushed and taken with water as diuretic. While the extract is used to

									cure injuries of the body.
	*Sisymbriumirio*L.	Herb	Zaman Bot.26 [PUP]	Khelikheli	Seeds	13	0.089		Decoction of seeds are used for KhuniPechis (bloody stool), Verenz (stabbing pain), Bukchomique (bronchitis) and Khodur (diarrhea)
Campanulaceae	*Codonopsisclematidea*(Schrenk) C.B. Clarke	Herb	Zaman Bot.27 [PUP]	Gundostak	Whole plant excluding roots	16	0.110	11.03	Leaves and stem are used locally for Indigestion and malarial fever. Urinary tract problems.
Capparidaceae	*Capparisspinosa*L.	Shrub	Zaman Bot.28 [PUP]	Kaveer	fruits & floral buds	12	0.082	8.27	Used for curing of Malaria, Niskamishti (typhoid) and abdominal pain.
Chenopodiaceae	*Chenopodiumbotrys* L.	Herb	Zaman Bot.29 [PUP]	Kunakh	Whole plant	6	0.041	25.5	Decoction of plant is used for intestinal disorders.
	*Chenopodiumfoliosum*Asch.	Herb	Zaman Bot.30 [PUP]	Darkunakh	Fruits	14	0.096		Berries are used for BukChomique(tonsillitis),abdominal pains, diuretic, eye problems, pimples and intestinal disorders.
	Chenopodiummurale L.	Herb	Zaman Bot.31 [PUP]	Pelileo march	Fruits	17	0.117		The ripe fruits are eaten raw for its taste; they are also used for eye infection.
Eleagnaceae	*Elaeagnusangustifolia* L.	Tree	Zaman Bot.32 [PUP]	Shinjoor	Fruits	14	0.096	24.8	The berries are edible and are used for asthma.
	*Hippophaerhamnoides*Rousi.	Tree	Zaman Bot.33 [PUP]	Mirghiz	Fruits	22	0.151		Berries are used for curing IshkamaChomique (abdominal pain) and Irritated eyes.
Hypericeaceae	*Hypericumperforatum* L.	Herb	Zaman Bot.34 [PUP]	Zerbali	Flowers	14	0.096	9.6	Petals (dried and make powdered) used as blood purifier. Dried powdered flowers are used for abdominal pain.
Junlandaceae	*Juglansregia* L.	Tree	Zaman Bot.35 [PUP]	Birmogh	Fruits and Bark	16	0.110	11.0	Dried fruits are mixed with coconut and honey and used as tonic. Bark is used for Tooth and gum diseases, Laxative and dye.
Lamiaceae	*Menthalongifolia* L.	Herb	Zaman Bot.36 [PUP]	Bhen	Roots	18	0.124	36.5	Roots are boiled in water to prepare herbal tea which is used to cure fever Zehch (dyspepsia) and indigestion.
	Menthaspicata L.	Herb	Zaman Bot.37 [PUP]	Podina	Leaves	16	0.110		Leaves act as paste, mixed with yoghurt and orally taken to treat diarrhea, blood pressure, cough, stomachache, asthma and headache.
	*Nepetacataria*L.	Herb	Zaman Bot.38 [PUP]	Mutrich	Leaves	14	0.096		Leaves stimulates sweating and useful in reducing fever. The herbal tea is also used to relieve Zahdan (Lumbago) andtoothache.
	Thymus serphyllum L.	Herb	Zaman Bot.39 [PUP]	Sewa	Shoots	5	0.034		Herbal tea from shoots prepared and drunk to reduce fever.
Moraceae	*Morus alba* L.	Tree	Zaman Bot.40 [PUP]	March	Fruits	18	0.124	22.0	Fruits are used for Zehchpayeni (jaundice), Verenz (stabbing pain) and urinary tract infection.
	*Morusnigra*L.	Tree	Zaman Bot.41 [PUP]	Giltikan	Fruits	14	0.096		Fruits are used in jaundice, dyspepsia and as a blood purifier.
Oleaceae	*Fraxinus xanthoxyloides*(G. DON) Wall.ex. DC	Tree	Zaman Bot.42 [PUP]	Toor	Bark	8	0.055	5.51	Decoction prepared from the bark of the stem is used to reduce high fever.
Papavaraceae	*Papaversomniferum*L.	Herb	Zaman Bot.43 [PUP]	Afyoun	Fruits	12	0.082	8.2	Opium is used for smoking and as drugs. It is also used as pain-killer.
Papilionaceae	*Astragalusamberstianus*Bth. ex. Royle.	Herb	Zaman Bot.44 [PUP]	Garmenzu	Roots	16	0.110	34.4	Roots are used as tooth brush for cleaning teeth and reduce toothache.
	Glycyrrhizaglabra(Waldst. & Kit.)	Herb	Zaman Bot.45 [PUP]	Moyo	Roots	18	0.124		The roots are boiled in water to form remedy and are given to children to eliminate intestinal worm and also used to cure cough in animals.
	*Sophoramollis*Royle	Shrub	Zaman Bot.46 [PUP]	Beshu	Branches & leaves	16	0.110		Oily substance from branches used externally on pimples, sun burn, swellings and wounds. While leaves decoction are used as pesticide, Eczema (Bichich) and

									green manuring
Plantaginaceae	*Plantagolanceolata*L.	Herb	Zaman Bot.47 [PUP]	Boiyekolegini	Seeds	14	0.096	9.6	Dried seeds are used with H_2O for relief of stomach from acidity, Ishkamabik (diarrhea),dysenteryandGarmi (fever).
Polygonaceae	*Polygonumpolyenmoroide* Wall.exMeisn.	Herb	Zaman Bot.48 [PUP]	Najukjoshu	Leaves	18	0.124	30.3	Leaves are cooked and eaten as a vegetable but most affective for digestive disorder.
	*Rheum webbianum*Royle.	Herb	Zaman Bot.49 [PUP]	Ishpar	Roots & Stem	14	0.096		Decoction of roots is used for constipation. The unripe stem is also eaten raw for its taste.
	*Rumexhastatus*D. Don	Herb	Zaman Bot.50 [PUP]	Sirkonzu	Leaves	12	0.082		Fresh leaves extraction is used for digestive disorders.
Ranunculaceae	*Delphinium nordhagenii*Wendelbo.	Herb	Zaman Bot.51 [PUP]	Jaghjoshu	Flowers & Roots	10	0.068	10.34	Flowers and roots are dried and powdered, mixed with mustard oil and used as a hair tonic for hair problems and dandruff.
	Clematis graveolens Lindl.	Shrub	Zaman Bot.52 [PUP]	Chuntruk	Flowers & Fruits	5	0.034		Used for dysentery, Bichich (eczema) and Ishkama Bik (diarrhea) locally.
Rosaceae	*Prunusdomestica*L.	Tree	Zaman Bot.53 [PUP]	Girvalogh	Leaves	16	0.110	44.8	Leaves are used to kill intestinal worms.
	Pyruscommunis L.	Tree	Zaman Bot.54 [PUP]	Tong	Stem & Leaves	14	0.096		Stem and leaves paste is boiled and used for relief of fever.
	*Maluspumilla*L.	Tree	Zaman Bot.55 [PUP]	Palogh	Fruits	10	0.068		Fruit is used as a good source of energy and to cure abdominal pain.
	*Crataegussongarica*C.Koch.	Tree	Zaman Bot.56 [PUP]	Goni	Fruits	12	0.082		Fruits are antiasthmatic, cough, cardio tonic and hypertensiveness.
	*Cotoneaster nummularia*Fish. &Mey	Shrub	Zaman Bot.57 [PUP]	Mikeen	Fruits	5	0.034		Berries are used as blood purifier.
	*Rosa brunonii*Lindl.,Ros. Monogr.	Shrub	Zaman Bot.58 [PUP]	Throni	Fruits	8	0.055		Fruits are dried and grinded a decoction is prepared then strained overnight to treat asthma.
Rubiaceae	*Galiumelegans*Wall.	Herb	Zaman Bot.59 [PUP]	Mattar	Whole plant	10	0.068	6.89	Juice (By pressing the plants in between the cloths) is extracted from the whole plant and is used for urinary tract problems.
Saxifragaceae	*Bergeniastracheyi*(Hook.f & Thorns.) Engl.	Shrub	Zaman Bot.60 [PUP]	Bisabur	Latex	11	0.075	18.6	Latex of the plant is directly applied for curing pimples on face.
	*Saxifragasibirica*L.	Tree	Zaman Bot.61 [PUP]	Dromosoru	Flowers & leaves	16	0.110		Flowers and leaves as tonic while decoction is used for backache.
Solanaceae	*Solanumnigrum*L.	Herb	Zaman Bot.62 [PUP]	Pirmilik	Fruits	18	0.124	12.4	Juice of fresh herb is used to control sore eyes and fever. The ripe fruits are applied to the skin to remove pimples.
Thymaliaceae	*Daphne mucronata*Royle.	Shrub	Zaman Bot.63 [PUP]	Lovomekin	Fruits	12	0.082	8.27	Fruits are dried, grind and then paste is used for removing of pimples and freckles on face.
Violaceae	*Viola rupestris*Schm.	Herb	Zaman Bot.64 [PUP]	Milkhon	Leaves	10	0.068	6.89	Leaves are dried, grinded and used for headache and fever locally.

Key:C: number of respondents citing the plant

RFC: relative Frequency of citation

FIV: family importance value.

In the context of ethno medicinal uses of plants, leaves were the most commonly used plant part, followed by fruits, roots, seeds, whole plant, flowers, bark, shoots, stem, latex, branches and galls respectively (Fig.3).

Based on habit of the plant species it clearly shows that herbs (61% sp.) is the most leading type of plants which have more utilization as a medicinal, Trees (22% sp.) is the second category while shrubs (17% sp.) is also used as a medicinal purpose for the curing of different ailements of humans in the valley (Fig. 4).

The local peoples of the valley have its own language called Khowar. The indeginous utility and medicinal value of these important medicinal plants were

tabulated according to its botanical name, family, voucher numbers, Khowar name, FIV, RFC and local use in the valley. Detailed ethnomedicinal uses of herbs, shrubs and trees reported from the native peoples of Terich valley are given (Table 1).

Family Importance Value (FIV)

The survey of medicinal vascular plant speciesshowed that there were 2 species (3.12%) ofgymnosperms with 2 families (6.45%), 2 monocotyledon (3.22%) with 2families (6.89%) and 60 dicotyledons (93.75%) with 27 families (87.09%).

Cupperaceae had the maximumFIV value (11.03) among Gymnosperms, Poaceae (15.86) among Monocotyledons, while Asteraceae (74.28), Apiaceae(66.20), Rosaceae (44.8), Lamiaceae (36.5), Papilionaceae(34.4), Chenopodiaceae (25.5) and Elegniaceae (24.8) had higher FIV among Dicotyledons (Table 1).

Relative Frequency of Citation (RFC)

The maximum RFC value were recorded for *Berberiscalliobotrys* (0.151) followed by*Pistaciachinensis* (0.117), *Glycyrrhizaglabra*, *Polygonumpolyenmoroide*, *Solanumnigrum*, *Morus alba*, *Menthalongifolia* (0.124 each), *Astragalusamberstianus*, *Sophoramollis*, *Saxifragasibirica*, *Juglansregia* and *Menthaspicata*with 0.110 each (Table 1).

Discussion

The present exploration of medicinal plants from Terich valley indicates that the native populations in the Terich valley are intensely dependent on the local medicinal flora for attaining basic life requirement such as medicines.

This can be described by a high percentage of uses of the local flora in the Terich valley, being very remote in nature with maximum of the native dwellers consuming small annual profits consequent after keeping livestock along with other restricted plant sources of income.

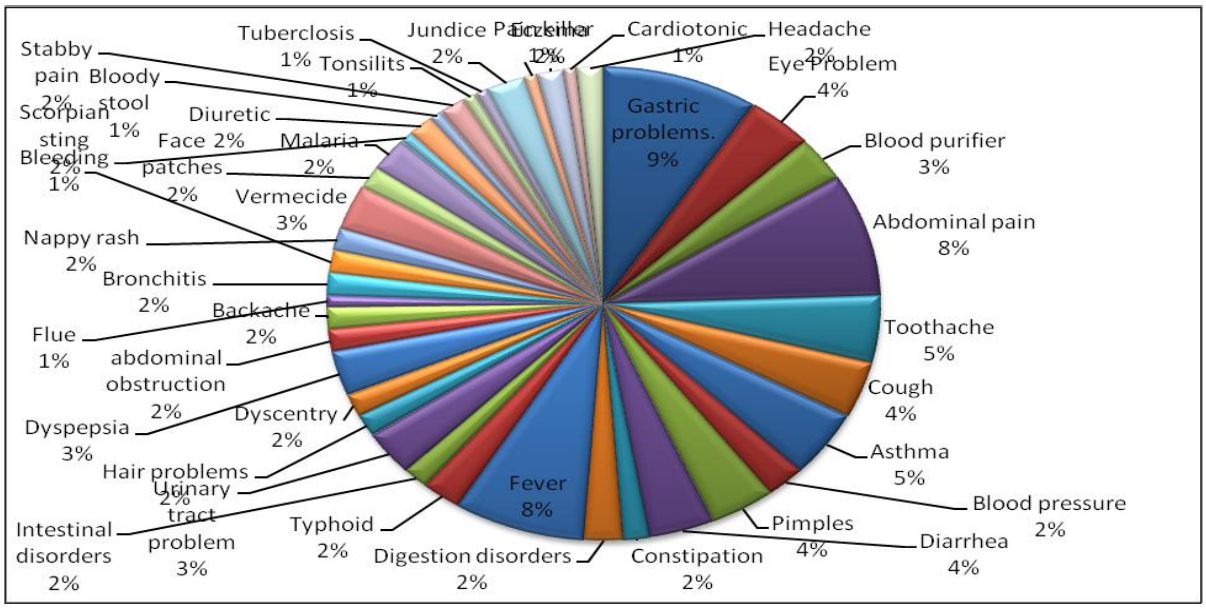

Fig. 2. Plants used and %age of each treatment.

The high ratio of medicinal plants used to maintain a local health system which is similar to the outcomes described by different ethnobotanists from other remote hilly areas of Chitral such as Birir, Bumburate, Shehekuh, Rumbur and Golin Gol (Khan *et al*., 2010), Booni and Mastuj, (Ali and Qaiser, 2009; Shah and Hussain, 2012) and Hadi*et al*., (2013) studied medicinal plants of Rech valley. Most of the species including *Buniumpersicum, Coriandrumsativum*, *Seriphidiumbrevifolium* and *ferula narthex* were used for Gastric problems; *Artemisia scoparia, Cichoriunintybus, Daucuscarota*, *Juniperusexelsa*

and *Zea mays* for abdominal pain disorder; *Berberislycium, Codonopsisclematidea, Menthalongifolia*, *Pyruscommunis*, *Viola rupestris, Solanumnigrum* and *Plantagolanceolata* used for curing high fever; *Crataegussongarica*, *Ephedra intermedia, Elaeagnusangustifolia, Menthaspicata* and *Rosa brunonii*as antiasthmatic; *Arnebiahispidisma, Astragalusamberstianus*and *Nepetacataria*to stop pain of teeth's (Fig. 2).

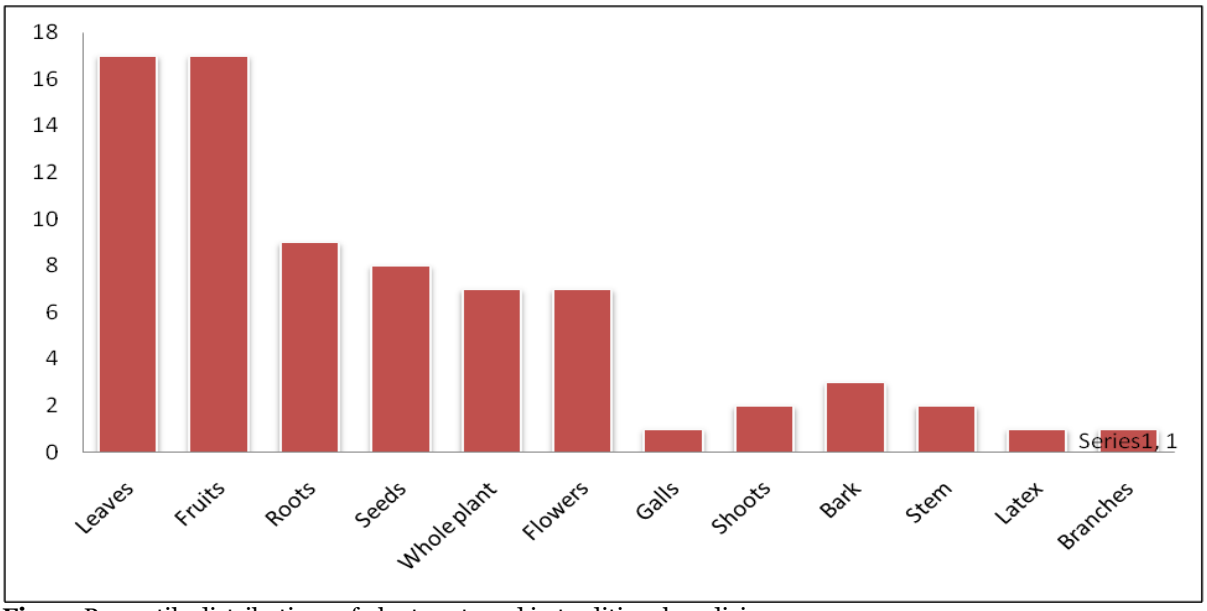

Fig. 3. Percentile distributions of plant part used in traditional medicine.

Due to the increase in populationrate more demands of pharmaceutical productions, however, medicinal flora have been severely exploitedfrom these hilly areas due to which the extinction of important medicinal plant species occurred. As a result of more exploitation, maximum number of desired therapeutic plant species which is only found at higher altitude containing peaks of hilly zones which are not accessible to the local peoples of the area. Due to rapid increasing of population in the Terich valley which leads to raise the stress on the ethnoflora, ensuing in the population rate as well as the numbers of medicinal plants decreasing. At higher altitude zones gujjars and nomads communities widely collected the medicinal plant species with a non-scientific way to increase their earnings.

They uprooted the whole medicinal plants instead of just gathering the specific part of the medicinal plant species.

There is no such work existing on the Terich valley but a very little indigenous information is present on the medicinal plants of Chitral. But in addition to over-collection, we recognized that deforestation, overgrazing and soil erosion are also causative aspects which are responsible for reduction in the medicinal and other economical plants in the valley.

In particular, overgrazing by the livestock's of the nomad communities of Terich valley were the mainagentsfor browsing and grazing on the medicinal plant species which leads to their possible extinction from the valley. Thus, effective planning and strategies for the protection of medicinal plants are immediately needed.

Similarly, the medicinal plants which are near to exploitation from an area is basically underground parts like rhizomes, roots, bulbs or corm are more endangered because the shoot/stem of the plant will be impotent to produce seeds and flowers and hence to propagate. Some plants in the valley are used for fodder or forage purposes which shows that the valley is well appropriate as a rangeland for livestock.

The valley has mountains which have poor vegetation and a moist and cold climate at upper elevation whereas drier/hotter situations occur at lesser altitude parts. Thus the valley does not livelihood cultivation very well and dependency on pastoralism is very common due to the mountainous topography. During the cold winter season, the nomad communities burn a large amount of fuel woods to heat both their animal shelters and homes.

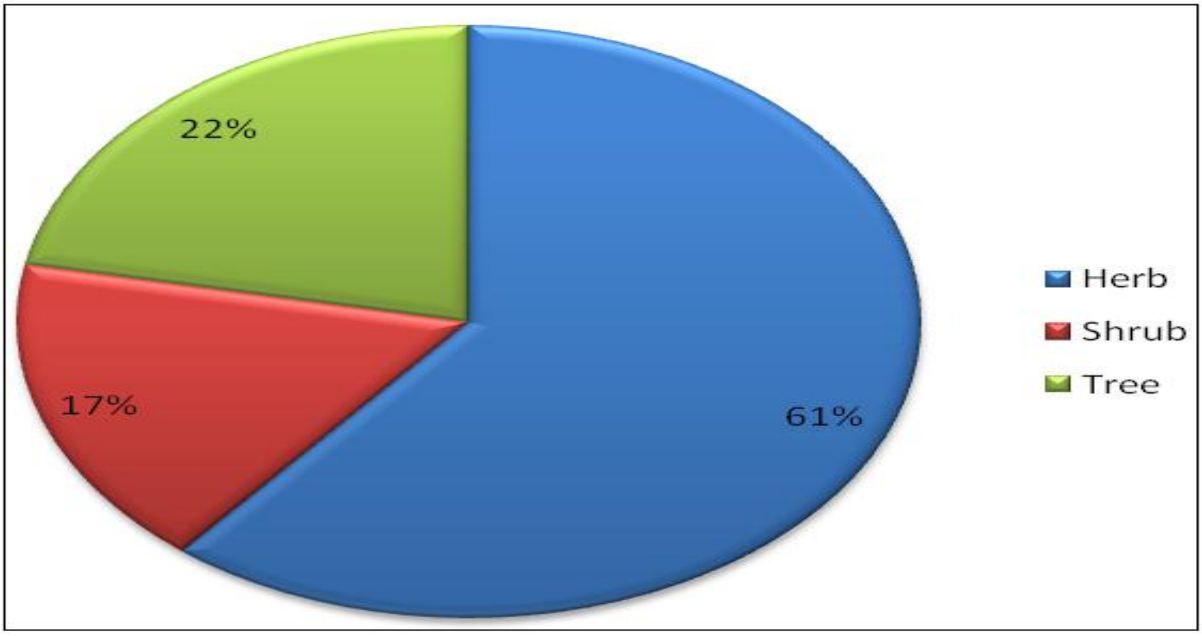

Fig. 4. No. of plant species on the basis of habit.

In combinations, overexploitation and heavy grazing for medicinal and fuel wood purposes have led to woodlands charming and degraded ecosystem. Another significant environmental problem in the valley is harvesting of wood for timber purposes which in turn results in the formation of unfertile areas. Interviews and Meetings with the local dwellers of the valley revealed the information's that indigenous knowledge was generally restricted to older folks and herbalist (traditional healer), with far less ethnobotanical knowledge amongst the younger generation. Moreover, the study outcomes disclosed that female informants had more ethnomedicinal knowledge as compared to the male informants. Similar findings were also described in Golin Gol Chitral (Khan *et al.*, 2010).

The potential for rapid loss of this ethno-medicinal knowledge, which is not being distributedin to future generation, combined with vegetation deterioration and habitat loss, e.g. through rapid overgrazing, means that there is a criticalprerequisite to report the whole of the ethnobotanical knowledge of Terich valley so that valuable and profitable species can be protected in their wild habitat and utilized for future generation, including for research purposes.

Conclusion

The present exploration of medicinal plants revealed that 64 ethnomedicinal plant species are present in Terich Valley, Hindu Kush Range, Chitral.

These plant species are used for treatment of humans and animals ailments through traditional ways.

It was concluded that over collection, over utilization, over exploitation, habitat loss, habitat degradation, deforestation, land use change, overharvesting, population explosion, introduction of alien invasive species and over grazing are the prominent biotic stresses which severely threatened the medicinal flora in the valley which affect the sustainable livelihood security of the local community and safety of the valley as well.

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