

An ethnomedicinal appraisal of the Kurram Agency, tribal area, Pakistan

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The present work was conducted at the Pakistan-Afghanistan border in the agency of Kurram (33° 49' 07" N and 70° 10' 24" E), an administrative part of the late federally administered tribal area (FATA) of Pakistan. Aim of the study was to document the medicinal flora based on local information, i.e., local classification, part used, drug preparation and dosage. Ethnomedicinal data was obtained through semi structured interviews after obtaining the respondents prior informed consent. During field visits 72 people were interviewed 150 plant species belonging to 131 genera in 86 families were documented. The documented plants were found to be effective for 64 disorders, from simple to complicated health issues. In a quantitative analysis, 31 plant species showed fidelity level ranges from 33-100% and relative frequency of citation from 0.03 to 0.28. Conservation issues related to plant use need to be investigated.

Keywords: Indigenous knowledge, Kurram agency, Medicinal plants, Pakistan, Tribal area

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Ethnobotanical research identifies the uses of plants and other associated knowledge in a particular society as well as the mechanisms of knowledge acquisition and transmission. It is the core of understanding traditional ecological knowledge, which now also includes an analysis of how this knowledge is adapted, linked, and transmitted through generation¹. Human beings use and have used plants to fulfill their day to day needs since the ages and traditional plant based remedies are often used as an alternative to allopathic medicines. Inhabitants of remote areas with little access to western medicinal facilities in particular, are assumed to have good knowledge about the utilization of plants. Local people often prefer medicinal plants due to their easy availability and low price as compared to costly pharmaceuticals². Over time local people have discovered the therapeutic activity of medicinal plants against certain diseases, knowledge is often passed orally to the next generation. Such knowledge has been a significant source of medical remedies³. Ethnobotanical studies cover a wide spectrum of complex relationships found between people and plants⁴ and the field of

ethnobotany has over the last decades shifted from mere documentation of knowledge to emphasizing on the sustainable use of local medicinal floras. However, even in the mountainous territories of Pakistan allopathic medicines are slowly substituting traditional plant based traditional preparations. Nevertheless, residents with limited access to medical technology and equipment may benefit from traditional remedies, which can form an effective indigenous healthcare system. Ethnobotanical research may be significant in revealing important traditional medicinal plant species, potentially leading to the discovery of new drugs and contributing to the local economy⁵. Pakistan has an altitude ranging from 0 to 8611 m, therefore, has a variety of climatic zones and a unique biodiversity. Six thousand species of higher plants are found in Pakistan, about 600 to 700 plant species (12%) are used medicinally^{6,7}. The flora of Kurram Agency was first studied under British rule by J E T Aitchison (1880), a Major of the Bengal Army. In the past 15 years the federally administered tribal area (FATA) of Pakistan have been exposed to diplomatic pressures and the activities of terror groups, making research difficult and dangerous.

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Material and Methods

Study area

The Kurram (33° 49' 07" N and 70° 10' 24" E) is an administrative part of federally administered tribal area (FATA) of Pakistan. It is located at the Pakistan-Afghan border and bordered by the Mountain system of Koh-e-Safed. It covers an area of 3,380 km² at the altitudinal range of 800-4755 m above sea level and exhibits varied topographic features. However, the study area can be divided into three regions, lower, central and upper Kurram (Fig. 1). The climate of Kurram varies with altitude and presents striking contrasts from sultry oppressive heat to bitter cold. January and February have generally heavy snowfall⁸. The principal mountain range locally called 'Speen Ghar' means the 'White Mountains'. It is famous as Koh-e-Safed in the country. It includes snow covered peaks and forms the catchment area for both bordered countries⁹. The highest peak is known as Sikaram Sar 4755 m. The melting snow of the catchment areas and 10 cold springs shape the Kurram river, the main water course for household use and irrigation. It is one of the major tributaries of the country's longest river Indus. The area does not have any permanent lakes but several ephemeral lakes locally known as 'Dand' found in the lower as well as in the upper Kurram. The current population of the region is

619553 according to the census 2017. Due to harsh sectarian terrorism and hostile border situations the native people are migrating to different parts of Pakistan¹⁰. Most of the population relies on livestock rearing, farming, overseas employment and local trading for their livelihoods. The major crops are rice, wheat, and corn. The staple food is the locally cultivated rice and cook a common traditional dish of it *Kurmiwaly-warzi*. The industrial and mineral sectors are disorganized. The people are Pashtun believed to have migrated from other parts of the world like Afghanistan, Iran, Iraq Turkey and central Asian countries. Therefore, they have different tribes and proudly speak and write their tribal name¹¹. The major tribes living in Kurram Agency are Turi, Bangash, Mangal, Ali sherzai, Masozai, Zuwimusht, Zazai, Ghilzai, Paracham kani, Afridi, Jadran, Manatwal, Kharooti, Muqbal and Syed. Floristically, the area is included in the Irano-Turanian (lower Kurram) and Sino Japanese regions¹² (Koh-e-Safed range, central and upper Kurram). The flora is diverse and considered as one of the zones of endemic species. Generally, the vegetation is dry temperate type and dominated with mesophytic plants¹³. The vegetation can be recognized in three layers, i.e., lower temperate, middle sub alpine and upper alpine.

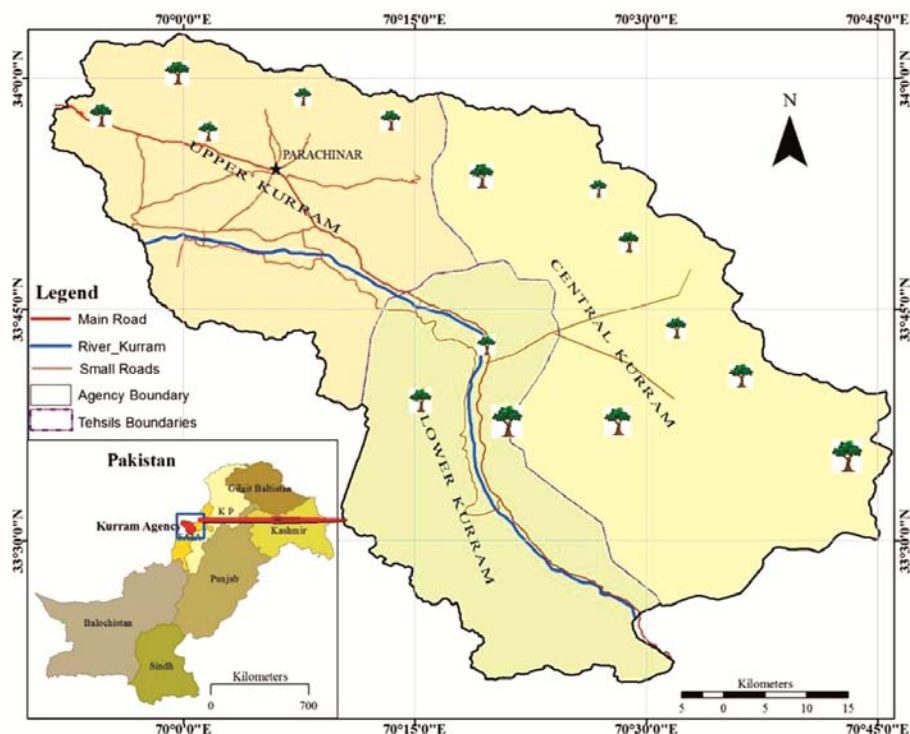


Fig. 1 — Map of the research area with visited location

Data collection

Ethnobotanical field trips were carried out to collect indigenous knowledge of medicinal plants during 2015-2016. Semi-structured interviews^{15,16} were conducted in 15 different localities of the study area. The inhabitants of these localities speak same language, i.e., Pashto, one of the largest language groups of the country, but ethnically the population is divided into local Pashtun tribes and migrants from Afghanistan, Iran, Iraq and Central Asian countries. The ethnic groups engaged in the study were Turi, Bangash, Mangal, Ali sherzai, Masozai, Zuwimusht, Zazai, Ghilzai, Paracham kani, Afridi, Jadran, Manatwal, Masozai, Kharooti, Muqbal and Syed (Table 1). During fieldwork 72 participants (37 men (51.38%), 20 women (27.77%) and 15 (20.83%) Hakeems (all men)) were interviewed (Table 2). In the interviews the lower number of participating women was a result of the strict code of honor of the local Pashtun society which prohibits to easily communicate with women. This was one of the hurdles in the research. Information about vernacular name, disease treated, part used, and drug preparation was recorded (Table 3). Most participants were farmers, livestock rearing and local traders.

Specimen identification and deposition

Plant specimens were collected and photographed, including flowers, fruits and habitat. Most of the species were identified by local names during the collection with the help of medicine men and the villagers. The scientific identification was carried out using the Flora of Pakistan^{21,22,23,24,25}, Flora Iranica²⁶ and a very old first taxonomic monograph of the

Kurram by Aitchison (1880)²⁷. The collected plants were tagged, pressed, dried and mounted on standard herbarium sheets and the voucher specimens are deposited at Hazara University Herbarium for further reference.

Data analysis

The collected data was tabulated using MS Excel and analyzed using descriptive statistics (percentage, family wise distribution, habit, flowering and fruiting dominance). The data were also analyzed using quantitative ethnobotanical tools, i.e., Relative frequency citations (RFCs) and Fidelity level (FL).

Relative frequency of citation (RFC)

Ethnomedicinal data was quantitatively analyzed using RFCs which indicated the local importance of medicinal species. The RFC was calculated using given formula^{17,18}.

$$RFC = FC/N \quad (0 < RFC < 1)$$

Where,

FC is the number of informants who reported the use of plant species

N is the total number of informants who participated in the survey

Table 2 — Age and gender characteristic of informants

Informants	Age group		Total interview
	<50	>50	
Male	20	17	37 51.38%
Female	12	8	20 27.77%
Hakeem	8	7	15 20.83%

Table 1 — Description of visited localities and Ethnic groups

Localities	Altitude (m)	Longitude	Latitude	Ethnic groups
Sadda Lower Kurram	1247	33°42'25	70°19'16	Bangash, Ali sherzai
Manato Central Kurram	1788	33°35'06	70°32'10	Zuwimusht, Manatwal
Murghan Central Kurram	2100	33°38'42	70°31'50	Ali sherzai, Afridi
Tarali Central Kurram	1582	33°44'41	70°24'32	Masozai
Awidara Central Kurram	2761	33°52'39	70°25'28	Parachamkani
Tari Mangal Upper Kurram	1244	33°57'20	69°53'52	Mengal, Kharooti, Jadran, Jaji
Daradar Upper Kurram	1788	33°54'43	70°19'48	Parachamkani, Mengal
Malana Upper Kurram	2748	33°56'50	70°06'19	Turi, Bangash, Syed
Gogani Central Kurram	1992	33°51'23	70°19'35	Parachamkani
Sikaram Upper Kurram	3709	33°59'43	69°56'34	Kharooti, Mengal
Kochi Lower Kurram	1337	33°42'26	70°18'01	Manatwal, Bangash
Pirqayum Lower Kurram	1243	33°41'58	70°20'26	Mengal, Muqbal
Pewar Tangi Upper Kurram	2358	33°58'05	69°56'36	Mengal
Sarkhawi Central Kurram	1991	33°37'51	70°24'18	Manatwal, zuwimusht
Gandaw Central Kurram	3046	33°54'01	70°29'24	Parachamkani

Table 3 — Medicinal plant species, Family, Habit, Part Used, local Name, Medicinal uses, Formulation of Drug, Rout of Administration, FC, RFCs, Ip, FL% of Kurram agency (tribal area) Pakistan

Family Botanical Name, Voucher #	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
Acanthaceae										
<i>Justicia adhatoda</i> L.; HUP-3294	S	Leaves	Shna Baza	diabetes	Dec	Oral	3	0.03	2	66.66
Adiantaceae										
<i>Adiantum venustum</i> D. Don.; HUP-746	H	Shoot	Sumbal	aphrodisiac, body cooling agent	Dec	Oral	7	0.08	6	85.71
Amaranthaceae										
<i>Amaranthus viridis</i> L.; HUP-5356	H	Leaves	Sarkoomal.	constipation	Dec	Oral	7	0.08	5	71.42
Amaryllidaceae										
<i>Allium griffithianum</i> Boiss.; HUP-0702	H	Whole plant	Payazaki	colic, vomiting	Fdu	Oral	14	0.17	12	85.71
<i>Allium jacquemontii</i> Kunth; HUP-3296	H	Rhizomes	Zangali Payaz	stomach disorder	Fdu	Oral	12	0.15	10	83.33
Anacardiaceae										
<i>Cotinus coggyria</i> Scop.; HUP-3309	S	Leaves	Gharanishawa	urinary tract infections, gastrointestinal, respiratory, disorders	Dec	Oral	10	0.12	8	80
<i>Pistacia atlantica</i> subsp. <i>cabulica</i> Rech. f.; HUP-3275	T	Fruits	Sheni	digestion	Fdu	Oral	13	0.16	10	76.92
Apiaceae										
<i>Eryngium coeruleum</i> M. Bieb.; HUP-3284	H	Roots	Condolla	appetite, digestion	Pow	Oral	2	0.02	2	100
Apocynaceae										
<i>Nerium oleander</i> L.; HUP-3267	S	Leaves	Gandderai	dental pain, skin diseases	Dec	Oral-Top	4	0.05	3	75
<i>Calotropis procera</i> (Aiton) W.T. Aiton; HUP-3300	S	Latex, Flowers	Spalmay	toothache, analgesic, antipyretic antidiarrheal, vermifuge	Dec	Top	17	0.21	14	82.35
<i>Caralluma tuberculata</i> N.E. Br.; HUP-3302	H	Whole plant	Famani	vermifuge, high blood pressure and diabetes	Fdu	Oral	23	0.28	20	86.95
<i>Periploca aphylla</i> Decne. ; HUP-3272	S	Stem, Bark, Latex	Barara	constipation, stomach, ulcers	Pow	Oral	14	0.17	12	85.71
Araceae										
<i>Arisaema jacquemontii</i> Blume; HUP-745	H	Tuber	Mangara Bar	stomachache	Pow	Oral	16	0.2	16	100
Araliaceae										
<i>Hedera nepalensis</i> K. Koch; HUP-5478	H	Leaves	Zangali Parwata	diabetes	Dec	Oral	3	0.03	3	100
Arecaceae										
<i>Nannorrhops ritchiana</i> (Griff.) Aitch.; HUP-3265	T	Leaves	Mazzari	carminative purgative	Dec	Oral	16	0.2	11	68.75
<i>Phoenix dactylifera</i> L. ; HUP-3273	T	Fruits, Leaves	Khajoor	constipation aphrodisiac tonic	Fdu	Oral	16	0.2	10	62.5
Asparagaceae										
<i>Polygonatum verticillatum</i> (L.) All.; HUP-3243	H	Rhizomes	Noor e Alam	joint pain	Dec	Oral	5	0.06	4	80
Asteraceae										
<i>Anthemis cotula</i> L.; HUP-3297	H	Flowers, Leaves	Spenaki	gastro-intestinal stomachache	Dec	Oral	3	0.03	3	100
<i>Artemisia absinthium</i> L.; HUP-734	H	Leaves	Mastyara	tonic, treat malaria	Pow	Oral	18	0.22	18	100

(Contd.)

Table 3 — Medicinal plant species, Family, Habit, Part Used, local Name, Medicinal uses, Formulation of Drug, Rout of Administration, FC, RFCs, Ip, FL% of Kurram agency (tribal area) Pakistan (Contd.)

Family Botanical Name, Voucher #	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
<i>Artemisia scoparia</i> Waldst & Kit.; HUP-0960	H	Stem, Leaves	Tarkhi Boti	stomachic, anthelmintic, purgative	Dec	Oral	12	0.15	9	75
<i>Artemisia vulgars</i> L.; HUP-1085	S	Leaves	Darlrang	vermifuge	Pow	Oral	10	0.12	7	70
<i>Carthamus oxyacantha</i> M. Bieb.; HUP-0982	H	Seeds	Spnazagai	jaundice. remove white spots of skin	Pow	Oral- Top	6	0.07	5	83.33
<i>Centaurea iberica</i> Trevir. ex Spreng.; HUP-3304	H	Leaves	Tar Panra	burns, skin rashes, eye vision defective lactation	Pst	Top- Oral	2	0.02	2	100
<i>Cichorium intybus</i> L.; HUP-3305	H	Whole plant	Sheen gulaki	typhoid and fever digestion	Dec	Oral	18	0.22	15	83.33
<i>Conyza canadensis</i> (L.) Cronquist; HUP-3308	H	Whole plant	Shenaki	homeostatic, stimulant, astringent, diuretic.	Pow	Oral	6	0.07	4	66.66
<i>Cousinia thomsonii</i> C. B. Clarke; HUP-3310	H	Roots	Khar	aphrodisiac	Dec	Oral	8	0.1	8	100
<i>Hertia intermedia</i> Kuntze; HUP-0855	S	Leaves, Flowers	Gango	cooling, acne	Pow	Oral	22	0.27	21	95.45
<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal; HUP-3260	Hs	Leaves	Sheen gulak	rheumatic diseaes	Dec	Oral	5	0.06	3	60
<i>Onopordum acanthium</i> L.; HUP-3269	H	Leaves, Roots	Okhanu Azghay	expectorant, diuretic, nervousness, tetanus, carcinomas, anti-asthmatic	Dec	Oral	8	0.1	7	87.5
<i>Seriphidium kurramense</i> (Qazilb.) Y. R. Ling; HUP-5460	S	Leaves	Tarkha	cough, vermifuge, malaria	Dec	Oral	25	0.31	20	80
<i>Sonchus asper</i> (L.) Hill; HUP-3258	H	Leaves	Katasari	wound healing	Pst	Top	5	0.06	5	100
<i>Taraxacum officinale</i> F.H. Wigg.; HUP-05327	H	Roots, Leaves	Ziargulac	gastrointestinal, liver function, diuretic, stimulant	Dec	Oral	6	0.07	6	100
<i>Xanthium strumarium</i> L.; HUP-1280	H	Roots, Flowers	Zagoki	malarial fever	Dec	Oral	9	0.11	7	77.77
Berberidaceae										
<i>Berberis lycium</i> Royle; HUP-5422	S	Fruits, Leaves	Ser Azghai	blood purification	Fdu	Oral	20	0.25	19	95
<i>Sinopodophyllum hexandrum</i> (Royle) T.S. Ying; HUP-3242	H	Rhizomes, Fruits	Gharanibad rang	anticancer	Fdu	Oral	12	0.15	12	100
Betulaceae										
<i>Betula utilis</i> D.Don. ; HUP-3299	T	Bark	Kharpata	earache. chronic wounds. jaundice.	Dec	Top- Oral	5	0.06	5	100
Bignoniaceae										
<i>Incarvillea emodi</i> Chatterjee; HUP-3266	H	Flowers, Leaves	Taro boti	Toothache	Pow	Oral	7	0.08	6	85.71
Boraginaceae										
<i>Onosma hispida</i> Wall. ex G. Don; HUP-0708	H	Roots	Azgheengu l	dandruff, coloring clothes	Pow	Top	6	0.07	4	66.66
<i>Trichodesma indicum</i> (L.) Lehm.; HUP-5330	H	Roots	Lasha Dar	kidney stones	Dec	Oral	4	0.05	3	75
Buxaceae										
<i>Buxus wallichiana</i> Baill; HUP-0706	S	Leaves	Shamshad	tonic, analgesic, purgative, diuretic, rheumatism	Dec	Oral	14	0.17	13	92.85

(Contd.)

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Family Botanical Name, Voucher #	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
Campanulaceae										
<i>Codonopsis clematidea</i> (Schrenk ex Fisch. & C.A. Mey.) C.B. Clarke ; HUP-3306	H	Roots	Lospikarboty	urinary tract problems, aphrodisiac	Dec	Oral	6	0.07	6	100
Canabinaceae										
<i>Cannabis sativa</i> L.; HUP-0697	H	Seeds, Leaves	Bang	stomach inflammation, sedative, anodyne, narcotic	Fdu	Oral	14	0.17	12	85.71
Cannabaceae										
<i>Celtis australis</i> L.; HUP-5344	T	Fruits	Tagha	tonic, blood purifier	Fdu	Oral	7	0.08	7	100
Capparaceae										
<i>Capparis cartilaginea</i> Decne.; HUP-3301	S	Latex, Leaves	Spalmaka	toothache, asthma	Smok	Top	5	0.06	3	60
Caprifoliaceae										
<i>Lonicera heterophylla</i> Decne. ; HUP-5363	S	Flowers, Stem	Kherawa	inhibits ascites, carcinoma, sarcoma	Dec	Oral-Top	6	0.07	5	83.33
<i>Scabiosa olivieri</i> Coult.; HUP-3253	H	Whole plant	Nari Sahra Buti	tonic	Pow	Oral	9	0.11	7	77.77
<i>Valeriana jatamansi</i> Jones ; HUP-5403	H	Rhizomes	Makhkak	perfume	Pow	Top	5	0.06	4	80
Caryophyllaceae										
<i>Silene conoidea</i> L.; HUP-3255	H	Flowers	Naroki	respiratory infections	Smel	Top	7	0.08	7	100
<i>Silene vulgaris</i> (Moench) Garcke; HUP-0931	H	Leaves, Flowers	Naroki	stomach disorder	Dec	Oral	6	0.07	5	83.33
Celastraceae										
<i>Gymnosporia royleana</i> Wall. ex M.A. Lawson; HUP-5333	S	Stem, Leaves	Taro Boti	toothache	Dec	Oral	3	0.03	2	66.66
Colchicaceae										
<i>Colchicum atchisonii</i> (Hook. f.) Nasir; HUP-3307	H	Rhizomes	Spargha	bodypain	Fdu	Oral	8	0.1	5	62.5
Convolvulaceae										
<i>Convolvulus arvensis</i> L.; HUP-1086	H	Flowers	Parwata	constipation	Dec	Oral	7	0.08	6	85.71
<i>Cuscuta reflexa</i> Roxb.; HUP-3311	P	Stem, Seeds	Zairawali	wounds, skin infection	Pst	Top	6	0.07	5	83.33
Crassulaceae										
<i>Sedum ewersii</i> Ledeb.; HUP-0889	H	Flowers, Leaves	Sabo gul	gastrointestinal	Dec	Oral	7	0.08	6	85.71
Cyperaceae										
<i>Cyperus difformis</i> L.; HUP-3277	H	Rhizomes	Sholo Della	constipation, dysentery, abdominal distention	Pow	Oral	6	0.07	5	83.33
<i>Cyperus rotundus</i> L.; HUP-3278	H	Rhizomes	Sholo Della	respiratory infection	Pow	Oral	3	0.03	1	33.33
Ebenaceae										
<i>Diospyros lotus</i> L.; HUP-5404	T	Fruits	Tor Amlook	purgative and laxative agent	Fdu	Oral	14	0.17	12	85.71
Elaeagnaceae										
<i>Elaeagnus angustifolia</i> L.; HUP-3283	T	Fruits	Senzala	cough, bronchial infections	Fdu	Ora	12	0.15	10	83.33
Ephedraceae										
<i>Ephedra gerardiana</i> Wall ex. Stapf.; HUP-0848	S	Whole plant	Muawa	aching backs	Dec	Top	22	0.27	18	81.81

(Contd.)

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Family Botanical Name, Voucher #	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
Ericaceae										
<i>Rhododendron afghanicum</i> Aitch. & Hemsl.; HUP-0832	S	Leaves, Flowers	Lewani	acute rhinitis	Pow	Inf	23	0.28	21	91.30
<i>Rhododendron collettianum</i> Aitch. & Hemsl.; HUP-3248	S	Leaves, Flowers	Khakhu	stomach disorder	Fdu	Oral	25	0.31	22	88
Euphorbiaceae										
<i>Euphorbia helioscopia</i> L.; HUP-1087	H	Leaves, Latex	Peshkhuty	constipation	Pow	Oral	7	0.08	5	71.42
Fabaceae										
<i>Acacia modesta</i> Wall.; HUP-752	T	Gum	Palosa	backache	Pow	Oral	12	0.15	12	100
<i>Acacia nilotica</i> (L.) Willd. ex Delile; HUP-5345	T	Whole plant	FarmyKikar	aphrodisiac, anti-asthmatic, antipyretic	Pst	Oral	9	0.11	7	77.77
<i>Albizia lebbbeck</i> (L.) Bth.; HUP-396	T	Seeds, Fruits	Sarkarikikar	cough	Dec	oral	12	0.15	11	91.66
<i>Prosopis juliflora</i> (Sw.) DC.; HUP-3246	T	Gum	Kikar	colds, diarrhea, dysentery, sore throat, wound healing	Pow	Oral	2	0.02	2	100
<i>Dalbergia sissoo</i> Roxb. ex DC.; HUP-3279	T	Bark, Leaves	Shawa	expectorant	Dec	Oral	4	0.05	4	100
<i>Ebenus stellata</i> Boiss.; HUP-711	S	Leaves		gastrointestinal	Fdu	Oral	12	0.15	11	91.66
<i>Sophora mollis</i> (Royle) Baker; HUP-5429	S	Leaves, Bark	Ghujira	skin allergies, antiseptic	Pst	Top	8	0.1	7	87.5
<i>Vicia sativa</i> L.; HUP-0698	H	Whole plant	ZangaliMat or	dandruff	Dec	Top	9	0.11	8	88.88
<i>Quercus baloot</i> Griff.; HUP-5457	T	Seeds	Speracheri	joint pain	SRF	Oral	11	0.13	11	100
<i>Quercus incana</i> W. Bartram; HUP-0857	T	Bark	Cheri	tonsillitis, diarrhea, dysentery	Dec	Oral	6	0.07	6	100
Geraniaceae										
<i>Geranium wallichianum</i> D. Don ex Sweet; HUP-5453	H	Roots, Leaves		vision problem	Pow	Oral	5	0.06	5	100
Hamamelidaceae										
<i>Parrotiopsis jacquemontiana</i> (Decne.) Rehder; HUP-5420	T	Leaves	Pecho	stomachache	Fdu	Oral	8	0.1	7	87.5
Iridaceae										
<i>Iris lacteal</i> Pall.; HUP-3292	H	Leaves	Sahragul	swelling	Dec	Oral	2	0.02	2	100
Ixiolirionaceae										
<i>Ixioliriontataricum</i> (Pall.) Herb.; HUP-3293	H	Leaves, Seeds	Tatarigul	chest pain	Pst	Oral	11	0.13	7	63.63
Juglandaceae										
<i>Juglans regia</i> L.; HUP-0940	T	Seeds, Roots	Ghawz	toothache, brain and heart tonic	Fdu	Top-Oral	18	0.22	14	77.77
Lamiaceae										
<i>Otostegia limbata</i> (Benth.) Boiss; HUP-3270	S	Leaves, Flowers	Speenazghai	wounds, sore throat,	Pst	Top	4	0.05	3	75
<i>Perovskia abrotanoides</i> Kar.; HUP-0901	S	Leaves, Flowers	Sansoobi	cooling effect	Dec	Oral	12	0.15	9	75
<i>Ajuga bracteosa</i> Wall. ex. Benth; HUP-5347	H	Leaves	Khawag-boti	blood purifier, fever	Dec	Oral	15	0.18	14	93.33
<i>Mentha longifolia</i> (L.) L.; HUP-3262	H	Leaves	Venalai	gastrointestinal, carminative	Dec	Oral	16	0.2	12	75

(Contd.)

Table 3 — Medicinal plant species, Family, Habit, Part Used, local Name, Medicinal uses, Formulation of Drug, Rout of Administration, FC, RFCs, Ip, FL% of Kurram agency (tribal area) Pakistan (Contd.)

Family	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
Botanical Name, Voucher #										
<i>Micromeria biflora</i> (Buch. -Ham. ex D. Don) Benth.; HUP-3263	H	Shoot	Narai Shamakay	toothache	Fdu	Top	12	0.15	12	100
<i>Scutellari abarbata</i> D. Don; HUP-3254	H	Flowers		anti-cancer, anti-inflammatory, antispasmodic	Pow	Oral	5	0.06	4	80
<i>Thymus linearis</i> Benth; HUP-5474	H	Leaves	Marwezi	asthma, toothache, digestive disorder	Fdp	Oral	9	0.11	7	77.77
<i>Vitex negundo</i> L.; HUP-5339	S	Leaves, Stems, Seeds	Marmandi	jaundice, kidney problems	Fdu	Oral	5	0.06	5	100
Liliaceae										
<i>Fritillaria roylei</i> Hook.; HUP-3289	H	Bulb		tuberculosis, asthma	Pow	Oral	16	0.2	12	75
<i>Lilium polyphyllum</i> D. Don; HUP-0841	H	Bulb		expectorant, diuretic, antipyretic, tonic	Pow	Oral	6	0.07	5	83.33
<i>Tulipa clusiana</i> Redouté; HUP-0942	H	Tuber, Flowers	Spargha	relief iching	Fdu	Top	13	0.16	13	100
<i>Linum corymbulosum</i> Rehb.; HUP-3261	S	Leaves		diabetes, cancer	Dec	Oral	3	0.03	2	66.66
Lythraceae										
<i>Punica granatum</i> L.; HUP-5380	T	Bark	Worang	vermifuge, blood pressure	Dec	Oral	12	0.15	10	83.33
Malvaceae										
<i>Malva neglecta</i> Wallr. ; HUP-5359	H	Whole plant	Tikali	kidney stones	Dec	Oral	8	0.1	7	87.5
Meliaceae										
<i>Melia azedarach</i> L.; HUP-5370	T	Whole Plant	Bakanra	diabetes, gastrointestinal, anthelmintic	Pow	Oral	12	0.15	10	83.33
Moraceae										
<i>Ficus carica</i> L.; HUP-3287	T	Fruits	Anzar	constipation. foot-ache	Fdu	Oral	12	0.15	11	91.66
<i>Ficus religiosa</i> L.; HUP-3288	T	Fruits	Anzar	diarrhea, dysentery, anti-bacterial, cooling, astringent	Fdu	Oral	11	0.13	9	81.81
<i>Morus alba</i> L. HUP-690	T	Fruits	Baidana toot	laxative	Fdu	Oral	5	0.06	4	80
<i>Morus nigra</i> L.; HUP-1082	T	Fruits	Toot	expectorant	Fdu	Oral	5	0.06	4	80
Myrtaceae										
<i>Eucalyptus globulus</i> Labill.; HUP-3285	T	Leaves	Lachi	antibacterial for wounds	Pow	Oral	3	0.03	2	66.66
Nitrariaceae										
<i>Peganum harmala</i> L.; HUP-5358	H	Leaves, Seeds	Spelani	inflammation, intestinal worms, measles treatment, anti-lice shampoo	Pow	Top	13	0.16	11	84.61
Oleaceae										
<i>Jasminum humile</i> L.; HUP-5399	S	Flowers, Roots,	Zeerchambe li	pimples	Pst	Top	12	0.15	10	83.33
<i>Jasminum officinale</i> L. ; HUP-1084	S	Whole plant	Chumbeli	kidney stones	Dec	Oral	7	0.08	6	85.71
<i>Olea europaea</i> L.; HUP-3268	T	Fruits	Khuna	anthelmintic, anti-diabetic, toothache	Fdu	Oral	5	0.06	3	60
<i>Olea ferruginea</i> Royle; HUP-5416	T	Fruits, Leaves	Khawwan	toothache, rheumatism	Dec	Oral	7	0.08	5	71.42

(Contd.)

Table 3 — Medicinal plant species, Family, Habit, Part Used, local Name, Medicinal uses, Formulation of Drug, Rout of Administration, FC, RFCs, Ip, FL% of Kurram agency (tribal area) Pakistan (Contd.)

Family Botanical Name, Voucher #	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
Oxalidaceae										
<i>Oxalis corniculata</i> L.; HUP-0699	H	Leaves	Tarwoky	appetizer, prevent tooth sensitivity, indigestion	Fdu	Oral	6	0.07	4	66.66
Papaveraceae										
<i>Fumaria indica</i> Pugsley; HUP-3299	H	Whole plant		constipation	Dec	Oral	13	0.16	11	84.61
<i>Papaver dubium</i> L.; HUP-5423	H	Seeds, Flowers	ZangaliDuda	skin problems, weak memory	Dec	Oral	7	0.08	5	71.42
<i>Papaver somniferum</i> L.; HUP-3271	H	Seeds	Dooda	sedative, astringent, expectorant, diaphoretic, antispasmodic, cough	Dec	Oral	5	0.06	5	100
Pinaceae										
<i>Abies pindrow</i> (Royle ex D. Don) Royle; HUP-0893	T	Bark	Bejoor	asthma	Dec	Oral	8	0.1	6	75
<i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don; HUP-3303	T	Branches, Leaves	Sraff	skin diseases	Pow	Top	3	0.03	3	100
<i>Pinus roxburghii</i> Sarg.; HUP-3274	T	Leaves, Bark	Nakthar	toothache, diarrhea	Dec	Oral	5	0.06	4	80
Plantaginaceae										
<i>Plantago major</i> L.; HUP-3276	H	Leaves, Seeds	Ghawyazaba	diuretic, dysentery	Dec	Oral	12	0.15	12	100
Platanaceae										
<i>Platanus orientalis</i> L.; HUP-3241	T	Whole plant	Chenar	dysentery	Pow	Oral	2	0.02	2	100
Poaceae										
<i>Cynodon dactylon</i> var. <i>coursii</i> (A. Camus) J.R. Harlan & de Wet; HUP-3312	H	Whole plant	Wakha	bleeding wounds, diarrhea	Pst	Top-Oral	5	0.06	5	100
<i>Imperata cylindrica</i> (L.) Raeusch.; HUP-3291	H	Leaves	Dripanri	diabetes, cardiac disorder, inflammation	Dec	Oral	5	0.06	4	80
<i>Puccinellia tenuiflora</i> (Griseb.) Scribn. & Merr.; HUP-3247	H	Leaves	Nariwakha	Stomachache	Pow	Oral	12	0.15	7	58.33
<i>Saccharum spontaneum</i> L.; HUP-3250	H	Leaves	Shar	fodder	Fdu	Oral	5	0.06	4	80
Polygalaceae										
<i>Polygala abyssinica</i> R.Br. ex Fresen.; HUP-5307	H	Roots		Snakebite	Pst	Top	12	0.15	12	100
Primulaceae										
<i>Myrsine africana</i> L.; HUP-5381	S	Leaves, Fruits		asthma, colic	Pow	Oral	4	0.05	3	75
<i>Primula denticulata</i> Sm.; HUP-3245	H	Rhizomes	Mamera	arsenic for cleaning eyes to sharpen eyesight.	Pow	Top	8	0.1	7	87.5
<i>Primula macrophylla</i> D. Don.; HUP-0821	H	Whole plant	Mamera	vision	Pow	Top	4	0.05	2	50
Ranunculaceae										
<i>Delphinium vestitum</i> Wall. ex Royle; HUP-3282	H	Whole plant		body swelling, wound	Pst	Top	16	0.2	14	87.5
Rhamnaceae										
<i>Sageretia thea</i> (Osbeck) M.C. Johnst.; HUP-3251	S	Fruits, Roots	Mamoti	cooling agent for jaundice	Dec	Oral	7	0.08	3	42.85

(Contd.)

Table 3 — Medicinal plant species, Family, Habit, Part Used, local Name, Medicinal uses, Formulation of Drug, Rout of Administration, FC, RFCs, Ip, FL% of Kurram agency (tribal area) Pakistan (Contd.)

Family Botanical Name, Voucher #	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
Rosaceae										
<i>Cotoneaster nummularioides</i> Pojark.; HUP-754	S	Whole Plant	Kherawa	vermifuge	Pow	Top	7	0.08	6	85.71
<i>Prunus armeniaca</i> L.; HUP-730	T	Fruits, Leaves, Seeds	Mandata	tonic, stomachache	Fdu	Oral	11	0.13	9	81.81
<i>Prunus dulcis</i> (Mill.) D. A. Webb.; HUP-5351	T	Seeds,	ZngaliBada m	brain tonic	Dec	Oral	15	0.18	4	26.66
<i>Rosa canina</i> L.; HUP-5454	S	Seeds, Flowers	Zangaligula b	carminative, diuretic, laxative	Pow	Oral	6	0.07	4	66.66
<i>Rosa webbiana</i> Wall ex Royle; HUP-3249	S	Leaves, Fruits	Zangali Gul	asthma.	Dec	Oral	7	0.08	5	71.42
Salicaceae										
<i>Populus alba</i> L.; HUP-3244	T	Leaves, Bark	Spidar	hip pains, joint pains.	Pst	Top	7	0.08	5	71.42
<i>Salix excelsa</i> S.G. Gmel.; HUP- 3252	T	Bark	Wala	pain-, fever- anti- inflammatory	Dec	Oral	8	0.1	7	87.5
Santalaceae										
<i>Viscum album</i> L.; HUP-5415	P	Leaves,	Spin khuna	blood pressure headache, epilepsy, hyperactivity, anti-diabetic	Dec	Oral	4	0.05	4	100
Sapindaceae										
<i>Dodonaea viscosaj</i> Jacq.; HUP-0705	S	Leaves, Roots	Zirawoni	fractures, rheumatism, aphrodisiac	Pst	Top- Oral	15	0.18	11	73.33
Sapotaceae										
<i>Monothec abuxifolia</i> (Falc.) A. DC.; HUP-3264	T	Fruits	Gurgura	blood purifier, anthelmintic,	Fdu	Oral	12	0.15	11	91.66
Saxifragaceae										
<i>Bergenia ciliata</i> Sternb.; HUP- 3298	H	Roots, Leaves	Qamar gul	liver, kidney stones	Dec	Oral	12	0.15	12	100
Scrophulariaceae										
<i>Buddleja crispa</i> Benth.; HUP-0935	S	Leaves	Spercho	vermifuge	Fdu	Oral	6	0.07	4	66.66
<i>Verbascum thapsus</i> L.; HUP-0850	H	Leave	Kharghugi	bronchitis, asthma, diarrhea	Pow	Oral	8	0.1	6	75
Simaroubaceae										
<i>Ailanthus altissima</i> (Mill.) Swingle.; HUP-3295	T	Wood, Leaves,	Lantus	wound healing	Pst	Top	9	0.11	8	88.88
Solanaceae										
<i>Atropa acuminata</i> Royle ex Lindl.; HUP-0958	H	Whole plant	Barkag	analgesic, mydriatic, narcotic, sedative, antispasmodic	Pow	Oral	9	0.11	7	77.77
<i>Datura stramonium</i> L.; HUP-3281	H	Seeds	Bhatura	boils, narcotic, anodyne, gonorrhea, hydrophobia, earache, skin diseases	Dec	Oral	15	0.18	12	80
<i>Solanum nigrum</i> var. <i>villosum</i> L.; HUP-3257	H	Fruits	Meko	skin diseases	Fdu	Top	5	0.06	4	80
<i>Solanum surattense</i> Burm. f.; HUP-3256	H	Roots, Leaves	Maraghunri	cough, asthma. rheumatism, sore throat	Dec	Oral	6	0.07	4	66.66
<i>Withania coagulans</i> (Stocks) Dunal; HUP-0707	S	Seeds	Khapyanga	chronic complaints of liver	Dec	Oral	22	0.27	20	90.90

(Contd.)

Table 3 — Medicinal plant species, Family, Habit, Part Used, local Name, Medicinal uses, Formulation of Drug, Rout of Administration, FC, RFCs, Ip, FL% of Kurram agency (tribal area) Pakistan (Contd.)

Family Botanical Name, Voucher #	Habit	Part(s) Used	Local Name	Medicinal uses	Crude drug	Drug route	FC	RFCs	Ip	FL %
<i>Withania somnifera</i> (L.) Dunal; HUP-1281	H	Leaves, Seeds	Kapyanga	kidney stones	Dec	Oral	16	0.2	16	100
Thymelaeaceae										
<i>Daphne mucronata</i> Royle; HUP-3289	S	Bark, Leaves	Laghuni	wound healing, bone diseases, washing hair	Dec	Oral	17	0.21	12	70.58
Typhaceae										
<i>Typha angustata</i> Borry. & Chaub.; HUP-1285	H	Leaves	Dellai	diuretic, haemostatic, wounds	Pow	Oral	6	0.07	5	83.33
<i>Typha latifolia</i> L.; HUP-1284	H	Leaves	Dellai	diarrhea	Pow	Oral	9	0.11	7	77.77
Urticaceae										
<i>Urtica dioica</i> L.; HUP-3329	H	Whole plant	Sizawonki	astringent and anthelmintic	Dec	Oral	6	0.07	4	66.66
Verbenaceae										
<i>Lantana camara</i> L.; HUP-3259	S	Leaves, Fruits		tetanus, malaria, inflammation and rheumatism.	Inf	Top	4	0.05	2	50
Viburnaceae										
<i>Viburnum cotinifolium</i> D. Don ; HUP-5482	S	Flowers, Leaves	Zarlakhta	sedative, astringent	Pow	Oral	6	0.07	4	66.66
Violaceae										
<i>Viola biflora</i> L.; HUP-1283	H	Whole plant	Bilamshah	aphrodisiac, leucorrhoea	Fdu	Oral	6	0.07	5	83.33
Vitaceae										
<i>Vitis vinifera</i> L.; HUP-1282	S	Fruits, Leaves	Angoor	liver disorders, diabetes	Raw	Oral	8	0.11	7	87.5
Zygophyllaceae										
<i>Fagonia cretica</i> L.; HUP-3286	H	Whole plant	Spinazghay	astringent, febrifuge	Dec	Oral	15	0.18	13	86.66

High RFC value indicates the prominence of a plant species among the informants. The RFC value may be 1 for a given plant species if informants report the plant species as useful and the RFC value could be 0 if nobody mentions the use of plant species¹⁹.

Fidelity level (FL)

The Fidelity level (FL) is used to indicate the plant species more ideal for the treatment of specific ailment¹⁵. FL was calculated using following formula²⁰.

$$FL = Ip/Iu \times 100$$

Where,

Ip shows the number of informants mentioning the use of plant species for a particular disease category

Iu shows the number of informants citing the usage of that plant species for any disease category

The high value of FL shows the importance of particular plant species over other plants for the treatment of specific disease as high value confirms the high frequency of plant usage against a particular

disease. The low value of FL shows the use of plant species for different medicinal purposes and it confirms its low frequency usage against a particular disease by the informants of the study area.

Results and discussion

A total of 150 species belonging to 131 genera and 86 families were found to be useful for the treatment of various ailments. The plant species were described with their family, habit, part used local name and medicinal uses. Asteraceae was the dominant family (16 species, 18.60%), followed by Solanaceae (6, 6.97%), Lamiaceae and Rosaceae contributed (5, 5.88%) each, while the remaining families were less than 4 species (Table 4). In term of habit utilization herbaceous plants were leading group with 77 species (52%) followed by shrub 36 (24%) and trees 35 (23%), while parasite contributed 2 (1%) only (Fig. 2). Research area and some details of important species are given in Fig. 3-6.

Leaves were the dominant plant part utilized, with 75 species (35.71%), followed by fruits 22 (10.47%),

Table 4 — Family-wise distribution of medicinal species

Family	Medicinal species	Family	Family	Family	Medicinal species
Asteraceae	16	Scrophulariaceae	2	Juglandaceae	1
Fabaceae	8	Typhaceae	2	Linaceae	1
Lamiaceae	8	Acanthaceae	1	Lythraceae	1
Solanaceae	6	Adiantaceae	1	Malvaceae	1
Rosaceae	5	Amaranthaceae	1	Meliaceae	1
Apocynaceae	4	Apiaceae	1	Myrtaceae	1
Moraceae	4	Araceae	1	Nitrariaceae	1
Oleaceae	4	Araliaceae	1	Oxalidaceae	1
Poaceae	4	Asparagaceae	1	Plantaginaceae	1
Bignoniaceae	3	Betulaceae	1	Platanaceae	1
Caprifoliaceae	3	Buxaceae	1	Polygalaceae	1
Liliaceae	3	Campanulaceae	1	Ranunculaceae	1
Papaveraceae	3	Canabaceae	1	Rhamnaceae	1
Pinaceae	3	Capparaceae	1	Santalaceae	1
Primulaceae	3	Celastraceae	1	Sapindaceae	1
Amaryllidaceae	2	Colchicaceae	1	Sapotaceae	1
Anacardiaceae	2	Crassulaceae	1	Saxifragaceae	1
Arecaceae	2	Ebenaceae	1	Simaroubaceae	1
Berberidaceae	2	Elaeagnaceae	1	Thymelaeaceae	1
Caryophyllaceae	2	Ephedraceae	1	Urticaceae	1
Convolvulaceae	2	Euphorbiaceae	1	Verbenaceae	1
Cyperaceae	2	Geraniaceae	1	Viburnaceae	1
Ericaceae	2	Hamamelidaceae	1	Violaceae	1
Fagaceae	2	Iridaceae	1	Vitaceae	1
Salicaceae	2	Ixiolirionaceae	1	Zygophyllaceae	1

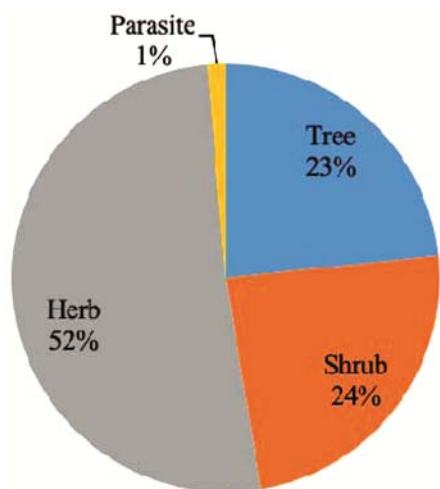


Fig. 2 — Life forms of medicinal flora

whole plants 21 (10%), flowers 20 (9.52%), seeds 18 (8.57%), roots 16 (7.61%); while the remaining parts were less than 11 (5.23%) (Table 5). The plants were used for curing more than 64 diseases ranging from simple stomach-ache to more complicated health problems including skin diseases, kidney stones, asthma, constipation, diarrhea, as astringent, for

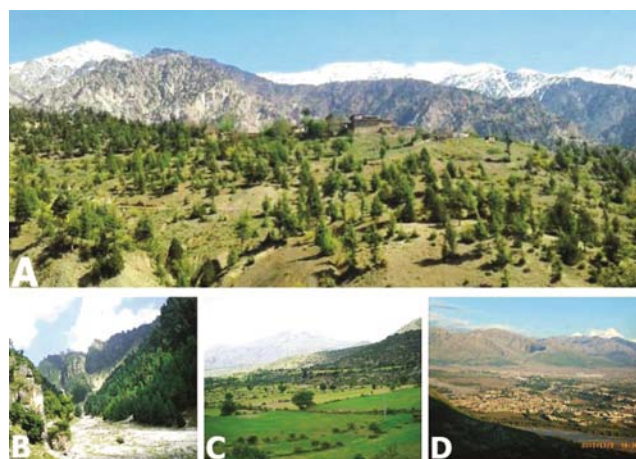


Fig. 3 — Pictorial view of the research area A, Upper, B and C, Central, D, Lower area of Kurram

diabetes, toothache, cough, gastrointestinal problems, liver complaints, as purgative, for rheumatism, as carminative, anthelmintic, expectorant, sedative and Vermifuge among others (Table 6). The highest number of species (16) was used to treat stomach disorders. Other diseases treated with more than 5 species were dermal diseases, kidney stones, impotency, diarrhea and constipation.

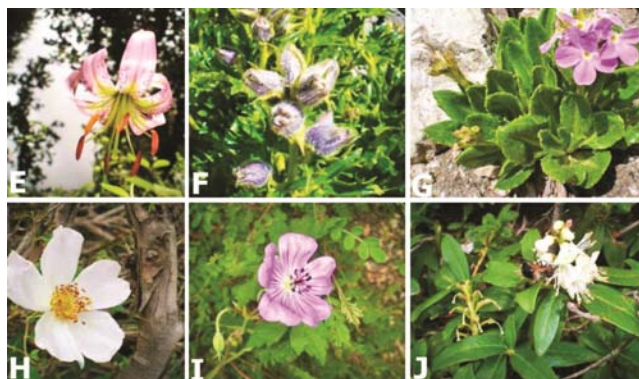


Fig. 4 — Medicinal plants of the research area. E. *Lilium polyphyllum*, F. *Delphinium vestitum*, G. *Primula macrophylla*, H. *Rosa canina*, I. *Geranium wallichianum*, J. *Rhododendron afghanicum*.

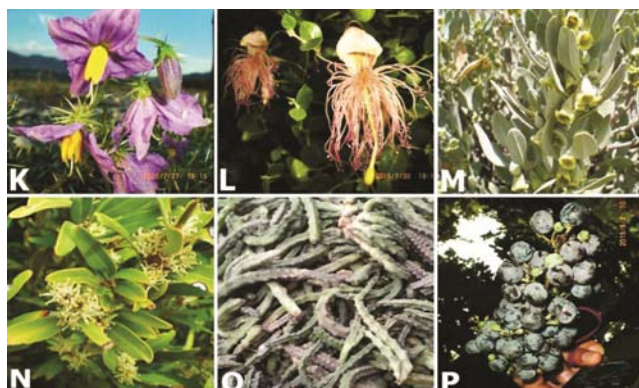


Fig. 5 — Medicinal plants of research area. K. *Solanum surattense*, L. *Capparis cartilaginea*, M. *Withania coagulans*, N. *Buxus wallichiana*, O. *Caralluma tuberculata*, P. *Vitis vinifera*.



Fig. 6 — Medicinal plants of research area Q. *Bergenia ciliata*, R. *Incarvillea emodi*, S. *Ephedra gerardiana*, T. *Thymus linearis*, U. *Nannorrhops ritchiana*, V. *Punica granatum*

The medicinal plant preparations commonly included powder (from 41 species), decoction (37), Infusion (23), paste (14), roasted seeds (1), juice (2), ash (1) and smoke (1). The parts of 30 plant species were ingested directly, while the materials of two

Table 5 — Number of species of different part (s) and drug formulation

Part(s) used	No. of species	Drug formulation	No. of species
Leaves	75	Powder	38
Fruits	22	Decoction	37
whole plant	21	Fresh directly used	30
Flowers	20	Infusion	23
Seeds	18	Paste	14
Roots	16	Seed Roasted on fire	1
Bark	11	Powder, fresh flowers	1
Rhizome	8	Powder/Decoction	1
Stem	6	Smelling	1
Latex	4	Smoked	1
Gum	2	Fresh or Dried powder	1
Shoot	2	Freshly used/Juice	1
Tuber	2	Paste/Juice	1
Bulb	2		
Nut	1		

species were directly smelled and the smoke inhaled. Overall 130 species were taken orally, sixteen applied topically and only two used both orally as well as topically.

The flora of Kurram is considered one of the most diverse, unique and rich in the regional flora similar to the flora of Chitral and Himalayan belt in Pakistan. The high number of medicinal plant species indicates the diversity of medicinal plants as well as their local utilization and the inhabitants' dependency on medicinal plants. Large numbers of species used for medicine have been earlier reported from neighboring areas^{28,29,30,31}. The prevalence of Asteraceae and Solanaceae can be related to their active compounds e.g. a diverse range of alkaloid³². This is also supported by^{33,34} who also found Asteraceae with 16 genera and 22 species to be the largest family used, and the largest genera were *Salsola* and *Acanthophyllum* with 4 species. Asteraceae is one of the largest plant families with 1600 genera and more than 23000 species, distributed across the world. Many species are easily available and have a large number of bioactive compounds therefore paying to the high use for medicinal purposes^{35,36}.

47 Plant species (40%) used as medicine, 8 (3%) as poisonous and 4% as industrial purposes. The prevalence of herbs as medicinal plants was also collaborated by^{37,38,39,40,41,42,43,44,45,46} who recorded maximum herb utilization for medicinal purposes. Concurrent with our study^{47,48} also found leaves as the

Table 6 — Number of species used to treat a particular disease

Disease type	No. of used species	Disease type	No. of used species	Disease type	No. of used species
Stomach ache	16	Body pain	5	Fractured bone	2
Skin diseases	11	Carminative	5	Gonorrhoea	2
Kidney stone	10	Expectorant	5	Stimulant	2
Aphrodisiac	9	Malarial fever	5	Tetanus	2
Asthma	9	Purgative	5	Antiepileptic	1
Constipation	9	Analgesic	5	Antileprotic	1
Diarrhea	9	Cooling agent	4	Antiseptic	1
Heat tonic	9	Narcotic	4	Appetite	1
Astringent	8	Vision problem	4	Dental pain	1
Diabetics	8	Sedative	4	Desiccant	1
Tonic	8	Sore throat	4	Diaphoretic	1
Toothache	8	Vermifuge	4	Emollient	1
Cough	7	Antidote	3	Febrifuge	1
Diuretic	7	Antipyretic	3	Hallucinogenic	1
Gastrointestinal	7	Antispasmodic	3	Headache	1
Liver complaints	7	Belching,	3	Leucorrhoea	1
Rheumatism	7	Blood pressure	3	Measles	1
Wound healing	7	Dandruff	3	Mydriatic	1
Anthelmintic	6	Jaundice	3	Respiratory	1
Inflammation	6	Laxative agent	3	Small-pox	1
Anticancer	5	Washing hair	3	Weak memory	1

most widely used plant part. The prevalent use of ethnomedicinal recipes have been reported in other studies⁴⁹. From a scientific point of view, leaves are the main organ responsible for photosynthesis and synthesis of secondary compounds⁵⁰.

The current study found RFC values ranging from 0.1 to 0.28. The medicinal plant species with highest RFC were *Seriphidium kuramense*, *Rhododendron colletianum* (0.31) and the high RFC value recorded for *Seriphidium kuramense* may be due to its medicinal value. Other important species were *Caralluma tuberculata* which contains bioactive steroidal glycosides (Pregnanes), flavones glycosides, and other important active compounds that might explain its anticancer and antidiabetic action⁵¹, while *Ephedra gerardiana* is well known for its content of Ephedrine⁵². Plants with high RFC value should be further evaluated for pharmaceutically important compounds, which may lead to the identification of potentially active constituents for drug discovery⁵³. Ethnomedicinal studies conducted in different parts of Pakistan reported some plant species with low RFC values similar to the current study^{54,55,56,57}. The low range of RFC values for some plant species could be due to the limited sharing of knowledge between the participants.

The present study reported FL values ranging from 33% to 100%. The results reported 31 medicinal plant species having maximum 100% FL. This indicates a high preference for these plant species, similar to other studies^{58,59} (Table. 2). We found a higher prevalence of knowledge among older participants, which indicates that the transfer of knowledge to younger generations must be fostered. Similar tendencies have been found in other studies⁶⁰. The medicinal flora is mainly restricted to the hilly areas, where grazing puts severe pressure on the resource, and many areas must be considered disturbed. To conserve the medicinal plants diversity, a more sustainable management is urgently needed. Some species like *Seriphidium kuramense*, *Artemisia absinthium*, *Rhododendron colletianum*, and *Ephedra gerardiana* and other important medicinal plant species are threatened and of over-harvesting, because these species are widely collected for sale. Thus, contrary to finding of other studies^{61,62}, the medicinal flora in the research region is heavily threatened by anthropogenic activities.

Novelty of the study

The present study explored and reported some endemic and sub endemic medicinal plants for the first time from the research area, e.g., *Podophyllum*

emodi, *Seriphidium kuramense*, *Rhododendron afghanicum*, *Rhododendron collettianum*, *Hertia intermedia*, *Caralluma tuberculata*, *Delphinium vestitum*, *Fritillaria roylei*, *Sophora mollis*, *Urtica dioica*, *Sedum ewarsii*, *Rosa canina*, *Primula macrophylla*, *Parrotiopsis jacquemontiana* and *Allium jacquemontii* and it is first ever comprehensive ethnomedicinal monograph covering this entire mountainous agency.

Conclusions

The valley of Kurram harbors a considerable medicinal flora including several endemic and sub-endemic species. Being a border area, the region has remained under bilateral diplomatic stress in addition to terrorism. These situations prohibited researcher until recently, and traditional ethnobotanical knowledge remained undocumented. The current study revealed the plant based medicinal knowledge which was found to be mostly confined to elders.

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