

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.

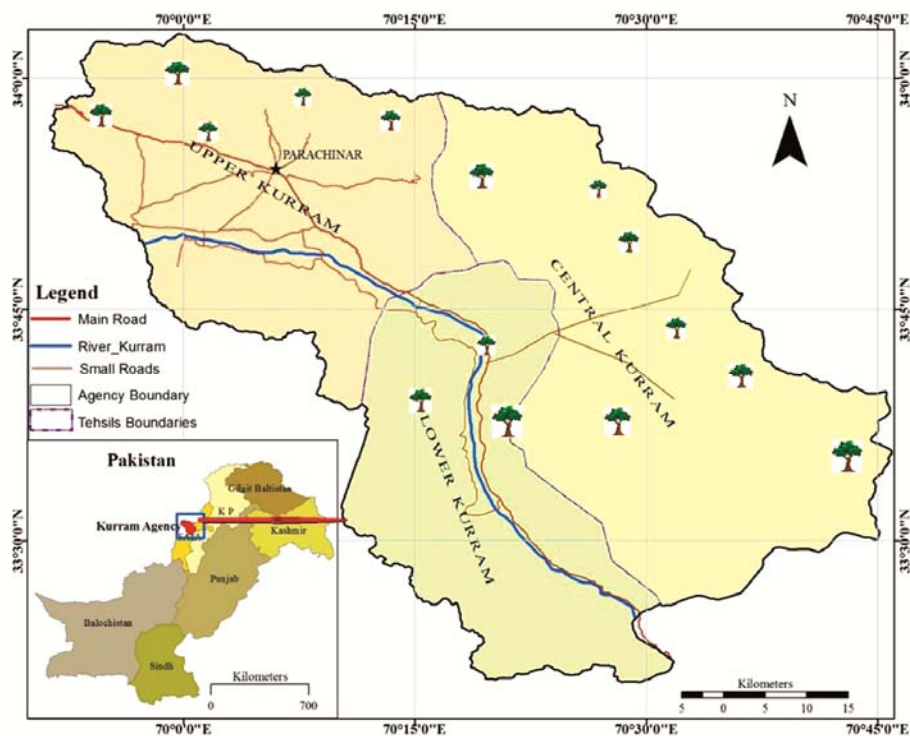


Fig. 1 — Map of the research area with visited location

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 | Gharanisha wa | 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 | Lesh 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.)

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 % |
|---|-------|-----------------|-----------------|---|---------------|---------------|----|------|----|-------|
| 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.)

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 % |
|--|-------|--------------------|------------------|--|---------------|---------------|----|------|----|-------|
| 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 lebbek</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>Ixiolirion tataricum</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 | Khawagboti | 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 disorders | 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>Monotheca 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 |

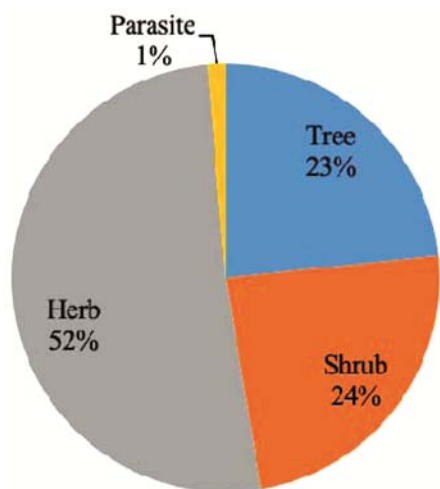


Fig. 2 — Life forms of medicinal flora

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

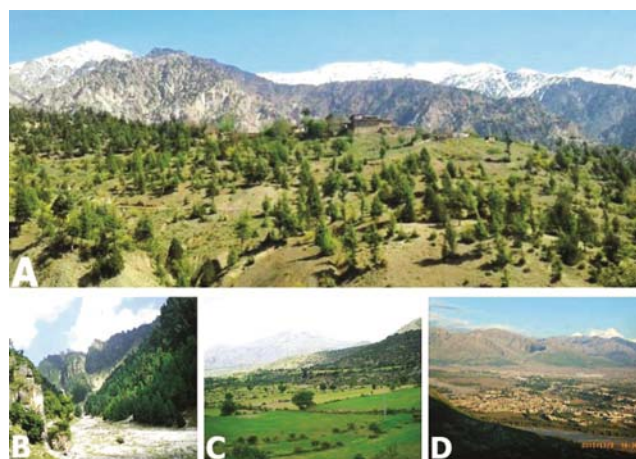


Fig. 3 — Pictorial view of the research area A, Upper, B and C, Central, D, Lower area of Kurram

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.

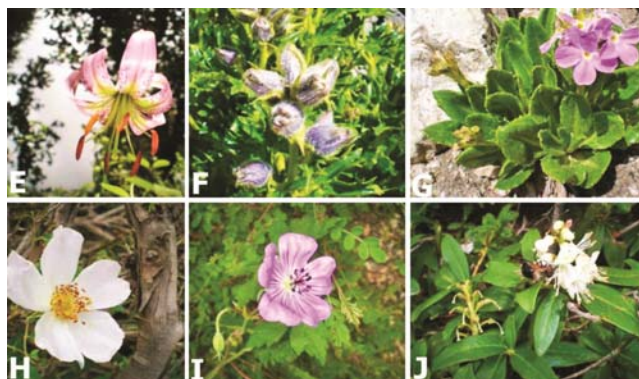


Fig. 4 — Medicinal plants of the research area. E. *Lilium polyphyllum*, F. *Delphinium vestitum*, G. *Primula macrophylla*, H. *Rosa canina*, I. *Geranium wallichianum*, J. *Rhododendron afghanicum*.

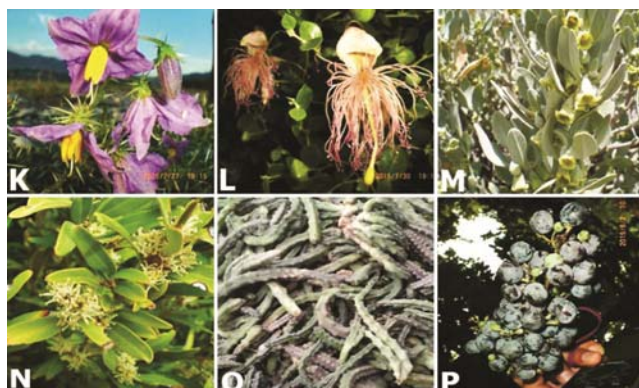


Fig. 5 — Medicinal plants of research area. K. *Solanum surattense*, L. *Capparis cartilaginea*, M. *Withania coagulans*, N. *Buxus wallichiana*, O. *Caralluma tuberculata*, P. *Vitis vinifera*.



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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