Traditional Uses of Medicinal Plants in Their Conservation in Charmang Village, Bajaur, KP, Pakistan

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Abstract: The Ethno-medicinal studies have been carried out for the first time in Charmang, Tehsil Nawagai, district Bajaur, Khyber Pakhtunkhwa (KP), Pakistan. In this project a total of 64 medicinal plants belonging to 39 families and 58 genera and species have been documented, which are being used by the local communities for the treatment of different human sicknesses. Among 64 plant species, 58 medicinal plants species were found as compared with the 12 earlier published articles. This study mainly focused to protect the world’s cultural tradition and to document the importance of medicinal plants present in the research area. A complete data has been established on the general and worldwide uses of the projected study to find out new possible species for further studies. A general field surveys was arranged in the desire area, which was based on semi-structured meetings of 135 local sneaks. To assess the exact herbal knowledge, the data were investigated using quantifiable Ethno medicinal records as RFC (Relative Frequency Citation) and UV (Use Value), separately. The local interviewed peoples used 64 plant species belonging to 58 genera in 39 families, mainly Lamiaceae, Rhamnaceae and Solanaceae. The type of most common diseases (25%) was Respiratory diseases (Asthma, Throat infection, Cough etc.). The present study was emphasized based on ironic herbal knowledge to know the novel findings of medicinal plants in district Bajaur, KP, Pakistan which could be a standard use for upgrading the knowledge in terms of plant phytochemistry, pharmacology and biological activities for the efficiency and safety of medicinal plants.

Keywords: Ethnobotany, Medicinal Plants, Charmang, Bajaur, Pakistan

1. Introduction

Ethnobotany is old as human civilization on earth [1]. Most of the peoples use these plants for different purposes like nutrition and medicine since the establishment of these civilizations [2]. In these modern years the Ethnobotanical studies have grown motivation at global level to make sure that plants are used for the treatment of different diseases, medicines and natural drugs are discovering day by day for the treatment of diseases [3]. In the local communities the traditional information almost, the practice of medicinal plants is transferred from generation to generation [4], although the plants have traditionally helped as most important weapon against pathogen in man [5]. Medicinal plants are widely used almost in every community either directly or indirectly in current medicine system [6]. From earliest times some numbers of medicinal plants are being used for treating many sicknesses. The homeeopathic plant information and their practices by local Hakeem’s and medicine development are not only treasured for management of ethnic practices and biodiversity but also for
Community health care [7]. Pakistan as a developing country more than 75% of citizens in different areas still rely on traditional medications as primary health care [8, 9]. In this modern life style, the societies are going away from the knowledge about the local medicinal plants is going to disappear among younger ones [3]. Today is the time to document this prosperity of knowledge about the natural medicinal plants for next generations throughout the world generally and specially in Pakistan particularly [3]. Plant species play a significant role in modern medicine, forming and pharmaceutical application [10]. Around 25% drugs are produced directly from the plants and many other drugs are synthetic from the raw compounds which are isolated from plants. Around 80% of the people of developing countries are still dependent on traditional indigenous medicines for their basic health care [1]. In Pakistan out of 6000 flowering plants about 372 species are very common, out of these species 200 plants species are used as a medicine by local societies [1]. In 1987, Pie and Manandhara reported that 70% to 80% of the Himalayan range’s community depends on medicinal plants of the local area [11]. People of the mountains area of Pakistan use plants for medicines, fire wood, food, fodder and timber wood [12]. The medically important plants of Himalayas are detailed from region to region and their distribution is dispersed and limited to small areas [1]. Plants are more important for us as compared to animals, due to their various collection of Rashid biochemical with a variety of potent biotic activities which is use in traditional healing systems [13]. In local people, different modes of application have been adopted to deed the natural flora [14]. In many rural communities, use of wild flora for medicine and food is banned since times [15]. Pakistan is full of medicinal plants that are used by rural people for a variety of purposes [16-18]. Ethnobotany of different areas of Pakistan has been reported by different researchers [1, 19]. According to World health organization (WHO) around 80% of the world’s human population depends on herbal medications for their crucial health care system (World Health Organization, 2003) [20]. In the last periods in Pakistan, important technical and profitable tendencies have been experiential due to the common cultural suitability and commercial budding of plants founded Crops [18]. Pakistan is situated at altitude of 70.40°-70.30°N and the longitude of 32.48°-33.23°E. It is situated at 340 m above the sea level.

The proposed study area i.e. Charmang tehsil Nawagai, spreads 22 km² and is surrounded by Chamarkhand, Kunar province from Afghanistan, Nakhter, Khamer Sar and Loesum. The total rural population of the Nawagai tehsil is about 79002 and the total House Hold population is 7,649 (www.pbscensus.gov.pk). It comprised of mountainous land with variety of significant medicinal plants. The area is not explored properly for the said scientific works, which is mainly due to the distant flora and fauna, lack of quality education and most important its location near Pak-Afghan border. The ethno medicinal traditional information are mainly limited to elder community members and local traditional health practitioners (THPs). It’s a dire need of the day to document this traditional knowledge in a scientific way and conserve these medicinal plants before its loss [18]. The ethnic composition of the people is same, most of them is Khenzadghan, Sayyedan (Sayyed), Serkhani, Torkhel, and Mulan. Shetezien and Khohesthanen are migrated family which belong to Afghanistan and the primary language is Pushto. The current research project i.e. the traditional applications of the medicinal plants in Charmang, tehsil Nawagai is the first ever scientific approach to document ethno-botanical uses and report new plant species from the area. The urgent need for this kind of information is meaningful because the vegetation in the desire area of the Bajaur is extensively poor due to high Biodiversity. The Charmang area is famous due to their natural sights and beauty. Most of the plants in the area are used for medicine, timber and construction. The main objective of the present study is to file the unique information of wild medicinal plants of Charmang village, tehsil Nawagai, District Bajaur, KP, Pakistan to provide systematic basis for further examination.

2. Materials and Methods

2.1. Field Interview

The field work was conducted in Charmang Tehsil Nawagai of district Bajaur, KP, Pakistan during February 2017 – 2019 and follows the method [21, 22] to report the folk use of plants by the local peoples. A total 135 (123 males and 10 females) local Malik and Khan across different family was randomly selected for interviews, with a miner who are aware with indigence use of plants. The survey was conducted on 135 individuals from the local population, aged from 20 to 65 years and above. Informants were made for the importance medicinal plants and their knowledge was added for them. Following the Worldwide Society of Ethno biology (ISE) code of ethics the interview was conducted in sociable environment to allow the informers to response the questions logically. Ethnobotanical data were collected through verbal interviews and semi structured questionnaires [23]. Questionnaires were developed by colleague’s methods [24]. Field works consisted of plant collection, photography and data documentation. The Questionnaires is consisting in two portions, in which the first portion is about personal information like age, educational level and gender of the informers, but the next portion collects treated, mode of application and their tonic uses. The interview was conducted in local language of the area (Pushto). The interview was taken in their local Hujra, of the community with reference to a place; the herbalists are interviewed at their local places. Rundown of plants were organized in order. Latin name and families were affirmed by online site: http://www.theplantlist.org (The Plant List), (The International Plant Name Index) http://www.ipni.org and Kew naming framework www.mpns.kew.org/mpns-entryway. The identified species were dried, labeled and...
attached on herbarium sheets and to deposit to the Herbarium of Abdul Wali Khan University, Mardan, Pakistan.

### 2.2. Study Area and Climate Vegetation

The geographical area of the Bajaur is about 1290 Km² [18, 25], its population is more then 0.942 million. Population density is about 73 % per Km² which is highest as compare to other districts, the population growth rate about 4.33 present per annum. The Environment is mountainous to sub mountain and climate is arid and semi-arid having both winter and summer seasons (winter temperature range from 5 to 10 degree centigrade and summer temperature differs from 23° C to 36° C) [26]. It's the smallest part (district) of the KP, which consist of two sub divisions and seven tehsils. The Charmang area is located west side of the Bajaur, which is round about 59 Km away from headquarter namely “Khar” which is the extreme end of the Himalayan range, which creates the uncertainty and vernation in the monsoon rains [18]. The Charmang is further divided into Hilal khel, Halkai Charmang, Hasham, Kamangara Charmang, Kotakai Charmang, Shah Khanai, Sharif khana, Saida shah and Panjak. The area Charmang is located near Pak Afghan border. Charmang is mostly populated by illiterate people. The zone is situated at an elevation of 1126 m.a.s.l with E 71° 30' scope and N 34° 41' longitude. The longing zone is for the most part populated by Tarkani Pushtoons people group. The land of the Charmang valley is hilly, and fertile which take about 800 mm of average rainfall per year (FATA Development Statistics, 2013).

The desire area of the district Bajaur is very faraway area with no access to the basic health facilities and income resources. The people mostly dependent on the plants for most of their essentials use and people have a rich knowledge about different uses of plants for daily requirements. The area has never been explored before for this ethno-medicinal knowledge. The deforestation rate is very high in this area the main cause of the deforestation is lake of electricity, more then 90% of the household use wood for cooking in Halki Charmang area. The other main cause of the deforestation is the operation against TTP (Tehrik-e-Taliban Pakistan) militants from since 2008. Most of the territories are farmer by calling while others are instructors and government hirelings. A low proportion of local individuals additionally acquire installment from different parts of the nation or abroad. The investigation region has constrained instruction offices, and other fundamental offices. This zone is exceptionally affected by war (started in 2009 and finish in the end of 2011) against Pak Army and TTP aggressors. Most of the people of the area use these plants as a raw material for their health. The main objective of the study to document the medicinal plants of the area and share the data with other communities through published literature. Most of the area is cultivated, while the uncultivated area is mostly arid and semi-arid, hilly, rugged and barren area. There is no good system for irrigation of the cultivated area but in some place mostly people irrigate their land by ground water, rain water and spring water.

### 3. Quantitative Investigation

#### 3.1. Relative Frequency of Citation (RFC)

The area information is foreseen quantitatively using Frequency of citation (FC) and Relative Frequency of citation (RFC). The RFC was found out to exhibit the solidarity between the observers on the use of helpful plants around there. It is figured by the going with formula using equation No 1 [27].

\[
RFC = \frac{FC}{N} \quad (0 < RFC < 1) \quad (1)
\]

Where,

FC is the quantity of sources that referred to the species Relative Frequency of Citation (RFC), and N are the aggregate number of sources partakes in the investigation. The estimation of RFC relies upon the referring to portion of sources for that species [27-29].

#### 3.2. Informant Consensus Factor (ICF)

The combination used for the calculation of plant species, by using the following formula of ICF, applying equation No 2 [7, 30].

\[
ICF = \frac{Nur - Nt}{Nur - 1} \quad (2)
\]

Where,

Nur: Stands for total number of use reports for each disease category and 
Nt: Stands for number of taxa used for the specific category

#### 3.3. Use Value (UV)

The formula used for plant calculation is UV, using equation No 3 [27, 31].

\[
UV = \frac{\sum U}{n} \quad (3)
\]

Where,

n: refers to the total number of informants,
U: Stands for the number of use reports mentioned by every informant for a certain species and UV: Use value for plants carry a measurable amount for the capable point of species.

#### 3.4. Fidelity Level (FL)

Fidelity level (FL) indications the ratio of informants which use and explain the plant species for exceptional purpose, using equation No 4 [32].

\[
FL = \frac{IP}{Lu} \quad (4)
\]

Where, (IP) Shows the number of informants which are to be cited of a use of species for specific disease category, and (Lu) Stand for the number of informants starting the use of medicines from that plant for any sort of aliments.
4. Results and Discussion

Demographic Characteristics of Informants

In the present research, a total 135 informants “Table 1” including indigenous people (91.11%) and Traditional Health Practitioner’s (THPs) is (8.8%) were interviewed divided into five different age groups ranging from 20-30, 30-40, 40-50, 55-65 and 65-80 & above years, which includes 12 herbalists and 123 people from local population. Among these individuals, larger part of men interviewed (92.59%) which were 65-80 years of age. Based on training, indigenous learning with respect to the utilization of plants is more overwhelming among unskilled individuals (23.70%) and this information is diminishing in exceptionally instructed class (11.11%).

| S/No | Variables          | Categories       | Number of persons | Percentage |
|------|-------------------|------------------|-------------------|------------|
| 1    | Informant Category| THP              | 12                | 8.8%       |
|      |                   | Indigenous people| 123               | 91.11%     |
| 2    | Gender            | Male             | 125               | 92.59%     |
|      |                   | Female           | 10                | 7.40%      |
|      |                   | 20-30            | 3                 | 2.22%      |
|      |                   | 30-40            | 20                | 14.81%     |
|      |                   | 40-50            | 29                | 21.48%     |
|      |                   | 55-65            | 34                | 25.18%     |
|      |                   | 65-80 & above    | 49                | 36.29%     |
|      |                   | Illiterate       | 32                | 23.70%     |
|      |                   | 5 years of education| 22    | 16.29%     |
|      |                   | 8 years of education| 33    | 24.44%     |
|      |                   | 10 years of education| 20    | 14.81%     |
|      |                   | 12 years of education| 13    | 9.62%      |
|      |                   | 14 years of education or above| 15 | 11.11% |

5. Medicinal Plant Diversity

A sum of 64 restorative plants species belonging to 39 families and 58 genera were recorded, where the given families i.e. Lamiaceae, Rhamnaceae, Asteraceae, Solanaceae and Malvaceae, having the highest numbers of species presence of 8, 4, 4, 3, and 2 species, respectively (Figure 1). The family Lamiaceae was the prevailing group of restorative plants because of the nearness of high substance of natural mixes, as carotenoids, phenolic acids, tannins, lignans, coumarins, quinones, xanthenes, cucurmin, and a few other plant mixes which manages phytochemical and cell reinforcement which help to battle against various maladies, and abiotic stretch [33]. During this research, most species belongs to herbs, followed by trees and shrubs 44%, 37% and 19 % respectively (Figure 2). This result is like the study reported in Chail valley, Tehsil Kabal District Swat Pakistan [32]. However, the antimicrobial, phytochemical and traditional studies of selected medicinal work have been published in Bajaur agency, Pakistan [25, 32, 34, 35].

Figure 1. Density of different members of medicinal plants of various families reported from research area. Lamiaceae has the highest number, while Acanthaceae & Meliaceae has the lowest as shown.
Figure 2. Percentage distribution of the habitat (types) of reported Medicinal Plants, which include herbs (44%), shrubs (19%) and trees (37%).

| S/No | Plant Name | Voucher Number | Family | Local Name | Life Form | Plant Part(s) Used | Route of Administration | Diseases Treated | FC | RFC | UR | UV | Comparisons |
|------|------------|----------------|--------|------------|-----------|-------------------|------------------------|-----------------|----|-----|----|----|-------------|
| 01   | *Abelmoschus esculentus* Moench. | AWKUM SA 122 | Malvaceae | Bendhyi | Herb | Seed | Powder | Joint pain | 14 | 0.10 | 1 | 0.071 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12●, 13●, 14●, 15●, 16● |
| 02   | *Adiantum capillus-veneris* L. | AWKUM 133 | Adiantaceae | Tur panbhy | Herb | Leave | Decoction | Fever, Cough | 12 | 0.08 | 2 | 0.166 | 1▲, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12●, 13●, 14●, 15●, 16● |
| 03   | *Ailanthus altissima* (Mill.) Swingle. | AWKUM 111 | Simaroubaceae | Speena bakhana | Tree | Seed | Eaten in raw form | Weight loss, Diabetes, Hernia | 45 | 0.33 | 3 | 0.066 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12●, 13●, 14●, 15●, 16● |
| 04   | *Ajuga bracteosa* Benth. | AWKUM 102 | Lamiaceae | Ghoti | Herb | Whole plant | Powder | Diabetes, Throat pain, Blood purification, Alopecia, Diabetes, Alopecia, Androgenetic alopecia | 14 | 0.10 | 4 | 0.285 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12●, 13●, 14●, 15●, 16● |
| 05   | *Ajuga parviflora* Benth. | AWKUM 103 | Lamiaceae | Ghoti | Herb | Whole plant | Juice | Eye treatment | 33 | 0.24 | 1 | 0.030 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| 06   | *Allium cepa* L. | SA AWKUM 115 | Amaryllidaceae | Pyaz | Herb | Root | Extract | Mouth diseases, Cough, Blood purification, Asthma, Cardia Calotropisc Arrhythmia, Hepatitis, Healing of wound | 56 | 0.41 | 9 | 0.160 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12●, 13● |
| 07   | *Anethum sowa* Roxb. | AWKUM 145 | Apiaceae | Khaga innaly | Herb | Seed | Eaten in raw form | Vomiting | 42 | 0.31 | 1 | 0.023 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| 08   | *Berberis lycium* Royle, | SA AWKUM 154 | Berberidaceae | Khwari | Shrub | Bark, fruit and leaf | Powder and eaten in raw form | Mouth diseases, Cough, Blood purification, Asthma, Cardia Calotropisc Arrhythmia, Hepatitis, Healing of wound | 56 | 0.41 | 9 | 0.160 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| 09   | *Calotropis procera* (Aiton) W.T.Aiton. | AWKUM 182 | Apocynaceae | Spelmai | Shrub | Latex, and leave milky water | Juice, Decoction, use externally over skin | Mouth resistance to Kangoo Virus, Diabetes, Acne | 16 | 0.11 | 3 | 0.187 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| 10   | *Cedrus deodara* (Roxb. ex D.Don) Loudon. | AWKUM 166 | Pinaceae | sraph | Tree | Seed and bark | Oil | Throat infection, Cough | 42 | 0.31 | 2 | 0.047 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| S/No | Plant Name/Voucher Number | Family | Local Name | Life Form | Plant Part (s) Used | Route of Administration | Diseases Treated | FC  | RFC | UR  | UV  | Comparisons |
|------|--------------------------|--------|------------|----------|--------------------|-------------------------|------------------|-----|-----|-----|-----|--------------|
| 11   | *Cichorium intybus* L. SA AWKUM 121 | Asteraceae | Han | Herb | Whole plant | Powder | Fever, Body pain | 12 | 0.08 | 2 | 0.166 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 12   | *Coryza cadens* (L.) Cronquist. SA AWKUM 112 | Asteraceae | har bothi | Herb | Leave | Powder, eaten in raw form | Stomach problem | 14 | 0.10 | 1 | 0.071 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 13   | *Carica longa* L. SA AWKUM 127 | Zingibeleaceae | korkaman | Herb | Rhizome | Powder | Wound healing, weight loss, | 56 | 0.41 | 2 | 0.035 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 14   | *Cuscuta reflexa* Roxb. SA AWKUM 130 | Cuscutaceae | Mecha | Shrub | Whole plant | Decoction | Joint pain | 19 | 0.14 | 1 | 0.052 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 15   | *Cymodon dactylon* (L.) Pers. SA AWKUM 132 | Poaceae | Kabal | Herb Stem and leave | Powder | Healing of wound | 14 | 0.10 | 1 | 0.071 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 16   | *Debregeasia salicifolia* Rendle. SA AWKUM 184 | Urticaceae | kherwala | Tree | Root | Juice | Throat infections | 20 | 0.14 | 1 | 0.05 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 17   | *Diospyros lotus* Blanco. SA AWKUM 128 | Ebenaceae | Thor Amlok | Tree | Fruit | Eaten in raw form | Cough | 39 | 0.28 | 1 | 0.025 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 18   | *Erigeron canadensis* Brot. SA AWKUM 110 | Asteraceae | Har bothi | Shrub | Leave | Extract or eaten in raw form | Stomach pain | 23 | 0.17 | 1 | 0.043 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 19   | *Ficus carica* L. SA AWKUM 119 | Moraceae | Inzar | Tree | Root | Extract | Hemorrhoid | 37 | 0.27 | 1 | 0.027 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 20   | *Fumaria indica* (Hausskn.) Pugsley. SA AWKUM 139 | Fumariaceae | Sha thara | Herb | Whole plant | Juice | Asthma, inflammation, Blood purifier | 19 | 0.14 | 3 | 0.157 | 1▲, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 21   | *Grewia optiva* J.R.Drum. ex Burret. SA AWKUM 136 | Malvaceae | Pesthaowan y | Tree | Leave, flower and stem bark | Decoction | Stomach problem, Intestinal problem, join pain | 31 | 0.22 | 3 | 0.096 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 22   | *Indigofera heterantra* Wall. ex Brandis. SA AWKUM 144 | Fabaceae | Ghowraja | Tree | Stem and Bark | Juice, gum form | 45 | 0.33 | 8 | 0.177 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 23   | *Isodon rugosus* (Wall.) Codd. SA AWKUM 104 | Lamiaceae | kharachay | Herb | Leave | Extract | Cough, Helmrithesis | 43 | 0.31 | 2 | 0.046 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 24   | *Juglans regia* L. SA AWKUM 154 | Juglandaceae | Ghuz | Tree | Leave and fruit | Eaten in raw form | Controlling of Cholesterol level | 52 | 0.38 | 2 | 0.038 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| 25   | *Justicia adhatoda* Mart. ex Nees. | Acanthaceae | Beakhen | Shrub | Leave | Powder | Cough, Fever, Cold | 15 | 0.11 | 3 | 0.2 | 1▲, 2e, 3e, 4▲, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e |
| S/No | Plant Name | Local Name | Life Form | Plant Part(s) Used | Route of Administration | Diseases Treated | FC | RFC | UR | UV | Comparisons |
|------|------------|------------|-----------|-------------------|-------------------------|------------------|----|-----|----|----|-------------|
| 27   | Melia azedarach L. | Tora bakhana | Tree | Seed, cotyledon and leave | Powder and iodex form | Weight loss, Hair strength, Androgenetic Alopecia, Hemorrhoids, Bone pain, Bone crack, Pain killer, joint pain, Chest infection. | 53 | 0.39 | 0.169 | 1n, 2e, 3e, 4e, 5e, 6n, 7n, 8e, 9e, 10e, 11e, 12e. |
| 28   | Mentha arvensis L. | Phodena | Herb | Leave | Juice and extract, eaten in raw form | Antispasmodic, Weight loss, | 32 | 0.23 | 0.093 | 1n, 2e, 3e, 4e, 5e, 6n, 7n, 8e, 9e, 10e, 11e, 12e. |
| 29   | Mentha longifolia Host. | | | | | | |
| 30   | Mirabilis jalapa L. | Gulla abasi | Shrub | Seed | Eaten in raw form | Stomach pain, Crack in bone | 24 | 0.17 | 0.083 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 31   | Morus nigra L. | Tor thoth | Tree | Bark and fruit | Juice | Fever, Blood pressure | 21 | 0.15 | 0.095 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 32   | Myrtus communis L. | Manrho | Shrub | Leaf | Infusion | Fever, Blood purification, Throat infection. | 46 | 0.34 | 0.065 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 33   | Nerium oleander L. | | | | | | |
| 34   | Ocimum basilicum L. | Kashmalai | Herb | Seed and leave | Powder, | Cardiac disease, stomach infection | 16 | 0.11 | 0.125 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 35   | Olea ferruginea Royle. | Khona | Tree | Leave | Extract, oil, juice, Infusion | Mouth infection, Blood pressure, Joint pain, Diabetes, Aphthus ulcer | 22 | 0.16 | 0.272 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 36   | Papaver pannonicum | Reday | Herb | Sepal | Extract, juice | Hyperopia | 28 | 0.20 | 0.035 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 37   | Papaver somniferum L. | Khoknar | Herb | Seed, latex, fruit bark | Powder, Infusion | Fever, cough, Headache, sleepy agent | 53 | 0.39 | 0.056 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 38   | Pinus roxburghii Sarg. | Nakhter | Tree | Cone | Powder | Diabetes | 22 | 0.16 | 0.045 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 39   | Platana orientalis L. | Chinar | Tree | Stem and bark | Extract, powder | Urticaria | 25 | 0.18 | 0.04 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 40   | Polygonum aviculare Bert. ex Meisn. | Bandakay | Herb | Whole plant | Powder | Eye diseases | 17 | 0.12 | 0.058 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 41   | Portulaca oleracea L. | Zangali warkhari | Herb | Whole plant | Cook as a vegetable and juice | Inflammatory disease | 25 | 0.18 | 0.04 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| 42   | Punica granatum L. | Anar | Tree | Fruit bark | Juice | Digestive problems, Urinary problems. | 24 | 0.17 | 0.208 | 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e, 11e, 12e. |
| S/No | Plant Name | Voucher Number | Family | Local Name | Life Form | Plant Part(s) Used | Route of Administration | Diseases Treated | FC | RFC | UR | UV | Comparisons |
|------|------------|----------------|--------|------------|-----------|-------------------|------------------------|-------------------|----|-----|-----|----|-------------|
| 43   | SA AWKUM 113 | Euphorbiaceae | Arhanda | Tree       | Seed      | Extract           | Cough, Throat infection, Chest pain | 17 0.12 4 0.235 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ■, 12 ● | 12 ● |
| 44   | Ricinus communis L. | Poaceae | Merkhanry | Tree       | Leaf      | Juice              | Cough, Fever, Swelling, Headache | 39 0.28 3 0.076 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲ | 12 ● | 12 ● |
| 45   | Rosalba | Rosaceae | Jowar | Shrub      | Petal     | Juice Gul (khand)  | Stomach pain, Cough, Fever, Blood clotting agent, Diuretic, Blood pressure, Coagulation agent, Hepatitis | 30 0.22 5 0.166 | 1 ▲, 2 ▲ | 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 46   | S. Ziziphus | Papilionaceae | Dambara | Tree       | Leave     | Juice and Eaten raw form | Fever and Body pain, Body tonic | 43 0.31 3 0.069 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲ | 12 ● | 12 ● |
| 47   | S. Zea mays | Solanaceae | Walla | Tree       | Leave     | Externally cover the whole body | Pain killer, fever, wound healing | 34 0.25 3 0.088 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 48   | S. Zanthoxylum | Rutaceae | Babwa | Herb | Leaf | Juice, extract, eaten in raw form | Thromboplastin, Diabetes, Dysentery, Liver inflammation, Kidney stone | 57 0.42 5 0.0877 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 49   | R. Ricinus | Solanaceae | Soraya | Herb | Leaf | Juice, Decoction | Pain killer during birth, Tonic | 11 0.08 2 0.181 | 1 ▲, 2 ▲ | 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 50   | R. noronha | Solanaceae | Walla | Herb | Leaf | Powder | Stomach infection, Acidity, | 25 0.18 3 0.12 | 1 ▲, 2 ▲ | 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 51   | B. bent | Solanaceae | Shershah | Herb | Leave | Powder | Digestion, Asthma, Myasthenia, Colic pain | 28 0.20 4 0.14 | 1 ▲, 2 ▲ | 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 52   | S. Solanum | Papilionaceae | Benazir | Herb | Whole plant | Extract, eaten in raw form | Diabetes Mellitus | 18 0.13 1 0.055 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 53   | S. Urtica dioica | Urticaceae | Salma | Herb | Root | Juice Extract | Kidney stone, Jaundice | 10 0.07 2 0.2 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲ | 12 ● | 12 ● |
| 54   | W. Becker | Solanaceae | Aghar | Shrub | Leave and flower | Juice | Fever, Flu, Cough, Digestive problem, Asthma | 32 0.23 5 0.156 | 1 ▲, 2 ▲ | 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ● | 11 ▲, 12 ● | 12 ● |
| 55   | N. Noronha | Solanaceae | Alia | Shrub | Leaves | Powder | Digestive problems | 23 0.17 1 0.043 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲, 12 ● | 12 ● |
| 56   | S. Solanum | Solanaceae | Kher | Shrub | Fruit and root | Extract | Emetic, Back ache | 22 0.16 2 0.090 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲, 12 ● | 12 ● |
| 57   | S. Zanthoxylum | Rutaceae | Shah | Tree | Fruit | Powder, spices, eaten in raw form | Tooth pain, Stomach disorders | 16 0.11 2 0.125 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲, 12 ● | 12 ● |
| 58   | S. Zea mays | Solanaceae | Peeta | Herb | Juice | Kidney stone | 21 0.15 1 0.047 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲, 12 ● | 12 ● |
| 59   | S. Ricinus | Papilionaceae | Lopana | Tree | Leaves | Juice, extract, | Diabetes Mellitus, | 47 0.34 3 0.063 | 1 ▲, 2 ▲, 3 ●, 4 ▲, 5 ● | 6 ●, 7 ●, 8 ●, 9 ●, 10 ●, 11 ▲, 12 ● | 12 ● | 12 ● |
Table 1. Plants Used in Medicinal Formulations

| S-No | Plant Name and Voucher Number | Family | Local Name | Life Form | Plant Part(s) Used | Route of Administration | Diseases Treated | FC | RFC | UR | UV | Comparisons |
|------|--------------------------------|--------|------------|-----------|--------------------|------------------------|------------------|----|-----|----|----|-------------|
| 60   | *Ziziphus nitida* Lam. SA AWKUM 159 | Rhamnaceae | Ghwandi | Tree | Fruit and leave | Eaten in raw form | Inflammation | 46 | 0.34 | 1 | 0.021 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12●, 13● |
| 61   | *Ziziphus nummularia* (Burm.f.) Wight & Am. SA AWKUM 166 | Rhamnaceae | Merkanry | Tree | Fruit and leave | Juice, eaten in raw form | Cough, Asthma, Inflammatory infection | 34 | 0.25 | 3 | 0.088 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| 62   | *Quercus dilatata* Royle SA AWKUM 134 | Fagaceae | Serai | Tree | Root | Powder | Stomach pain | 32 | 0.23 | 1 | 0.031 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| 63   | *Cirsium arvense* (L.) Scop. SA AWKUM 139 | Asteraceae | Jahta | Herb | Seed | Powder | Inflammatory infection, Asthma and abdomen pain | 45 | 0.33 | 3 | 0.066 | 1●, 2●, 3●, 4●, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |
| 64   | *Ziziphus oxyphylla* Edgew. SA AWKUM 168 | Rhamnaceae | Welanai | Tree | Leave and root | Juice, extract | Asthma, Cough, Cardiac Arrhythmia, Hepatitis C. | 34 | 0.25 | 4 | 0.117 | 1▲, 2●, 3●, 4▲, 5●, 6●, 7●, 8●, 9●, 10●, 11●, 12● |

FC: (Frequency of Citation), RFC: Relative Frequency of Citation, UR: Use Report. UV: Use Value. Symbols ▲: Plants Reported with Similar Uses, ■: Plants Reported with Dissimilar Uses, ●: Plants Not Reported.

1: [18]; 2: [7]; 3: [18]; 4: [33]; 5: [34]; 6: [18]; 7: [16]; 8: [35]; 9: [7]; 10: [4]; 11: [36]; 12: [27].

6. Parts of Medicinal Plants Use

Data on medicinal plant parts used in making herbal medicine are shown in figure 3. The most used parts of plants are leaves (33%) followed by seeds (10%) fruits and whole plants 10%, which is followed by root and stems (8%). The use of leaves in herbal medicine was found commonly in several ethnomedicinal studies [37, 38]. The regular use of leaves doesn’t mean that the other plant parts having fewer active elements, it is famous that the whole plant body contains active elements. This can be clarified by the way that most informants have acquired traditional knowledge which is different from scientific learning. Leaves are more frequently use as compared with other parts because they are more in number, collection is quite easy as compared to roots, tubers and according to conservation point of view, the collection of whole plant cause the plant to be died out [26, 39].

Figure 3. Graphic presentation of the percentage distribution of various plant parts used for different diseases, in which Leaves application as medicine, have been reported the highest (33%).

6.1. Method of Preparation and Their Applications as Herbal Medicines

There are two modes of administration of herbal preparations i.e. (1) internal and (2) External. Internal mean decoction, infusion, teas, maceration, powder, juices etc. and External means Paste, oil, or externally cover the whole...
body. The most dominantly used preparation is the powder and juice which is 19 in numbers followed by the extract and eaten in raw form 16 from each (Figure 4). Similar results were found in the previous ethno medicinal studies conducted in different parts of the world. Most of the plants in this study are also used by mixing with honey, ghee, milk and water or cook like as vegetable. Some plants have bad test, in these causes they used to mixed it with some sweet’s substance like honey, sugar etc. and eaten in raw form like Ailanthus altissima (Mill.) Swingle. Berberis lycium Royle. Mirabilis jalapa L. Solanum nigrum Acerb ex Dunal [23, 40].

![Figure 4. Percentage distribution of medicinal plants administered by local communities in various forms/products in their daily life based on data collected from inhabitants.](image)

### 6.2. Frequency of Citation (FC) of Mostly Reported Medicinal Plants and Their Uses

In present study, the most cited plant is Solanum nigrum with 57 citations followed by Curcuma longa L. and Berberis lycium Royle 56 citations, Melia azedarach L. 53 which is followed by Ziziphus jujuba Lam, 47 citations, Myrtus communis L, Ziziphus nitida Roxb and Ziziphus nitida Roxb 46 citation, Ailanthus altissima (Mill.) Swingle and Indigofera heterantha Wall. ex Brandis 45 citation (Table 2, Figure 5). Mentha longifolia Host, Salix babylonica L and Isodon rugosus (Wall.) Codd 43 citation. The high frequency of citations of medical plants mean these plants are well known and are more frequently used by the local informers, on behalf of a source of reliability. In this study, highest number of citations is of Solanum nigrum which is used to treat Helmmlenthesis, Diabetes, Dysentery, Liver inflammation, Kidney stone Carbohydrates. We found similar result for Periploca in other ethno-medicinal surveys as well [41, 42]. Curcuma longa L, is use for weight loss and healing of wounds. Berberis lycium Royle is used for Flavonoids, Carbohydrates, Phenols, Phlobatannins, Saponin, Cardiac Glycosides, Proteins, Volatile oils, Resins Glycosides and Terpenoids diseases, the same medicinal uses were reported in other areas of Pakistan [4, 12, 28].

### 7. Newly Reported Medicinal Plants and Their Uses

The current study is associated with 12 published research papers, from connecting areas and from the country for similar and dissimilar uses. Current study revealed that 10 plants were reported for the first time, with new uses (Table 2 & 3). Lingering 30 plants were previously documented in earlier literature for various diseases with similar and dissimilar uses. In the proposed work we observed these new medicinal uses for one species in many diseases’ categories of the country level, mention the following examples.

In present study, Ziziphus nummularia is used for treating Cough, Asthma and Inflammatory infection, Cardiac Arrhythmia, and Hepatitis C. Mentha longifolia another plant from present study is used to cure Diarrhea and headache, while previously it been reported to be used in vomiting, carminative and refrigerant. The present study is also compared with the formerly published work from Pakistan.
Table 3. List of newly reported medicinal wild plant species from research area, which were not reported before.

| S/No | Plants not reported in previous findings                      |
|------|---------------------------------------------------------------|
| 01   | Diospyros lotus Blanco                                        |
| 02   | Erigeron canadensis Brot                                      |
| 03   | Eucalyptus obliqua L’Hér.                                    |
| 04   | Isodon rugosus (Wall.) Codd                                   |
| 05   | Platanus orientalis (L.)                                      |
| 06   | Polygonum aviculare Bert.ex Meisn.                           |
| 07   | Rosa gallica (L.)                                             |
| 08   | Salix babylonica (L.)                                         |
| 09   | Cirsium arvense (L.) Scop                                     |
| 10   | Zea mays (L.)                                                 |

Myrtus communis with used valve (UV) 0.065 are used frequently for Fever, Blood purification and throat infection. This plant is interesting for further phytochemical and medical studies. Based on statistical analysis following plant species are important with respect to high UV values; Ajuga bracteosa Benth (0.285) and Ajuga parviflora Benth (0.266) are the plants with high UV values, which is commonly used for diabetes blood purification and alopecia.

8. Quantitative Analyses of Ethno Medicinal Data

8.1. Informant Consensus Factor (ICF)

The value of ICF ranges from (0.130 to 0.538) low to high

Table 4. Disease categories of medicinal plants of Charmang, tehsil Nawagai, District Bajaur, KP, with Informant Consensus Factor (ICF).

| S/No | Disease category             | No of use report (Nur) | No of Texa (Nt) | Informant Consensus Factor (ICF) |
|------|-----------------------------|------------------------|-----------------|---------------------------------|
| 01   | Blood purification          | 10                     | 8               | 0.222                           |
| 02   | Cardiac disease             | 7                      | 6               | 0.166                           |
| 03   | Diabetes                    | 14                     | 12              | 0.153                           |
| 04   | Gastric disorders           | 24                     | 21              | 0.130                           |
| 05   | Hemrlenthesis               | 8                      | 7               | 0.142                           |
| 06   | Kidney stone                | 6                      | 5               | 0.2                             |
| 07   | Mouth diseases              | 4                      | 3               | 0.333                           |
| 08   | Muscle and skeletal disorders| 19                     | 15              | 0.222                           |
| 09   | Respiratory diseases        | 36                     | 22              | 0.4                             |
| 10   | Skin problem                | 14                     | 7               | 0.538                           |

8.2. Relative Frequency of Citation (RFC)

The Relative Frequency of Citation (RFC) is used to regulate the maximum used plant species of the area with orientation to informants that have been interviewed for those plant species. The range of (RFC) was plan from high to lowest. The highest value of (RFC) was calculated 0.42 which was observed for Solanum nigrum, Berberis lycium Royle and Curcuma longa L. respectively, this status confirms that this medicinal plant species is normally found everywhere in the area and the concern people are quite familiar with its medicinal uses, mostly they are in practices for Hemrlenthesis, Diabetes, Dysentery, Liver inflammation, Kidney stone, Mouth diseases, Cough, Blood purifier, Asthma, Cardia, Calotropisc Arrhythmia, Hepatitis, Healing of wound, and weight loss. The most frequently used medicinal plants species in the study area are Solanum nigrum (0.42), Berberis lycium Royle (0.41), Curcuma longa L. (0.41), Papaver somniferum (0.39), Melia azedarach (0.39) and Juglans regia (0.38) respectively (Table 2).

8.3. Use Value (UV)

UV (use value) is a quantitative method that shows the relative importance of a plant species or plant family among the population. In the present study, the UV was calculated and ranges from highest to lowest species. The highest UV in term of numbering sequence was reported in Solanum nigrum (0.42) followed by Berberis lycium Royle (0.41), Curcuma longa L. (0.41), Papaver somniferum (0.39), Melia azedarach (0.39) and Juglans regia (0.38) respectively (Table 2).
However, the plants species with lowest UV indicate that these plants are very rare in the area due to the medicinal knowledge and concern information by the local community.

8.4. Future Effect of the Study and Recommendation

The examination will give a feeling of social and financial obligation between the network, to ensure the nearby verdure. This acknowledged data will likewise empower the neighborhood network to pull in tourism in the zone by rationing its common magnificence, which will expand the financial achievement and prosperity of the rustic network. The commitment of the nearby network will help in keeping the flower decent variety and to advance exchange and tourism. In any case, then specialists occupied with the arrangement making could deliver the issues identified with the floristic structure and preservation. The pharmacological and nourishment assembling could simply abuse the nearby therapeutic verdure, which could be utilized for the general well-being and financial inspire of the region. This examination will additionally demonstrate the essential data of neighborhood individuals and relocated people groups of the territory, it's likewise pulls in the nearby government to give fundamental wellbeing resources and training to the said network.

9. Conclusion

Th current investigation reports the important of the medicinal plants used in ethnomedicinal practices at Charmang district Bajaur, KP, Pakistan. Indigenous communities of the desire region usually rely on local flora for their medicinal practices and the traditional knowledge is in the protection of elder people. The study highlights that due to modernization, the younger generation does not take interest in the application of medicinal plants which is present in this local flora. This area is highly affected by “TTP War” which effect the local flora [43]. In this research area a total of 64 medicinal plants have been recorded, in which most of the plants belongs to family Lamiaeae followed by Asteraeae (Figure 1). Furthermore, the current investigation reported that D. lotus, E. canadensis, Eucalyptus obliqua, Isodon rugosus, Platanus orientalis, Polygonum aviculare, Rosa gallica, Salix babylonica, Cirsium arvense and Zea mays wild plants which are not reported in previous findings have been reported for the first time with new uses for various diseases, which is enlist in (Table 3). It was also found during interview of local traditional healers and local respondents of the study area that most of the peoples use these wild plants species for fever, stomach pain, kidney stone and other different illness (table 2). On the base of the studied area, most of the diseases which treated by these plants are very common in daily life, such is cough, fever and infection etc (table 4). According to the survey result, most of the wild plants species is used for various diseases such as diabetes, asthma, hepatitis fever and different infections (table 2 & 4). According to the survey mostly peoples of the Charmang use these plants for primary health care. Most the use these plant as a vegetable (Sagh). According to the interviewed reports the most frequently use plants is Solanum nigrum and curcuma longa etc as shown in figure 5. Mostly herbs were found to be the most common life form (44%) as compare to tree (37%) and shrub (19%) in different preparations.

Furthermore, these areas are near the Pak afghan border, so there is very highly biodiversity and natural vegetation, but there is very highly loss of the natural vegetation. In these studies, the result show that all the plants species ware reported from the local communities of the desire area. In
these research articles the (Table 4) shows that ten plants species were informed in traditional herbal method for the first time. This study can donate well in the protection of world traditional heritage as well as the collection of valuable knowledge to document a local record and improve the existing practices. Meanwhile, it may contribute in writing the pharmacopeia in a better strategy, which is still a question subject. The proposed results show that the cultivators and local community have an energetic and significant understanding showed by the assortment of various species used to treat few disorders, which is considered a worthy hotspot for social event. The Ethno medicinal and pharmacological data in the region comparatively show fundamentals that how the societies and civilizations affect the entire basin’s herbal knowledge in term of science promotion in various field, including medicine, pharmacy, biochemistry and biology in general.

Charmang Valley is famous due to its unique landscape and location, which consists of hilly areas and good forest. Most of the local peoples collect these plants from their local habitat and generally use it for commercial and domestic uses without conservation policy. The over grazing and cause the reduction of natural habitats. It’s necessary to study the pharmacological, phytochemical, antimicrobial, toxicological activity of the remaining reported medicinally important plants species to make a better understanding about the safety and efficacy of the recommended dosage. It’s also necessary for preservation to aware the local people about the importance of traditional herbal knowledge and motivate them regarding the sustainable use of the local flora.

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