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ORIGINAL ARTICLE

Quantitative analysis of medicinal plants consumption in the highest mountainous region of Bahrain Valley, Northern Pakistan

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The purpose of the current study was to provide information on traditional uses of medicinal plants used by the inhabitants of Bahrain valley, District Swat, Northern Pakistan. This is the first quantitative ethnobotanical survey from the locality. A total of 134 informants were interviewed through semi-structured interviews and group discussions. The data were analyzed through quantifiable tools, i.e., informant consensus factor (ICF), Relative frequency of citation (RFC), Fidelity level (FL), Direct Matrix Ranking (DMR) and Use value (UV) indices. A total of 72 medicinal plants from 45 families were studied. The largest numbers of medicinal plants were reported from family Asteraceae with 5 species. Highest (0.89) informant consensus factor was observed for gastrointestinal and lowest (0.54) as painkiller. Highest fidelity level (94.12%) was observed for Ajuga bracteosa and lowest (56.52%) for Plantago major. The Relative frequency of citation was observed high (0.43) for Valeriana jatamansi while lowest for Nerium oleander (0.04). For Direct Matrix Ranking Melia azedarach (24) got first rank lowest (10) by Vitex negundo. Leaves (31%) were mostly used as the part used for ethnomedicines. Mostly herbs (65%) were detected for the preparation of ethnomedicines. Decoction (28%) was mostly observed with oral (76%) as a route of administration. The inhabitants in Northern Pakistan use mostly ethnomedicines for primary health care. Plants with high ICF value should be subjected to comprehensive pharmacological and phytochemical studies for novel drug discovery.

Keywords: Bahrain valley; informant consensus factor; medicinal plants; Northern Pakistan; traditional knowledge

Introduction

Ethnomedicinal studies play an important role in contemporary drugs discovery from native available medicinal plant resources. In traditional healing systems, wild resources of the medicinal plant have been under practice for centuries. The documentation of traditional knowledge of wild medicinal plant species is the good approach towards new drug discovery (Gilani & Atta-ur-Rahman, 2005). About 80% world population particularly in developing countries ethnomedicines are taken (approximately 85%) for different health disorders (Savikin et al., 2013). Although 25% of medicines are plants based in modern pharmacopeia, however, countless synthetic drugs are contrived from plants isolates. WHO (2002). Local people have adopted diverse styles of applications to use these natural resources in different ways (Adnan et al., 2014). This system of indigenous folk medicines based on uses of medicinal plants by the inhabitants has been passed from generations to generation at the passage of time orally (Ugulu et al., 2009).

Ethnobotanical research survey is not only applied for documenting ethnobotanical information, and circulating ethnopharmacological knowledge, but also provide the interaction between plant diversity and human society to know that at which degree plant diversity in natural environments is used and disturbs (Canales et al., 2005; Frei et al., 1998) and also can be considered as a part of culture (Heyd, 1995). Even now, about 25% of all recommended medicines in modern world comprise ingredients derivative from medicinal plant species (Rao, Palada & Becker, 2004). About, 50,000 flowering medicinal plant species are taken for medicinal purpose throughout the globe, out of the 422,000 are reported as flowering plants

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(Govaerts, 2001; Parmesan, 2006). The traditional practice of medicinal plant species and plant resources is speedily growing in hilly areas because of their fewer side-effects, affordable, accessibility, and very affordable to the poor community (Acharya & Acharya, 2009; Hassan et al., 2017). The right selection of medicinal plant is the first obligation to initiate an ethnopharmacological study and to identify that at what rank the plant species is used for the preparation of ethnomedicines (Canales et al., 2005; Frei et al., 1998).

Pakistan has different vegetation comprising 1,572 genera and 5,521 species, most of them are found in Himalaya. Hindukush, and Karakorum areas (Ali & Qaiser, 2010; Sheikh, Ahmad & Khan, 2002). Out of a total 12% are used in the preparation of herbal medicines (Shinwari & Qaiser, 2011) About six hundreds (600) medicinal plants constitute the main non-timber forest products (NTFPs) (Adnan et al., 2012), five hundred (500) are used in traditional healthcare practices while three hundred and fifty (350) are traded to national and international markets for getting a huge money (billions of dollars) (Ahmad, 2003). Approximately sixty thousand (60,000) traditional practitioners (Hakeems) in urban especially in hilly areas use medicinal plant species for the preparation of household herbal medicines for the treatment of different health disorders. (Hamayun, 2004). Indigenous communities have centuries of traditional knowledge which has been diffused from generation to generation. (Shinwari, 2010).

Documentation of traditional knowledge in the study area may be an essential step toward plant conservation as the flora is under pressure due to unwise use of wild plant resources. In Pakistan northern areas are enriched with high valued medicinal plants which need appropriate assessment. Therefore current study was conducted (i) to identify and file traditional knowledge on indigenous plants used as remedy in Bahrain Valley,District Swat Northern Pakistan, (ii) To document that how and how many different health disorders are cured with medicinal plant species, (iii) to assess data using FIC, FL, DMR, UV and RFC, indices to discover high valued medicinal plant species in the area.

Materials and methods

Study area

Bahrain is a lush green mountain valley located in District Swat of Khyber Pakhtunkhwa, Northern Pakistan. It is a famous tourist spot. Topographically, the area lies in Hindukush foothills range. It lies 35° 12' 27" N, 72° 32' 44.16" E with 1,435 m above sea level (Figure 1). The valley has snow covered mountains, rivers, streams, meadows, forests and diversified vegetation with a huge number of medicinal species. Geoclimatically the area lies in the humid subtropical zone. The peoples of the locality are called Kohistanis and pashtoons (thorwali), they depend on agriculture, medicinal plants, royalty from forests and hotel business as the basic mean of earning. The soil is porous, light sandy, shallow and light to average in texture. The area has an annual average temperature of 16.6 °C and precipitation 866 mm. The driest month is November with 21 mm precipitation and the wettest month is March with an average precipitation of 120 mm. The hottest month of the year is July with an average temperature of 27.0 °C, while the coldest month is January with an average temperature of 4.8 °C.



Figure 1. Geographical location of study area.

Data collection and plant identification

Ethnomedicinal data was collected through group discussions and semi-structured interviews from 2013 to 2014 in the flowering season. A total of 134 informants of different ages were interviewed. Out of total randomly selected 50 (36 men and 14 women) as key informants. An ethnobotanical survey was collected following (Ahmad et al., 2014; Hassan et al., 2017) A questionnaire was structured in English in which Key questions were a local name, part used, types of disease cured, *Ukrainian Journal of Ecology*, 9(1), 2019

preparation, socio-cultural information and dose taken etc. Informants were interviewed in their local language to get complete information about plant species. The collected plant species were confirmed through international plant name index (http://www.ipni.org), and plant list (www.theplantlist.org). Plant specimen were identified through flora of Pakistan (Ali, 1980; Nasir, 1981) in Herbarium Department of Botany University of Malakand and deposited as a future reference.

Quantitative analysis of ethnobotanical information

Indigenous knowledge was analyzed through different quantitative indices like Relative frequency citation (RFC), Use value (UV), Informant consensus factor (ICF), Fidelity level (FL) and Data matrix ranking (DMR). Data was structured into Excel spreadsheet 2007 and concise through graphical statistics like percentages and proportions.

Informant consensus factor (ICF)

Informant consensus factor can be applied to document consensus on the practical use of the medicinal plant for a specific ailment (Canales et al., 2005). The Informant consensus factor value ranges from 0 to 1. The ICF value will be high if a plant is reported by a large number of informants, while it will be low which means that, inhabitants had less knowledge about that plant species (Kloutsos et al., 2001; Teklehaymanot, 2009). The ICF value calculated by the formula (Tabuti, Lye & Dhillion, 2003).

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

Where "nur" is the total number of use reports for each disease class and "nt" is the number of species used in that class.

Use value (UV)

Use value (UV) provides the relative importance on the use of medicinal plant species. If the value is near to 1, UV will be high which shows the importance of plant species among informants while low UV will be near to 0 which shows few use reports were obtained for a given plant species (Phillips et al., 1994; Savikin et al., 2013). Use value (UV) cab be calculated by using the formula (Kayani et al., 2014).

$$UV = \frac{U}{n}$$

Where UV is the use value, u is the value of a plant species to treat a disease while n is the number of respondents reporting overall usages of a plant species.

Relative frequency of citation (RFC)

Relative frequency of citation (RFC) shows the local importance and rank of each medicinal plant species (Vitalini et al., 2013). The RFC value may be 1 if informants report specific plant species as essential and will be 0 if nobody agrees with the use of plant species (Medeiros, Silva & Albuquerque, 2012). RFC can be calculated by the formula (Butt et al., 2015).

$$RFC = \frac{FC}{N} \left(0 \le RFC \le 1 \right)$$

Where FC is informants number who reported the usage of medicinal plant species and N is the total number of informants who participated in the survey.

Fidelity level (FL)

Fidelity level (FL) is carried out to select best fit medicinal plant species for the treatment of a specific disease (Musa et al., 2011). FL value specifies the importance of a particular plant species because high value indicates a high frequency of plant uses against a specific disease. A low value indicates the use of plant species for various medicinal purposes with low usage against a specific disease. Fidelity level may be calculated by the formula (Friedman et al., 1986)

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

Where Ip is the number of informants stated the usages of plant species for a specific disease category and Iu is the number of informants cited the use of that particular plant species for any other disease category.

Direct matrix ranking (DMR)

In order to rank medicinal different medicinal plant species, DMR was carried out. DMR can be applied to match plant diversity of certain plant based on data collection from respondents. (Cotton, 1996).A total of 15 experienced and knowledgeable informants were preferred for DMR data collection. Experienced and knowledgeable informants were allowed to give rank to medicinal plant species as 0=not used, 1=least used, 2=less used, 3=good, 4=very good, 5=best) to every single plant species. The average scores given to each plant species was summed up and ranked (Hassan et al., 2017).

Results and discussion

Demographic data

A total of 134 informants were interviewed for ethnomedicinal data collection, out of which 3 were the most experienced traditional healers and the rest were the local inhabitants of the area comprising only kohistani. Out of total randomly selected 50 respondents including 36 (72%) male and 14 (28%) female. The number of a male was high as compared to female due strict family rules for female. Age wise, informants were classified into 5 main categories. The majority of informants were between 70 to 80 years (34%). Mostly the informants (44%) were illiterates and more knowledgeable as compared to educated, while educated peoples also played a vital role in data collection. Among 3 traditional healers, all were experienced from 5-17 years (6%) (Table 1) (Figures 2-5).

| Table 1. Demographic data | a of informants in Bahrain | Northern Pakistan. |
|---------------------------|----------------------------|--------------------|
|---------------------------|----------------------------|--------------------|

| Gender | Density | % Contribution |
|--------------------|---------|----------------|
| Male | 36 | 72 |
| Female | 14 | 28 |
| Age classes | | |
| 30-40 | 8 | 16 |
| 40-50 | 6 | 12 |
| 50-60 | 10 | 20 |
| 60-70 | 9 | 18 |
| 70-80 | 17 | 34 |
| Literacy level | | |
| Illiterate | 22 | 44 |
| Primary | 17 | 34 |
| Secondary | 9 | 18 |
| Graduate | 2 | 4 |
| Professional level | | |
| House wives | 14 | 28 |
| Teacher | 6 | 12 |
| Shopkeepers | 7 | 14 |
| Farmers | 16 | 32 |
| Labors | 4 | 8 |
| Hakeem and nomads | 3 | 6 |

Taxonomic classification

A total of 72 medicinal plant species from 45 different families were studied and documented (Table 2). Asteraceae and Lamiaceae (7%) with 5 plant species each were the most leading families, followed by Amaranthaceae, Brassicaceae, Euphorbiaceae, Moraceae, Polygonaceae, Ranunculaceae, Solanaceae, with 10 plant species (11%), Polygonaceae with 5 species (6%), Brassicaceae, Pinaceae, Solanaceae with 3 plant species (4%) each, Asclepiadaceae, Caryophyllaceae, Convolvulaceae, Urticaceae with 2 plant species (3%) and other families contribute only one species. The large number of medicinal plant species reported from family Asteraceae is in agreement with (Bibi et al., 2014; Umair, Altaf & Abbasi, 2017) and Lamiaceae with (Dei Cas, Pugni & Fico, 2015; Hassan et al., 2017) at national and international where the inhabitants take more medicinal plant species from family Asteraceae and Lamiaceae. It might be due to their high traditional uses and wide distribution. Out of total medicinal plant species habit wise (65%) were herbs (Figure 4), which is in agreement with (Ahmad et al., 2014) who also observed herbs (58%) used by the inhabitants of Chail valley district Swat, Pakistan for the preparation of herbal medicines. Shrubs contribute (20%) and trees (15%). Our findings are in agreement with previous studies(Akhtar et al., 2013; Rehman et al., 2017). The wide usage percentage of herbs was due to their stress-free accessibility (Sanz-Biset et al., 2009; Uniyal et al., 2006) high efficacy, easily collection, the existence of pharmacologically active ingredients and easy for the preparation of herbal medicine (Hassan et al., 2017; Khan et al., 2014).

| Botanical | L.N | Н | Part | Therapeutic uses | Mode | Herbal formulation | Appli | F | R | U | U |
|-----------------------|------|----|------|----------------------------|--------|-------------------------|-------|---|---|---|---|
| Name/Family/V. | am | а | Use | | of | | catio | С | F | V | R |
| Ν | е | b | | | prepa | | n | | С | | |
| | | it | | | ration | | mod | | | | |
| | | | | | | | е | | | | |
| Acacia nilotica L. | Kek | tr | bark | carminative, diarrhea, | powde | bark is crushed into | oral | 1 | 0 | 0 | 3 |
| Mimosaceae | kar | е | | dysentery | r | powder and take with | | 3 | • | | |
| H.UOM.BG.403 | | е | | | | water | | | 1 | 2 | |
| | | | | | | | | | | 3 | |
| Achillea | Jara | h | leav | stomach ache, | decoct | fresh leaves are boiled | oral | 1 | 0 | 0 | 1 |
| <i>millefolium</i> L. | i | е | es | | ion | in water and make it | | 1 | • | • | |
| Asteraceae | | r | | | | cool | | | 0 | 0 | |
| H.UOM.BG.404 | | b | | | | | | | 8 | 9 | |
| Achyranthes | Buc | h | whol | toothache and digestive | decoct | plant is boiled and | oral | 2 | 0 | 0 | 6 |
| aspera L. | hka | е | e | problems, bloody diarrhea, | ion | makes decoction | | 7 | • | | |
| Amaranthaceae | nda | r | plan | insect bite, asthma, cough | | | | | 2 | 2 | |
| H.UOM.BG.405 | | b | t | | | | | | | 2 | |

Table 2. Ethnomedicinal plant species of Bahrain valley, District Swat, Northern, Pakistan.

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| 2 | 0 |
|-----|---|
| - 1 | v |
| | |

| chasmantum S. arm e me stupor, soothing r are mixed with butter 7 7 3 0 Acorus calamus L. okch h h r digestive disorders, chronic powder dried root powdered oral 5 0 0 3 0 Acacacceae a b aeracceae a b aeracceae aeracceae aeracceae aeracceae a b a 0 3 0 Ajuga bracteosa Buti h aerai chicken pox. jaundice, juice juice juice of fresh aerial parts is taken orally 5 0 0 8 6 1 | <i>39</i> Quantitative analysis of medicinal plants consumption | | | | | | | | | | | |
|--|---|------|-----|-------|------------------------------|---------|-------------------------|------|---|---|---------|----|
| Barunculaceae oral oil oil s 3 0 Arans catamus L skh h n rot digestive disorders, chronic powde dired root powdered oral S 0 0 3 Aracs case and y and root a b a b a a a a b a a b a a b a b a b a a b a a b a a b a a b a a b a a b a c a b a a b a a b a | Aconitum | Zah | h | rhizo | joint pain, high fever, | powde | dried rhizome powder | oral | 4 | 0 | 0 | 4 |
| H.UOM.BG.406 b c c c c c c s <t< td=""><td>chasmanthum S.</td><td>arm</td><td>е</td><td>me</td><td>stupor, soothing</td><td>r</td><td>are mixed with butter</td><td></td><td>7</td><td></td><td></td><td></td></t<> | chasmanthum S. | arm | е | me | stupor, soothing | r | are mixed with butter | | 7 | | | |
| Accruz catomus L. sh n root. digestive disorders, chronic powde dired for dired oral 5 0 0 3 0 Apugo brazeosa Buti h aeria chicken pox. jaundice, juice juice juice juice file juice | Ranunculaceae | ora | r | | | | oil | | | 3 | 0 | |
| Aracacceae H, LUOM, BG, 4077 a a b b dige brace as b dige brace b a b a b a b Aluag b b a b a b a b a b a b a b a b a b b a b <t< td=""><td>H.UOM.BG.406</td><td></td><td>b</td><td></td><td></td><td></td><td></td><td></td><td></td><td>5</td><td>9</td><td></td></t<> | H.UOM.BG.406 | | b | | | | | | | 5 | 9 | |
| H.UOM.BG.407 wais a r a b c c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a c a c a c a | Acorus calamus L. | skh | h | root | digestive disorders, chronic | powde | dried root powdered | oral | 5 | 0 | 0 | 3 |
| a b - R 6 - R 6 0 8 6 0 8 6 0 | Aracaceae | а | е | S | dysentery, diarrhea | r | are mixed with sugar | | 1 | | | |
| jugg bractessa Buti h aeria chicken part juice fuice fresh aerial oral 5 0 0 8 H.UOM.BG.408 r part | H.UOM.BG.407 | waj | r | | | | | | | 3 | 0 | |
| W. Lamiaceae hUOM.BG.408 r I Headache, s diuretic, acidity, internal colic parts is taken orally before breakfast. 6 . 4 1 Alga porvillora kiga porvillora is a h leav fever, treating tonsilitis, rest parts is taken orally before breakfast. is a 0 | | а | b | | | | | | | 8 | 6 | |
| HUOM.BG.408 r part pimples, measles, stomach acidity, internal colic before breakfast. Image: approximation before breakfast. Ima | Ajuga bracteosa | Buti | h | aeria | chicken pox. Jaundice, | juice | Juice of fresh aerial | oral | 5 | 0 | 0 | 8 |
| b s acidity, internal colic - - 2 4 Ajuga parviffora sra h leav constipation, hepatitis, dermatuis paste leaf paste is prepared oral 5 0 0 4 HUOM.BG.409 b b b constipation, treating tonsilitis, dermatuis paste leaf paste is prepared oral 5 0 0 4 Milum Gan h bulb wounds pain, stimulant, owands pain, stimulant, stimulan | W. Lamiaceae | | е | 1 | Headache, diuretic, | | parts is taken orally | | 6 | | | |
| Algog parviflora sraf h leav constipation, hepatitis, dermatitis paste leaf paste is prepared oral 5 0 4 B. Lamiaceae boti r | H.UOM.BG.408 | | r | part | pimples, measles, stomach | | before breakfast. | | | 4 | 1 | |
| B. Lamiaceae boti e es fever, treating tonsilitis, dermattis n n 0 1 0 1 0 1 0 1 0 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 1 0 0 1 | | | b | s | acidity, internal colic | | | | | 2 | 4 | |
| H.UOM.BG.409 r dermatitis dermatitis <thdermatitis< th=""> dermatitis</thdermatitis<> | Ajuga parviflora | sra | h | leav | constipation, hepatitis, | paste | leaf paste is prepared | oral | 5 | 0 | 0 | 4 |
| dilum Allium Allium Allium Allium Allium Allium Allium Allium Allium Allium Allium B Amarylidacea H.UOM.BG.411Gan dec hhbulb wounds pain, stimulant, carminative colicpowde rbulbs are used to cure wounds pain allder g10000Amarylidaceae H.UOM.BG.411S. e eGar e etrleav e esores, infection, diurctic, expectorant, diaphoretic useddecoct iondecoction of leaves is usedoral oral2005Berberis lycium H.UOM.BG.412S. a bsbark pan epimples, scables, diabetes, wounds, blood purifiercrushe dcrushed bark is soaked in water and extract is usedoral s5003Berberis lycium H.UOM.BG.413A pan bhroot infections, demulcentdecoct iondecoction of rhizome is preparedoral s2003Bistorta alfinis D. Aplogonacea bAnj bhRhiz sore throat, joint pain sore throat, joint painpowder rroot powders prepared roral r1004Bistorta amily B. F. Apiaceae h.UOM.BG.413Anj bhRoot sore throat, joint pain sore throat, joint pain rpowder rroot powders are mixed roral r1004Bistorta amily B. F. Apiaceae h.UOM.BG.413Anj bhRoot sore throat, point pain rr | B. Lamiaceae | boti | е | es | fever, treating tonsillitis, | | | | 0 | | | |
| Allium Gan h bulb wounds pain, stimulant, carminative colic powde bulbs are used to cure derm 1 0 0 4 Maraylidaceae har b scres, infection, diuretic, ion decott decott of leaves is oral 2 0 0 5 HUOM.BG.410 av e es expectorant, diaphoretic decott decott of leaves is oral 2 0 0 5 HUM.BG.411 e e e pimples, scables, diabetes, wounds, blood purifier used orushed bark is soaked in water and extract is used oral 5 0 0 5 H.UOM.BG.412 r u urinary disorders, skin infections, demulcent ion prepared oral 1 0 0 3 9 2 0 3 1 1 1 1 1 0 0 3 1 1 1 0 0 3 1 1 1 1 0 0 3 1 1 1 1 1 1 1 0 0< | H.UOM.BG.409 | | r | | dermatitis | | | | | 3 | 0 | |
| griffhindumare B. dec e carminative colic r wounds pain al 9 . . Amarylidaceae har r leave sores, infection, diureti, on decott decotton of leaves is used oral 2 0 0 5 Betulaceae ay e es sores, infection, diureti, on decott decotton of leaves is used oral 2 0 0 5 Betberis lycium R, HUOM.BG.412 s b bark pimples, scables, diabetes, wounds, blood purifier crushed bark is soaked in water and extract is used oral 5 0 0 3 9 Berberiagceae pan e s infections, demulcent on from rhizome and use with milk 1 | | | b | | | | | | | 7 | 8 | |
| Amaryllidaceae HJUOM.BG.410har br br c12 4Aluss nitida Betulaceae HJUOM.BG.411Ger atr eleav esores, infection, diuretic, expectorant, diaphoreticdecocti iondecoction of leaves is usedoral a2005Berberiaceae HJUOM.BG.412s bbbpimples, scables, diabetes, wounds, blood purifiercrushe dcrushed bark is soaked in water and extract is usedoral a5005Berberiato Asstrifagaceae HJUOM.BG.412Cat pan ehrot r rurinary disorders, skin infections, demulcentdecocti iondecoction of rhizome is preparedoral r r2003Bistorta anipexicuti Guniaecae HJUOM.BG.413Ani bhRotiz r r rfever, body pains, muscle contractionpowder r rpowders rot powder are mixed with milkoral r1004Bistorta CanneticutionAni r r rhRotiz r rrot powder are mixed with milkoral r r1004HJUOM.BG.413hhroot r rsore throat joint painpowder rrot powder are mixed with milkoral r1004HJUOM.BG.417hhRoot r rsore throat, joint painpowder rrot powder are mixed with milkoral r2001 <td>Allium</td> <td>Gan</td> <td>h</td> <td>bulb</td> <td>wounds pain, stimulant,</td> <td>powde</td> <td>bulbs are used to cure</td> <td>derm</td> <td>1</td> <td>0</td> <td>0</td> <td>4</td> | Allium | Gan | h | bulb | wounds pain, stimulant, | powde | bulbs are used to cure | derm | 1 | 0 | 0 | 4 |
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| LementLemen | H.UOM.BG.411 | 5 | е | | | | | | | | 2 | |
| Berberis lycium R. Berberidaceae H.UOM.BG.412 Kwa ray r s h h bark pimples, scabies, diabetes, wounds, blood purifier crushed d crushed bark is soaked in water and extract is used oral S 4 0 5 0 0 5 Berberidaceae H.UOM.BG.412 n n noot to urinary infections, demulcent decottion decottion of rhizome is prepared oral 2 0 0 3 9 Berberidiaceae thuDM.BG.413 a r n noot to urinary fections, demulcent decottion decottion of rhizome is prepared oral 2 0 0 3 . Bistorta amplexicuulis G. aba b Anj b h Rot e urinary disorders, cough, sore throat, joint pain powder r propter and use with milk oral 1 1 0 0 4 Bistorta amplexicuulis G. b Aba e e sore throat, joint pain paste notat, joint pain fruits are boiled in water and decottion is prepared oral 1 1 0 0 4 | | | | | | | | | | | | |
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| H.UOM.BG.412r ur uuu< | - | | | | | | | | | | | |
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| H.UOM.BG.413arbfhff <th< td=""><td>-</td><td></td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>_</td></th<> | - | | | | 3 | | | | | | | _ |
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| Bistorta affinis D. Polygonaceae H.UOM.BG.414Anj aba | | - | | | | | | | | | | |
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| H.UOM.BG.414rrr <th< td=""><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>_</td></th<> | | - | | | | | | | | | | _ |
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| Polygonaceae H.UOM.BG.415rrrrrlalalaa< | amplexicaulis G. | - | е | | , | • | | | | | | |
| H.UOM.BG.415bbcaa <th< td=""><td></td><td></td><td></td><td>-</td><td></td><td></td><td>0</td><td></td><td></td><td></td><td>2</td><td></td></th<> | | | | - | | | 0 | | | | 2 | |
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| H.UOM.BG.416 rkaispei rkair bro a10 a10 a10 a4Calendula officinalisash r r r bhroot root stomach ache, antisepticpaste r pasteroot is crushed to make paste, and applied on forehead for feverderm al2004Calendula officinalisL. rafirafi e sssstomach ache, antisepticpaste r rroot is crushed to make paste, and applied on forehead for feverderm al2004Calotropis proceraspal r u bsflow er expectorantcough, asthma, dysentery, expectorantpowde r rpowdered flowers are used with wateroral1004Cannabis sativa L. Cannabaceae H.UOM.BG.419bha r ehleav es stomach inflammations, pain killerextract tfresh leaves extract is taken with sugaroral g3004Capsella pastorisba ehleav es stimulant, astringentdecott ionfresh leaves decoction is prepared9003 | | - | | | ····· | | | | | | | |
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| Asteraceae H.UOM.BG.417r br br cough, asthma, dysentery, expectorantpowde rforehead for fever111Calotropis proceraspal mai r u bsflow expectorantcough, asthma, dysentery, expectorantpowde rpowdered flowers are used with wateroral1004Asclepiadaceae H.UOM.BG.418mai bh e eer e stimulant, astringentindigestion, lever and pain killerextract t tfresh leaves extract is taken with sugaroral3004Cannabic sativa L. Cannabaceae H.UOM.BG.419bha e eh e es rleav stomach pain killerextract t tfresh leaves extract is taken with sugaroral g3004Capsella pastorisba e eh e es stimulant, astringentdecoct ionfresh leaves decoction is prepared9003 | | | | | - | 1- 2000 | | | | | . | |
| H.UOM.BG.417bImage: Second seco | Asteraceae | | | - | | | | | | 1 | | |
| Calotropis proceraspal mais h r u bflow er expectorantcough, asthma, dysentery, expectorantpowde r rpowdered flowers are used with wateroral1 r 00 04 r 1Asclepiadaceae H.UOM.BG.418h ber u ber expectorantcough, asthma, dysentery, expectorantpowde rpowdered flowers are used with wateroral1 r 00 04 rCannabis sativa L. Cannabaceae H.UOM.BG.419bha e r bh es r pain killerleav stomach pain killerindigestion, lever and stomach pain killerextrac t tfresh leaves extract is taken with sugaroral3 9 00 04 0Capsella pastorisba mh e esleav stimulant, astringentdisorder, iondecoct is preparedfresh leaves decoction is preparedoral9 00 03 0 | | | | | | | | | | | | |
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| H.UOM.BG.418u bu bu bu bu bu bu bu bu bu bu c </td <td>'</td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td>2</td> <td></td> | ' | | | | | - | | | | | 2 | |
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| Cannabis sativa L. Cannabaceae H.UOM.BG.419bha ng r bh leav es r bleav indigestion, lever and inflammations, pain killerextract tfresh leaves extract is taken with sugaroral3 9 00 04 0Capsella pastorisbursa mbba eh es esleav menstrual stimulant, astringentdisorder, iondecoct ionfresh leaves decoction is preparedoral9 00 00 03 0 | | | | | | | | | | - | | |
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| pastoris L. mb e es stimulant, astringent ion is prepared | Capsella hursa | ba | - | leav | menstrual disorder | decort | fresh leaves decortion | oral | 9 | | 0 | 3 |
| | | | | | | | | 0.01 | | | Ŭ | |
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|-------------------------------|------------|--------|------------|--|------------|--|------|----------|--------|--------|---|
| H.UOM.BG.420 | | b | | | | | | | 7 | 3 | |
| Caralluma | ра | S | whol | anti- diabetic, tonic, fever, | fresh | fresh leaves are cooked | oral | 5 | 0 | 0 | 4 |
| <i>tuberculata</i> R. | ma | h | e | carminative | | as a vegetable and | | 4 | • | | |
| Asclepiadaceae | nka | r | plan t | | | eaten | | | 4 | 0 7 | 1 |
| H.UOM.BG.421 | У | u b | t | | | | | | | / | |
| Chenopodium | sar | h | whol | constipation, intestinal | fresh | fresh leaves are cooked | oral | 1 | 0 | 0 | 2 |
| album L. | may | е | e | worms | | as a vegetable and | | 1 | • | | |
| Amaranthaceae | | r | plan | | | eaten | | | 0 | 1 | |
| H.UOM.BG.422 Chenopodium | skh | b h | t aeria | diuretic, antispasmodic, | coup | soup is propared from | oral | 1 | 8 0 | 8 0 | 4 |
| botrys L. | а | e | l | carminative and laxative | soup | soup is prepared from aerial parts | Urai | і З | 0 | 0 | 4 |
| Amaranthaceae | kha | r | part | | | | | | 1 | 3 | |
| H.UOM.BG.423 | raw | b | S | | | | | | | 1 | |
| | а | | | | | | | | | | |
| Cichorium intybus | han | h | leav | anti-inflammatory, hepatic | decoct | decoction of leaves | oral | 3 | 0 | 0 | 6 |
| L. Asteraceae H.UOM.BG.424 | | e | es | complaints, fever, jaundice, gas trouble, antiasthmatic | ion | | | 4 | 2 | 1 | |
| H.UUWI.BG.424 | | r b | | gas trouble, antiastrinatic | | | | | 2 5 | 8 | |
| Clematis grata W. | zela | s | leav | boils | paste | fresh leaves paste are | derm | 1 | 0 | 0 | 1 |
| Ranunculaceae | i | h | es | | • | applied on boils | al | 6 | | | |
| H.UOM.BG.425 | | r | | | | | | | 1 | 0 | |
| | | u | | | | | | | 2 | 6 | |
| Convolvulus | pre | b h | leav | constipation, intestinal | extrac | fresh plant extract is | oral | 2 | 0 | 0 | 3 |
| arvensis. | wat | e | es | worms, Purgative | t | taken with sugar | orai | 2 | 0 | 0 | 5 |
| Convolvulaceae | kai | r | cs | worms, r arguare | C C | taken man sagar | | Ũ | 1 | 1 | |
| H.UOM.BG.426 | | b | | | | | | | 5 | 5 | |
| Curcuma longa L. | kur | S | Rhiz | analgesic, flu and nasal | powde | powder is mixed with | derm | З | 0 | 0 | 3 |
| Zingiberaceae | ka | h | ome | congestion | r | lime and dermally used | al | 8 | | | |
| H.UOM.BG.427 | ma | r | | | | on the painful area. | | | 2 8 | 0 8 | |
| | n | u b | | | | | | | 0 | 0 | |
| Dalbergia sissoo | sha | tr | leav | mental disorder, stimulant, | decoct | decoction of leaves is | oral | 2 | 0 | 0 | 5 |
| D. Papilionaceae | wa | е | es | astringent, boils, | ion | prepared | | 9 | | | |
| H.UOM.BG.428 | | е | | gonorrhoea | | | | | 2 | 1 | |
| Daphne | legh | s | whol | wounds, abdominal pain, | powde | root powder are taken | oral | 1 | 2 | 7 | 4 |
| mucronata R. | ona | h | e | swellings, gastrointestinal | r | orally with water as | orai | 5 | | | |
| Thymelaeaceae | y | r | plan | | | gastro-intestinal irritant | | | 1 | 2 | |
| H.UOM.BG.429 | | u | t | | | | | | 1 | 7 | |
| | | b | | | | | | - | - | | _ |
| Datura stramonium L. | dat hor | H e | root | asthma, expectorant, fever, sedative, anodyne | powde r | a minute amount of powder are taken with | oral | 2 6 | 0 | 0 | 5 |
| Solanaceae | a | r | S | sedative, anodyne | 1 | water | | 0 | 1 | 1 | |
| H.UOM.BG.430 | - | b | | | | | | | 9 | 9 | |
| Debregeasia | ajlai | S | whol | urticaria, jaundice, eczema, | powde | arial parts powder | derm | 3 | 0 | 0 | 4 |
| saeneb F. | | h | e | dermatitis | r | mixed with mustard oil | al | 2 | • | • | |
| Urticaceae | | r | plan | | | | | | 2 | 1 | |
| H.UOM.BG.431 | | u b | t | | | | | | 4 | 3 | |
| Dodonaea viscosa | ghw | s | Leav | Rheumatism, wounds, | paste | The leaves are warmed | derm | 2 | 0 | 0 | 4 |
| L. Sapindaceae | aras | h | es | burns, swellings | | and kept on joints to | al | 2 | • | | |
| H.UOM.BG.432 | kay | r | | | | relieve pain | | | 1 | 1 | |
| | | u | | | | | | | 6 | 8 | |
| Duchesnea indica | zma | b h | fruit | bloody diarrhea, tonic, | nasto | fruit paste is prepared | oral | 7 | 0 | 0 | 3 |
| J. Rosaceae | ki | e | nuit | laxative | paste | in air paste is prepared | UIAI | / | | | 5 |
| H.UOM.BG.433 | toot | r | | | | | | | 0 | 4 | |
| | h | b | | | | | | | 5 | 3 | |
| Eruca sativa M. | sala | h | whol | bleeding piles, ear pain, | extrac | oil is slightly warmed | ear | 9 | 0 | 0 | 2 |
| Brassicaceae | d | е | е | | t | over fire and poured | drop | | | | |

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| 41 | | | Quantitative analysis of medicina | al plants co | onsumption | | | | | _ |
|---|-----------|----------------|--|---------------|--|------|--------|--------|--------|---|
| H.UOM.BG.434 | r b | plan t | | | into ears to relieve pain. | | | 0 7 | 2 2 | |
| <i>Euphorbia</i> m | | | skin eruption, intestinal | latex | milky latex, roasted | oral | 5 | 0 | 0 | 3 |
| <i>helioscopia</i> L. nc Euphorbiaceae nc | | S | problems, constipation, | | with additive, also applied on skin | | | 0 | 6 | |
| H.UOM.BG.435 | b | | | | | | | 4 | Ū | |
| Euphorbia ar | - | | wounds, skin diseases, | latex | stem latex is applied over skin to treat the | derm | 1 | 0 | 0 | 4 |
| <i>wallichii</i> H. ha Euphorbiaceae m | | X | emetic, cathartic | | wounds and to remove | al | 8 | 1 | 2 | |
| H.UOM.BG.436 a | b | | | | pain | | | 3 | 2 | |
| Fagonia indica B. az | | | blood purifier, skin | decoct | whole plant is boiled in | derm | 2 | 0 | 0 | 3 |
| Zygophyllaceae ak H.UOM.BG.437 y | ka e r | part | infection, diabetes | ion | water and applied on skin | al | 3 | 1 | 1 | |
| , | b | | | | | | | 7 | 3 | |
| <i>Ficus carica</i> L. air Moraceae ar | _ | fruit | boils, laxative, asthma, sexual debility | fresh | fruits are mixed with milk | Oral | 3 2 | 0 | 0 | 4 |
| Moraceae ar H.UOM.BG.438 | e e | | Sexual debility | | IIIIK | | 2 | 2 | 1 | |
| | | | | | | | | 4 | 3 | |
| <i>Foeniculum</i> so <i>vulgare</i> M. nf | | fruit, leav | gastrointestinal, abdominal pain, stimulant, vermicide | juice | juice of the fruit is used | oral | 2 1 | 0 | 0 | 4 |
| Umbelliferae | r | es | pain, sumulant, vermicide | | | | 1 | 1 | 1 | |
| H.UOM.BG.439 | b | | | | | | | 6 | 9 | |
| <i>Fumaria indica</i> P. pa Fumariaceae ra | | whol e | blood purifier, High fever, chest pain, diuretic | decoct ion | Plant is boiled in water | oral | 4 1 | 0 | 0 | 3 |
| H.UOM.BG.440 | r | plan | | 1011 | | | | 3 | 0 | |
| | b | t | | | | | - | 1 | 7 | |
| <i>Geranium</i> Sr. <i>wallichianum</i> D. ela | - | rhizo mes | backache, mouth ulceration, chronic diarrhea | powde r | rhizomes powder is mixed with wheat flour, | oral | 3 0 | 0 | 0 | 3 |
| Geraniaceae | r r | mes | | | sugar and oil | | U | 2 | 1 | |
| H.UOM.BG.441 | b | | | | | | | 2 | | |
| <i>Grewia asiatica</i> L. fal Malvaceae a | ls tr | whol e | diabetics, cooling agent, stomachic, | fresh | fruits is taken orally | oral | 1 9 | 0 | 0 | 3 |
| H.UOM.BG.442 | e | plan | | | | | 5 | 1 | 1 | |
| Cumposporia | | t seed | colic ducantony diarrhaa in | docost | the plant is bailed with | oral | 3 | 4 | 6 0 | 3 |
| <i>Gymnosporia</i> Su royleana W. Az | | | colic, dysentery, diarrhea in children | decoct ion | the plant is boiled with salt and water | oral | 3 3 | 0 | | 3 |
| Celastraceae ha | | | | | | | | 2 | 0 | |
| H.UOM.BG.443 | u b | | | | | | | 5 | 9 | |
| Hedera nepalensis Pa | | - | heart disease, cancer, | decoct | Fresh and ground | oral | 4 | 0 | 0 | 3 |
| K. Araliaceae ola | | es | diabetes | ion | leaves are boiled in | | 1 | | | |
| H.UOM.BG.444 la | r b | | | | water | | | 3 1 | 0 7 | |
| Impatiens bicolor at | | | joint pains. speeding | paste | paste of leaves is | derm | 1 | 0 | 0 | 2 |
| R. Balsaminaceae ng | - | le | defecation | | applied for joint pains | al | 2 | | • | |
| H.UOM.BG.445 | r b | plan t | | | | | | 0 9 | 1 7 | |
| <i>Ipomoea</i> pr | | Leav | wound healing, painkiller, | crushe | Leaves are grinded and | derm | 3 | 0 | 0 | 4 |
| <i>purpurea</i> L. wa Convolvulaceae a | at e r | es | blood clotting. lice killer | d | the extract is used for washing hairs to get rid | al | 1 | 2 | 1 | |
| H.UOM.BG.446 | b | | | | of lice. | | | 2 3 | і З | |
| Isodon rugosus W. sp | | | antiseptic, dermatitis, | crushe | leaves are crushed and | derm | 4 | 0 | 0 | 2 |
| Lamiaceae rk. H.UOM.BG.447 | ay e r | es | wound | d | applied on skin | al | 2 | 3 | 0 | |
| 1.00Wi.b0.447 | b | | | | | | | 5 1 | 5 | |
| 5 | eik s | root | asthma, cold, cough, high | crushe | dried, ground leaves | oral | 1 | 0 | 0 | 4 |
| L. Acanthaceae an H.UOM.BG.448 | nd h r | | fever | d | mixed with sugar and root extract mixed with | | 5 | 1 | 2 | |
| | | | | | | | | | 7 | |
| | u | | | | sugar | | | 1 | / | |
| Lactuca sativa L. sa | b | leav | blood purifier, sedative, | fresh | fresh leaves are taken | oral | 1 | 0 | 0 | 1 |

| Ukrainian Journal or | 1 | ř | | diuratia | | with model | [| 4 | 2 | | |
|---|------------------------------|-----------------------|---------------------------------|--|---------------|--|------------|--------|-------------|-------------|---|
| Asteraceae H.UOM.BG.449 | d | e r b | es | diuretic | | with meal | | 9 | 1 4 | 0 5 | |
| Melia azedarach L. Meliaceae H.UOM.BG.450 | thor a sha nda i | tr e e | fruit | leprosy, urinary disorders, diuretic, | crushe d | ripened fruits are crushed and mixed with wheat flour | oral | 3 7 | 0 2 8 | 0 0 8 | 3 |
| Mentha arvensis L. Lamiaceae H.UOM.BG.451 | pod ina | h e r b | leav es | vomiting, nausea, dysentery | paste | dried leaves are taken with curd to control dysentery vomiting and nausea | oral | 4 3 | 0 3 2 | 0 0 7 | 3 |
| Mentha longifolia L. Lamiaceae H.UOM.BG.452 | wel any | h e r b | Who le plan t | indigestion, vomiting, cholera, carminative, colic | powde r | plant powder taken with water | Oral | 5 3 | 0 4 | 0 0 6 | 3 |
| <i>Mirabilis jalapa</i> L. Nyctaginaceae H.UOM.BG.453 | Gul- e- aba ssi | h e r b | root | piles, blood purifier, cathartic, dropsy | juice | leaves juice are taken | Oral | 1 3 | 0 1 | 0 3 1 | 4 |
| <i>Morus alba</i> L. Moraceae H.UOM.BG.454 | spin toot h | tr e e | fruit | heart, liver tonic, dyspepsia | fresh | fresh ripen fruit is taken | oral | 2 3 | 0 1 7 | 0 1 3 | 3 |
| <i>Morus nigra</i> L. Moraceae H.UOM.BG.455 | thor tho oth | tr e e | fruit | analgesic, flu and throat infection | fresh | fresh ripen fruit is taken | oral | 1 9 | 0 1 4 | 0 1 6 | 3 |
| Nasturtium officinale R. Brassicaceae H.UOM.BG.456 | Tar me era | h e r b | whol e plan t | blood purifier, diuretic, antiscorbic, expectorant | decoct ion | leaves are boiled in water | oral | 2 4 | 0 1 8 | 0 1 7 | 4 |
| Nerium oleander L. Apocynaceae H.UOM.BG.457 | gan dec har | s h r u b | whol e plan t | heart diseases, Sexual purpose ,diuretic, cathartic | decoct ion | plant especially flowers are boiled with milk | oral | 5 | 0 0 4 | 0 8 | 4 |
| Plantago major L. Plantaginaceae H.UOM.BG.458 | sath | h e r b | areal part | pain killer, carminative, stomach disorders, purgative | decoct ion | arial parts are crushed and taken with yogurt and milk | oral | M 5 | 0 2 6 | 0 1 1 | 4 |
| Polygonum barbatum L. Polygonaceae H.UOM.BG.459 | pul pol uk | h e r b | whol e plan t | stomach disorders, constipation, infections | paste | leaf paste is applied on skin infections | derm al | 1 1 | 0 0 8 | 0 2 7 | 3 |
| <i>Quercus incana</i> B. Fagaceae H.UOM.BG.460 | ban j | tr e e | fruit | urinary disorders, asthma, diarrhea, gonorrhoea | powde r | half roasted fruit powder is mixed in honey | Oral | 2 0 | 0 1 5 | 0 2 | 4 |
| Ranunculus muricatus L. Ranunculaceae H.UOM.BG.61 | zyar gwa lay | h e r b | leav es | skin infection, wounds | paste | fresh leaf paste is applied on infected skin | derm al | 7 | 0 0 5 | 0 2 9 | 2 |
| <i>Ricinus communis</i> L. Euphorbiaceae H.UOM.BG.462 | arh and a | s h r u b | leav es and fruit s | constipation, jaundice, abdominal pain | fresh | leaves are heated and applied over the abdomen | derm al | 8 | 0 0 6 | 0 3 8 | 3 |
| <i>Salix alba</i> L. Salicaceae H.UOM.BG.463 | wal a | tr e e | Bark | pain, fever, astringent | decoct ion | cleaned bark is boiled in water | Oral | 4 8 | 0 3 6 | 0 0 6 | 3 |

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| 43 Quantitative analysis of medicinal plants consumption | | | | | | | | | | | |
|--|----------|--------|----------|-------------------------------|--------|--|------|--------|---|---|---|
| Silene conoidea L. | bas | h | seed | pimples, backache, | paste | paste is prepared by | derm | 1 | 0 | 0 | 3 |
| Caryophyllaceae | hka | е | S, | emollient | | grinding seeds and | al | 0 | | | |
| H.UOM.BG.464 | | r | leav | | | young leaves and | | | 0 | 3 | |
| | | b | es | | | applied externally | | | 7 | | |
| Silene vulgaris M. | mat | h | leav | respiratory diseases, cough | decoct | leaves and flowers are | Oral | 1 | 0 | 0 | 3 |
| Caryophyllaceae | a r | e | es, | , asthma | ion | boiled in water | 0.01 | 4 | Ũ | • | 0 |
| H.UOM.BG.465 | ran | r | flow | , ascinia | 1011 | Solice in Water | | | 1 | 2 | |
| 11.0011.001.105 | gay | b | ers | | | | | | | 1 | |
| Solanum nigrum | thor | h | leav | eye pain, expectorant, | crushe | leaves and fruits are | Oral | 4 | 0 | 0 | 5 |
| L. Solanaceae | ka | e | es | laxative, leprosy, Sedative | d | crushed and eaten with | Orai | - 1 | 0 | 0 | 5 |
| H.UOM.BG.466 | | r r | es | laxative, lepiosy, sedative | u | water | | 1 | 3 | 1 | |
| H.UUWI.DG.400 | mac | b | | | | water | | | | | |
| C. L. | ho | - | C | | C Is | | 1 | (| 1 | 2 | 2 |
| Solanum | ka | h | fruit | diabetes, toothache | fresh | eaten as a raw in small | oral | 3 | 0 | 0 | 2 |
| pseudocapsicum | mac | e | | | | amount | | 9 | · | • | |
| L. Solanaceae | ho | r | | | | | | | 2 | 0 | |
| H.UOM.BG.467 | | b | | | | | | | 9 | 5 | |
| Taraxacum | bud | h | rhizo | jaundice, diuretic, tonic, | decoct | fresh rhizome is boiled | oral | 2 | 0 | 0 | 4 |
| oficinale N. | abu | е | me | aperient | ion | in water | | 1 | • | • | |
| Asteraceae | dai | r | | | | | | | 1 | 1 | |
| H.UOM.BG.468 | | b | | | | | | | 6 | 9 | |
| Urtica dioica L. | sez | h | whol | external irritant, stringent, | juice | juice of plant is used as | derm | 3 | 0 | 0 | 3 |
| Urticaceae | onk | е | e | diuretic | | external irritant | al | 9 | | | |
| H.UOM.BG.469 | ay | r | plan | | | | | | 2 | 0 | |
| | - | b | t | | | | | | 9 | 8 | |
| Valeriana | mu | h | Root | diarrhea, dysentery, | decoct | leaves are boiled in | oral | 5 | 0 | 0 | 5 |
| jatamansi J. | shk | е | /leav | analgesic, skin infections, | ion | water | | 8 | | | |
| Valerianaceae | ebal | r | es | carminative | | | | | 4 | 0 | |
| H.UOM.BG.470 | а | b | | | | | | | 3 | 9 | |
| Viola canescens | ban | h | whol | fever and chills, muscle | decoct | plant is boiled with | oral | 5 | 0 | 0 | 5 |
| W. Violaceae | afsh | e | e | tension, sore throat, | ion | water and sugar | | 0 | | | - |
| H.UOM.BG.471 | a | r | plan | laxative | | | | - | 3 | 1 | |
| | G | b | t | | | | | | 7 | • | |
| Vitex negundo L. | war | s | Leav | mild fever, urinary | extrac | leaves are boiled in | oral | 7 | 0 | 0 | 4 |
| Verbenaceae | ma | h | es | disorders, worms problem | t | water, filtered and | 0101 | ' | | 0 | - |
| H.UOM.BG.472 | nda | r | | anthelmintic | | extract is prepared | | | 0 | 5 | |
| 1.00101.00.472 | | | | | | childer is prepared | | | _ | - | |
| | I | u h | | | | | | | 5 | / | |
| Zanthovadure | da | b | cocd | stomach discurdants to the | pourde | nounder of dry fry it and | oral | n | 0 | 0 | 2 |
| Zanthoxylum | da mb | S b | seed | stomach disorders, tooth | powde | powder of dry fruit are taken with meal and | oral | 3 | U | U | 2 |
| armatum D. | mb | h | | problems | r | | | 5 | ^ | • | |
| Rutaceae | ara | r | | | | water | | | 2 | 0 | |
| H.UOM.BG.473 | | u | | | | | | | 6 | 6 | |
| | | b | | | | | | | | | |
| Zizyphus jujuba | mar | tr | Leav | skin infections, diabetes | fresh | Fresh leaves are | oral | 3 | 0 | 0 | 2 |
| M. Rhamnaceae | kha | е | es | | | chewed | | 4 | • | • | |
| H.UOM.BG.474 | nai | е | | | | | | | 2 | 0 | |
| | | | | | | | | | 5 | 6 | |

Part used, mode of preparation and application

For the preparation of ethnomedicines the inhabitants used leaves (31%) mostly followed by whole plant (21%), fruit and root (9%), rhizome (7%), seed and aerial parts (6%), bark (4%), bulb, flower and latex (1%) (Figure 3). Our study is in line at national and international level with (Hazrat et al., 2011; Randrianarivony et al., 2017) where leaves are mostly used for the preparation of ethnomedicine.

The inhabitants did not report any side effect however some plants were poisons which might be due to proper and administered doze utilization. The inhabitant's used decoction, crushed, extract, juice, latex, paste, powder, soup and in raw form. They use decoction (28%) commonly for the preparation of ethnomedicine followed by powder (21%), raw and paste (14%), juice, extract (6%), latex (3%) and (1%) as a soup (Figure 2). The results are in line with other studies at national and international level (Ahmad et al., 2014; Chellappandian et al., 2012) where healer use mostly decoction for the preparation of ethnomedicine. It might be due to get more chemical constituents for fruitful results. The taste of ethnomedicine is mostly very bitter and unpleasant, therefore they use additive like wheat flour, sugar, milk, salt, honey, desi ghee. In the locality frequently ethno medicines (76%) were taken as orally followed by dermal (22%) and ear drops (2%) (Figure 5). Our conclusions are in the settlement at national and international level with (Hassan et al., 2017; Namukobe et al., 2011) and (Ssegawa & Kasenene, 2007), who also observed that the main practice in preparation of herbal medicine was decoction with

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oral intake. For external use, they use oil paste and poultice mostly for skin irritation, infection and joint pain. The results are in agreement with (Umair, Altaf & Abbasi, 2017).

Informant consensus factor (ICF)

To calculate ICF diseases were categorized into 10 different categories based on use reports obtained (Table 2). Highest number of use reports (93) were observed for gastrointestinal and (92) for antispasmodic while lowest (23) for tonic. Out of total (14.5%) plant species were used as febrifuge followed by diuretic (13.19%), painkiller (11.11%), carminative (11.8%), diarrhoea and dysentery (10.41%), antispasmodic (9.72%), dermatitis (9.02), gastrointestinal (7.63%), anti-diabetic (6.94%) and tonic (5.55%) (Table 3). Informants consensus factor plays an important role in plant selection for phytochemical and pharmacological analysis (Giday et al., 2007). In our study, mostly plant species were used as a febrifuge (21) and a diuretic (19), which might be due to bad hygiene, unpurified drinking water, cold weather and effective use of herbal drugs. Our results are in connection with (Amiri, Jabbarzadeh & Akhondi, 2012; Korkmaz et al., 2016) where the inhabitants use mostly plant species as febrifuge and diuretic. High Informant consensus factor, ICF (0.89) was observed for gastrointestinal disorder while lowest (0.54) for painkiller, which is parallel with the study of (Zahoor et al., 2017).

Table 3. Informant consensus factor of traditional medicinal plants used as remedy Bahrain Valley.

| Disorders | Number of use reports (NUR) | Use reports percentage | Number of taxa used (Nt) | Taxa Percentage | ICF |
|------------------------|--------------------------------|------------------------|-----------------------------|--------------------|----------|
| Carminative | 71 | 11.25 | 17 | 11.8 | 0.7 7 |
| Gastrointestinal | 93 | 10.45 | 11 | 7.63 | 0.8 9 |
| Diuretic | 87 | 13.78 | 19 | 13.19 | 0.7 9 |
| Antispasmodic | 92 | 12.51 | 14 | 9.72 | 0.8 5 |
| Febrifuge | 92 | 14.58 | 21 | 14.5 | 0.7 8 |
| Diarrhea/ dysentery | 81 | 12.83 | 15 | 10.41 | 0.8 2 |
| Dermatitis | 59 | 9.35 | 13 | 9.02 | 0.7 9 |
| Anti-diabetic | 39 | 6.18 | 10 | 6.94 | 0.7 6 |
| Pain killer | 34 | 5.38 | 16 | 11.11 | 0.5 4 |
| Tonic | 23 | 3.64 | 8 | 5.55 | 0.6 8 |

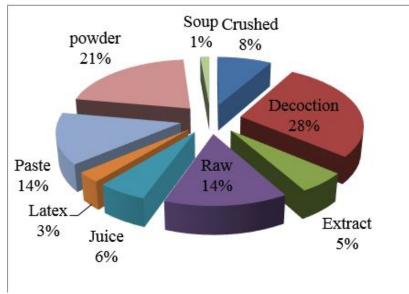


Figure 2. Methods for preparation of ethno medicines.

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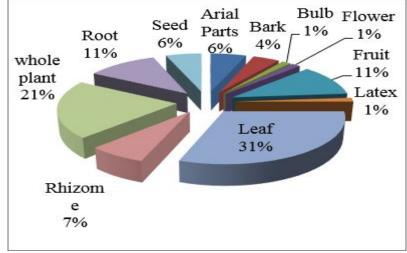


Figure 3. Part used for preparation of ethno medicine.

Relative frequency of citation (RFC) and use value (UV)

Relative frequency of citation (RFC) shows the local importance and rank of each medicinal plant species, while Use value (UV) provides the relative importance on the use of medicinal plant species (Vitalini et al., 2013). The RFC was observed high (0.43) for *Valeriana jatamansi* followed by *Ajuga bracteosa* (0.42), *Caralluma tuberculata* and *Mentha longifolia* (0.40) while lowest for *Nerium oleander* (0.04), *Ranunculus muricatus, Vitex negundo* (0.05) and *Ricinus communis* (0.6) (Table 2). It was clear from the fact that knowledgeable inhabitants have a comprehensive knowledge regarding medicinal plants in the study area (Northern Pakistan). Our results are in line with (Ahmad et al., 2014) who also observed nearly same RFC (0.42) for *Valeriana jatamansi*, 0.24 for *Ajuga bracteosa* and 0.88 for *Mentha longifolia* which were usually well-known by the inhabitants with in the same district. Use value (UV) provides the relative importance on the use of medicinal plant species (Savikin et al., 2013). The use value (UV) was observed high (0.80) for *Nerium oleander* while lowest (0.05) for *Isodon rugosus*, *Lactuca sativa* and *Solanum pseudocapsicum*. *Nerium oleander* has used a substitute of Digitalis and is a good cardiac stimulant, diuretic, cathartic and sexual stimulant. It might be due to that highly poisonous plants have highly biologically active compounds which depend on preparation method and doze taken for fruitful results. The use value (UV) of *Nerium oleander* has also been observed by (Bulut & Tuzlaci, 2013) as (0.04) for Rheumatism. Our study is in agreement with (Shinwari et al., 2006) where the inhabitants in the same district use *Nerium oleander* as a diuretic, cathartic and to treat cardiac diseases, *Isodon rugosus* as antiseptic (Hassan et al., 2017) and Lactuca as a sedative (Ali et al., 2016).

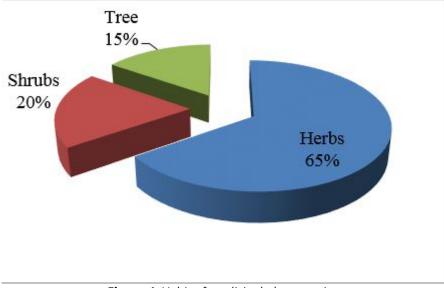


Figure 4. Habit of medicinal plant species.

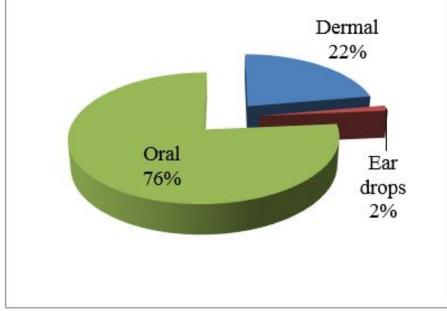


Figure 5. Mode of application of ethnomedicines.

Fidelity level (FL)

Fidelity level indicates informants percentage appealing the usages of definite medicinal plant species for the similar major purpose. Fidelity level (FL) of high valued 18 medicinal plant species was observed 92.31 to 56.52 (Table 4). Plant species with high FL value identifies the usages of specific plant species for a specific disease in the study area (Bibi et al., 2014). High fidelity level 94.12% was observed for *Ajuga bracteosa* (stomach disorder) followed by *Achyranthes aspera* 92.31% (asthma, cough), *Salix alba* (Pain and fever) and lowest 56.52% for *Plantago major*. *Ajuga bracteosa* with (100%) fidelity level has already been observed for diabetic disorders by(Ahmad & Habib, 2014), *Achyranthes aspera* (82%) as antimalarial by (Wangpan et al., 2016), Plantago major as purgative by (Shinwari et al., 2006) and *Salix alba* as painkiller by (Chevallier, 1998).

| Table 4. FL values of frequently used traditional medicinal plants as remedy in Bahrain Valley. |
|--|
|--|

| Achyranthes aspera L.Asthma, cough121392.31Aconitum chasmanthum S.High fever141782.35Ajuga bracteosa W.Stomach disorder161794.12Cichorium intybus L.Anti-inflammatory91369.23Fagonia indica B.Skin infection141973.68Foeniculum vulgare M.Stimulant91369.23Fumaria indica PBlood purifier71070Ipomoea purpurea L.Blood clotting111668.75Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Pain killer212972.41Solanum nigrum L.Laxative132065Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Botanical Nane | Major Disorders | LP | LU | FL |
|---|-------------------------|-------------------|----|----|-------|
| Aconitum chasmanthum S. High fever 14 17 82.35 Ajuga bracteosa W. Stomach disorder 16 17 94.12 Cichorium intybus L. Anti-inflammatory 9 13 69.23 Fagonia indica B. Skin infection 14 19 73.68 Foeniculum vulgare M. Stimulant 9 13 69.23 Fumaria indica P Blood purifier 7 10 70 Ipomoea purpurea L. Blood clotting 11 16 68.75 Melia azedarach L. Urinary disorders 19 25 76 Mentha longifolia L. Carminative 11 15 73.33 Nasturtium officinale R Antiscorbic 26 30 86.67 Plantago major L. Purgative 13 23 56.52 Salix alba L. Pain killer 21 29 72.41 Solanum nigrum L. Laxative 13 20 65 Valeriana jatamansi J. Skin infections 17 19 89.47 Viola canescens W. Sore throat 18 | | - | | | |
| Ajuga bracteosa W.Stomach disorder161794.12Cichorium intybus L.Anti-inflammatory91369.23Fagonia indica B.Skin infection141973.68Foeniculum vulgare M.Stimulant91369.23Fumaria indica PBlood purifier71070Ipomoea purpurea L.Blood clotting111668.75Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Achyranthes aspera L. | Asthma, cough | 12 | 13 | 92.31 |
| Cichorium intybus L.Anti-inflammatory91369.23Fagonia indica B.Skin infection141973.68Foeniculum vulgare M.Stimulant91369.23Fumaria indica PBlood purifier71070Ipomoea purpurea L.Blood clotting111668.75Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Aconitum chasmanthum S. | High fever | 14 | 17 | 82.35 |
| Fagonia indica B.Skin infection141973.68Foeniculum vulgare M.Stimulant91369.23Fumaria indica PBlood purifier71070Ipomoea purpurea L.Blood clotting111668.75Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Ajuga bracteosa W. | Stomach disorder | 16 | 17 | 94.12 |
| Foeniculum vulgare M.Stimulant91369.23Fumaria indica PBlood purifier71070Ipomoea purpurea L.Blood clotting111668.75Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Cichorium intybus L. | Anti-inflammatory | 9 | 13 | 69.23 |
| Fumaria indica PBlood purifier71070Ipomoea purpurea L.Blood clotting111668.75Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Fagonia indica B. | Skin infection | 14 | 19 | 73.68 |
| Ipomoea purpurea L.Blood clotting111668.75Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Sore throat182475Viola canescens W.Anthelmintic81457.14 | Foeniculum vulgare M. | Stimulant | 9 | 13 | 69.23 |
| Melia azedarach L.Urinary disorders192576Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Fumaria indica P | Blood purifier | 7 | 10 | 70 |
| Mentha longifolia L.Carminative111573.33Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | lpomoea purpurea L. | Blood clotting | 11 | 16 | 68.75 |
| Nasturtium officinale RAntiscorbic263086.67Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Melia azedarach L. | Urinary disorders | 19 | 25 | 76 |
| Plantago major L.Purgative132356.52Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Mentha longifolia L. | Carminative | 11 | 15 | 73.33 |
| Salix alba L.Pain killer212972.41Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Nasturtium officinale R | Antiscorbic | 26 | 30 | 86.67 |
| Solanum nigrum L.Laxative132065Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Plantago major L. | Purgative | 13 | 23 | 56.52 |
| Valeriana jatamansi J.Skin infections171989.47Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Salix alba L. | Pain killer | 21 | 29 | 72.41 |
| Viola canescens W.Sore throat182475Vitex negundo L.Anthelmintic81457.14 | Solanum nigrum L. | Laxative | 13 | 20 | 65 |
| <i>Vitex negundo L.</i> Anthelmintic 8 14 57.14 | Valeriana jatamansi J. | Skin infections | 17 | 19 | 89.47 |
| - | Viola canescens W. | Sore throat | 18 | 24 | 75 |
| Zanthoxylum armatum D. Tooth problems 6 10 60 | Vitex negundo L. | Anthelmintic | 8 | 14 | 57.14 |
| | Zanthoxylum armatum D. | Tooth problems | 6 | 10 | 60 |

Direct matrix ranking (DMR)

In order to rank medicinal different medicinal plant species, DMR was carried out. DMR can be applied to match plant diversity of certain plant based on data collection from respondents. (Cotton, 1996).A total of 15 experienced and knowledgeable informants were preferred for DMR data collection. Experienced and knowledgeable informants were allowed to give rank to medicinal plant species as 0=not used, 1=least used, 2=less used, 3=good, 4=very good, 5=best to every single plant species (Table 5). The average scores given to each plant species was summed up and ranked (Hassan et al., 2017).DMR was observed high for trees mostly followed by shrubs. Highest DMR was observed for *Melia azedarach* (24) followed by

Dalbergia sisso (22) and lowest (10) for Vitex negundo.

| Plant | Agriculture tools | Construction | Fodder | Fuel | Medicinal | Rank |
|------------------------|-------------------|--------------|--------|------|-----------|------|
| Acacia nilotica L | 3 | 4 | 3 | 5 | 4 | 19 |
| Alnus nitida S. | 3 | 3 | 2 | 5 | 3 | 16 |
| Berberis lycium R. | 0 | 0 | 3 | 4 | 5 | 12 |
| Dalbergia sissoo D. | 5 | 5 | 3 | 5 | 4 | 22 |
| Ficus carica L. | 3 | 1 | 2 | 4 | 4 | 14 |
| Melia azedarach L. | 3 | 4 | 4 | 5 | 4 | 19 |
| Melia azedarach L. | 5 | 5 | 4 | 5 | 5 | 24 |
| Morus alba L. | 4 | 4 | 3 | 5 | 3 | 19 |
| Salix alba L. | 3 | 3 | 2 | 3 | 5 | 16 |
| Vitex negundo L. | 0 | 0 | 2 | 4 | 4 | 10 |
| Zanthoxylum armatum D. | 0 | 0 | 4 | 4 | 5 | 14 |

| Table 5. DMR Score of most frequently used medicinal plants species |
|---|
|---|

Conclusions

The inhabitants depend on medicinal plant species for the treatment of different health disorders although English medicine is reachable up to some extent. Mostly the aged people claimed that they are using ethnomedicine since childhood; this knowledge has been passed from elders to the youngster. The inhabitants use *Berberis lycium* for mouth sour, *Canabis sativa* as painkiller, stomach disorders, *Mentha longifolia* as carminative, and colic on a regular basis as per need. Harvesting of plant species for fuelwood and medicinal purpose was observed commonly in the locality. The inhabitants were found unaware about sustainable use, conservation, and storage of medicinal plant species, which can affect the biodiversity of the region. The peoples of the locality were observed agree to share their ethnobotanical knowledge with investigators. In the current study, many medicinal plant species were documented which need further phytochemical investigation. Further exploration, awareness, conservative strategies, Joint collaboration and wise use of resources are highly recommended.

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