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# Wild vegetables, the future food crops: Use of wild plants as food and medicine by tribal mountainous communities of the northern Balochistan, Pakistan

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**Abstract**
Food is a basic human need and a prerequisite for a healthy life, so strong connection between food and health is increasingly recognized. The goal of this study was to record the medicinally important wild edible vegetables and their medicinal uses in different villages of northern Balochistan, The data was obtained through structured questionnaires, free interviews and informal conversations about 60 wild edible plants and their medicinal uses belonging to 21 families and 45 genera. From 228 informants. The Use report (UR), use value (UV), family importance value (FIV) and informants consensus factor (FIC) were calculated for the quantitative study of ethnomedicinal data. Brassicaceae was the dominant botanical family with the largest number of cited species (11) and (13.6 FIV). Leaves are highly utilized (42%) plant part, while decoction of plant parts (34%) as medicine was common mode of recipes. Mostly the plants are consumed in cooked form, while as medicine these plants are often used orally. Highest ICF value (1) was recorded for antidote category. The highest use value was reported for the *Amaranthus viridis* (0.67) highest use report were calculated in *Apium graveolens, Lepidium sativum, Malvaneglecta,* and *Mentha longifolia,* seven use reports for each. The actual cooking practices with traditional vegetables need to be investigated and a

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nutritional, dietary requirements, essential and toxic components in conventional food resources; pharmacological applications of edible wild plants need to be done to determine their actual nutrient contribution and promote for future cultivation.

**Keywords:** Edible vegetables, Medicinal plants, Balochistan, Use values, Use report

## Introduction

The strong connection between food and health is increasingly recognized (Etkin 1996). Nutrition is the basic human need and a prerequisite for healthy life. It is the science that deals with all the various factors of which food is composed and the way in which proper nourishment is brought about. (Vaishali and Jadhav 2013). For centuries traditional vegetables have constituted a substantial part of the human diet and humans' use of traditional vegetables has been reported all around the world. (Dweba and Mearns 2011). Evidence indicates that above 300 million people throughout the modern world gain part or all of their livelihood and food from forests (Burlingame 2000, Pimentel et al. 1997). Out of these, came the direct dependence of numerous resource poor households on indigenous plant resources in rural areas of most countries as an integral part of their livelihoods (Arnold and Perez 2001, Shackleton and Shackleton 2004). Such dependence is predominant in areas where there are easily accessible communal area resources, in conjunction with limited economic options (Dovie et al. 2005). Also wild vegetables are easy to cook having good taste without addition of any spices, and give a very good taste even without cooking oil and food additives. Wild vegetables can bring variety, vitamins and other nutrients (Faber et al. 2002; Faber and Benade 2003). They are inexpensive yet high quality sources of nutrition especially for low income and marginalized sectors of the economy (Smith and Ezyaguirre 2007). It is documented that traditional vegetables are not only used as food sources but also as medicinal sources (Ezebilo 2010) the reason is that the food plants not only provide adequate amounts of vitamins and minerals for humans but also as a factor of prevention of most prevalent life style diseases, such as diabetes, cardiovascular diseases and cancer. According to modern nutritional studies the consumption of leafy vegetables brings numerous health benefits, and their everyday consumption in diet is highly recommended (Block 1991). The benefits that traditional vegetables offer communities as a food source, medicinal source and source of income validate the need to determine current use and investigate the potential of future use. The conservation of the associated indigenous knowledge is vital for the processing and preservation of traditional vegetables. Furthermore, it is vital to transfer the indigenous knowledge to younger women to ensure that the utilization of traditional vegetables continues. The attitudes of specifically young people towards traditional vegetables determine the potential for future use of these vegetables as a food source (Dweba and Mearns 2011). In addition the Food and medicinal uses of these plants have been two of the most relevant and reliable reasons for popular plant management, even in cultures that are increasingly losing their close relationship with nature (Hadjichambis et al. 2008). It is for this reason that ethno-directed research is very useful in the discovery and

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development of new drug and food resources (Khafagi and Deward 2000, Heinrich and Gibbons 2001). Knowledge of such foods is a part of traditional knowledge which is mainly transmitted through contribution of individuals of households (Misra et al. 2008). It is of outmost importance to obtain data about popular uses of wild edible plants before this knowledge disappears, because in many parts of the world these traditions are at risk of disappearing, and hence the crucial need to study such knowledge systems and find innovative ways of infusing them to the future generations (Pieroni et al. 2005, Hadjichambis et al. 2008).

Traditional vegetables are currently neither widely consumed nor produced in large quantities because people are not aware of their nutritional value and westernization has led to a negative perception of these vegetables. Research scientists and policy makers have neglected traditional vegetables, with the result that too little or no information is available on their uses, cooking methods and nutritional value or the bioavailability of nutrients they contain. Recent research indicates that there are a number of traditional vegetables that could help to alleviate the inadequate intake of nutrients that has resulted from the inaccessibility of introduced vegetables to households (Lephole 2004, Modi et al. 2006, Uusiku et al. 2010). The decline in the consumption of traditional vegetables can also be attributed to a decrease in the variety of traditional vegetables and fruits that are available. It can therefore be seen that there are a number of environmental, political and socio economic reasons that lie at the heart of indigenous knowledge loss with regard to traditional vegetables (Adebooye and Opabode 2004).

## Materials and methods

### Study Area

Balochistan, the largest of the four provinces of Pakistan, spreads over an area of 347,190 Sq., Kms. forming 43.6 per cent of the total area of Pakistan. It has clustered population and is smallest in proportion as compared to that of other provinces. Physically, Balochistan is an extensive plateau of rough terrain divided into basins by ranges of sufficient heights and ruggedness. Broadly, Balochistan geographic area can be divided in to four distinct zones: Upper high lands, lower high lands, plains, and deserts.

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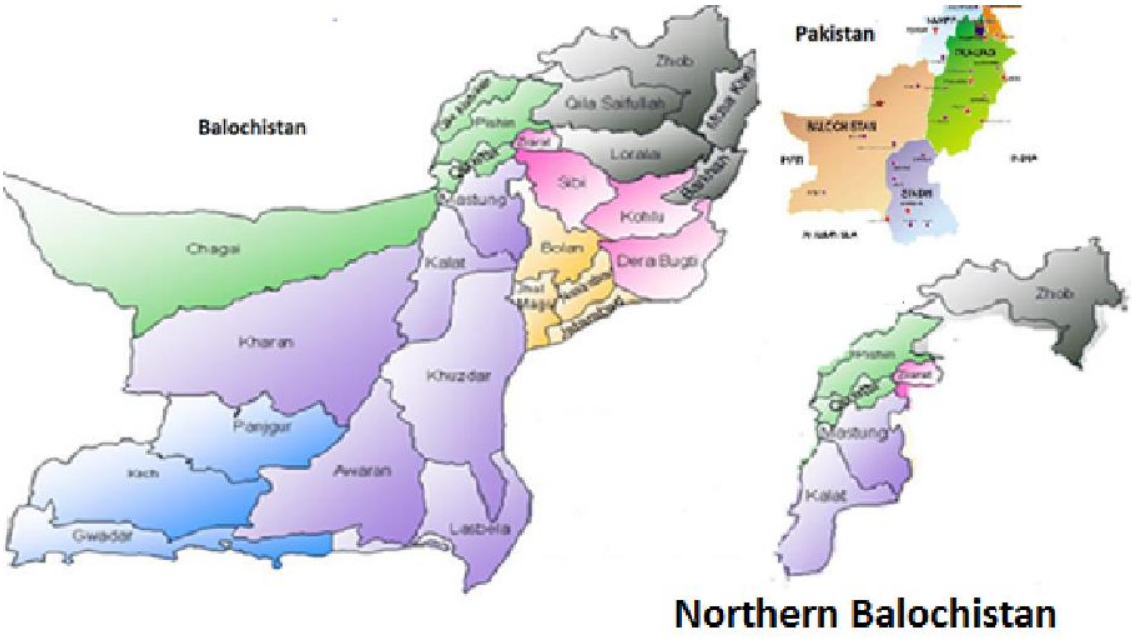


Fig. 1. Map of Pakistan showing Balochistan Province and study area.

The upper highlands, known locally as Khorasan, rise as high as 3,700 meters, with valley floors about 1,500 meters above sea levels. The highlands include Makran, Kharan and Chaghi ranges in the West and Sulaiman, Pab, Kirther in the east. The Upper High Lands fall mainly in districts Zhob, Killa Saifullah, Pishin, Quetta, Ziarat and Kalat (Fig. 1). It comprises a number of ranges such as Sulaiman, Toba Kakari, Murdar, Zarghoon, Takatu, and Chiltan ranges. The Lower High Lands have an altitude ranging from 1970 to 3940 ft (600 to 1200 M). They are located in the south-eastern Balochistan, except eastern part of Kachi, the southern end of Dera Bugti and Nasirabad districts. Some are extension of lower high lands that exist at boundaries of Gwadar, Turbat, Panjgur, Kharan and Chaghi districts.

Balochistan has relatively small area of plains as compared to its total land area. They include the Kachi plain, situated to the south of Sibi and extending into Nasirabad Division, the southern part of Dera Bugti district, and narrow plain area along the Mekran coast stretching from Kachi to the Iranian border. The plains of Kachi, Las Bela and that of river Dasht cover sizable area. Mountains dominate the terrain, and valley floors, and piedmont plain make up only 15% of the landscape. The western part of the province, mostly in Kharan and Chaghi districts, consists of vast plains covered with black gravel surface and broad expanses of sand dunes. The climate of the upper highlands is characterized by very cold winters and warm summers. Winters of the lower highlands vary from extremely cold in the northern districts to mild conditions closer to the Makran coast. Summers are hot and dry (Anon 2012).

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**Socio economic conditions and ethnic groups of the area**

The Brahui and Pashto is used primarily in speech particularly, we find a large Brahui population in the Kalat and Mastung and Quetta regions, while Ziarat, Harnai and Zhob were dominated by Pashtoons. Other ethnic groups are Urdu, Balochi, Dehwari, Hindko, Persian, Punjabi and Sindhi. All ethnic groups residing in the province commonly speak Urdu with each other for communication. (Anon 2012).

The Balochistan has blessed with diverse flora including a great number of medicinal plants. The rural areas of the Balochistan are still dependent on medicinal plants for their health care because of lack of health centers in the area. Agriculture is the major earning means of the people in the region. Nearly 50% of the population of Balochistan depends on Agriculture. If the sustainable use of wild flora and cultivation of medicinal and food plants are promoted in the area this will strongly effect on the socio economic condition of the local inhabitants.

**Data Collection**

The method employed in this study were designed with the purpose of providing base line information on the use of plant species in local system, through field visits to the different villages of Balochistan province of Pakistan. The information on the use of food plants was obtained through a combination of tools and techniques of structured questionnaires, complemented by free interviews and informal conversations (Ghorbani et al. 2011). During the field survey aims, methods, anticipated benefits of the study were adequately informed to the informants and due consent has been taken from the local people in this regard to publish the information obtained from them. The interviews were individually carried out with members of the local population. Most of the selected informants were those women who have a strong connection with kitchen and collection of wild vegetables.

**Surveyed areas and participants**

A total of 228 inhabitants of the area were interviewed using the local languages that are *Brahui, Pashtoo* and *Urdu*, as the first and third authors are local person of the region. 138 women and 90 men traditional healers were interviewed. The informants were divided into three different age groups i.e.21–40, 41–60 and61–80 years old. Surveys were conducted in ten areas of Balochistan province of Pakistan (*viz*., Kalat, Mastung, Quetta, Dreangharh, Khadkhoocha, Mangochar, Kuchlak, Pishin, Shahrag and Ziarat) (Fig. 1, 2).

**Plant collection and deposition**

Plant collections are valuable because they serve as voucher specimens, and records of the plants (Martin 1995). A voucher specimen facilitates the identification of the species encountered during the research and permits colleagues to review the results of the study (Jain and Rao 1977, Jain 1987). Informants with a sound traditional knowledge of useful wild plants, mostly elderly long-time residents, were consulted to record local plant

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names, edible parts, habit and habitat, medicinal uses and mode of utilization. The local languages spoken in rural areas were Brahui and Pashto and 1st author was aware with the local languages of the study area which permits the accuracy in data recordings. Plants were collected, conserved as herbarium specimens and submitted in the Herbarium of Pakistan (ISL), Department of Plant sciences; Quaid-i-Azam University Islamabad for future correspondence. Taxonomic identification of the specimens was subsequently done by with the help of plant taxonomist at Quaid -i- Azam University Islamabad Pakistan and compared with the specimens of Herbarium of Pakistan (ISL). Botanical names and families were verified using Flora of Pakistan (Nasir and Ali 1970-1989, Ali and Nasir, 1989- 2007) and websites of (www.efloras.org/flora_page.aspx?flora_id=2; http://www.ipni.org/ and http://www.tropicos.org ).

**Quantitative analysis of data**

The data was tabulated and analyzed using four quantitative ethnobotanical indices: Use value (UV), reports (UR) Use and family importance value (FIV).

**Use values (UVs) and Use report (UR)**

The UV was obtained by the following formula proposed by (Ritter et al. 2012). $UVis=U_{si}/n$; where $U_{si}$ is the number of uses mentioned by the informants for the species and n is the number of interviews with the informant. To calculate the use value of each species (UVs), the formula $UVs=\Sigma UV_{is}/n$ was used, where $UV_{is}$ equals the use value of a species for an informant and n is the total number of informants. The use value (UV) is a quantitative method that demonstrates the relative importance of species and plant family for a population. This index was calculated to establish a relationship between each species and the uses assigned to it by analyzing the index in relation to the use categories, while use report (UR) is the use recorded for every species.

**Family importance value (FIV)**

Family importance value (FIV) was calculated by following formula to taking the percentage of informants mentioning the family (Friedman et al. 1986)

FIV= FC (family)/N ×100. Where, FC is the number of informants mentioning the family while N is the total number of informants participating in the study.

**Results and discussion**

**Socio-demographic information of the inhabitants and documentation of medicinally important vegetables**

A total of 228 inhabitants were interviewed. They comprised 28% men and 72% women. The majority of participants were female and mostly all of them were illiterate house wives and were available at home for the interviews because most of them were looking after young children and house hold works. Most of the informants were aged above 50 years i.e. 46% (34 males and 71 females), 34% (21 males and 56 females) were aged between 36-50 years and 20% (9 males and 37 females) between 18-25 years (Fig. 2).

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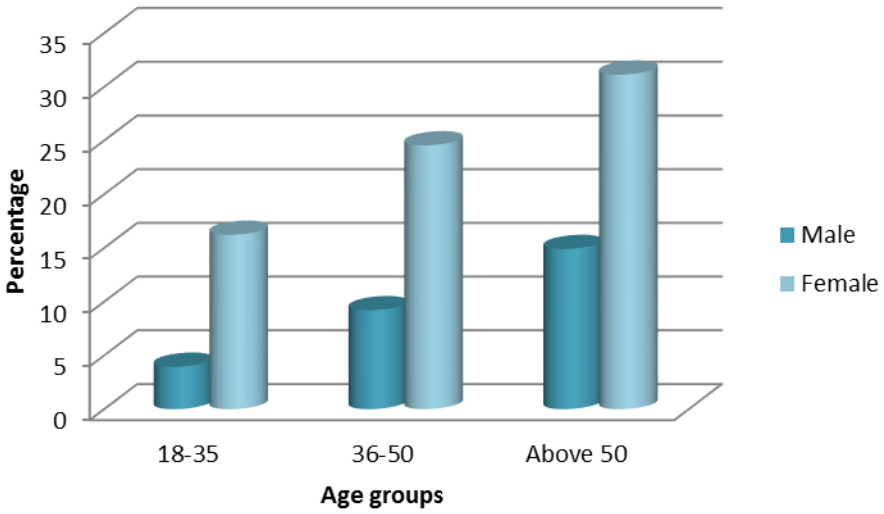


Fig. 2. Distribution of gender, age and number of informants interviewed.

In this study elderly women were found to be more knowledgeable about the number of traditional vegetables and their medicinal uses .as compared to young women and men who participated in the study. These findings on the younger generation's knowledge of traditional vegetables corroborate previously published literature as reported by (Dweba and Mearns 2011, Odhav et al. 2007, Vorster et al. 2007). The ethnobotanical interviews provided information about 60 wild edible vegetables and their medicinal uses from 21 families and 45 genera with local names of the plants, family names, their medicinal uses, parts of the plants used as vegetable and parts used for their medicinal values, mode of consumption of vegetables, use report and use values are listed in Table1. Brassicaceae was the dominant botanical family with the largest number of cited species (11), followed by Asteraceae (9) Apiaceae (6) and Polygonaceae (5) (Table 2) Growth forms indicated that herbs were dominating (98%) followed by shrubs (2%) no tree species was found as vegetable in the area. Highest family importance value index (13.6 FIV) was recorded for family Brassicaceae (Fig. 8). Mostly the plants are consumed in cooked form (51.6%) followed by salads (25.8%) and as snacks (9.7%) (Fig. 4), while as medicine these plants are often used orally (80%) and small proportion is used externally (Fig. 7). Moreover a single plant is used for more than one disease for example, *Apium graveolens* (Digestion, fever, antiseptic, spleen problems, bronchitis, asthma and fever), *Lepidium sativum* (Fever, dysentery, diarrhea, asthma, cough, secondary syphilis and tenesmus) and *Mentha longifolia* (Joints pain, stomachache, digestion, dysentery, diarrhea, blood purifier and stimulant) .Highest ICF value (1) was recorded for antidote category. The highest use value was reported for the *Amaranthus viridis* (0.67). Highest use report were calculated in *Apium graveolens, Lepidium sativum, Malvaneglecta,* and *Mentha longifolia,* seven use reports for each (Table 1)

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●= cooked vegetables, ▲= raw salads, ♣= snacks, ♦= spices, ▄= drinks

Table 1
List of wild edible plants used by the local people of upper Balochistan, Pakistan.

| Botanical name and (Voucher specimen) | Family | Local name | Life form | Part used as food | Category of indigenous use | Medicinal uses | Part used as medicine | Mode of administrations | Mode of preparation | UR* | UVs* | $UV_{is}$* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Allium farctum* Wendelbo (SBK-E1) | Alliaceae | Gara piaz | Herb | Leaves, bulbs | ●, ▲,♦, ♣ | Cooling of body, jaundice, increase sexual power | Leaves, bulbs | Oral | Raw leaves, bulbs | 3 | 34 | 0.09 |
| *Allium griffithianum* Boiss. Diagn. (SBK-E2) | Alliaceae | Ghara tom | Herb | Leaves, bulbs | ●, ▲,♦, ♣ | Jaundice, increase sexual power | Leaves, bulbs | Oral | Raw leaves, bulbs | 2 | 28 | 0.071 |
| *Amaranthus hybridus* L. (SBK- E3) | Amaranthaceae | Azghan, morli, jao sag | Herb | Leaves, | ● | Gastric, ear ache | Leaves, roots, shoots | Oral | Juice, powder | 2 | 14 | 0.14 |
| *Amaranthus graecizans* L. (SBK-.E4) | Amaranthaceae | Jao sag, Morli, shin sag | Herb | Leaves | ● | Diarrhea, gonorrhea, Vermifuge | Whole plant | External | Paste | 3 | 12 | 0.25 |
| *Amaranthus viridis* L. | Amaranthaceae | Jao sag, Morlai | Herb | Leaves | ● | Gastric | leaves | Oral | Decoction | 1 | 15 | 0.67 |

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| (SBK-UOB.E5) | | | | | | | | | | | |
| *Apium graveolens* L. (SBK-E6) | Apiaceae | Dania jangli | Herb | Leaves | ●, ▲ | Digestion, fever, antiseptic, spleen problems, bronchitis, asthma, fever | Roots, seeds, leaves | Oral | Decoction | 7 | 18 | 0.39 |
| *Bunium cylindricum* (Boiss. and Hoh.) (SBK-E7) | Apiaceae | Spina Zera | Herb | Leaves, seeds | ●, ▲, ♦ | Flue, cough, digestion | Leaves, seeds | Oral | Powder | 3 | 21 | 0.14 |
| *Bunium persicum* B. Fedtsch (SBK-E8) | Apiaceae | Torazera | Herb | Leaves, seeds | ●, ▲, ♦ | Digestion, stomachache, stimulant | Leaves, seeds | Oral | Powder | 3 | 21 | 0.14 |
| *Capsella bursa-pastoris* (L.) Medik (SBK-.E9) | Brassicaceae | Chamarak | Herb | Leaves | ● | Swelling of body, fever, kidney diseases, wounds | Leaves | Oral | Paste, decoction, infusion | 4 | 09 | 0.45 |
| *Caralluma tuberculata* N.E. Brown, Gardn. | Asclepiadaceae | Pamani | Herb | Whole plant | ● | jaundice, dysentery, high blood pressure, Vermifuge | Whole plant | Oral | Paste, juice, Powder, raw plant | 5 | 33 | 0.15 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chron (SBK-E10) | | | | | | , joints pain, diabetes. | | | | | | |
| *Cardaria chalepensis* (L.) Hand.-Mazz (SBK-E11) | Brassicaceae | Ghar bust, Bashki | Herb | Leaves | • | Eczema, flatulency | Seeds, leaves | Oral, external | Paste, powder | 2 | 18 | 0.11 |
| *Chenopodium botrys* L (SBK-.E12) | Chenopodiaceae | Sag | Herb | Leaves | • | Antiseptic, wounds healing, insect bite, Vermifuge | Whole plant | Oral, External | Paste, Decoction | 4 | 17 | 0.24 |
| *Chenopodium album* L. (SBK- E13) | Chenopodiaceae | Tor Sag | Herb | Leaves | • | Vermifuge cooling of stomach. | Leaves | Oral | Decoction, infusion | 2 | 15 | 0.33 |
| *Chenopodium foliosum* Asch. (SBK-.E14) | Chenopodiaceae | Joasag | Herb | Leaves | • | Vermifuge, constipation | Leaves | Oral | Decoction, paste | 2 | 17 | 0.12 |
| *Crambe cordifolia* ssp. *kotschyana* Stev (Boiss.) Jafrij (SBK-E15) | Brassicaceae | Jangli siray | Herb | Leaves, root | • | Obesity, high blood pressure, blood purifier | Leaves, root | Oral | Cooked | 3 | 13 | 0.23 |

Table 2

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| *Descurainia sophia* (L.) Webb and Berth (SBK-E16) | Brassicaceae | Roosh | Herb | Leaves, seeds | ●, ■ | Menstruation problems, cooling of stomach, heat stroke | Leaves, seeds | Oral | Powder, infusion | 3 | 21 | 0.14 |
| *Dorema ammoniacum* D. Don (SBK-E17) | Apiaceae | Jangli sonf | Herb | Leaves | ●, ▲,♦ | Chest infections, cold, cough | Seeds, gum | Oral | Powder, decoction | 3 | 14 | 0.21 |
| *Eremostachys vicary* Benth. ex Hook. F (SBK-E18) | Lamiaceae | Stagh | Herb | Whole plant | ▲ | Cooling agent | Seeds | Oral | Powder, decoction | 1 | 11 | 0.1 |
| *Eremurus persicus* (Jaub. and spach) Boiss. (SBK-.W19) | Asphodeloideae | Seresha ko, Shezgai | Herb | Leaves | ● | Antiseptic, burns | Leaves | External | Gel | 2 | 18 | 0.11 |
| *Eremurus stenophyllus* (Boiss. andBuhse) Baker (SBK-.E20) | Asphodeloideae | Seresha ko, Shezgae jarh gulae | Herb | Leaves, | ● | Cooling of body | Leaves, leaves gel | External | Gel | 1 | 18 | 0.06 |
| *Erodium cicutarium* (L.) L. Herit. | Geraniaceae | Sagdan dan | Herb | Leaves | ● | constipation | Whole plant | Oral | Decoction | 1 | 07 | 0.14 |

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| ex Aitch. (SBK- E21) | | | | | | | | | | | | |
| *Erodium oxyrrhynchum* Boiss. ssp. *bryoniifolium* Boiss. (SBK-E22) | Geraniaceae | Bakhal saag | Herb | Leaves | ● | Bachache, constipation | Whole plant | Oral | Decoction | 2 | 08 | 0.25 |
| *Ferula assafoetida* L. (SBK-E23) | Apiaceae | Hinga 34 | Herb | Seeds, gum | ●,♦ | Vermifuge wound healing | Seeds, gum | Oral | Powder | 2 | 19 | 0.11 |
| *Fumaria indica* (Hausskn.) Pugsley (SBK- E24) | Fumariaceae | Shook sag | Herb | Leaves | ● | Itching, blood purifier | Whole plant | Oral | Powder | 2 | 10 | 0.2 |
| *Gagea baluchistanica* Levichev (SBK-E25) | Liliaceae | Khokhae | Herb | Whole plant, leaves | ●, ▲ | Constipation, high blood pressure | Whole plant, leaves | Oral | Raw leaves | 2 | 13 | 0.15 |
| *Goldbachia laevigata* (M. Bieb.) DC (SBK-E26) | Brassicaceae | Khulaif | Herb | Leaves | ● | Chest infections, cough | Leaves | Oral | Decoction, powder | 2 | 21 | 0.1 |

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| *Ixiolirion tataricum* Pall (SBK-E27) | Ixioliriaceae | Hadoogai | Herb | Leaves, bulb | ▲, ♣ | Digestion, smell of mouth | Leaves, bulb | Oral | Raw bulbs | 2 | 27 | 0.07 |
| *Koelpinia linearis* Pallas (SBK-E28) | Asteraceae | Riza bubuzuk/ rish buzhak | Herb | Leaves | ● | Cough, cold, fever | Whole plant | Oral | Infusion | 3 | 17 | 0.18 |
| *Lactuca dissecta* D. Don (SBK-E29) | Asteraceae | Poi boti / zarkboti | Herb | Leaves | ▲ | Cough, whooping cough, cold, fever | Whole plant | Oral | Decoction | 4 | 10 | 0.4 |
| *Lactuca serriola* L. (SBK-E30) | Asteraceae | Zarko poi boti | Herb | Leaves | ▲ | Cough, bronchitis. | Whole plant | Oral | Decoction | 2 | 08 | 0.25 |
| *Lactuca viminea* J. Presl and C. Presl (SBK-E31) | Asteraceae | Poi botinari | Herb | Leaves | ▲ | Bronchitis, diabetes | Whole plant | Oral | Decoction, infusion | 2 | 12 | 0.17 |
| *Lathyrus erectus* Lag. (SBK-UOB.E32) | Fabaceae | Chunka matar, Mater koshni | Herb | Seeds | ● | Spleen resolvent | Seeds | Oral | Powder | 1 | 06 | 0.17 |
| *Launaea intybacea* (Jacq.) Beauverd (SBK-E33) | Asteraceae | Zarkoboti pasapas thoke | Herb | Leaves | ▲, ♣ | Burns | Whole plant | External | Decoction | 1 | 05 | 0.2 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Launaea procumbens* (Roxb.) Ramayya and Rajagopal (SBK-E34) | Asteraceae | shantrazi | Herb | Leaves | ▲, ♣ | Fever | Whole plant | Oral | Decoction | 1 | 07 | 0.14 |
| *Lepidium sativum* L. (SBK-E35) | Brassicaceae | Jamboi | Herb | Leaves | ●, ▲ | Fever, dysentery, diarrhea, asthma, cough, secondary syphilis, tenesmus. | Leaves | Oral | Raw leaves, powder, decoction | 7 | 16 | 0.44 |
| *Lonicera hypoleuca* Decne (SBK-.E36) | Caprifoliaceae | Pushkun pulli | Shrub | Leaves | ● | Flue, cold, cough | Leaves | Oral | Decoction, powder | 3 | 11 | 0.27 |
| *Malcolmia africana* (L.) R. Br. (SBK-E37) | Brassicaceae | Khatol | Herb | Leaves | ●, ▲, ♣ | Cooling stomach, stomachache. | Leaves | Oral | Decoction | 2 | 13 | 0.15 |
| *Mentha longifolia* (L.) L. (SBK-E38) | Lamiaceae | Shamshobi/ walina | Herb | Leaves | ●, ▲, ♦ | Joints pain, stomachache, digestion, dysentery, diarrhea, | Leaves | Oral | Powder, juice, tea | 7 | 28 | 0.25 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | blood purifier, stimulant | | | | | |
| *Mentha spicata* Crantz. (SBK-E39) | Lamiaceae | Podina | Herb | Leaves | ●, ▲, ♦ | stomachache antiseptic, stimulant, refrigerant, urine discharge | Leaves | Oral | Powder, juice, tea | 5 | 26 | 0.19 |
| *Oxalis corniculata* L (SBK-.E40) | Oxalidaceae | Lewana i booti | Herb | Leaves | ● | Kidney pain, urine discharge | Leaves | Oral | Decoction, Powder | 2 | 09 | 0.22 |
| *Peucedanum kotschyi* Boiss. (SBK-E41) | Apiaceae | Raghbol | Herb | Early young leaves, seeds | ▲, ♣ | Stomachache, gastric | Early young leaves, seeds | Oral | Raw young leaves, powder | 2 | 11 | 0.18 |
| *Plantago ciliata* Desf. (SBK-.E42) | Plantaginaceae | Baretang | Herb | Seeds | ■ | Children appetite, chest infections, cough, | Seeds | Oral | Infusion | 3 | 20 | 0.15 |
| *Polygonum polycnemoides* Jaub. and Spach (SBK-E43) | Polygonaceae | Sag | Herb | Leaves | ● | Chest infections, cough, blood purifier | Leaves | Oral | Decoction, powder | 3 | 12 | 0.25 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| *Polygonum aviculare* L. (SBK-.E44) | Polygonaceae | Sag | Herb | Leaves | ● | Stomach, cooling, pain killer | Whole plant | Oral | Decoction, powder | 2 | 12 | 0.17 |
| *Portulaca oleracea* L. (SBK-.E45) | Portulacaceae | Kharbari, kulfa, Pichli | Herb | Leaves | ● | Stomach problems, constipation, kidney diseases, lung diseases, burns, skin diseases. | Whole plant, leaves | Oral | Juice, paste, decoction, cooked | 6 | 17 | 0.35 |
| *Ranunculus afghanicus* DC. (SBK-E46) | Ranunculaceae | Da obo boti jarhgul | Herb | Leaves | ●, ▲ | Skin diseases | Whole plant | Oral | Decoction, infusion | 1 | 08 | 0.13 |
| *Reichardia tingitana* (L.) Roth (SBK-E47) | Asteraceae | Dodalgi / dodalak | Herb | Leaves | ▲ | Vermifuge | Leaves | Oral | Decoction | 1 | 04 | 0.25 |
| *Rumex chalepensis* Mill. (SBK-.E48) | Polygonaceae | Turush oko | Herb | Leaves | ● | Cutaneous disorder | Leaves, roots | Oral | Decoction | 1 | 13 | 0.08 |
| *Rumex crispellus* Rech. F. L. (SBK-.E49) | Polygonaceae | Turush ako | Herb | Leaves | ● | Skin diseases | Roots | External | Decoction | 1 | 12 | 0.08 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Rumex vesicarius* L. (SBK-E50) | Polygonaceae | Turshoka | Herb | Leaves | ●, ▲ | Snake bite, nausea cooling agent. dysentery | Root, Leaves, seeds | Oral, External | Juice, decoction | 4 | 12 | 0.33 |
| *Sisymbrium brassiciforme* C.A. Mey (SBK-.E51) | Brassicaceae | Bushkai | Herb | Leaves | ● | Headache, fever, chest infections | Leaves | Oral | Decoction | 3 | 17 | 0.18 |
| *Sisymbrium irio* L. (SBK-.E52) | Brassicaceae | Chamarak | Herb | Leaves | ● | Asthma, cough, fever | Leaves | Oral | Powder, decoction | 3 | 18 | 0.17 |
| *Sisymbrium loeselii* L. (SBK-.E53) | Brassicaceae | Bushkai | Herb | Leaves | ● | Constipation, dysentery | Leaves | Oral | Powder, decoction | 2 | 18 | 0.11 |
| Sonchus arvensis L. (SBK-.E54) | Asteraceae | Poi Boti, azgan | Herb | Leaves | ● | Wounds, cooling of body, cough, bronchitis asthma. | Whole plant | Oral, External | Paste, decoction | 5 | 13 | 0.38 |
| *Taraxacum neolobulatum* V. Soest. (SBK- E55) | Asteraceae | Chamanai gul | Herb | Leaves, shoot | ●, ♣ | Kidney pain, discharge of urine, skin diseases | Leaves | Oral, External | Milky latex, decoction, powder | 3 | 16 | 0.19 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| *Trigonella monantha* C.A. Mey. (SBK- E56) | Fabaceae | Morgha ispasthi | Herb | Leaves | ●, ♦ | dysentery | Leaves | Oral | Powder | 1 | 19 | 0.05 |
| *Trigonella uncata* Boiss. (SBK-.E57) | Fabaceae | Methi | Herb | Leaves | ●, ♦ | Small pox, as cooling agent, dysentery. | Seeds, leaves | Oral | Powder, infusion | 3 | 21 | 0.14 |
| *Tulipa clusiana* DC. (SBK-E58) | Liliaceae | Spin gul | Herb | Bulbs | ▲, ♣ | Joints pain | Bulbs | Oral | Raw bulbs | 1 | 17 | 0.06 |
| *Typha domingensis* Pers. (SBK-E59) | Typhaceae | Lookh | Herb | Young shoots | ▲ | Skin diseases | Young shoots and roots, latex | External | milky latex, raw shoots | 1 | 12 | 0.08 |
| *Vicia sativa*. L. (SBK-.E60) | Fabaceae | Kishnae matar | Herb | Leaves | ● | Cough, flue, eczema | Whole plant, fruit | Oral, External | Powder, paste, decoction | 3 | 14 | 0.21 |

Most used families of the study area.

| Family | Genus | Species |
|---|---|---|
| Brassicaceae | 10 | 11 |
| Asteraceae | 6 | 9 |
| Apiaceae | 5 | 6 |
| Polygonaceae | 3 | 5 |
| Fabaceae | 3 | 4 |

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| | | |
|---|---|---|
| Amaranthaceae | 1 | 3 |
| Chenopodiaceae | 1 | 3 |
| Lamiaceae | 2 | 3 |
| Alliaceae | 1 | 2 |
| Asphodeloideae | 1 | 2 |

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**Plant parts used and mode of consumption**

Different parts of wild edible vegetables were consumed in diverse ways according to local traditions. (51.6%) plants are consumed in cooked form, (25.8%) as salads, (9.7%) as snacks, (10.7%) as spices and (2.5%) as drinks. (Fig. 3). The edible plants are mostly cooked, as stews, soups or relishes (Keith, 1992). Mostly the leaves of the wild plants are cooked or eaten in raw form as salads and snacks except some species like *Caralluma tuberculata* where the whole plant is cooked and the bulbs of *Tulipa clusiana*, bulbs and leaves of *Allium farctum*, *Allium griffithianum*, *Ixiolirion tataricum* both are consumed. Seeds of some vegetables species were also consumed as spices and in drinks such as *Bunium cylindricum Bunium persicum Descurainia sophia* and *Plantago ciliata*. Seeds of *Lathyrus erectus* are cooked as vegetable. Present findings are in agreement to (Hadjichambis et al. 2008) regarding plants consumed cooked in several Mediterranean regions.

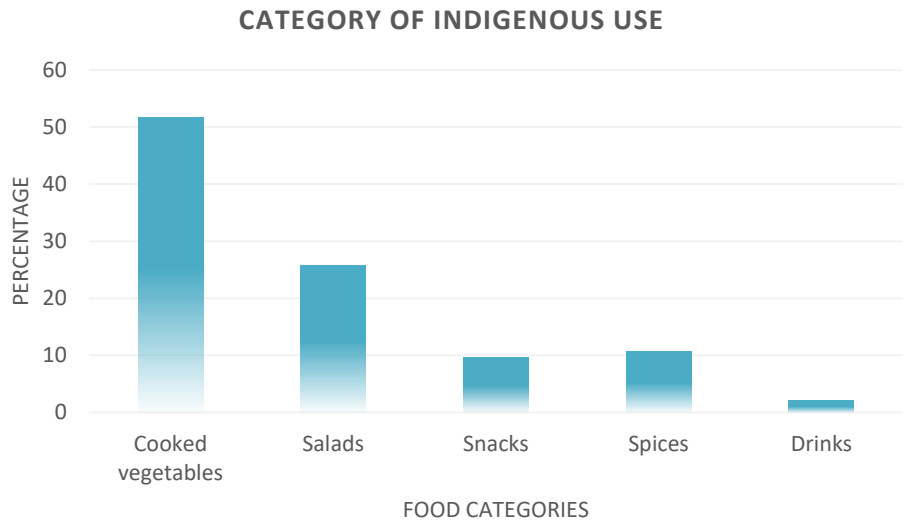


Fig. 3. Percentage of indigenous food categories.

**Use of wild species as food or medicine?**

The wild plant resources are often employed multi-contextually, for example, both as medicine and food (Pieroni and Giusti 2009). Moreover, no clear dividing line between the two groups usually exists; food can be used as medicine and vice versa (Etkin 2006). Several wild edible species are considered medicinal foods and used because of their assumed health benefits. In present study 60 plant species are used for both purposes. Adebooye and Opabode (2004) listed 24 indigenous leafy vegetables that are used for medicinal purposes. In Lesotho 43.7% of the respondents of a study conducted by Lephole (2004) mentioned that they had used certain traditional vegetables to treat hypertension and diabetes. While, (Vitalini et al. 2013) reported that wild *Asparagus turions*, eaten in

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soups and 'risotto' or cooked with eggs, were considered diuretic. This plants in recipes have specific medicinal properties and this effect has been known for a long time. Ancient Grecians and Romans used *Asparagus* for its diuretic properties.

**Traditional vegetable use**

A total of 60 wild vegetables and their medicinal uses belonging from 21 families and 45 genera were reported. Brassicaceae was the dominant botanical family with the largest number of cited species (11), followed by Asteraceae (9) Apiaceae (6) and Polygonaceae(5) (Table 2).In a study conducted in the Rukungiri district in Uganda, 34 plants were identified as traditional vegetables (Musinguzi et al. 2006). While, Adebooye and Opabode (2004) confirmed about 397 different species of traditional vegetables in Africa. Apart from these vegetables there are several other vegetable species that are consumed in different parts of Pakistan. Abbasi et al. (2013) identified 45 species in a conducted at Lesser Himalayas in Pakistan, while Shad et al. (2013) reported the nutritive potential of 17 wild food species of traditional vegetables that are eaten by people of Pakistan. Of these wild edible vegetables herbs were Prominent than other life forms (Fig. 4). A total of 59 species were found herbs and only one shrub species '*Lonicera hypoleuca*' was reported from the area. Wild plants are commonly harvested and eaten while they are still fresh during the spring season. Because they are mostly annuals (Delali et al. 2007).

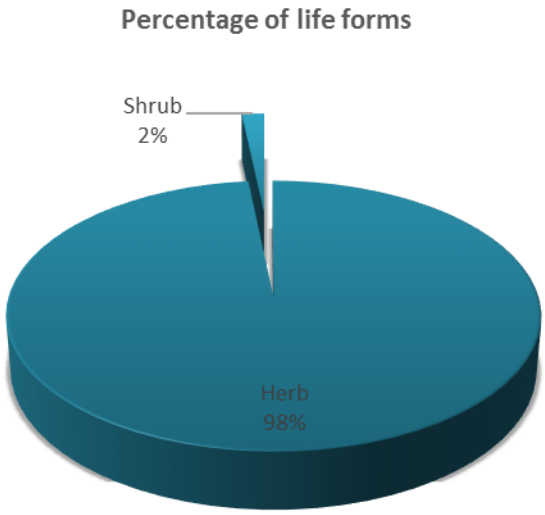


Fig. 4. Percentage of plant life forms.

**Local dishes**

The edible plants are mostly cooked or eaten fresh as snacks and as salad. The method used to prepare traditional vegetables in study area was mostly reported as boiling the leaves in large quantities of water (Abbasi et al. 2013). Once the vegetables were cooked, the excess water was drained and discarded and fried with tomato, onion, garlic, oil, and

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number of spices called “Saag” locally. Which is taken with local bread and salad. This cooking method is likely to cause nutrient loss, especially where the water soluble vitamins such as vitamin B complex and vitamin C are discarded with the drained water (Den Hartog et al. 2006; Flyman and Afolayan, 2006). In general, only this one method is used to prepare traditional vegetables in the village. This lack of variety could make the traditional vegetables less appealing especially among the youth, thus contributing to reduced usage (Vorster et al. 2007). It is suggested that recipes used by different ethnic groups be made available to the women of this community, since it is believed that access to a greater variety of cooking methods would increase the inclusion of traditional vegetables in their diets, thus increasing diet diversity. People of Kalat Mangochar, Khadkoocha, Dreangarh and Mastung uses herbs as vegetables in cooked form while the people of Pashtoon areas like Kuchlak, Ziart, Harnai, Shahrag uses plant in raw form as snacks and salads. Individual species are used in the preparation of meals in Pashtoon areas while in Baloch tribes a mixture is preferred. (Delali et al. 2007). Wild gathered food plants are consumed regularly when in season. In the perception of most informants, that bitter edible greens are perceived as being particularly healthy for example *Caralluma tuberculata*.

The habit of collecting and cooking edible non cultivated plants is still alive among the older generation. However, it seems only a question of time before this traditional knowledge is lost forever. Already today, a lot of traditional knowledge regarding food use is no longer actively used by the younger generation and is subject to many outside influences and changes. The fact, that wild food plants are especially appreciated among the elderly people can be ascribed to many factors: the perceived healthiness, taste appreciation as well as “sense of local/ cultural identity”.

**Preservation of traditional vegetables**

These herbs are harvested from farmers’ fields, grazing areas (mainly the barren lands), around homesteads or a combination of these. Sometimes a large quantities of herbs are harvested, dried and stored for off-season use by the people of Baloch areas. The drying is the only method reported to preserve traditional vegetables. This finding can be compared to that of Vorster et al. (2007), Preservation of traditional vegetables helps to ensure food availability during the dry season (Bhat and Rhubuluza 2002, Vorster et al. 2007). However, since preservation, like the rest of other food processing methods, largely affects the nutrient composition of food, especially vegetables, more suitable processing methods need to be used (Flyman and Afolayan 2006). When green vegetables are dried in direct sunlight without prior blanching much of the nutrients are destroyed (Flyman and Afolayan 2006). This means that although drying makes it possible for vegetables to be available in the dry season, some members of the community might prefer not to consume them.

**Awareness about food toxicity**

The plants cited during the interviews appear devoid of acute toxicity. However, it must

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be critically noticed that some species contain secondary metabolites (Abbet et al. 2014) of toxicological relevance. For example, pyrrolizidine alkaloids are known to be hepatic and pulmonary toxicants, and to possess high antimitotic and Geno toxic activity in vitro and in vivo (Petry et al. 1984, Kim et al. 1993). During the interviews in Baloch dominant areas, some people were conscious of the toxicity of these plants and used a local word for this toxicity "Garam Taseer" for genus *Chenopodium, Rumex* and *Polygonum* but they conceded that they boil discard and drain the boiled water from the vegetables before cooking them or add curd during cooking. However the effectiveness of such procedures, is not known. Luczaj (2010) reported that the consumption of wild plants containing high level of these substances may be toxicologically relevant. Consequently, sensitive groups such as children and pregnant women should avoid consumption such plants (Committee on Herbal Medicinal Products (HMPC 2007). Plants of the genus *Oxalis, Rumex* and *Chenopodium* are known to be rich in oxalic acid, which may lead to hypocalcaemia and formation of calcium oxalate crystals in kidneys (Luczaj 2010). However, safe collection of wild plants requires sound knowledge of botany. Self-learning through media or internet is probably not sufficient and can lead to severe intoxication. (Abbet et al. 2014)

**Use of Wild vegetables as medicine**

The estimated total flora of Pakistan is comprised of 6000 species, out of which more than 4000 plant species grow in mountainous regions (Abbasi et al. 2012; Shinwari et al. 2006 ) and over 75% of population in Pakistan is cured by means of traditional medicines (Shinwari et al. 2009. During present survey it was observed that leaves are highly utilized (42%) plant parts followed by whole plant (22%) and seeds (5%) (Fig. 5). Modes of preparation falls into different categories such as decoction of plant parts (34.3%) was common mode of recipes followed by powder (26.2%) and eaten fresh raw parts (10.1%) (Fig. 6). In majority the water is used as medium for preparation. Mostly the mode of application falls in two categories topical as well as oral. 80% plants are taken orally, 10% used externally, while 10% plants are used both orally and externally (Fig.7). Oral medications are taken along with water, milk, honey or green tea. Medicinal uses of wild edible vegetables were compared with the available ethnobotanical literature which indicated that present applications of *Bunium persicum*, *Caralluma tuberculate*, *Cardaria chalepensis*, *Ixiolirion tataricum*, *Plantago ciliata, Sisymbrium irio* were in agreement to (Bibi et al. 2014).

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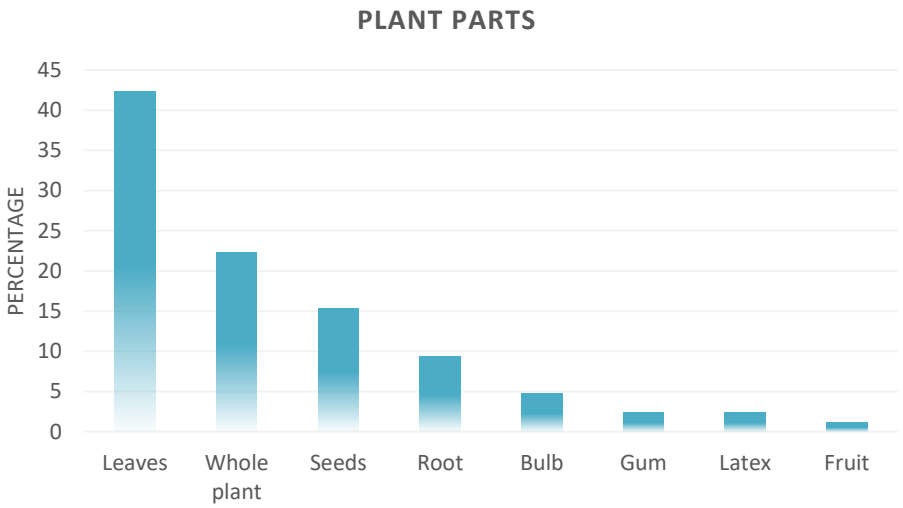


Fig. 5. Percentage of plant parts used.

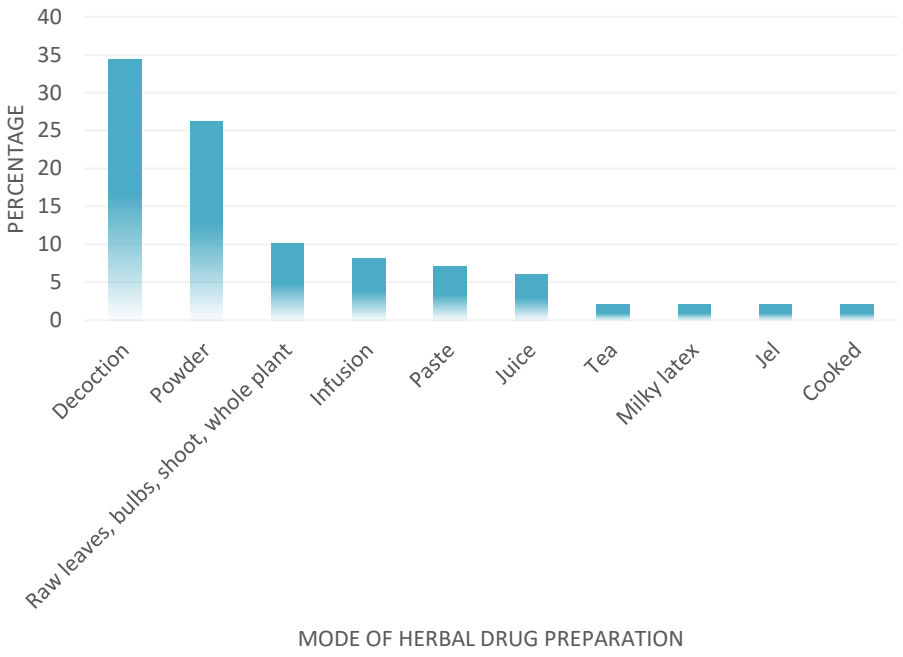


Fig. 6. Percentage of herbal drug preparation.

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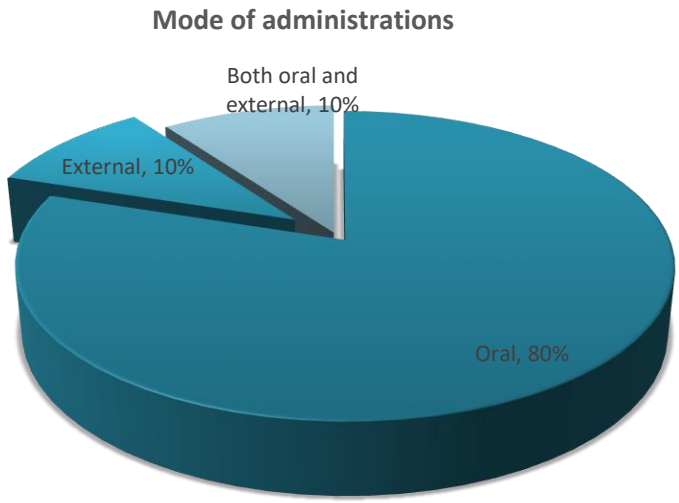


Fig. 7. Percentage of mode of administrations.

**Quantitative results**

**Family Importance value (FIV)**

The most common families as depicted by its FIV were Brassicaceae as the dominant family with (13.6) FIV followed by Asteraceae (9.6) and Apiaceae (8.8).The least values of FIV were observed for Ranunculaceae and Typhaceae (0.4 each) (Fig. 8).

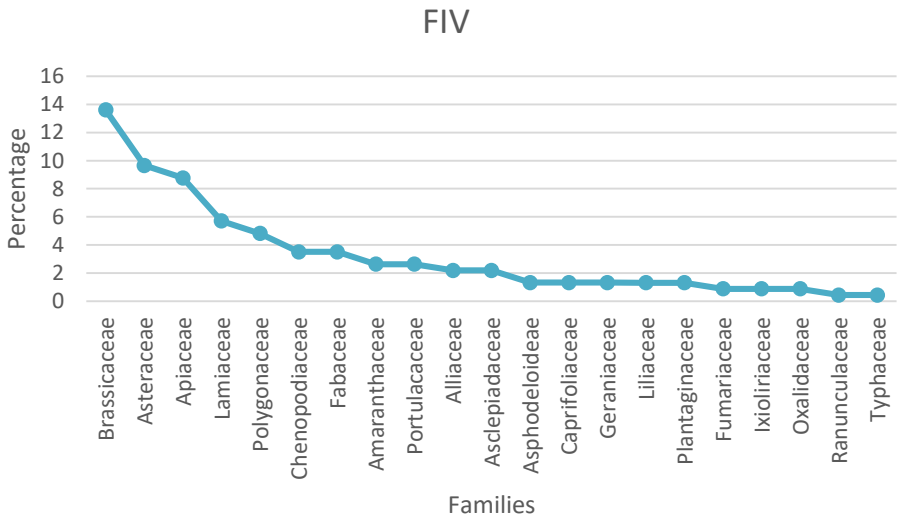


Fig. 8. Family importance value index of plant families

**Use values (UVs) and Use report (UR)**

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The use value (UV) is a quantitative technique for data analysis that authenticates the relative importance of species or family for a population (Vendruscolo and Mentz, 2006). In this investigation, the highest use value was reported for the *Amaranthus viridis* (0.67). *Capsella bursa- pastoris* (0.45) and *Lepidium sativum* (0.44) entitle their extensive practice in the ethnomedicinal custom in the assessment area. The lowest UVs were attained for *Trigonella monantha* (0.05) *Eremurus stenophyllus* and *Tulipa clusiana* (0.06) each (Table 1). High use values can be attributed to its frequent use in the treatment of various diseases with medicinally important vegetables with high use reports and number of informants showing that it is well accustomed by all the informants as medicinal plant. The three medicinally important vegetables plants with high UVs (*Amaranthus viridis, Capsella bursa- pastoris* and *Lepidium sativum*) strengthens the impression that these plants are the most medicinally important vegetables of the area. Present findings are contrary to the findings of Bibi et al. (2014) who, reported least use values for some medicinally important vegetables like Cardaria chalepense, Plantago lanceolata and Rumex vasicarius (with 0.04 each). While, Highest use report were calculated in *Apium graveolens, Lepidium sativum, Malva neglecta,* and *Mentha longifolia,* seven use reports for each and least use report were calculated for 14 species (1UR for each) (Table1).

### 3.6.1. Informant's consensus factor (ICF)

The informant consensus factor (ICF) of medicinal plants in our study ranges from (0–1.0) (Table4). Antidote category has highest ICF value (1.0) in which only one species *Rumex vesicarius* is used for snake bite and insect bite. Bibi et al. (2014) reported similar results during for the plants of Mastung district. The second highest value observed is for ear, nose and throat diseases (ENT) (Earache, throat inflammation) and eye diseases (0.66).The least agreement between the informants was observed for plants used for Infectious diseases and respiratory diseases both having the zero ICF (Table 3). Contrary results were reported by Jamila and Mostafa (2014), who reported the second highest ICF for respiratory diseases and least ICF for eye and vision problems. These points to the fact that although the local people have access to Government healthcare system, still medicinal plants have not lost their values among the local people.

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**Table 3**
Informant consensus factor, Percentage of species and citations for different use categories

| Disease category | No. of use reports | %age of use reports | No. of Taxa | %age of taxa used | Informant consensus factor (ICF) |
|---|---|---|---|---|---|
| Antidote (Snake bite, insects bite) | 2 | 2.4 | 1 | 1.59 | 1 |
| Dermatological problems (Antiseptic, burns, cutaneous, Eczema, itching, ,secondary syphilis, skin diseases, wounds healing) | 13 | 15.66 | 9 | 14.29 | 0.34 |
| Ear, nose and throat diseases (ENT) (Earache, Eye diseases) | 6 | 7.2 | 4 | 6.3 | 0.66 |
| Gastrointestinal diseases (stomach cooling, constipation, digestion, diarrhea, dysentery, flatulency, gastric, nausea, smell of mouth, stomachache, stimulant, intestinal worms,) | 21 | 25.3 | 12 | 19.05 | 0.45 |
| Glandular disorders (Diabetes, Jaundice, spleen problems) | 9 | 10.84 | 8 | 12.7 | 0.13 |
| Infectious diseases (fever, refrigerants, body cooling, small pox) | 7 | 8.43 | 7 | 11.12 | 0 |
| Musculoskeletal disorders (backache, headache, joints pain, as pain killer) | 7 | 8.43 | 6 | 9.52 | 0.17 |
| Reproductive problems (gynecological problems, menstrual diseases, increase sexual power) | 4 | 4.82 | 3 | 4.76 | 0.34 |
| Respiratory diseases (Asthma, bronchitis, chest problems, cold, cough, flue, chest infection, whooping cough, lungs diseases) | 7 | 8.43 | 5 | 7.94 | 0.34 |

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| Urogenital problems (Gonorrhea, kidney pain, sexual weakness, tensmus, urine discharge) | 4 | 4.82 | 3 | 4.76 | 0.34 |
| Respiratory diseases (Asthma, bronchitis, chest problems, cold, cough, flue, chest infection, whooping cough, lungs diseases) | 3 | 3.62 | 3 | 4.76 | 0 |
| Veterinary | 2 | 2.4 | 1 | 1.59 | 1 |

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## Conclusions

This study is one of the first attempts to record the medicinally important wild edible vegetables and their medicinal uses. The results of this study have revealed that traditional knowledge on the use of edible plants as food and to cure various ailments is still practiced by the rural people in Northern Balochistan, Pakistan, but, this traditional knowledge have severely eroded due to change in the life style of local inhabitants, which needs be documented before it is too late. These findings, although directly related to the study area, are not necessarily relevant to the study area only, but have international relevance. Studies conducted on indigenous knowledge conservation should go beyond merely documenting the indigenous knowledge. Alternative systems to conserve the indigenous knowledge such as databanks, technology-based repositories in the form of recordings and internet-based portals have proved to be valuable in conserving indigenous knowledge. The preservation of this knowledge is due to continued reliance on wild edible plants for consumption at times of food shortage and that these species have the potential to become valuable staple foods and important alternatives to the usual food crops by many households. Efforts to conserve biodiversity and preserve traditional food systems need to be combined and enhanced for the benefit of the posterity. It is suggested that there is a need for awareness campaigns which could help to recreate awareness, which in turn could increase knowledge, status and utilization. It is also recommended that future research efforts include a nutritional assessment of the community's food intake to enable researchers and policy makers to recommend and design appropriate intervention strategies. The actual cooking practices with traditional vegetables need to be investigated and a nutritional, phytochemical analysis, dietary requirements antioxidant potential, essential and toxic components in conventional food resources; pharmacological applications of uncooked, cooked and preserved traditional vegetable dishes need to be done to determine their actual nutrient contribution

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