

ETHNO-MEDICINAL ASSESSMENT OF SOME SELECTED WILD EDIBLE FRUITS AND VEGETABLES OF LESSER-HIMALAYAS, PAKISTAN

ARSHAD MEHMOOD ABBASI*, MIR AJAB KHAN AND MUHAMMAD ZAFAR

Department of Plant Sciences, Quaid-i-Azam University, Islamabad Pakistan

*Corresponding author e-mail: arshad799@yahoo.com

Abstract

The present investigation is an attempt to assess the ethno-medicinal worth of some selected wild edible fruits and vegetables used by the inhabitants Lesser Himalayas, Pakistan. Informed consent semi-structured interviews from 95 inhabitants of fifteen mountainous vicinities were conducted to collect data. A total of 20 wild edible fruits and vegetables belonging to 18 families and 18 genera were documented. *Amaranthus viridis*, *Berberis lycium* and *Zanthoxylum armatum* were found most significant ethno-medicinal species. Among wild edible fruits *Berberis lycium*, *Carissa opaca*, *Ficus carica*, *Ficus palmata* and *Ziziphus nummularia* express extreme citation; while *Amaranthus viridis* and *Solanum nigrum* were among the most popular wild edible vegetables. *Ficus carica*, *Ficus palmata*, *Phyllanthus emblica* and *Zanthoxylum armatum* were used equally as fruit and vegetables. Gathering, processing and consuming wild edible plants are still experienced in all explored areas. The tradition of using wild palatable plants is still alive in the rural populations of Lesser Himalayas, but is vanishing. Consequently, the recording, preserving, and infusing of this traditional knowledge to upcoming generations is pressing and vital.

Background

Millions of people in many developing countries do not have enough food to meet their daily requirements and a further more people are deficient in one or more micronutrients (Hussain *et al.*, 2011). Thus, in most cases rural communities depend on wild resources including wild edible plants to meet their food needs in periods of food crisis. The diversity in wild species offers variety in family diet and contributes to household food security (Anon., 2004). Term 'wild-food' is used to describe all plant resources outside of agricultural areas that are harvested or collected for the purpose of human consumption in forests, savannah and other bush land areas. Wild-foods are incorporated into the normal livelihood strategies of many rural people, shifting cultivators, continuous croppers or hunter gatherers (Bell, 1995).

Out of half million species of plants existing on Earth, only about 3,000 species have been used as agricultural crops and 150 plant species have been cultivated on commercial bases (Heywood, 1999). Utilization of wild plants for food occurs both in times of surplus and food shortage (Zinyama *et al.*, 1990, Shinwari & Qaisar, 2011). Despite agricultural societies' primary reliance on crop plants, the tradition of eating wild plants has not completely disappeared. Evidence indicates that more than 300 million people throughout the contemporary world gain part or all of their livelihood and food from forests (Pimentel *et al.*, 1997). The nutritional role and health benefits of wild food resources have being reported in many surveys worldwide (Ansari *et al.*, 2005; Balemie *et al.*, 2006; Pieroni *et al.*, 2002 and Della *et al.*, 2006).

Many wild edible plants having rich nutritional contents Ogle & Grivetti, (1985) are important as dietary supplements, providing trace elements, vitamins and minerals. However, consumption is determined less by calorie input and more by the pleasure of gathering wild resources, recreating traditional practices and enjoying characteristic flavors (Pardo-de-Santayana *et al.*, 2007, Gul *et al.*, 2012). Both food and medicinal plants have interventional uses. This exists mainly in indigenous and local traditions. Food can be used as medicine and vice versa. However, certain wild edible plants are used because of their assumed health benefits and thus can be called

medicinal foods (Etkin, 1994). Knowledge of such foods is part of traditional knowledge which is largely transmitted through participation 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. In many regions 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 (Hadjichambis *et al.*, 2008; Pieroni *et al.*, 2005).

Wild edible plants have always been important in the folk traditions. However, food and medicinal uses of these plants have been two of the most relevant and consistent reasons for popular plant management. It is for this reason that ethno-directed research is very useful in the discovery and development of new drug and food resources. Although many ethnobotanical surveys have been conducted by different workers (Abbasi *et al.*, 2012; Awan *et al.*, 2011; Hazarat *et al.*, 2011; Abbasi *et al.*, 2010; Qasim *et al.*, 2010; Ajaib *et al.*, 2010; Abbasi *et al.*, 2009; Hussain *et al.*, 2008 & Gilani *et al.*, 2006) in different areas of Lesser Himalayas but to our knowledge no systematic investigation on ethno-medicinal potential of wild edible fruits and vegetables of Lesser-Himalayas, Pakistan has been made (Shaheen *et al.*, 2011). In this context, the present study is the first reference with particular emphasis on traditional uses of wild edible fruits and vegetables as there is dramatic loss of traditional knowledge regarding wild edible plants.

Methodology

Study site: The Lesser Himalayas is a prominent range 2,000 to 3,000 meters high formed along the main boundary Thrust fault zone, with a steep southern face and gentler northern slopes. The Lesser Himalayas in Pakistan include entire Hazara (covering the districts of Batagram, Mansehra, Haripur and Abbottabad), Islamabad-Rawalpindi districts excluding the plains of Tehsil Gujar Khan and Pakistan Administered Kashmir. The Lesser Himalayas, lies between 33°-30' to 33°-50' north latitude and 72°-33' and 74°-05' east longitude (Hussain & Ilahi, 1991). Due to variation in the topography, altitudes aspects and vegetation cover the

climate of Lesser Himalayas ranges shows tremendous variation. Even within the range inner and outer parts contrastingly differ in the amount of rainfall, snowfall and temperature conditions.

Ethnobotanical data collection and analysis:

Ethnobotanical data was collected through informed consent semi-structured interviews during spring and summer 2010-2011 from 15 different sites of Lesser Himalayas. Approximately 95 informants (15-20 informants in each site) between that age of 25-75 years with a sound traditional knowledge of useful wild plants, mostly either native born or had been living in the region for more than 30 years, were interviewed. Questions addressed to the informants about wild food consumption were mainly focused on local name of plant, habitats, place of collection, season of collection, parts used, use categories, way of fruits and vegetables consumption, the manner of drug preparation and administration and diseases cured. Plants were mostly collected in flowering and fruiting conditions and confirmed by the local inhabitants to ensure that the proper plants have been collected. Specimens were dried, pressed, poisoned and mounted on herbarium sheets. All collected specimens were identified with the help of available literature (Nasir & Ali, 1970-1989) and were deposited in the Quaid-i-Azam University Herbarium, Islamabad for future references.

Ethnobotanical use categories based on folk perceptions:

On the basis of folk perceptions, data was grouped into the following use categories: vegetables, fruits, herbal tea, medicinal, fodder and forage, fuel wood, ornamental, tools handles, agricultural implements, roofing, brooms, fencing and hedges and decorative articles. Every plant species mentioned by an informant within one-use category was counted as a one use report (UR) (Pardo-de-Santayana *et al.*, 2007).

Results and Discussion

Present study deals with ethnomedicinal assessment of wild edible fruits and vegetables of Lesser Himalayas–Pakistan. All plant species are arranged alphabetically including botanical name; family; local name; use category; part used and way of consumption, ethnomedicinal uses; number of informants and percentage citation (Tables 1 & 2).

Taxonomic diversity: Lesser Himalayas of Pakistan provides diversity of useful plant species especially wild edible fruits and vegetables. A total of 20 wild edible plant species belonging to 18 families and 18 genera were investigated ethnomedicinally. About 9 plants species were found to be used as edible fruit, 6 species were used as culinary vegetables while 5 plant species including *Ficus carica*, *F. palmata*, *Phyllanthus emblica*, *Solanum nigrum* and *Zanthoxylum armatum* were found to be used both as fruit and vegetable.

Plant parts used and modes of consumption: Within the edible plants, fruits (62.9%), leaves (33.3%), and flower buds (3%) were the plant parts most widely used (Table 1). Wild edible plants are used by the local inhabitants in many

different ways and are prepared by using diverse recipes based on local conditions. It is noticeable that raw species predominate in the mode of consumption (51.7%) in the surveyed areas, while other species eaten cooked (48.2%) and require more or less complex process. This is in agreement with that the Mediterranean people always portrayed eating wild edible plants raw (Keys & Keys, 1959; Ali-Shtayeh *et al.*, 2008).

All wild edible vegetables assessed in the present study were eaten cooked either in water medium or diluted milk (Lusi) and seasoned with garlic, condiments and flavoring agents in cooking oil or ghee. Leaves of *Cichorium intybus*, *Ficus carica*, *F. plamata*, *Oxalis corniculata* and *Pimpinella diversifolia* are consumed after boiling in diluted milk (Lusi); while leaves of *Amaranthus viridis* and *Solanum nigrum*, unripe fruits of *Ficus carica*, *F. plamata* and *Phyllanthus emblica* are cooked in water. Fruits and twigs of *Zanthoxylum armatum*, leaves of *Pimpinella diversifolia* and *Oxalis corniculata* are also consumed as flavoring agent. The inhabitants of the Lesser Himalayas use 51.7% wild edible species as raw. The majority of these plant species like *Berberis lyceum*, *Carissa opaca*, *Ficus carica*, *F. plamata*, *Grewia optiva*, *Olea ferruginea*, *Oxalis corniculata*, *Phyllanthus emblica*, *Pistacia integerrima*, *Rosa brunonii*, *Rumex hastatus*, *Solanum nigrum* are eaten fresh, after they are gathered. *Ziziphus nummularia* and *Z. oxyphylla* are consumed both in fresh and dried form (Table 1). Few species including *Ziziphus* spp. *Zanthoxylum armatum* and *Phyllanthus emblica* are gathered and preserved after shade and air drying, to be stored in suitable containers and consumed on longer periods of the year.

Ethnomedicinal approaches: Wild edible plants have always been important in the folk traditions of the different region in the world (Hadjichambis *et al.*, 2008; Saqib *et al.*, 2011). However, food and medicinal uses of these plants have been two of the most relevant and consistent reasons for popular plant management, even in cultures that are increasingly losing their close relationship with nature. It is for this reason that ethno-directed research is very useful in the discovery and development of new drug and food resources (Khafagi & Deward, 2000; Heinrich & Gibbons, 2001). Most of the wild edible reported species in the present investigation were also used to cure various ailments by the inhabitants of study areas. A total of twenty seven recipes (Table 2) based on wild edible fruits and vegetables were recorded which were used against skin infections, ear and eye diseases, gastrointestinal disorders, jaundice, sexual disorder and piles etc. Modes of drug preparation fall in to seven categories (Fig. 2); powder (8), decoction (8), paste (4), extract (3), latex (2), fresh branches and infusion (1 each). Present ethnomedicinal uses of wild edible plant species were found in accordance to as reported by (Abbasi *et al.*, 2012; Abbasi *et al.*, 2010; Hussain *et al.*, 2008; Ahmed *et al.*, 2007; Shah & Khan, 2006; Ilyas *et al.*, 2012; Shinwari & Khan, 2000; Arshad & Akram, 1999; Haq & Hussain, 1993; Shaheen *et al.*, 2012; Sarwat *et al.*, 2012; Inam *et al.*, 2000 & Dastagir, 2001). Ethnobotanical uses of wild edible fruits and vegetables indicates that 18 plant species are used as fodder, 14 as fuel wood, 8 species for each construction and as ornamental purpose, 6 edible species for bee keeping, 5 species were used for each fencing/hedges and in making agriculture tools and 2 species were used in making brooms (Fig. 1).

Table 1. Botanical name, use categories, part used and way of consumption of Lesser-Himalayas, Pakistan

S. No.	Botanical name/Family	Local name	Use category	Part used and way of consumption	% citation n=95
1.	<i>Amaranthus viridis</i> L. Amaranthaceae	Ghinar	Vegetable	Fresh leaves are boiled in water for 20-25 minutes, and then mixed with seasoned garlic and spices	65%
2.	<i>Berberis lycium</i> Royle, Berberidiaceae	Sumbal	Fruit	Fresh and ripened fruits are eaten raw	47%
3.	<i>Bombax malabaricum</i> DC., Bombacaceae	Dug sumbal	Vegetable	Young flowering buds are roasted in ghee and then cooked along with crushed meat (Qeema)	23%
4.	<i>Carissa opaca</i> Stapf ex Haines, Apocynaceae	Garanda	Fruit	Fresh and ripened fruits are eaten raw	39%
5.	<i>Cichorium intybus</i> L. Asteraceae	Kashni	Vegetable	Young leaves are cooked in boiled diluted curd (Lusi) for 10-15 minutes on slow fire then with seasoned garlic and spices	35%
6.	<i>Ficus carica</i> L. Moraceae	Phagwar	Vegetable Fruit	Young leaves are cooked in boiled diluted curd (Lusi) for 40-50 minutes on slow fire then mixed with seasoned garlic and spices. Unripe fruits are boiled in water for 15-20 minutes and mixed with seasoned garlic and spices. Sometime also cooked with crushed meat (Qeema). Ripened fruits are eaten raw	37%
7.	<i>Ficus palmata</i> Forssak. Moraceae	Phagwar	Vegetable Fruit	Young leaves are cooked in boiled diluted curd (Lusi) for 40-50 minutes on slow fire then mixed with seasoned garlic and spices. Unripe fruits are boiled in water for 15-20 minutes and mixed with seasoned garlic and spices. Sometime also cooked with crushed meat (Qeema). Ripened fruits are eaten raw	35%
8.	<i>Grewia optiva</i> Drum. ex. Burret. Tiliaceae	Dhaman	Fruit	Fresh and ripened fruits eaten raw	25%
9.	<i>Myrsine africana</i> L. Myrsinaceae	Khukhan	Fruit	Fresh and ripened fruits eaten raw	30%
10.	<i>Olea ferruginea</i> Royle. Oleaceae	Kaho	Fruit	Fresh and ripened fruits eaten raw	20%
11.	<i>Oxalis corniculata</i> L. Oxalidaceae	Gandora	Vegetable	Young leaves are used for flavoring along with <i>Cichorium intybus</i> and <i>Ficus carica</i> in boiled diluted curd (Lusi) for 40-50 minutes on slow fire then with seasoned garlic and spices. Fresh leaves are also eaten raw	29%
12.	<i>Phyllanthus emblica</i> L. Euphorbiaceae	Amla	Vegetable Fruit	Dried fruits are boiled in water for 10-15 minutes and then seasoned with ghee, garlic and spices. Fresh and ripened fruits eaten raw	50%
13.	<i>Pimpinella diversifolia</i> (Wall.) DC. Prodor. Umbellifereae	Tarpakhi	Vegetable	Fresh are dried leaves or aerial parts are boiled in Lusi along with <i>Rumex hastatus</i> , <i>Cichorium intybus</i> and <i>Ficus carica</i> as flavoring agent in diluted curd (Lusi) for 40-50 minutes at slow fire	17%
14.	<i>Pistacia integerrima</i> J.L. Stewart ex Brandis. Anacardiaceae	Kungar	Fruit	Ripened fruits eaten raw	25%
15.	<i>Rosa brunonii</i> Lindl. Rosaceae	Tarni	Fruit	Ripened fruits eaten raw	19%
16.	<i>Rumex hastatus</i> D. Don, Prodor. Polygonaceae	Khatimal	Vegetable	Young leaves of <i>Rumex hastatus</i> , <i>Cichorium intybus</i> and <i>Ficus carica</i> are cooked together in boiled diluted curd (Lusi) for 10-15 minutes on slow fire then with seasoned garlic and spices. Fresh leaves are eaten raw	37%
17.	<i>Solanum nigrum</i> auct. Solanaceae	Kachmach	Vegetable Fruits	Fresh leaves and young twigs are boiled in water for 10-15 minutes, and then seasoned along with roasted garlic and condiments in ghee. Ripened fruits eaten raw	41%
18.	<i>Zanthoxylum armatum</i> D.C. Prodor. Rutaceae	Timber	Fruit Vegetable	Fresh and dried fruits are used as carminative in cooked food (Sag) and local carminative dish (Channi). Young twigs and leaves are mixed in cooked food (Sag) of <i>Ficus</i> , <i>Rumex</i> and <i>Cichorium intybus</i>	54%
19.	<i>Ziziphus nummularia</i> (Burm. f.) Prodor. Rhamnaceae	Ber	Fruit	Fresh and dried ripened fruits eaten raw	55%
20.	<i>Ziziphus oxyphylla</i> Edgew. Rhamnaceae	Ber	Fruit	Fresh and dried ripened fruits eaten raw	18%

Table 2. Ethno-medicinal use categories and percentage citation of wild edible plants of Lesser-Himalayas, Pakistan.

S.No.	Botanical name	Part used	Ethno-medicinal use categories								Number and % of Citation n = 95	
			Fd.	Fw.	Agt.	Con.	F&H	Bk.	Brm.	Or.		Medicinal uses
1.	<i>Amaranthus viridis</i>	Lvs, Sds, Ap.	✓								Dried seed powder of <i>Amaranthus viridis</i> and <i>Ficus carica</i> is mixed in sugar and taken orally improve eye vision	45 (47%)
2.	<i>Berberis lycium</i>	Wp.	✓	✓			✓	✓			Bark infusion is used against skin diseases, ear ache, eye ache, mouth gums and toothache. Bark powder is used as wound healer. Roots and leaves decoction is effective against chronic diarrhea, piles and jaundice.	55 (58%)
3.	<i>Bombax malabaricum</i>	Wp.		✓		✓			✓		Paste of fresh bark is used to cure body weakness, eruptions, gleet, menstrual disorder, stomach disorder and to heal wounds (cattle) and restore fertility	15 (16%)
4.	<i>Carissa opaca</i>	Wp.	✓	✓		✓	✓	✓			Leaves and roots decoction is effective against asthma, jaundice, kidney pain, liver disorder and wound healing	25 (26%)
5.	<i>Cichorium intybus</i>	Lvs.	✓								Leaf decoction is used to cure fever, gas trouble, diarrhea, vomiting, and jaundice, stomach disorder, and to control spleen enlargement.	28 (29%)
6.	<i>Ficus carica</i>	Wp.	✓	✓	✓	✓			✓		Fruit powder is used to improve eye vision; latex is applied topically on eruptions and pimples	22 (23%)
7.	<i>Ficus palmata</i>	Wp.	✓	✓	✓	✓			✓		Fruit powder is used to improve eye vision; latex is applied topically on eruptions and pimples.	20 (21%)
8.	<i>Grewia optiva</i>	Wp.	✓	✓	✓	✓			✓		Bark decoction is effective against diarrhea and stomach inflammation	15 (16%)
9.	<i>Myrsine africana</i>	Wp.	✓	✓		✓	✓		✓		Fruit powder is taken orally to remove intestinal worms. Leaves decoction is used against kidney pain, skin infections and to purify blood	35 (37%)
10.	<i>Olea ferruginea</i>	Wp.	✓	✓	✓	✓			✓		Fresh leaves and twigs paste is effective for mouth gums and toothache	19 (20%)
11.	<i>Oxalis corniculata</i>	Lvs.	✓								Extract of aerial parts is used to cure, liver and urinary bladder inflammation, stomach disorder; to kill germs and to check bleeding	13 (14%)
12.	<i>Phyllanthus emblica</i>	Wp.	✓	✓				✓			Bark and fruit decoction is taken orally against internal inflammation, dysentery, anaemia, fever, jaundice and as appetizer	27 (28%)
13.	<i>Pimpinella diversifolia</i>	Ap.	✓								Powder of aerial parts is used to cure gas trouble, indigestion and leucorrhoea	21 (22%)
14.	<i>Pistacia integerrima</i>	Wp.	✓	✓	✓	✓			✓		Powder of roasted leaf galls is used for the treatment of asthma, cough, diarrhea, gleet and phlegm; as antidote to snake venom and scorpion sting	18 (19%)
15.	<i>Rosa brunonii</i>	Wp.	✓	✓			✓		✓		Flowers paste is effective against bilious affection, burning of skin, constipation and eye diseases	10 (11%)
16.	<i>Rumex hastatus</i>	Lvs, Rt.	✓								Roots and leaves extract is used to cure jaundice, asthma, cough and fever	13 (14%)
17.	<i>Solanum nigrum</i>	Lvs, Fr.	✓								Leaves extract is used for mouth gums, skin infection, gouty joints, liver and spleen enlargement and piles	30 (32%)
18.	<i>Zanthoxylum armatum</i>	Wp.	✓	✓				✓	✓		Fruit powder is effective against cholera, gas trouble, piles and stomach disorder. Young branches (Miswak) are used as tooth brush to cure toothache and mouth gums	40 (42%)
19.	<i>Ziziphus nummularia</i>	Wp.	✓	✓					✓		Bark decoction is used to cure cold, cough and throat inflammation while leaf paste is used for wound dressing and skin diseases	21 (22%)
20.	<i>Ziziphus oxyphylla</i>	Wp.	✓	✓					✓		Bark decoction is used against skin diseases, piles and throat inflammation	12 (13%)

Key: Fd: Fodder; Fw: Fuel wood; Agt: Agricultural tools; Con: Construction; F&H: Fencing and hedges; Bk: Bee keeping; Brm: Brooms; Or: Ornamental; Lvs: Leaves; Sds: Seeds; Ap: Aerial parts; Wp: Whole plant; Rt: Root; Fr: Fruit; n: Total number of informants

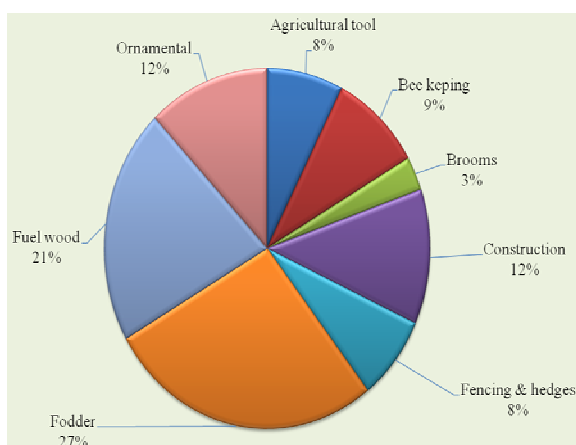


Fig. 1. Ethnobotanical use categories.

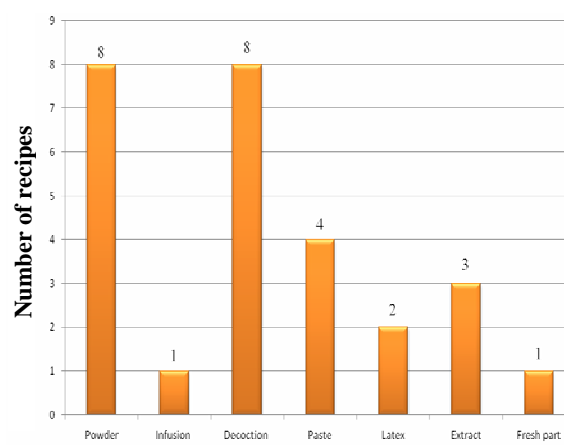


Fig. 2. Mode of preparation.

Most cited plants: Based on number of informants who mentioned the plants as food and for ethnomedicinal purpose at different localities the following were most utilized plant species: *Berberis lyceum*, *Amaranthus viridis*, *Zanthoxylum armatum*, *Myrsine africana*, and *Solanum nigrum* (Fig. 3). These plants have been traditionally used as food, medicine

and other ethnobotanical purposes. Percentage citation of wild edible fruits and vegetables (Fig. 4) indicates that *Amaranthus viridis*, *Ziziphus nummularia*, *Zanthoxylum armatum*, *Phyllanthus emblica*, *Berberis lyceum*, *Solanum nigrum*, *Carissa opaca* and *Ficus carica* were among the highest cited species.

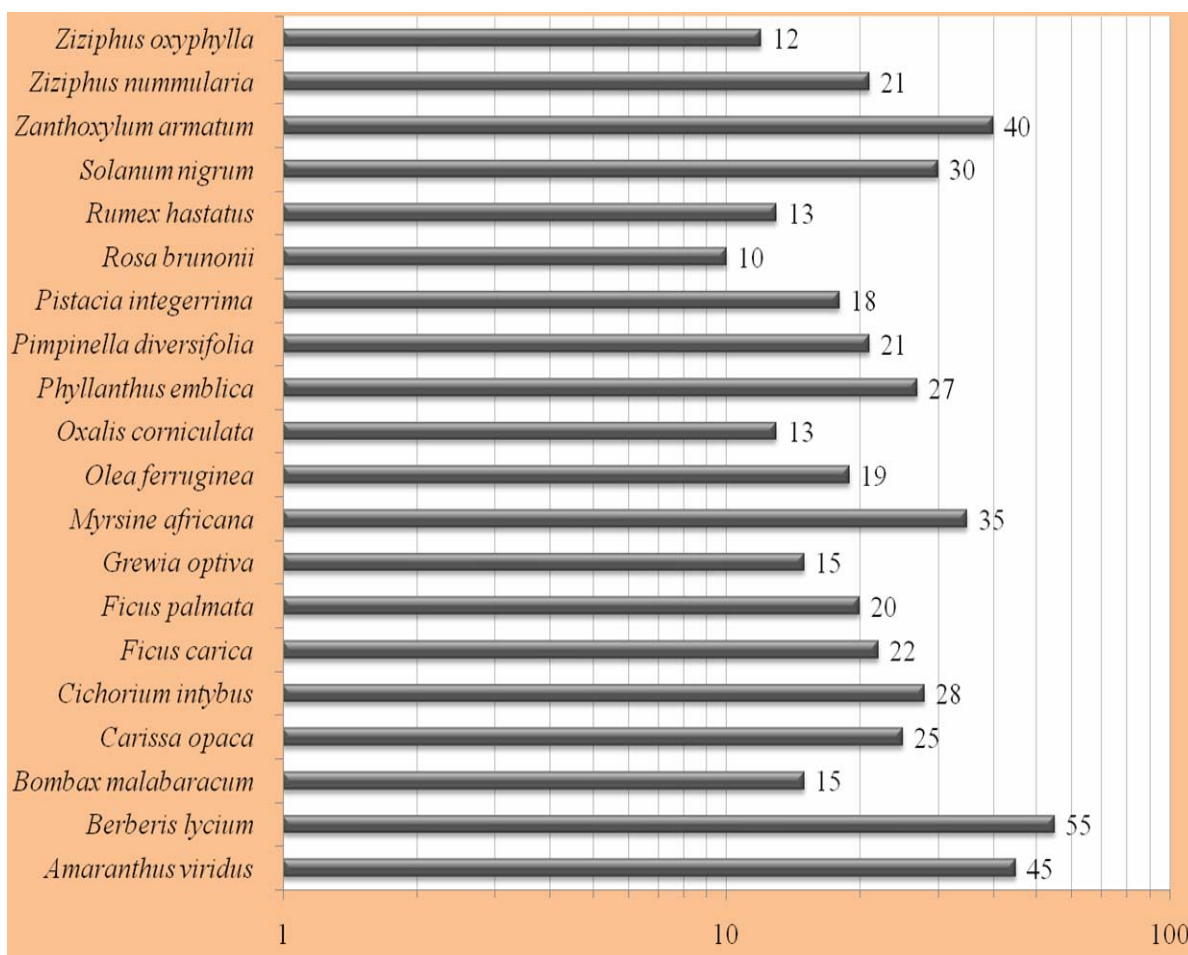


Fig. 3. Ethnobotanical use report by informants (n=95).

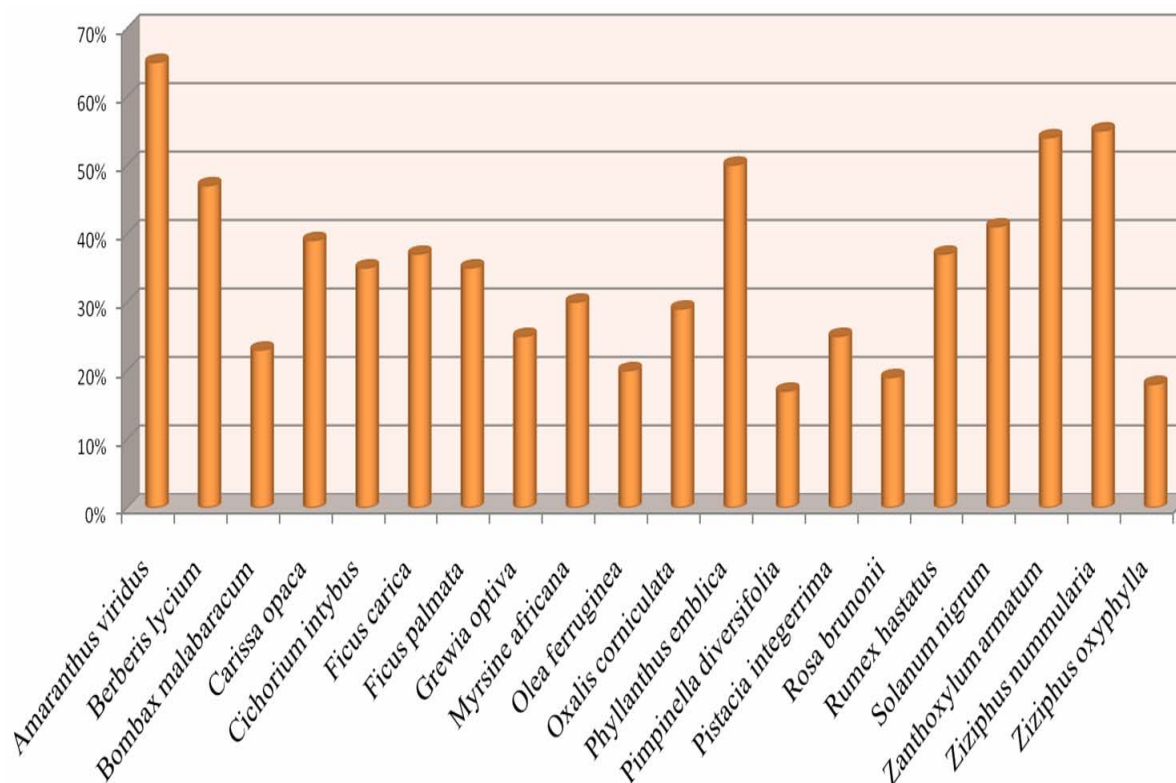


Fig. 4. Use citation % of wild edible fruits and vegetables.

Conclusion

Present ethnomedicinal investigation indicated that gathering, processing and utilization of wild edible fruits and vegetables are still valuable activities in the Lesser Himalayas-Pakistan. Several wild edible plants have been quoted and cited in the different areas, demonstrating that there is a common cultural heritage in these areas regarding the gathered food plants. It is obvious that with change in dietary habits and the influence of contemporary western life style, younger generation has lost the conventional knowledge essential to identify, gather and process these species. The decline in wild food gathering appears to be due to a number of factors including socio-economic conditions, agricultural practices and higher accessibility of agricultural products, and negative connections (i.e., many middle-aged people recognize the consumption of wild edible plants as a symbol of poverty of the past).

Most of the wild species in the surveyed areas have no protection. However, very few plant species (e.g., *Ficus carica*; *Ficus palmata*) are now cultivated by some inhabitants thus reducing threats to rare wild edible plants and their habitats, which indicate that acquisition of economic payback from species might endorse local people's interest in conservation and maintenance of locally significant and susceptible species. The habit of using wild edible plants is still alive among the tribal communities of Lesser Himalayas-Pakistan but is disappearing with the passage of time. Therefore, the recording and preserving of this knowledge is pressing

and fundamental. Sweeping changes in the way of life of rural people in Lesser Himalayas have harshly eroded knowledge and traditions relating to the exploitation and management of most natural resources. This rich element of bicultural diversity needs, therefore, to be studied before it is too late.

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