Pak. J. Bot., 52(5): 1715-1725, 2020. DOI: http://dx.doi.org/10.30848/PJB2020-5(6)

EVALUATION OF NUTRITIONAL POTENTIAL OF WILD EDIBLE FRUITS CONSUMED BY INDIGENOUS COMMUNITIES OF CENTRAL PUNJAB, PAKISTAN

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Abstract

The current study was based upon nutritional value of wild edible fruits consumed by rural people in Central Punjab, Pakistan. The study area is gifted with fertile agricultural land that is blessed with arid and semi-arid climatic conditions. However, uncultivated landscapes in the region are occupied by wild flora including wild edible fruits. This work focused on the consumers of wild edible fruits in the indigenous communities because of their vast traditional knowledge on the nutritional importance of indigenous wild species. A total of 27 wild edible fruit plants were recorded in the area belonging to 16 families. All the plants were native and have occupied the area for decades or centuries. *Ziziphus nummularia*, *Morus nigra and Morus alba* were found to be the most abundant and consumable species. The most rarely occurring species were *Asparagus officinalis*, *Cocculus hirsutus, Cordia gharaf* and *Grewia tenax.* The plant samples were collected, identified, preserved and deposited in the Herbarium of University of Sargodha (SARGU) for future reference. Fruit samples were subjected to proximate analysis such as moisture, crude protein, crude fat, crude fiber, ash and nitrogen free extract (NFE) contents to evaluate their nutritional importance. Moisture content, crude protein, crude fat, crude fiber, ash and NFE ranged from 9.36 to 84.05%, 0.18 to 3.68%, 0.12 to 5.46%, 0.32 to 45.43%, 0.17 to 19.68% and 32.52 to 99.03% respectively. Thus, these wild edible fruits were found promising alternatives of food.

Key words: Rural communities, Proximate parameters, Semi-arid region, Wild plants.

Introduction

Overpopulation has become a major biological issue today which demands alternative food resources. Plants are major producers in the biosphere and are used as a source of food, vegetables, fruits, drinks, medicines, spices and condiments (Schutles, 1992). Along with cultivated varieties of fruit plants, wild edible fruits play a cheap source of food for rural people especially the poor. The uncultivated, un-hybridized or untamed plants occurring in an area are included in wild flora. Trees, shrubs, herbs, lianas, mosses, wild flowers and ferns; all types of plants are enlisted in wild plants. The nutritional potential of wild edible fruits is better than cultivated fruit varieties (Eromosele *et al*., 1991; Maikhuri *et al*., 1994). Wild edible fruit plants are source of balanced diet to overcome food insecurity and provide the base-line for species domestication (Shrestha & Dhillion, 2006; Deshmukh & Waghmode, 2011). Wild fruits are good source of nutrients like proteins, carbohydrates, vitamins, and fibers (Craig & Beck, 1999; Quebedeaux & Bliss, 1988; Quebedeaux & Eisa, 1990; Wargovich, 2000) and fulfill the domestic needs of food and income security during the periods of food shortage or dry seasons and so are considered as famine foods (Guinand & Dechassa, 2000; Kebu & Fassil, 2006). Wild plants have great nutritional potential possessing organic and inorganic nutrients (Penny *et al*., 2002). Fruits are important medicinally and nutritionally as they are valuable storehouse of minerals (Marwat *et al*., 2009a). Unfortunately, the dependency and popularity of wild edible fruit species has declined due to introduction of exotic species and genetically modified organisms (GMOs). However, a great interest has developed to explore wild edible fruit plants as food alternatives due to high cost of cultivated commercial fruits (Glew *et al*., 2005; Nkafamiya *et al*., 2007; Musinguzi *et al*., 2007; Aberoumand & Deokule, 2009; Nazrudin, 2010).

Pakistan is blessed with plant resources including wild flora and has a key position with respect to wild medicinal diversity of plants. Punjab is the second largest province of Pakistan. It is the land of five rivers (Anon., 1994). All soil types are found in the Province. A number of native wild species occur in the uncultivated landscapes of the Punjab. The region possesses fertile land and has most of its population in rural areas. Indigenous people in the rural areas consume wild edible plants for different reasons but mainly for food to overcome food shortage, medicinal imbalance and malnutrition. Wild edible fruits are abundant in the study area, the Central Punjab and commonly consumed by the rural people. The majority of fruits are eaten fresh or raw, some are sold in the rural markets or during festivals and others are pickled or preserved to be used in dry seasons. The utilization of wild edible fruits by the local inhabitants in considerable amounts motivated the study of the proximate analysis of samples for their nutritional evaluation. Proximate analysis is a valuable mean to assess nutritional significance of wild edible fruits (Pandey *et al*., 2006). This study aimed to document the nutritional potential of wild edible fruits consumed by the indigenous communities of Central Punjab, Pakistan, living as dehaties (villagers), agriculturists, farmers, peasants, herdsmen, pastoralists, saniasies and hakeems. The study also emphasized the indigenous knowledge on wild edible plants.

Materials and Methods

Study area: Central Punjab includes the districts of Sargodha, Khushab, Mianwali, Bhakkar, Faisalabad, Jhang, Toba Tek Singh, Chiniot, Hafizabad and Mandi Bahauddin (Fig. 1). Geographically, this region is located in the center of the province, Punjab and is considered as

the heart of Punjab and even of the whole country being the vast agricultural production center. The climate of the area ranges from extreme heat (50°C) in summers to 0°C in winters. Temperature may fall below the 0°C in winters in some parts of the area like Sakesar (Soon Valley, Khushab) (Shah & Rahim, 2017). There are mainly flat plains in the area, however hilly and desert areas also flourish in its geographic beauty. Kirana hills occur in district Sargodha while other mountainous area is found in district Khushab (including the areas of Katha, Naushera, Uchhali, Sakesar, Khabeki, Jhalar and Dhep Sharif); district Mianwali (including the areas of Chhidru, Namal Valley, Rikhi, Kalabagh, Swans, Mitha Khatak, Makerwal and Gulla Khel) and district Chiniot. The semi-tribal area of district Mianwali (Makerwal, Gulla Khel and Kundal) are rich source of biodiversity (Shah *et al.*, 2013; Batool *et al*., 2017). Desert areas are found in district Khushab (Noor Pur Thal) and district Bhakkar-Thal. Three major rivers of the country, Indus, Chenab and Jhelum flow from the region. Most of the landscape is irrigated with a network of canal system. Despite modern agricultural techniques and domestication of crop and fruit plants in the Central Punjab, wild edible fruits are common and are consumed by the local people. The natural habitat of the wild plants in the study area is uncultivated land, river and canal banks, along rain-water channels, graveyards, road sides, along railway lines, forests, deserts and hilly areas.

Surveys of the ancient villages: The information about the importance of wild edible plants were collected during January 2015 to March 2017 from more than 170 different villages of 10 districts of Central Punjab (Fig. 1). The ancient villages were focused on to gather information from the indigenous communities inhabited there for centuries.

Data collection: Both the qualitative and quantitative research techniques were applied to gather information. The relevant data were collected by applying the techniques of well-versed semi-structured interviews from key informants and focus group discussion (Alexiades & Shelden, 1996). A total of 357 key informants, traditional consumers and local users including men and women ranging from 15 to 80 years old of the study area were interviewed. The observations and information about the local names, part used, edibility, mode of utilization and locally used recipes were documented (Martin, 1995; Andrea *et al*., 2000a; 2007b). Botanical names of the observed and collected plants were confirmed with the help of "Flora of Pakistan" (Nasir & Ali, 1970-2003). Preserved plant specimens were deposited in the Herbarium of University of Sargodha (SARGU) for future reference.

Sample collection: The fresh fruit samples were collected during their respective fruiting seasons and deposited in the Institute of Food Science and Nutrition (IFSN), University of Sargodha, Sargodha for proximate analysis. Few fruit samples along with plant specimens were dried, preserved and deposited in the Herbarium of the Department of Botany, University of Sargodha for future reference.

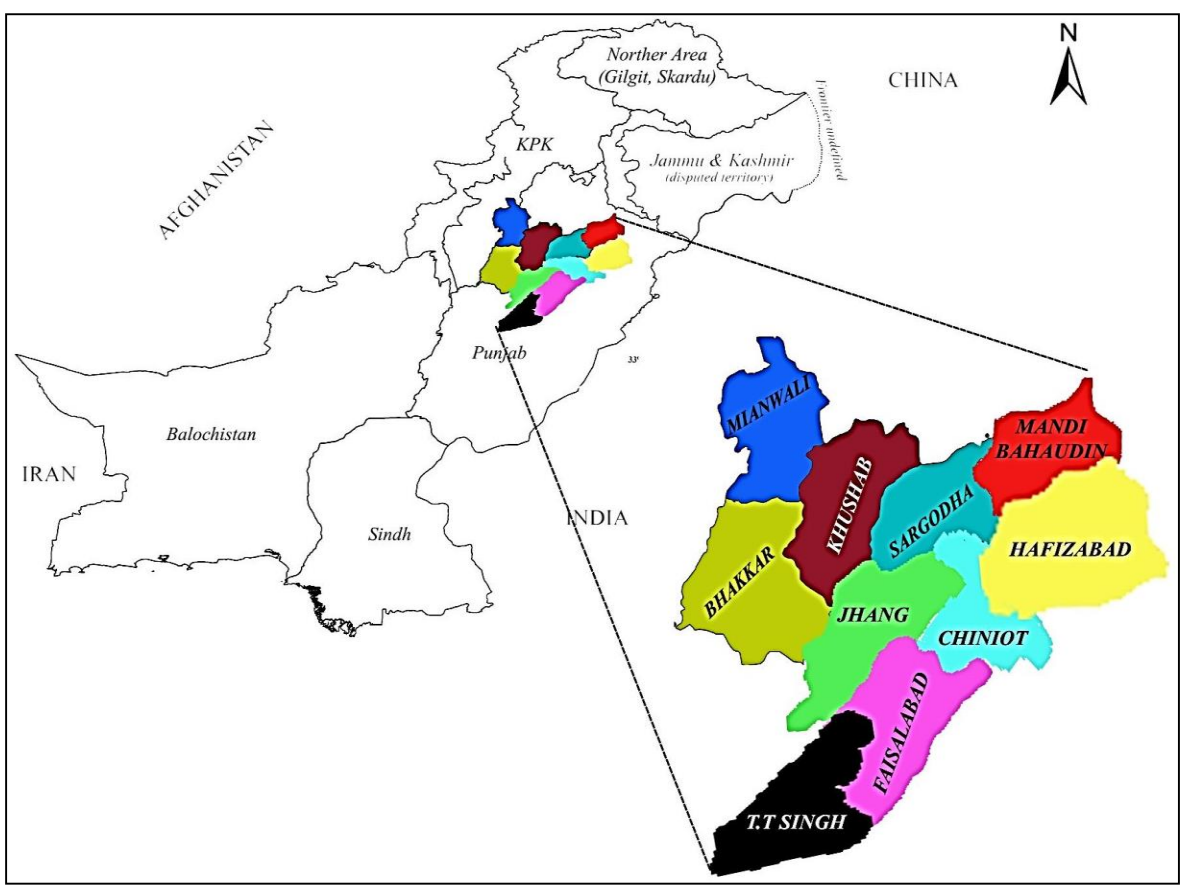


Fig. 1. Map of the study area.

Proximate analysis: The nutritional analysis of fruit samples was carried out in the laboratories of IFSN, University of Sargodha for proximate parameters of moisture, ash, crude fiber, carbohydrates, crude fats and crude proteins using standard laboratory procedures (Anon., 2006). All the proximate values were calculated in percentage (Anon., 2000).

Moisture content was determined by weighing the fresh sample before and then oven-drying the sample at 105ºC until constant weight was obtained and subtracting the value from fresh weight (Indrayan *et al*., 2005). Similarly, ash content was determined by keeping the sample in muffle furnace at 550ºC for 5-6 hours. The residue was cooled and weighed (Indrayan *et al*., 2005). Crude fat was estimated by using Soxhlet apparatus (Anon., 2006). Crude fibers represent indigestible carbohydrates and their content was determined by digestion of oven-dried and fat free sample (Anon., 2006). The nitrogen value for the estimation of crude protein was determined using Micro Kjeldahl apparatus. The protein content was calculated by using the formula;

Protein (%) = Nitrogen (%) x 6.25 (Anon., 2006).

Nitrogen free extract (NFE) represents digestible carbohydrates and its value was determined by subtracting the sum of the percentages of ash, moisture, crude fat, crude fiber and crude protein from 100 (Iqtidar & Saleemullah, 2004).

NFE= 100 ─ % (ash + crude fat + crude fiber + crude protein).

Statistical analysis: Descriptive statistics was used to analyse the results. Correlation was done by using MS Excel 2007 version.

Results and Discussion

The results show that a plentiful diversity of wild flora is found in the study region and the indigenous people particularly in the villages of Central Punjab consume these wild edible fruits in considerable quantity. Indigenous communities inhabiting rural areas are prone to malnutrition, poverty, rapid population growth and illiteracy. The inhabitants of the subject area use wild edible fruits as alternate source of food to meet their dietary needs. The studied species were found most effectual with respect to edibility and nutritional potential. The fruits of all the species were found edible with slight differences in mode of utilization. Table 1 reveals that some fruits are eaten raw, others are used fresh and some are dried for future use. Some plants are used as a whole but the mostly used part of the studied plants was the fruit. The results of the proximate analysis bring into focus the rich nutritional composition and scope for their use as an alternative source of bio-nutrition and dietary supplements (Mahapatra *et al.*, 2012). Use of these fruits may be responsible for overcoming the nutrient deficiency, food shortage and chronic malnutrition among the peoples belonging to remote and rural areas due to unavailability of modern health care facilities and awareness in this regards (Table 2).

A total of 27 species were recorded (Table 1). It was found that most abundant and consumed species were *Ziziphus nummularia, Morus nigra and Morus alba*. The most rarely occurring species were *Asparagus officinalis, Cocculus hirsutus, Cordia gharaf* and *Grewia tenax.* With respect to the habit of the plants, trees ranked first with 16 species; shrubs, herbaceous vines, herbs and lianas ranked next with 6, 2, 2 and 1 species respectively (Fig. 2). A total 16 families were recorded of which Moraceae ranked first with (5) species, Boraginaceae (4), Rhamnaceae (3), Arecaceae (2), Cucurbitaceae (2) while others such as Capparaceae, Myrtaceae, Malvaceae, Meliaceae Verbenaceae, Rutaceae, Solanaceae, Oleaceae, Meninspermaceae, Salvadoraceae, Asparagaceae had 1 species each (Fig. 3).

The mean values for moisture content in all wild edible fruits are shown in Fig. 4 and Table 2. The maximum moisture content was found in *Azadirachta indica* (84.053±0.77%). The minimum moisture content was found in *Ficus palmata* (9.360±0.86%). The results were comparable with moisture contents reported by the Gopalan *et al*., (1982), Longvah (2002) and Sankhala *et al*., (2005). The mean values for crude protein content in all wild edible fruits are shown in Fig. 5 and Table 2. The maximum crude protein was found in *Momordica balsamina* (3.68±0.01). The minimum crude protein content was found in *Lantana camara* (0.18±0.01%). The similar results of crude protein contents were obtained by the Ogle *et al*., (1985), French (2006) and Mahapatra *et al*., (2012).

The mean values for fat content in all wild edible fruits are shown in Fig. 6 and Table 2. The maximum fat content was found in *Ficus palmata* (05.46±1.02%). The minimum fat content was found in *Morus alba* (0.125±0.01%). The results of fat contents in present investigation are supported by the results obtained by the Longvah (2002) and Sankhala *et al*., (2005). The mean values for fiber content in all wild edible fruits are shown in Fig. 7 and Table 2. The maximum fiber content was found in *Asparagus officinalis* (45.43±0.80%). The minimum fiber content was found in *Cordia dichotoma* (0.320±0.01%). These results are comparable with the results of fiber contents obtained by the Rathore (2009). The mean values for ash content in all wild edible fruits are shown in Fig. 8 and Table 2. The maximum ash content was found in *Asparagus officinalis* (19.68±0.78%). The minimum ash content was found in *Cordia dichotoma* (0.17±0.01%). The results of ash contents in this study are strengthen by the result of ash contents found by the Alverez (2002), Gupta *et al*., (2005) and Li *et al*., (2008). The mean values for NFE content in all wild edible fruits are shown in Fig. 9 and Table 2. The maximum NFE content was found in *Cordia dichotoma* (99.030±0.02%). The minimum NFE content was found in *Asparagus officinalis* (32.523±1.42%). These results are supported with results obtained by the Sundriyal & Sundriyal (2004) and Tapan Seal *et al*., (2017).

It is worth mentioning that some species like *Lantana camara* are generally known to be noxious and toxic (Sharma, 2007) but in the study area (people of Soon Valley) and many parts of the world, the plant is edible. For example, ripe black fruit/ berries in handful quantity are eaten by children and herdsmen as snack (Ruffo *et al*., 2002; Carstairs *et al*., 2010).

Table 1. General account of wild edible fruits of Central Punjab, Pakistan.

S. No.	Scientific name/ Voucher number	Common name	Family	Part(s) used	Mode of utilization	Picture of plant
1.	*Asparagus officinalis* L./ASIF-05	Hazarmuli, Marchoba Shatmuli,	Asparagaceae	Fruits	Ripened fruits are boiled to eat. Unripe fruits are cooked as vegetables.	
2.	*Azadirachta indica* A. Juss./ASIF-15	Neem	Meliaceae	Whole Plant	Ripened fruits are eaten raw. Pounded fresh leaves are mixed with water to make a solution "Sharbat" for the use as blood purifier and as anti-diabetic. Powdered hard seeds are used against leprosy and diabetes.	
3.	*Capparis decidua* (Forssk.) Edgew./ASIF-01	Dela/ Karya	Capparaceae	Fruits	Ripened fresh fruits are eaten raw. Unripe fruits are pickled to make "Achaar", a local recipe.	
4.	*Citrus medica* L./ASIF-25	Khatti	Rutaceae	Fruits	Mature fruit pulp is eaten for stomach disorder. Roughage from fully ripened fruit is eaten for constipation. Fresh juice is extracted from the fruit and taken orally which is effective against the arthritis and digestive ailments. Fruits pieces are rubbed to clean hands and feet before washing.	
5.	*Cocculus hirsutus* (L.) Diels/ASIF-06	Farid buti	Menispermaceae	Whole Plant	Ripened fruits are edible and eaten by birds and local inhabitants which prove to be tonic and laxative. A decoction of fresh pounded leaves is prepared to treat fever.	
6.	*Cordia dichotoma* G. Forst./ASIF-23	Lasoora	Boraginaceae	Fruits	Fully ripened fruits are eaten raw. Unripe mature fruits are pickled to make pickle locally called "Achaar".	
7.	*Cordia gharaf* Ehrenb. ex Asch./ ASIF-16	Gondi/ Gondni	Boraginaceae	Fruits	Fresh ripened fruits are eaten by the peoples of all ages that are very sweet in taste and prove to be tonic and energetic.	

Table 1. (Cont'd.).

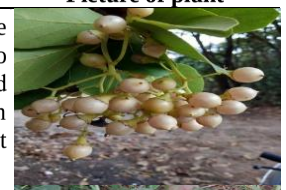
S. No.	Scientific name/ Voucher number	Common name	Family	Part(s) used	Mode of utilization	Picture of plant
8.	*Cordia myxa* L./ASIF-08	Lasoori	Boraginaceae	Fruits	Ripened fruits are edible and sweet in taste. Unripe fruits are pounded and mixed with pepper and salt to make "Chatni", a local recipe used with bread (Roti). Mucilage from the ripened fruits is taken orally which is effective for cough and chest complaints.	
9.	*Cucumis melo* L./ASIF-11	Chibherr	Cucurbitaceae	Fruits/ Seeds	Ripened fruits are eaten fresh which prevent dehydration. Nutritive seeds are edible. Fresh fruits are cut into two halves and rubbed on skin which proves to be cooling and moisturizing.	
10.	*Ehretia acuminata* R. Br./ASIF-07	Peelak	Boraginaceae	Fruits/ Seeds	Pulp of fresh ripened fruits is eaten because of its delicacy while the seeds powder taken along with water is quite effective against jaundice.	
11.	*Ficus palmata* Forssk./ASIF-10	Jangli Injeer	Moraceae	Fruits/ Seeds	Fresh ripened fruits are eaten raw. Seeds are edible which are eaten along with fruit pulp and beneficial for constipation.	
12.	*Ficus racemosa* L./ASIF-18	Gulhar	Moraceae	Fruits/ Seeds	Ripened fruits are eaten by people of all ages which are nutritive and effective against sexual weaknesses. Seeds are edible which are eaten with fruits and prove to be laxative. Cooked fruit used as vegetable is best remedy of leucorrhoea.	
13.	*Ficus religiosa* L./ASIF-26	Peepal/ pippal	Moraceae	Fruits/ Seeds	Ripened fruits are eaten by birds and herdsmen. Seeds are edible while dried fruit have stimulating effect for CNS.	
14.	*Grewia tenax* (Forssk.) Fiori/ASIF-22	Ghungair	Malvaceae	Fruits/ Leaves	Ripened fruits are eaten which are highly nutritive and delicious. Fruits are dried and preserved for future use. A paste is made by pounding fresh leaves to apply on boils (daany).	

Table 1. (Cont'd.).

S. No.	Scientific name/ Voucher number	Common name	Family	Part(s) used	Mode of utilization	Picture of plant
15.	*Lantana camara* L./ASIF-13	Bhangi Booti/ Panj Phulli	Verbenaceae	Whole Plant	Ripened black fruits/ berries are edible. An aqueous extract (Sharbat) is prepared from mature flowers which have anti-inflammatory and carminative effects. Sharbat is also made from fresh pounded leaves which have good results against fever, cold, cough and dysentery.	
16.	*Momordica balsamina* L./ASIF-24	Jangli Karela	Cucurbitaceae	Fruits	Mature, unripe and fresh fruits are pickled. Fruit is cooked as vegetable and has beneficial effects against diabetes. Harvested when ripe. A tonic soup is also prepared from fruit.	
17.	*Morus alba* L./ASIF-02	Toot safaid	Moraceae	Fruits/ Leaves	Fresh fruits are eaten raw which are effective for sore throat and dehydration. Fresh leaves are chewed to cure inflammatory throat. Gargle practice is done by boiling fresh leaves in water.	
18.	*Morus nigra* L./ASIF-17	Toot siaah	Moraceae	Fruits/ Leaves	Mature fresh fruits are eaten which are nutritive and delicious. Fruits are sold in rural markets. Gargle practice is done by boiling fresh leaves in water. Fresh young leaves are rubbed on skin which have moisturizing effects.	
19.	*Nannorrhops ritchiana* (Griff.) Aitch./ASIF-20	Patha	Arecaceae	Whole Plant	Ripened fruits are eaten raw which are sweet in taste highly nutritious and edible. Local people take ripened fruits orally to treat alimentary tract disorders. Leaves are sold on commercial scale.	
20.	*Olea ferruginea* Royle/ASIF-03	Kaho	Oleaceae	Fruit/ Leaves	Ripened fruits are eaten fresh which are astringent, nutritive and edible. Decoction of leaves is made to use as gargle against sore throat.	
21.	*Phoenix sylvestris* (L.) Roxb./ASIF-12	Khajji/ Doka/ khajoor	Arecaceae	Fruits	Mature fruits are eaten which are sweet in taste and nutritive. Fruits are sold in rural markets. Fruits are dried and preserved for future use.	

Table 1. (Cont'd.).

S. No.	Scientific name/ Voucher number	Common name	Family	Part(s) used	Mode of utilization	Picture of plant
22.	*Salvadora oleoides* Decne./ASIF-09	Van/ Peeloun	Salvadoraceae	Fruits/ Seeds	Fresh fruits are eaten raw by children and rural people. Oily seeds are eaten along with fruits which have antibacterial properties.	
23.	*Solanum nigrum* L./ASIF-27	Mako/ Kach Mach	Solanaceae	Fruits/ Leaves	Black colored fresh fruits are eaten raw. Young twigs and fresh leaves are cooked as vegetable.	
24.	*Syzygium cumini* L. Skeels/ASIF-21	Jaman	Myrtaceae	Whole Plant	Ripened fruits are eaten and sold in rural markets. A syrup, "Sharbat" is prepared from the extracted juice of fruits which has cooling effect and useful against diarrhea. Bark pieces are boiled in water which is used to cure bowl motion and stomach disorders.	
25.	*Ziziphus mauritiana* Lam./ASIF-04	Bair	Rhamnaceae	Whole Plant	Delicious ripened fruits are eaten fresh which are nutritive, tonic and effective against constipation. Fruits are dried by local people for future use. A decoction of root and bark is prepared which has cooling effects and effective against fever and diarrhea.	
26.	*Ziziphus nummularia* (Burm.f.) Wight & Arn./ASIF-19	Malha Beri	Rhamnaceae	Whole plant	Small sized ripened fruits are eaten raw by herdsmen, shepherds and dehaties. An astringent suspension is made by mixing pounded roots and bark. Leaves are chewed which are laxative.	
27.	*Ziziphus spina-christi* (L.)Willd/ASIF-14	Kunkair malha	Rhamnaceae	Whole Plant	Sweet ripened fruits are eaten raw. Fruits are dried by local people for future use. A decoction of root and bark is prepared which has cooling effects and effective against fever and diarrhea.	

Table 2. Proximate analysis (Mean ± SD) of wild edible fruits.

S. No.	Fruit species	Moisture content (%)	Crude protein (%)	Crude fat (%)	Crude fiber (%)	Ash (%)	NFE content (%)
1.	*Asparagus officinalis*	74.490±1.07	1.3900±0.20	0.975±0.08	45.430±0.80	19.680±0.78	32.523±1.42
2.	*Azadirachta indica*	84.053±0.77	0.6900±0.01	3.328±0.62	13.200±0.90	6.500±0.80	76.283±2.31
3.	*Capparis decidua*	64.240±0.79	0.2000±0.01	0.473±0.01	3.220±0.85	0.918±0.63	95.190±1.46
4.	*Citrus medica*	65.443±1.07	0.5600±0.01	0.650±0.06	13.603±0.87	10.773±0.80	74.412±1.73
5.	*Cocculus hirsutus*	79.238±1.03	0.7625±0.01	2.182±0.83	11.110±0.78	6.280±0.59	79.663±2.20
6.	*Cordia dichotoma*	51.192±0.86	0.1900±0.01	0.282±0.01	0.320±0.01	0.170±0.01	99.030±0.02
7.	*Cordia gharaf*	64.418±1.06	0.2100±0.01	1.230±0.48	0.433±0.01	0.323±0.01	97.802±0.46
8.	*Cordia myxa*	76.480±1.10	0.7325±0.01	0.633±0.38	1.500±0.48	0.528±0.08	96.610±0.13
9.	*Cucumis melo*	70.063±0.86	0.8800±0.02	3.450±1.00	20.332±0.48	10.230±0.58	65.108±2.04
10.	*Ehretia acuminata*	69.588±1.12	1.4275±0.65	3.328±0.25	19.090±0.81	8.622±1.13	67.533±2.69
11.	*Ficus palmata*	20.212±12.12	0.6125±0.01	5.463±1.02	2.197±0.79	4.493±1.02	81.930±2.74
12.	*Ficus racemosa*	76.370±0.92	0.3425±0.01	2.590±0.90	40.328±0.92	10.250±0.75	46.490±2.54
13.	*Ficus religiosa*	76.548±0.79	0.4525±0.01	3.663±0.91	7.500±0.78	2.490±0.73	91.198±2.37
14.	*Grewia tenax*	32.228±0.95	0.4025±0.01	1.633±0.62	38.233±0.58	15.343±1.16	44.388±2.34
15.	*Lantana camara*	67.833±0.74	0.1875±0.01	3.463±0.09	18.573±1.17	8.663±0.57	69.113±1.83
16.	*Momordica balsamina*	70.678±0.74	3.6800±0.01	3.053±0.82	27.542±0.92	14.698±0.80	45.930±2.53
17.	*Morus alba*	75.343±0.86	0.6925±0.00	0.125±0.01	1.580±0.81	4.513±0.83	93.085±1.66
18.	*Morus nigra*	78.273±0.79	0.5400±0.01	0.463±0.09	9.543±0.49	15.350±0.64	74.100±1.23
19.	*Nannorrhops ritchiana*	65.143±0.02	0.4275±0.02	1.663±0.02	2.592±0.01	4.010±0.02	91.608±0.02
20.	*Olea ferruginea*	9.360±0.86	0.5775±0.01	3.437±0.91	5.500±0.70	3.290±1.01	87.198±2.62
21.	*Phoenix sylvestris*	64.373±0.79	0.6125±0.01	0.190±0.01	1.337±0.07	3.263±0.65	94.595±0.73
22.	*Salvadora oleoides*	78.363±1.15	0.2300±0.01	0.330±0.01	1.910±0.08	0.643±0.39	96.887±0.31
23.	*Solanum nigrum*	63.203±0.90	0.6600±0.01	2.733±1.03	11.137±0.90	4.388±0.91	81.083±2.83
24.	*Syzygium cumini*	30.298±1.11	0.9100±0.01	2.030±0.74	1.192±0.74	2.020±0.75	93.845±2.23
25.	*Ziziphus mauritiana*	72.480±1.07	0.4925±0.01	0.373±0.00	0.748±0.09	0.760±0.10	97.683±0.20
26.	*Ziziphus nummularia*	64.580±0.56	0.5325±0.01	0.305±0.01	0.665±0.07	0.735±0.09	97.760±0.15
27.	*Ziziphus spina-christi*	81.580±0.09	0.8575±0.02	0.713±0.44	0.572±0.02	0.453±0.02	97.403±0.46

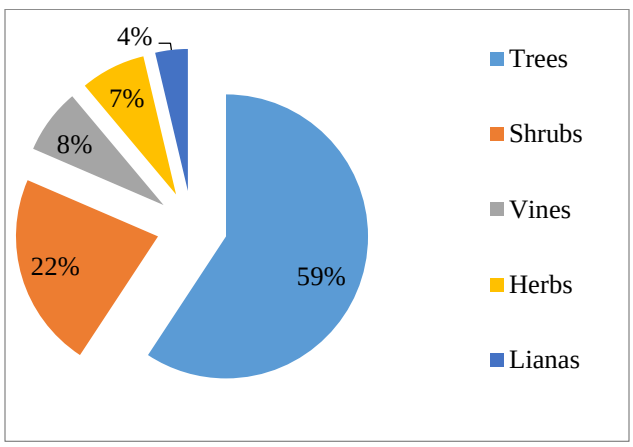


Fig. 2. Habit of plants reported.

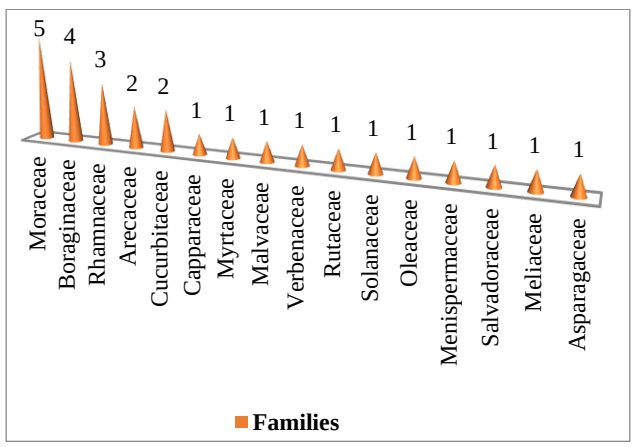


Fig. 3. Number of plant species in respective families.

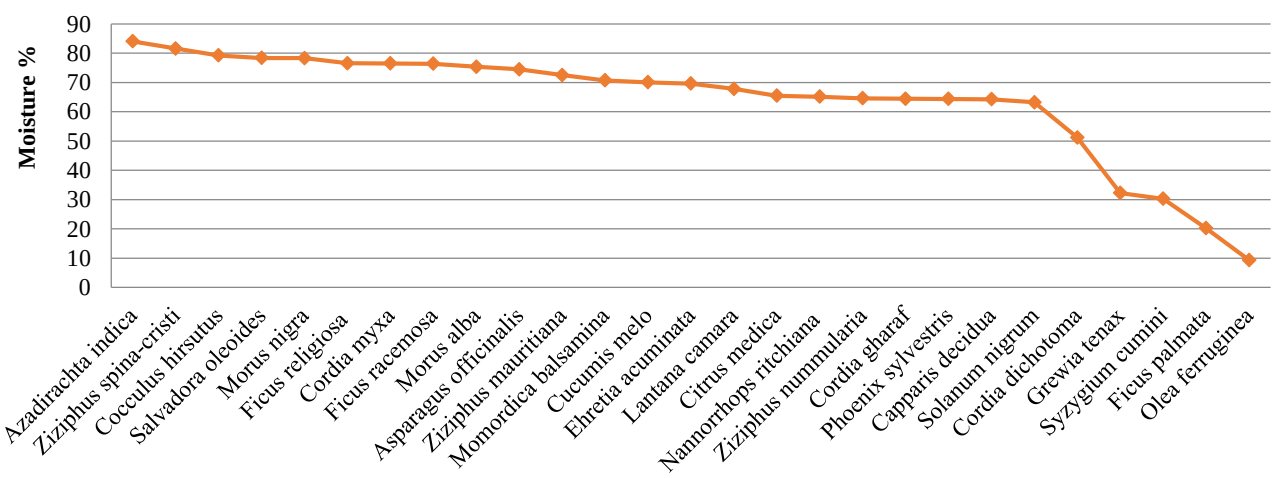


Fig. 4. Moisture content of wild edible fruits.

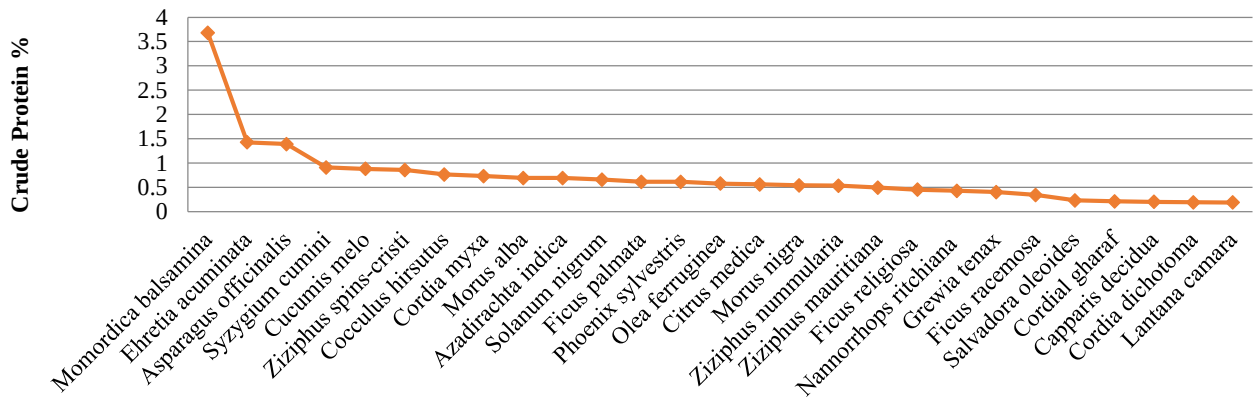


Fig. 5. Crude protein content of wild edible fruits.

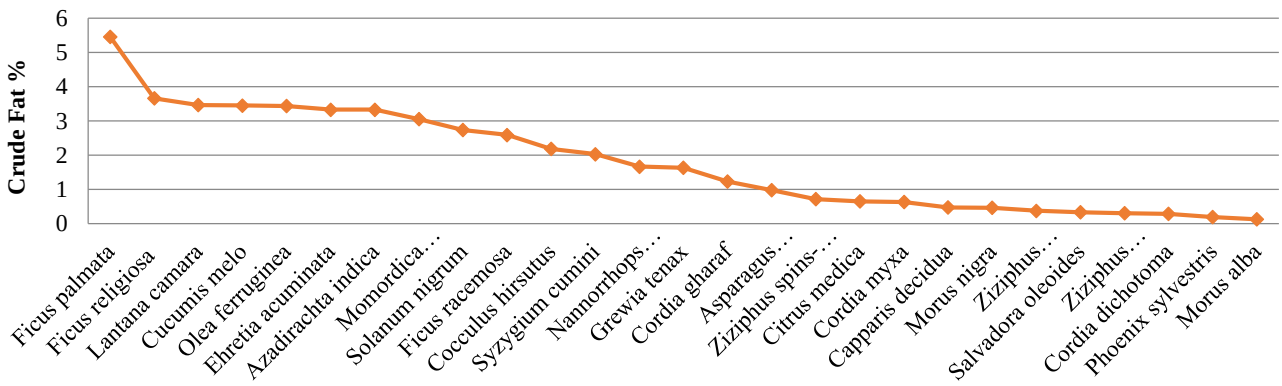


Fig. 6. Crude fat content of wild edible fruits.

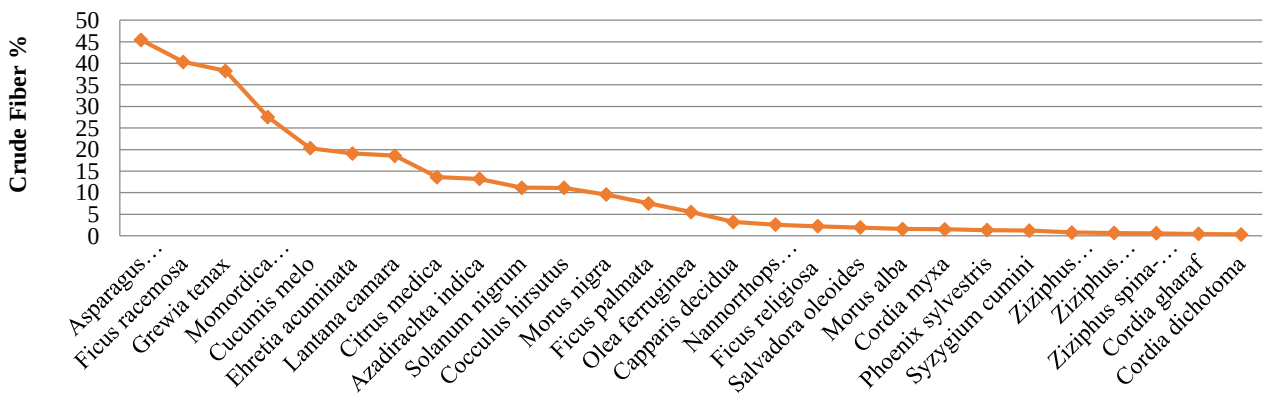


Fig. 7. Crude fiber content of wild edible fruits.

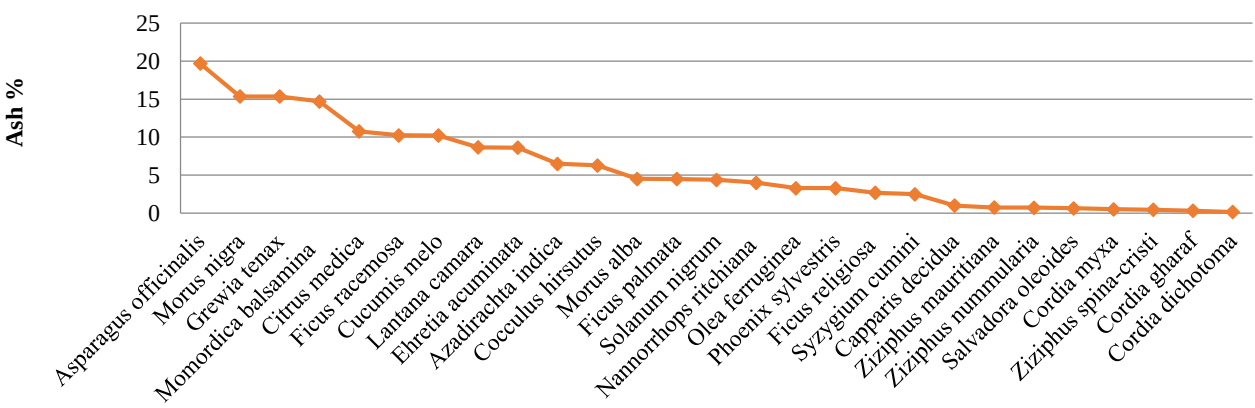


Fig. 8. Ash content of wild edible fruits.

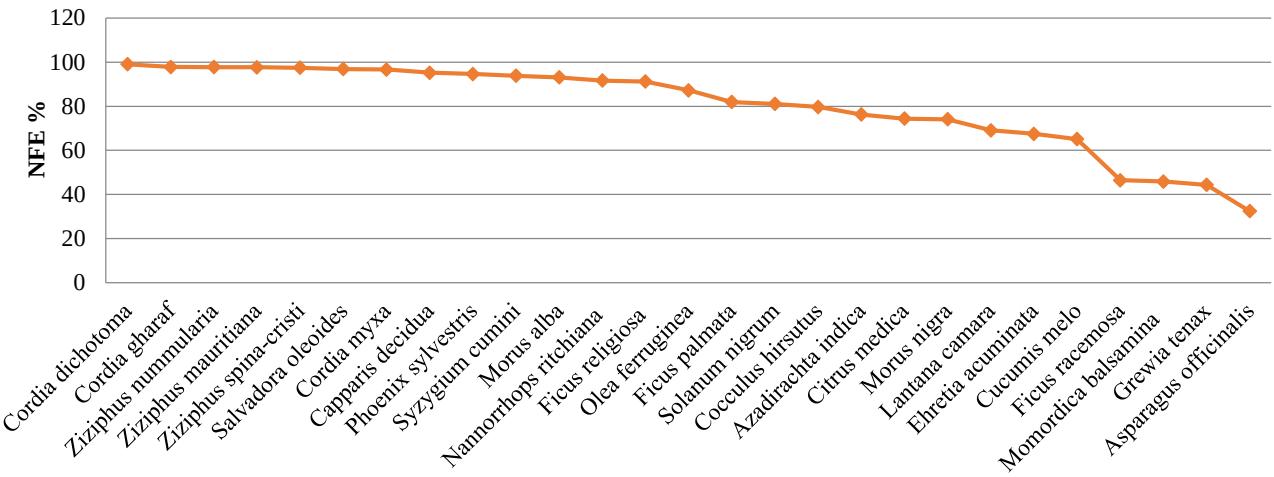


Fig. 9. NFE content of wild edible fruits.

Conclusion

The study revealed that all the investigated plants had detectable amount of nutrients especially ash contents (minerals) and dietary fiber, so proved to be effective not only for utilization by the indigenous communities of Central Punjab, Pakistan who may not be able to afford commercial fruits but also for the other people of the country. The study suggests that further biological and conservational works and identification of bioactive compounds are needed for the unexplored and endangered species of the area.

Acknowledgements

This paper is part of PhD research work of Asif Abbas Shah and the study was supported by Higher Education Commission Pakistan (Programme No. 20-1599/ 09/3007). The authors appreciatively thank all the guides and the traditional healers who accepted to participate to the study.

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(Received for publication 2 February 2019)