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Original Article

Varietal Comparison of Proximate Composition and Mineral Profiling of Pakistan Native Barberry Powder

Madiha Batool[1*], Aurangzeb[1], Tara Khursheed[1], Tanzeel Shahid[1], Sadaf[2] and Morad Yaser Al Mostafa[3]

[1]University Institute of Diet and Nutritional Sciences, The University of Lahore, Lahore, Pakistan
[2]Center for Research in Molecular Medicine University of Lahore, Lahore
[3]Ministry of Health, Princess Basma Hospital, Jordan
* madihamirza15@gmail.com

Abstract:

Berberis Vulgaris fruit (barberry) also commonly known as "zereshk" is one of the world's renowned medicinal plant with highly nutritious and therapeutic values, world widely. It is an elongated, 8-10mm long, bright red colored, fruit. *Berberidaceae* family*; B. vulgaris* fruit is very useful tonic for liver, heart, pancreas, gallbladder and kidneys. It prevents chronic bleeding disorders, purifies blood, lowers blood cholesterol level, blood pressure and most importantly it help to treat diabetes. In addition it is effective in treatment of parasitic liver, kidney stones, gout, colon cancer, prostate inflammation, fever, asthma and malaria. **Objective:** This study is aimed to check the mineral and chemical profiling of Pakistan native barberry fruit. **Methods:** Proximate analysis of three different varieties (BVF01, BVF02, and BVF03) of *B. vulgaris* fruit from different three regions Azad Kashmir, Chitral and Gilgit Baltistan demonstrated a nutritional composition in range of 77.43, 70.08, 73.12% for moisture, 0.98, 0.76, 0.89% for crude ash, 0.42, 0.33, 0.39% for crude fat, 1.53, 1.32, 1.44% for crude protein, 2.76, 2.64, 2.75% for crude fiber, 16.88, 24.87, 21.41% for Nitrogen free extract (NFE).The different varieties of barberry contained the ranges of minerals such as calcium 2724.70, 2584.13, 2693.59ppm, magnesium 998.46, 944.06, 986.32ppm, potassium 12189.75, 11,114.21, 12021.19ppm, sodium 1402.16, 872.38, 1269.44ppm, iron 449.67, 334.58, 396.90ppm, zinc 8.42, 13.78, 29.5ppm, copper 15.11, 5.45, 11.63ppm, manganese 32.5, 25.86, 28.91ppm(mg/L), respectively. **Conclusions:** The type of barberry cultivated in Azad Kashmir is the best having good proximate composition and highest minerals amount as compared to Chitral and Gilgit Baltistan cultivated barberry.

Keywords: *Berberis vulgaris*, bioactive compounds, proximate analysis, natural product

Introduction:

Barberry (Berberis vulgaris L.) is an elongated, red colored highly nutritious fruit that is commonly known as "zereshk" belonging to berberidaceae family. Barberry is native of Asia and Europe such as Iran, South Khorasan, Kashmir, Karakoram, and Hindu Kush regions of Indo-Pak [1]. Barberry is traditionally used to cure many ailments and it shows significant health promoting and therapeutic effects [2]. It contains high amount of antioxidants and active constituents that helps to treat different diseases such as fever, asthma, gout, kidney stones, gall bladder diseases, bone healing, chronic bleeding, internal wounds, hepatitis, neurological disorders, prostate inflammation, cardiovascular diseases, blood pressure, diabetes, hepatic disorders, and colon cancer [3].

Medicinal plants are used traditionally as therapeutic drugs from prehistoric times [4]. The nutrients and nutraceutical compounds present in the medicinal plants make them better choice for medicinal purposes [5]. Barberry and its active constituents more commonly berberine is used in food and pharmaceutical industries [6]. Food industries uses barberry in jellies, food nectars, carbonated drinks, sauces, chocolates and it is

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also used to manufacture natural food colorants due to its attractive color [7]. According to an estimation of World Health Organization, it is stated that 80% of the World population used medicinal/herbal plants as whole or in the form of extracts to get active essential components of plant for medicinal purposes [8].

Berberis vulgaris L. contains one of the most important pharmaceutical component such as berberine which plays a vital role as an antioxidant, hypoglycemic, anti-inflammatory, and hypolipidemic agent [9]. The bioactive compounds present in the *Berberis vulgaris L.* is the major reason to use it for medicinal purposes [10]. Now a days, researchers try to find out the mechanism of action of all new discovered medicinal herbs or plants through animal trials. Literature shows that barberry have many therapeutic effects which includes its hypoglycemic [11], hypolipidemic [12], antioxidant [13], antipyretic, anti-inflammatory [14], anti-cancer [15], antimicrobial, antidepressant, cardio-protective, hepatoprotective and many more pharmacological properties [16].

Earlier studies show the proximate analysis of barberry fruits of other regions such as, According to Akbulut, barberry contains 71.42% of moisture, 10.32% of crude proteins, 0.84% of crude fat, 1.12% of ash, 3.35 PH, respectively and minerals are in such ratio, calcium is 2,744.06ppm, sodium is 2,569.33ppm, magnesium is 1,193.30ppm, potassium is 12,111.19ppm, zinc is 7.95ppm, and phosphorus is 2,715.51ppm [17]. According to another study, 0.7363% of ash, 75.01% of moisture, 0.1200% of crude protein, 0.6173% of crude fat, 2.6222% of fiber, 3.060 of PH, 14110ppm of potassium, 455.8ppm of iron, 475.6ppm of sodium, 3318ppm of phosphorus, 136ppm of zinc, and 34.66ppm in manganese is found in North-East of Iran native barberry [3].

In this study, barberry fruit is collected from different areas of Pakistan and used to compare the chemical composition of these cultivations for the purpose to find out the best type from them. Knowledge of these properties can be used for the other studies.

Material and Methods:

Procurement of the raw material

Barberry fruit of three varieties was collected from the Mirpur region of Azad Kashmir, Chitral and Gilgit Baltistan transported to The University of Lahore. The study was carried out in UIDNS Lab. The fruits were washed and air dried to remove all impurities and dust particles. The dried fruits were crushed in electric grinder to make the fine powder and save it in air tight glass container for further tests and procedures.

Analytical methods

Proximate analysis

Barberry dried fruit were used in equal amounts to evaluate the proximate composition of fruit such as moisture, ash, crude fat, crude protein, crude fiber and nitrogen free extract.

Moisture content

The moisture content of the barberry fruit was evaluated by following the procedure described by the Association of Official Analytical Chemists [18]. Three samples of 5g of barberry was kept in drying oven at 80°C for 36 hours to determine the moisture content of the fruit.

Ash Content

5g of sample was oven dried for 36 hours on 80°C for removing its moisture content and then remove the carbon of sample by ignition process and then placed the sample in muffle furnace at 550°C for about 4-5 hours. The result was presented as the percentage of ash [18].

Crude fat

The moisture free sample (2g) in powdered form was used to determine the fat content by using Soxhlet method, it takes 4-5 hours in extracting the oil or fat from the sample by using n-hexane as a solvent [18].

Crude protein

2g of powdered sample was used to determine the percentage of protein content by using Kjeldhal method and the total percentage of protein is calculated by using conversion factor

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(N x 6.25) that values are given by Li *et al.*, 2014 [19].

Crude fiber

Fiber content was determined by using the defatted sample, 2g dried powder sample was firstly digested with 1.25M $H_2SO_4$and then 1.25M of NaOH, after removing the fat content oven dry and weight the sample. Weight loss residue were the fiber content in sample [18].

Nitrogen Free Extract (NFE)

The nitrogen free extract of the barberry was determined by subtracting the sum of total moisture, ash, protein, fat and fiber from 100.

Mineral contents

The mineral composition of the fruits of *berberis vulgaris* (barberry) were determined by ash content that are obtained from muffle furnace. Ash of dried *berberis vulgaris* fruit was dissolved in HNO_3 to determine its mineral contents with the help of atomic absorption spectrophotometer according to given method by AOAC, 1990 [18].

Results and Discussion:

Proximate content in Berberis vulgaris fruit

The proximate analysis of barberry fruit was obtained from Azad Kashmir, Gilgit Baltistan and Chitral. The samples were dried and ground into fine powder to perform analysis. The results of proximate analysis of three different varieties of barberry fruit showed that they contained the following in ranges of 77.43, 70.08, 73.12% moisture content, 0.98, 0.76, 0.89% ash content, 0.42, 0.33, 0.39% crude fat, 2.76, 2.64, 2.75% crude fiber, 1.53, 1.32, 1.44% crude protein and 16.88, 23.87, 20.41% Nitrogen free extract (NFE), respectively (Table 1). This indicates that barberry is a rich source of nutrients and also promoted as a tonic for digestive system, liver, heart, kidneys, gallbladder and it is a good blood purifier since it helps to support nutrient absorption and also reduces triglycerides, cholesterol and blood pressure. The current study was carried out in order to compare the nutritional composition of different varieties of *Berberis vulgaris* fruit found in Azad Kashmir, Chitral and Gilgit Baltistan. The results showed that cultivar of Azad Kashmir had higher nutritional composition as compared to cultivars of Gilgit Baltistan and Chitral.

The earlier study carried out by Ardestani [3] showed results of the nutritional composition of the fruits to be lower as compared to all of the different varieties of *Berberis vulgaris* fruit investigated in the present study. The moisture content was (75.01 ± 0.78%), ash content (0.7363 ± 0.0027%), crude fat (0.6173 ± 0.0589%), crude protein (0.1200 ± 0.0192%) and crude fiber (2.6222 ± 0.1438%) (Ardestani *et al* 2013). There was also found a slight change in the values of proximate analysis themselves in present study. The highest amount of nutritional components were present in BV01 that contains moisture (77.43%), ash (0.98%), crude fat (0.42%), crude protein (1.53%) and crude fiber (2.76%). The lowest amount of nutritional components were found in BV02 variety having moisture (70.08%), ash (0.76%), crude fat (0.33%), crude protein (1.32%) and crude fiber (2.64%). Such difference in nutritional values may be due to different varieties of seeds, climate, temperature, soil, location, storage etc [20].

Nutritional components	BVF01* (%) Azad Kashmir	BVF02* (%) Chitral	BVF03* (%) Gilgit Baltistan
Moisture	77.43	70.08	73.12
Ash	0.98	0.76	0.89
Crude fat	0.42	0.33	0.39
Crude protein	1.53	1.32	1.44
Crude fiber	2.76	2.64	2.75
NFE	23.11	24.87	21.41

Table 1: Proximate analysis of three cultivars of *Berberis Vulgaris* (barberry) fruit
*BVF: Berberis vulgaris fruit

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Mineral content in Berberis vulgaris fruit

The mineral composition of the barberry fruit showed a varying variety of minerals with varying quantities. The minerals that are found in higher amount are calcium, sodium, potassium, and magnesium where as some are found in smaller amount such as copper, zinc, manganese, iron as shown in table 2 below. The range of mineral content in BV01, BV02, and BV03 type of barberry is calcium 2724.70, 2584.13, 2693.59ppm, magnesium 998.46, 944.06, 986.32ppm, potassium 12189.75, 11,114.21, 12021.19ppm, sodium 1402.16, 872.38, 1269.44ppm, iron 449.67, 334.58, 396.90ppm, zinc 8.42, 13.78, 29.5ppm, copper 15.11, 5.45, 11.63ppm, and manganese 32.5, 25.86, 28.91ppm, respectively (Table 2). Barberry is as well a rich source of nutrients. The nutritional composition of the *Berberis vulgaris* fruit (barberry) having very closed values with already present literature with slight differences.

Minerals	BVF01*(ppm) (Azad Kashmir)	BVF02*(ppm) (Chitral)	BVF03*(ppm) (Gilgit Baltistan)
Calcium (Ca)	2724.70	2584.13	2693.59
Magnesium (Mg)	998.46	944.06	986.32
Potassium (K)	12189.75	11,114.21	12021.19
Sodium (Na)	1402.16	872.38	1269.44
Iron (Fe)	449.67	334.58	396.90
Zinc (Zn)	8.42	13.78	29.5
Copper (Cu)	15.11	5.45	11.63
Manganese (Mn)	32.5	25.86	28.91

Table 2: Mineral content in three cultivars of *Berberis Vulgaris* (barberry) fruit
*BVF: Berberis vulgaris fruit

Conclusions:

Berberis vulgaris is a well-known plant that is world widely used due to its therapeutic effects. The proximate and mineral analysis showed that barberry of Azad Kashmir is a rich source of protein, fats, fiber and minerals as compared to other two types (cultivation of Chitral and Gilgit Baltistan). Composition analysis showed significant results. The nutraceutical compounds present in barberry enhances its nutritive value and potential of its usage for health benefits. Barberry contains antioxidants and other bioactive compounds, which are attributed to have beneficial health advantages and that's the reason it can be used in pharmaceutical and food industries.

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