MINERAL PROFILE AND PROXIMATE STUDIES
OF SELECTED NUTRACEUTICAL PLANTS OF DIFFERENT
LOCALITIES OF PAKISTAN

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ABSTRACT

Five wild medicinal plants viz: Bacopa monnieri, Bauhinia variegata,
Berberis aristata, Caltha alba and Cordia obliqua, were collected from different
areas of Abbottabad, Murree, Swat and Azad Kashmir in the months of May-
June, 2014 to analyze their nutraceutical potential. The results of proximate
analysis indicated highest value of ash content (12.60%) in B.aristata. and fiber
content (25.59%) in C.obliqua. Highest value of NFE (56.73%) was found in B.
monnieri. Fats (9.70%) along with protein (17.53%) was reported high in B.
variegata. The minerals profile determined by Energy Dispersive X-rays
Spectroscopy (EDX) divulged that among all the plant species highest amount of
Carbon (C) in B.aristata (55.63%), Oxygen (O) in C.alba (44.93%), and
Magnesium (Mg) in B.monnieri (0.55%) was recorded. Likewise promising
concentration of Aluminum (Al) (0.23%) in C.alba, highest value of Silicon (Si)
(0.33%) in C.obliqua and Phosphorus (0.32%) in B.variegata was observed,
while Aluminum was not detected in B. monnieri and B. variegata. The highest
level of Sulphur (S) (0.72%), Potassium (K) (4.37%), Calcium (Ca) (1.64%) and
Chlorine (3.09%) was noted in B. monnieri.

INTRODUCTION

Plants are the fundamental module of selected recipes of folk medicines
in remote areas of Pakistan. They are the key reserves for diets, medicines,
pharmaceuticals intermediates, food additives and biological entities for various
synthetic drugs (Ncube et al., 2008). According to WHO about 80% of world
population used natural resources for their primary health care needs. These
plants are found as weeds across Pakistan and research literatures reveal that it
is the key source of diversified bioactive molecules. Likewise, in other parts of
Asia the population particularly, the rural people of India, Iran, Afghanistan and
China etc. mostly depend on these wild plants (Farnsworth, 1994; Srivastava et
al., 1996). The research conducted in the last few decades reveals that the most
common drugs are obtained from plants or other natural resources (Sukanya et
al., 2009).

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Moisture content is among the most vital and mostly used measurement in the processing, preservation and storage of food (Onwuka, 2005). High amount of moisture content proliferate microbial attack which causes spoilage (Desai and Salunkhe, 1991). The moisture content of any food is an index of its water activity and is used as a measure of stability and the susceptibility to microbial contamination (Scott, 1957; Frazier and Westoff, 1978; Davey, 1989).

Fiber helps in the maintenance of human health and has been known to reduce cholesterol level in the body (Bello et al., 2008). A low fiber diet has been associated with heart diseases, cancer of the colon and rectum, varicose veins, phlebitis, obesity, appendicitis, diabetes and even constipation. Crude fiber enhances digestibility however its presence in high level can cause intestinal irritation, lower digestibility and decreased nutrient usage.

Lipid provides very good sources of energy and aids in transport of fat soluble vitamins, insulates and protects internal tissues and contributes to important cell processes. Taigo et al. (2011)

Diet is nutritionally satisfactory, if it contains high caloric value and a sufficient amount of protein. Ali (2010) also stated that any plant foods that provide about 12% of their calorific value from protein are considered good source of protein.

Minerals are considered to be essential in human nutrition. These minerals are vital for the overall mental physical well-being and are important constituent of bones, teeth, tissues, muscles, blood and nerve cells. They generally help in maintenance of acid-base balance, response of nerves to physiological stimulation and blood clotting (Hanif et al., 2006). The macronutrient potassium is highly important because it is necessary for upkeep of the acid-base balance in the body, as well as the osmotic pressure. It plays an important role in the nerve impulse transmission of the muscle contraction because it has the ability to increase the muscle and nerve cells excitability.

Potassium has an impact on carbohydrate metabolism and membrane transport. Calcium, potassium and magnesium are reported to be responsible for the repair of worn out cells, strong bones and teeth, building of red blood cells and for body mechanisms. Also, Ca and K are essential for disease prevention and control and may therefore contribute to the medicinal influences of the plant. Moreover, it was previously reported that containing rich amount of calcium may support the medicinal uses of plants (Jawhar et al., 2004). The high concentrations of Ca are very significant because Ca is known to enhance the qualities of bones and teeth and also of neuromuscular systemic and cardiac functions. Silicon is important element to prevent the hardening of veins and
arteries. Chloride works with sodium and potassium to carry an electrical charge in dissolved body fluids and it also helps to regulate the pH in the body. Chloride is important for digestion of food and to absorb many trace elements that what we need to survive (Starlin et al., 2012).

Magnesium participates in many biochemical and physiological processes in the body. It is necessary for the normal function of many different enzymes. The magnesium deficiency causes a variety of neurological and neuromuscular signs (cramps, pausing and altered muscle reflexes), and affects arrhythmia and myocardial infarction. In addition, magnesium regulates the sugar level in blood, affects the blood pressure. Iron is generally required for normal physiological functions by assessing numerous biochemical processes such as binding and transport of oxygen, electron transfer reactions, gene regulations, cell growth regulation and differentiations and immune system respectively.

The present study aims at determining the nutritional potential of wild medicinal plants viz: *Bacopa monnieri, Bauhinia variegata, Berberis aristata, Caltha alba, Cordia oblique*;

*Berberis aristata* belonging to family *Berberidaceae* is native to mountainous parts of North India and Nepal. In Pakistan many species of *Berberis* are found in hilly areas like Chitral, Gilgit, Kurram, Swat, Murree and Ziarat. Ethnobotanical studies indicate that the decoction of *B. aristata* leaves is commonly used to treat skin diseases, diarrhea, cholera, jaundice, eye and ear infections, as well as urinary tract infections.

*Bacopa monnieri* belongs to the family *Scrophulariaceae*, is a creeping, glabrous, succulent herb grows in marshy areas throughout India. Apart from India, Nepal, Sri Lanka, China, Taiwan and Vietnam, it is also found in Florida and other southern states of USA. It has been traditionally used to treat anxiety, anger, nerve pain, insomnia, learning problems and concentration difficulties. It is used as a laxative and curative for ulcers, inflammation, anemia, scabies, leucoderma, epilepsy and asthma.

*Bauhinia variegata* belonging to family *Leguminosae* is locally known as kachnar. The various parts of the plant viz., leaves, flower buds, flower, stem, stem bark, seeds and roots are used in fever, as tonic, astringent, diarrhea, dysentery, piles, edema, laxative, in skin diseases, wound healing, in obesity, stomatitis, antidote for snake poisoning, and as carminative. It is also distributed in most tropical countries, including Africa, Burma, and China. The various parts of the plant viz., flower buds, flowers, stem, stem bark, leaves, seeds and roots are practiced in various indigenous systems of medicine and popular among the various ethnic groups in India for the cure of variety of ailments (Arvind et al.,
Caltha alba belonging to family Ranunculaceae is widely distributed in wet lands in temperate regions of the Northern Hemisphere. In Pakistan the plant is found in Kashmir, swat and other surrounding areas. The plant is used as an antispasmodic and sedative and is a rich source of phenols, alkaloids, cyanogenic compounds and acrid principles.

Cordia obliqua locally known as Lasora belongs to family Boraginaceae. It is a deciduous tree with medium height and found throughout the mid Himalayas up to an elevation of 1470 meters. The fruit is sweet and have effects like slightly cooling, anthelmintic, purgative, diuretic, expectorant, and useful in diseases of the chest, urethra, dry cough, biliousness and chronic fever. It lessens thirst and the scalding of urine, removes pains in the joints, bad humors, burning of the throat and also good in diseases of the spleen. Seeds are utilized as an anti-inflammatory agent (Agnihotri et al., 1987).

MATERIALS AND METHODS

Sampling of plant materials

Five medicinal wild plants viz: B. monnier i, B. variegata, B. aristata, C. alba, C. obliqua were collected from different areas of Abbotabad, Murree, Swat and Kashmir in the month of May-June in the year 2014 and analyzed for their nutraceutical potential, proximate analysis and Mineral analysis by standard method (AOAC, 2012).

All the plants were identified by the Taxonomist and were deposited at the Herbarium of Botany Department, University of Peshawar.

RESULTS AND DISCUSSION

Proximate Analysis

Proximate and nutrient analysis of edible plants and vegetables play a crucial role in assessing their nutritional significance. As various medicinal plant species are also used as food along with their medicinal benefits, evaluating their nutritional significance can help to understand the worth of these plant species. Fortunately, chemical composition diversity in plants also includes many compounds that are beneficial to humans such as nutrients and many other compounds with medicinal value.

The results depicted in table 1 showed moisture, ash, fiber, fat, protein and NFE content of various plant species. The moisture content of selected plant
species ranged from 6.26-13.70% which is in close proximity with Ooi et al. (2012) who reported 8.33 g/100g of moisture content for *Peperomia pellucida*.

It was observed that among all the plants highest ash content (12.60%) was found in *B.aristata* and lowest value was observed in *C.alba* (8.3%).

The fiber content observed during our research work was ranged from 7.23-25.59% which is at par with the study of Abolaji et al. (2007) who reported 4.21% and 12.14% of crude fiber in *P. polyandra* and *X. aethiopica*. Therefore the examined plants could be recommended as crude fiber source in the diet as a result of their relative high crude fiber content.

The crude fat or lipid content observed in the present study ranged between 3.26-9.70%. Similar justifications was also given by Tairo et al. (2011) who recorded 6.70% and 3.12% of lipid content in *C. siamea* and *M. angolensis*.

The crude protein content examined during the current research work ranged from 5.60-17.53% which is in line with the results of investigated values 2.10 and 7.09 crude protein content in *Xylopia aethiopica* and *Parinari polyandra*. Ali (2010), which also supports our findings.

The NFE of the selected medicinal plants in our study ranged from 44.05-56.73% which clearly indicates that carbohydrates are the primary ingredient and major class of naturally occurring organic compounds that are essential for the maintenance of plant and animal life and also provide raw materials for many industries.

Table 1. Proximate composition of different plant species collected from various locations of Pakistan

<table>
<thead>
<tr>
<th>Plant species</th>
<th>Moisture (%)</th>
<th>Ash (%)</th>
<th>Fiber (%)</th>
<th>Fat (%)</th>
<th>Protein (%)</th>
<th>NFE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. aristata</td>
<td>13.70</td>
<td>12.60</td>
<td>10.06</td>
<td>6.56</td>
<td>12.30</td>
<td>44.76</td>
</tr>
<tr>
<td>B. monneria</td>
<td>12.33</td>
<td>10.33</td>
<td>9.46</td>
<td>4.36</td>
<td>6.76</td>
<td>56.73</td>
</tr>
<tr>
<td>B. varigata</td>
<td>6.26</td>
<td>9.43</td>
<td>11.53</td>
<td>9.70</td>
<td>17.53</td>
<td>45.53</td>
</tr>
<tr>
<td>C. alba</td>
<td>9.76</td>
<td>8.30</td>
<td>14.90</td>
<td>5.23</td>
<td>13.06</td>
<td>48.73</td>
</tr>
<tr>
<td>C. obliqua</td>
<td>7.30</td>
<td>10.50</td>
<td>25.59</td>
<td>3.86</td>
<td>8.68</td>
<td>44.05</td>
</tr>
<tr>
<td>SE of Mean</td>
<td>0.34</td>
<td>0.29</td>
<td>0.65</td>
<td>0.28</td>
<td>0.46</td>
<td>0.73</td>
</tr>
<tr>
<td>LSD (p&lt;0.05)</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
</tr>
</tbody>
</table>

SE = Standard Error; LSD = Least Significant Difference; Sig = Significant
Minerals analysis

The results depicted in Table 2 showed the mineral profile of different plant species. In case of magnesium (Mg), highest value was observed for B. monnieri (0.55%) and promising concentration of Al (0.23%), Si (0.33%) and P (0.32%) was recorded in B. araristata. Al was not detected in B. monnieri and B. variegata, whereas Si was found lowest in B. aristata (0.12%) Likewise highest amount of S (0.72%), K (4.37%) and Cl (3.09%) Ca (1.64%) was recorded in B. monnieri among all the examined plants. It was suggested from the present findings that all plant species possess appreciable amount of minerals which help them to regulate various physiological functions. Results of mineral profile of selected plant species in the present study are in close proximity with Bibi et al. (2006) who evaluated C, O, Na, Mg, Al, Si, Cl, K, Ca and Fe in different parts of V. odorata and C, O, Mg, Al, Si, K, Ca, Fe, S, Na, CI, B, P and Zn in different parts of Alstonia scholaris. and reported chloride, nitrogen and potassium in Nicotiana tabacum.

Table 2. Minerals profile (%weight) of different plant species collected from various locations of Pakistan

<table>
<thead>
<tr>
<th>Plants species</th>
<th>C</th>
<th>O</th>
<th>Mg</th>
<th>Al</th>
<th>Si</th>
<th>P</th>
<th>S</th>
<th>K</th>
<th>Ca</th>
<th>Cl</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. aristata</td>
<td>55.63</td>
<td>42.85</td>
<td>0.17</td>
<td>0.15</td>
<td>0.12</td>
<td>0.28</td>
<td>0.14</td>
<td>0.63</td>
<td>0.39</td>
<td>NT</td>
</tr>
<tr>
<td>B. monniera</td>
<td>48.65</td>
<td>35.5</td>
<td>0.55</td>
<td>NT</td>
<td>0.32</td>
<td>0.15</td>
<td>0.72</td>
<td>4.37</td>
<td>1.64</td>
<td>3.09</td>
</tr>
<tr>
<td>B. variegata</td>
<td>55.3</td>
<td>39.13</td>
<td>0.26</td>
<td>NT</td>
<td>0.24</td>
<td>0.32</td>
<td>0.26</td>
<td>2.81</td>
<td>0.57</td>
<td>NT</td>
</tr>
<tr>
<td>C. alba</td>
<td>51.95</td>
<td>44.93</td>
<td>0.29</td>
<td>0.23</td>
<td>0.29</td>
<td>0.22</td>
<td>0.10</td>
<td>1.91</td>
<td>0.43</td>
<td>0.34</td>
</tr>
<tr>
<td>C. obliqua</td>
<td>49.89</td>
<td>42.23</td>
<td>0.21</td>
<td>0.15</td>
<td>0.33</td>
<td>0.30</td>
<td>0.14</td>
<td>1.58</td>
<td>0.28</td>
<td>0.25</td>
</tr>
<tr>
<td>SE of Mean</td>
<td>0.70</td>
<td>0.72</td>
<td>0.01</td>
<td>0.03</td>
<td>0.08</td>
<td>0.02</td>
<td>0.02</td>
<td>0.16</td>
<td>0.08</td>
<td>0.12</td>
</tr>
<tr>
<td>LSD (p&lt;0.05)</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
<td>Sig</td>
</tr>
</tbody>
</table>

SE = Standard Error NT = Not Tested; LSD = Least Significance difference; Sig = Significant

CONCLUSIONS

From the present study it was concluded that:

1. All the examined plants are good source of fat, fiber, protein therefore they should be included in our daily life to overcome different physiological disorder.

2. The crude methanol extract of all plants species have appreciable mineral contents which are healthy food source and nutritionally very important nutraceutical potential. Therefore they may be used to fulfill dietary requirements.
REFERENCES


