INTRODUCTION

Medicinal plants play a significant role in providing primary health care services to rural people and are used by about 80% of the marginal communities around the world\(^1\)-\(^4\). Phytochemicals are thus applied as natural anti-pathogenic which can be derived from leaves, stems, barks and flowers of plants and thus they will be used in the treatment of pathogenic diseases associated with the infection of the pathogens\(^5\). In recent years, increasing interest has been focused on phytochemicals as safer and more congenial to the human body. Medicinal plants are used for the preparation of various drugs singly or in combination or even are used as the principal source of raw material for the other medicines\(^6\). More than 40 elements have been considered essential to life systems for the survival of both mammals and plants. An element is considered essential when its deficiency causes a reduction of a physiologically important function, or when the element is an integral part of an organic structure performing a vital function in that organism\(^7\).

Mineral deficiencies have manifested in forms of different disease conditions as goiter, rickets, and one form of metabolic dysfunction or the other. Minerals are divided into two groups: major minerals and trace minerals. The body needs larger amounts of major minerals than trace minerals, although trace minerals can be just as important for good health\(^8\)-\(^10\). The major minerals include calcium, chloride, phosphorus, potassium, sodium, sulphur, and magnesium, while the trace minerals include iodine, iron, zinc, selenium, fluoride, chromium, copper, molybdenum, and manganese\(^8\)-\(^10\). Leaves are potential sources of minerals and vitamins, and are reportedly inexpensive and easy to cook\(^11\). The objective of the present study is to evaluate the physico-chemical and elemental analysis of ash of some medicinal plants from Garhwal region, Uttarakhand, India by atomic absorption spectrophotometer (AAS).

MATERIAL AND METHODS

\textit{Rawolfia serpentina} root (Sargandha), \textit{Asparagus Racemosus} (Satavari) root, \textit{Hedychium spicatum} (Kapurkachari) root, \textit{Nardostachys jatamansi} (Satavari) root, \textit{Clerodendrum indicum} (Bharangi) root, \textit{Chlorophytum borivilianum} (swet musli) root, \textit{Terminalia arjuna} (Arjun) bark, \textit{Withania somnifera} (Ashwagandha) root, \textit{Alpinia galanga} wild (Kulanjan) rhizome, \textit{Adhatoda vasica} (Adnasi) root, \textit{Zingiber officinalis} (Sunth) rhizome, and \textit{Terminalia chebula} (Harar) fruit are collected from local market of Haidwar and Dehradun. The Plant parts were identified by Dr. Sumer Chand, Scientist, Forest Research Institute, Dehradun, Uttarakhand (U.K.), India. The glasswares were used were cleaned & sterilized in an oven at 150-160°C for 2 hrs. To prepare the samples for mineral analysis, plant material was kept to a constant weight. Dried plant material was ground to fine powder and used for dry ashing. Pre cleaned silica crucible was heated at 600°C until the weight of the crucible became constant. Approximately five gram powdered plant material was taken in the silica crucible and heated in a muffle furnace at 400-500°C till there was no evolution of smoke. The crucible was cooled at room temperature in a desiccators and ash was moistened with concentrated \textit{H}2\textit{SO}4(0.5ml). Crucible was placed on hot plate until fumes of sulphuric acid ceased to evolve. The crucible with sulphated ash was then heated in a muffle furnace at 600°C till the weight of the content became constant.

The physico-chemical analysis includes number of parameters such as physical state, colour, taste, percentage of loss on drying as per standard method\(^12\)-\(^13\), ash content as per method\(^14\)-\(^15\), ash value (water, alcohol and acid soluble or insoluble ash) as per method\(^16\), pH value and conductivity\(^17\). Chloride and Sulphate\(^18\)Potassium has been detected by Flame photometer and the elements Mn, Zn, Fe, Ni, Mg, have been detected by AAS. Chloride content and sulphate content were quantified by titrimetric and gravimetric method. The samples in six replicates of selected plants parts were analyzed.

RESULT AND DISCUSSION

The results of physico –chemical analysis of plant ash are given in Table-2. The ash of all the plants was shown as fine powder. The plants taken for the analysis having high medicinal quality due to their chemical composition e.g. \textit{Chlorophytum (swet musli)} contains 42% carbohydrate, 80-89% protein, 3-45 fiber and 2-17% saponin.

Ash composition and its amount obtained after combustion of plant material depends upon the age and the part of the plant taken. The percentage of ash content is highest in \textit{N.jatamansi} rhizome (7.37%\(^\text{a}\)), \textit{A.vasica} root (7.27%), \textit{H. spicatum} root (6.19%) given in Table-2. It contains high inorganic material of the plant because ashing destroys all the organic material present in the sample. Percentage of loss on drying was highest in \textit{Hedychium spicatum} root (0.94%) followed by \textit{Nardostachys jatamansi} rhizome (0.57%). All the samples were found alkaline in pH while the conductivity was higher in \textit{Hedychium spicatum} root (1136µs/cm).

KEYWORDS: Elemental analysis, Medicinal plants, Plant ash, AAS.
Brain. Maximum Ca is present in control things like muscle growth and the electrical impulses in and minimum in important in building and maintaining strong bones and teeth, one of the most abundant elements in our bodies and accounts for 2 ppm (18,400 ppm) are high.

Calcium is an extremely important element in the human body. It is one of the most abundant elements in our bodies and accounts for 2 to 3 pounds of our total body weight. Most of us know that calcium is important in building and maintaining strong bones and teeth, besides this it is also important for many other things. It helps in control things like muscle growth and the electrical impulses in brain. Maximum Ca is present in Adhatoda vasica root (20900ppm) and minimum in Hedychium spicatum root (3400 ppm).

Magnesium is an element that is required by our bodies for numerous different functions such as for the proper growth, formation and function of bones and muscles. In fact, magnesium and calcium even control the muscles contraction. Magnesium prevents some heart disorders and high blood pressure. Plant roots of Adhatoda vasica (20500 ppm), followed by Zingiber officinal (2000ppm) Rawolfia serpentina (12400ppm), Asparagus Racemosus (10200 ppm), etc contains very high amount of magnesium. Their importance has been realized in recent years when sensitive tools for the determination of trace amounts of these elements become available. Zinc is present in sufficient amount in H. spicatum root (155ppm), N. jatamansi rhizome[26 ppm], Withania Somnifera root (170ppm), Clerodendrum indicum root (108 ppm). Zn is an essential component of a number of enzymes present in animal tissue including alcohol dehydrogenase, alkaline phosphatase, carbonic anhydrase and procarboxypektidase. It is also essential for the growth and reproduction and helps in the process of tissue repair and wound healing. Zinc deficiency causes growth retardation and skin lesions 18.

Phosphorus is present in highest amount in Z. officinalis (15,100ppm), and lowest in Terminalia arjun bark (8200ppm). Phosphorus helps in the process of ossification of bones by getting deposited in the form of calcium phosphate. Nickel is present highest in N. jatamansi (47 ppm) and lowest in Alpinia galanga wild (2ppm).

The element iron has many functions in the body. This element is used by the body to make tendons and ligaments. Certain chemicals in our brain are controlled by the presence or absence of iron. It is also important for maintaining a healthy immune system and for digesting certain things in the food that we eat. The iron is an essential part of haemoglobin which is the part of blood that carries oxygen thus iron is essential for blood to work efficiently. In present study, Iron content is highest in Nordostachys jatamansi rhizome (1840ppm) and minimum (440ppm) in Hedychium spicatum root.

CONCLUSION

This present study shows that all plants named Rawolfia serpentine, Asparagus Racemosus, Hedychium spicatum, Nardostachys jatamansi, Clerodendrum indicum, Chlorophytum borivilianum Terminalia arjun, Withania Somnifera, Alpinia galangal, Adhatoda vasica, Zingiber officinal and Terminalia chebula are rich source of mineral elements. These plants can be utilized to treat number of diseases that are mainly caused due to the deficiency of these minerals. The data obtained in the present work will be useful in synthesis of new drugs with various combinations of plants, which can be used in the treatment of different diseases.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Species name Plants (Botanical name)</th>
<th>Local name</th>
<th>Part taken for analysis</th>
<th>Medicinal use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rawolfia serpentina</td>
<td>Sarphangha</td>
<td>Root</td>
<td>Hypertension, used as an antidote to the bites of poisonous reptile like snakes.</td>
</tr>
<tr>
<td>2</td>
<td>Asparagus racemosus</td>
<td>Satvari</td>
<td>Root</td>
<td>The roots are bitter, sweet, emollient, cooling, nerve, tonic, constipating, opthalmic, anodyne, aphrodisiac. Useful in nervous disorders, dyspepsia.</td>
</tr>
<tr>
<td>3</td>
<td>Hedychium spicatum</td>
<td>Kapurkachari</td>
<td>Root</td>
<td>Rhizome is used for the treatment of asthma and internal injury. Powder of rhizome is used as an anti-spetic agent, for various aches and pains. The rootstock is useful in the treatment of liver complaints, fever, vomiting diarrhea, inflammation, pain and snake's bite.</td>
</tr>
<tr>
<td>4</td>
<td>Nardostachys jatamansi</td>
<td>Jatamansi</td>
<td>Rhizome</td>
<td>It helps in cough and asthma, urinary problems and can be used in the treatment of sexual debility and impotence.</td>
</tr>
<tr>
<td>5</td>
<td>Clerodendrum indicum</td>
<td>Bharangi</td>
<td>Root</td>
<td>It is a good anti-inflammatory agent, helps in healing of wounds, improves blood circulation, improves the digestive activities, cough, cold, asthmatic symptoms and opens the body pores.</td>
</tr>
<tr>
<td>6</td>
<td>Chlorophytum borivilianum</td>
<td>Musli</td>
<td>Root</td>
<td>Used to prepare nutritive tonic for sexual weakness, improves the quantity and flow of breast milk and control and prevent obesity and its side effects.</td>
</tr>
<tr>
<td>7</td>
<td>Terminalia arjun bark</td>
<td>Arjun</td>
<td>Bark</td>
<td>Hypertension &amp; Tachycardia, Hypercholesterolemia and cardiac protection.</td>
</tr>
<tr>
<td>8</td>
<td>Withania somnifera</td>
<td>Ashvagandha</td>
<td>Root</td>
<td>Used in Leucoderma, bronchitis and asthma, increases the iron content in the blood. It is used as a tonic, which increases sperm count and sexual potency. It is considered to be one of the seven ayurvedic herbs capable of curing AIDS.</td>
</tr>
<tr>
<td>9</td>
<td>Alpinia galanga</td>
<td>Kulanjan</td>
<td>Rhizome</td>
<td>For cough and asthma, it contains durg vasacine, which is brancho- dialator.</td>
</tr>
<tr>
<td>10</td>
<td>Adhatoda vasica</td>
<td>Adrusi</td>
<td>Root</td>
<td>Most ayurvedic cough mixtures cotain juice extracted from the leaves of this plant. Leaves are used as green manure, and for packing purposes.</td>
</tr>
<tr>
<td>11</td>
<td>Zingiber officinale</td>
<td>Sunthi</td>
<td>Rhizome</td>
<td>Used for skin diseases, indigestion, dysentery, enlarged spleen, respiratory diseases, mouth and stomach cancer.</td>
</tr>
<tr>
<td>12</td>
<td>Terminalia chebul’a</td>
<td>Harar</td>
<td>Fruitcarp</td>
<td>Useful in chronic constipation, puerperal and mostly in eye-infection.</td>
</tr>
</tbody>
</table>
REFERENCES


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