ABSTRACT

Objective: Karnataka (India) is the darling child of nature where about 722 medicinal plants are available. Ions of different metal elements have an important role in both the reactions. Few elements are essential to the body as nutrients called minerals. Present study deals with trace element analysis were carried out in Indian traditional medicinal spice seeds of Ballari district, Karnataka, India.

Methods: 0.25g each of the powdered medicinal plant spice seeds samples digested in 6.5 ml of acid solution to study the trace element like Mn, Fe, Cu, Zn, Cd, and Cr in Coriander seeds, Ajwain seeds, Pepper seeds, Cumin seeds and Sweet cumin seeds at ppm levels were figured out by using AAS analysis.

Results: Analysed trace mineral contents of these spice plants resulted high level of Manganese is 1.92 ppm, Ferrous is 3.69 ppm and in Chromium is 0.0980 ppm in Ajwain seeds, Copper is 0.42 ppm in Coriander seeds, Zinc is 3.02 ppm and Cadmium is 0.0070 ppm in Sweet cumin seeds and lowest were found Mn is 0.65 ppm, Fe is 2.43 ppm in Coriander seeds, Cu is 0.15 ppm in Cumin seeds, Zn is 1.64 ppm in Pepper seeds, Cd is 0.0018 in Ajwain seeds and Cr is 0.0069 ppm in Sweet cumin seeds were studied in (n=3 ppm) all the sample selected spice seeds by AAS and suggests that the monitoring of trace elements in these medicinal plants do not exceed the limiting values set by World Health Organization to use it as a medicinal application.

Conclusion: These Indian traditional medicinal spice plant seeds can be safely used for food and medicinal purposes.

Keywords: Medicinal Plants, Spice seeds, AAS, Trace elements, Minerals.
Sample analysis and atomic absorption spectroscopy (AAS) measurement

The standard working solutions of elements of interest were prepared to make the standard calibration curve. Absorption for a sample solution uses the calibration curves to determine the concentration of a particular element in that sample. AA240FS Atomic Absorption Spectroscopy (AAS) was used for the determination of 6 metals that is, Mn, Zn, Fe, Cu, Cd and Cr. Cathode lamps were used for the radiation source. Air acetylene gas was used for all the experiments. This method provides both sensitivity and selectivity since other elements in the sample will not generally absorb the chosen wavelength and thus, will not interfere with the measurement.

<table>
<thead>
<tr>
<th>Seeds name</th>
<th>Local name</th>
<th>Scientific name and family</th>
<th>Elements</th>
<th>Medicinal Use &amp; Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coriander seed</td>
<td>Dhania</td>
<td>Coriandum sativum Umbellifera</td>
<td>Iron, Copper, Calcium, Sodium, Phosphorus, Potassium, Manganese, Zinc, Magnesium</td>
<td>Swellings, Diarrhea, High cholesterol levels, mouth ulcers, Anemia, Menstrual disorders, Digestion, Small pox, Eye care, Conjunctivitis, Skin disorders, Blood sugar disorders</td>
</tr>
<tr>
<td>Ajwain seed</td>
<td>Ajwain</td>
<td>Trachyspermum ammi Apiaceae</td>
<td>Sodium, Potassium, Calcium, Copper, Iron, Magnesium, Zinc, Manganese, Phosphorus</td>
<td>Excessive bleeding, Diabetes, Colic Disease, Arthritis, Reduction in weight, Bed wetting, Ear pain, Joint pains, Greying of hair, Paralysis, Eye cleanser, Piles</td>
</tr>
<tr>
<td>Pepper seed</td>
<td>Kali mirch</td>
<td>Piper nigrum Piperaceae</td>
<td>Potassium, Calcium, Zinc, Manganese, Iron, Magnesium.</td>
<td>Gastro diseases, Cough, Cold, Skin treatment, Metabolism, Dental health, Antiarhitic, Carminative, Regulates Blood, Wrinkles, Cancer prevention and controlling Helps heart rate and blood pressure, Indigestion reduces t</td>
</tr>
<tr>
<td>Black Cumin seed</td>
<td>Shahi jeera</td>
<td>Bunium bulbocastanum Apiaceae</td>
<td>Iron, Copper, Calcium, Potassium, Manganese, Selenium, Magnesium, Zinc</td>
<td>Cold, Kidney, Asthma, Anemia, Cancer, Piles, Diabetesoothache.</td>
</tr>
<tr>
<td>Sweet cumin seed</td>
<td>Cumin seeds</td>
<td>Cuminum cyminum Apiaceae</td>
<td>Iron, Manganese</td>
<td>Common Cold, Kidney, Bronchities Asthma, Disorders, Anemia, Cancer, Piles, Diabetes, Respirator Disorder</td>
</tr>
</tbody>
</table>

Table 2: Concentration of trace elements studied in spice seeds of (in ppm: n=3) Ballari district, Karnataka, India

<table>
<thead>
<tr>
<th>Seeds name</th>
<th>Mn</th>
<th>Fe</th>
<th>Cu</th>
<th>Zn</th>
<th>Cd</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coriander seed</td>
<td>0.65</td>
<td>2.43</td>
<td>0.42</td>
<td>2.85</td>
<td>0.0042</td>
<td>0.0706</td>
</tr>
<tr>
<td>Ajwain seed</td>
<td>1.94</td>
<td>3.69</td>
<td>0.32</td>
<td>2.42</td>
<td>0.0018</td>
<td>0.0980</td>
</tr>
<tr>
<td>Pepper seed</td>
<td>1.78</td>
<td>2.58</td>
<td>0.72</td>
<td>1.64</td>
<td>0.0030</td>
<td>0.0802</td>
</tr>
<tr>
<td>Cumin seed</td>
<td>0.75</td>
<td>3.37</td>
<td>0.15</td>
<td>2.80</td>
<td>0.0043</td>
<td>0.0752</td>
</tr>
<tr>
<td>Sweet cumin seed</td>
<td>1.08</td>
<td>2.47</td>
<td>0.19</td>
<td>3.02</td>
<td>0.0070</td>
<td>0.0669</td>
</tr>
</tbody>
</table>

RESULTS AND DISCUSSION

Selection of the plants used for this study was based on their extensive use in the traditional system of medicine in India. Table 1 summarises the botanical as well as the common name of the plant, its part used, the place of collection, major metallic constituents and medicinal uses. As is evident from the table, efforts were made to procure samples from the fields of Ballari district, Karnataka, India. The medicinal uses of these plants in Ayurveda cover a number of ailments including hypertension, neurological disorders, asthma, immuno-stimulants, antibacterial, menstrual disorders, rheumatism and urinary tract infection, etc. In Table 2, concentrations in the seeds have got significance with Mn, Fe, Cu, Zn, Cd and Cr. This indicates that the relation among them is meaningful for human as well as animal welfare to use it as remedial measures.

Ferrous

The average content of Fe range between 3.69-2.42 ppm/100g (table 2) in the estimated 6 medicinal plant seeds. The variation due to climatic variability, physicochemical and presence of mining activities in selected areas. It is an important hemoglobin component responsible for oxygen transport in the human body [4]. The normally tolerable range of iron (Fe) is 15-120 mg/day. Iron is undoubtedly the most important nutrient and its deficiency causes of several disorders.
Zinc

The average content of Zn ranged between 2.85-3.02 ppm/100g (table 2) in the estimated 5 medicinal plant seeds. The highest amount of Zn is recorded in the Sweet cumin seed (3.02 ppm) and least amount was recorded in Pepper seed (1.64 ppm). It is clear from the above results accumulation of high amount of Zn content in the field of Ballari district, the soil contains rich amount of minerals due to mining activities, and it is a second abundant element in estimated 5 medicinal plants. The physiological activities of the plant influence the Zn absorption and the interaction with many elements like Fe, Mn and Cu, affects Zn uptake [8]. Zn is the component of more than 270 enzymes [9] and its deficiency causes many physiological disorders. Besides, it is responsible for stimulating the growth of epidermal and epithelial cells [10]. The normal per day intake of Zn level is 12-15 mg/day. The similar kind of reports in seeds has been reported by researchers [5-7].

Manganese

The average content of Mn arranged between 1.94-1.78 ppm/100g (table 2) in the estimated 5 medicinal plant Seeds. The highest amount of Mn is recorded in the Ajwain seeds (1.94 ppm) and the lowest amount was recorded in Pepper seeds (1.78 ppm). From the results, it is clear that variation among the different area samples the highest content of Mn was detected in plants collected from Ballari fields, due to soil contains a high amount of Mn. Manganese is an important electrolyte also responsible for proper bones and liver function. It also works as co-factor in more than 300 metabolic reactions [11]. Normal daily intake of Mn is 2-8 mg/day. Sheded et al, estimated the manganese from seven medicinal plants, he was found Mn in Acacia ehrenbergiana 339 mg/kg/1 highest amount were detected [5]. According to findings of Reddy and Reddy, most of the plants examined plants are safe [12].

Copper

The average content of Cu ranged between 0.42-0.72 ppm/100g in the estimated 5 medicinal plant spice seeds is presented in table 2. The highest amount of Cu is recorded in the Coriander seeds (0.72 ppm) and least amount was recorded in Pepper seeds (0.42 ppm). Cu is the main constituent of the bone, connective tissue, brain, heart, and many other body organs [13]. Normal daily intake of copper is 2-5 mg/day. The Cu is macronutrients, which is essential to human health and nutrition by Reddy and Reddy et al., [12, 14]. Sheded et al, reported that range of Cu contents in 50 medicinal important leafy materials growing in India [5, 15].

Chromium

Highest Chromium content found in Ajwain seeds (0.0980 ppm) only among tested spices which is more than WHO and German limitations [15, 16] as shown table 1. The daily chromium intake from food range is 50–200 μg/day.

Cadmium

High Cadmium content found in Sweet cumin seeds (0.0070 ppm) where its accumulation causes reducing glucose level in blood, gastrointestinal disorder, cardiovascular shock, etc. [18]. Normal daily intake of Cd in food is 0.049 gm/kg. It is naturally occurs in rocks and soil. Table 2 showed that Chromium ranged 0.0669-0.0980 ppm that may be a result of its low solubility water and plant uptake (6-12).

CONCLUSION

Trace elements are useful in human physiological activities. Therefore concluded that the plants under study are rich in elements may also help in biodiversity function etc. A total 6 elements had been determined in 5 medicinal plant spices collected from the fields of Ballari district, Karnataka, India, these are commonly used in curing various human ailments. From the results, indicated that variations in elemental composition and concentration between the species and depends upon ecological area. Therefore, it is reflecting differences in the physiological functioning of the specific plants depending upon the elemental interaction within it. Also it will be helpful to develop an approach towards a direct link between elemental content and its curative probability having coherence with the traditional use of spices.

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CONFLICT OF INTERESTS

Declared none

REFERENCES

15. Federal Office for Consumer Protection and Food Safety, Germany (Gesundheitlicher und wirtschaftlicher Verbrauchsschutz); 2010.

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