INTRODUCTION

Medicinal plants have been increasingly used in food additives, pharmaceuticals, cosmetics and other products (1, 2). In developing countries, thousands of rural communities still depend mainly on folklore medicine to cure disease. Some medicinal plants are more efficient to treat infectious diseases than synthetic antibiotics. Due to their proximity, reliability and age long practice, people still depend largely on traditional medicine for their health care (3). As reported by World Health Organization (2003), large number of the world population lack access to adequate health care services, hence people to rely on medicinal plants which are available and affordable (4). Various researchers have reported that a large number of plants possess some potential in the treatment of several disease (5, 6). Medicinal plants contain both organic and inorganic constituents and many medicinal plants are found to be rich one or more individual elements, thereby providing a possible link therapeutic action of the medicine (7, 8).

Rhizomes and flowers of Alpinia galanga were used in food item by local peoples of Manipur. In addition its rhizome is used for cough, indigestion, dysentery and food poisoning. Fresh juice of the rhizomes is also used for the treatment of ringworm. Seeds of Alpinia galanga are used for colic, diarrhoea and vomiting (12)

Kaempferia rotunda is a rhizomatous aromatic herb. Rhizomes and roots are applied for proper hair growth; used as an ingredient of an indigenous hair lotion; rhizome is locally applied for the treatment of tumour. For removing coagulated blood from body rhizomes are taken internally and also used in abdominal pain and gastric troubles (13).

Costus speciosus is a rhizomatous flowering herbs, flowering time in India is August to October. It has antioxidant, antifungal, antituberculosis and oestrogenic activity. The rhizome extract is used as tonic and useful in relieving burning sensation, constipation, asthma, bronchitis, leprosy, anaemia and other skin alignments (14). It is also used internally for eye and ear infections.

MATERIAL AND METHODS

Collection and identification of the plant sample

The samples (rhizome) of Keampferia rotunda, Costus speciosus and Alpinia galanga were collected from Kangmong village, Imphal west district, Manipur, India, during Jan.-Mar. 2015 and identified by Prof. P. Kumar Singh, Advance Studies Centre, Life Science Department, Manipur University, Imphal, India.

Sample preparation

The three collected samples were washed many times in running water, for removing impurities, lastly by distilled water, cut into thin slice separately. It was then oven dried at 45°C and then subjected to grinding separately for powder formation. The powders of the three samples were stored in three different air tight glass containers and used for further analysis.

Sample Digestion

For the digestion of plant sample, 0.5g sample(s) was weighed and was digested for 3 h at 85°C with concentrated HNO3: HClO4 (1:3) mixture. Then concentrated HClO4 (1 mL) was added to enhance Plant the oxidation properties in the digestion. The solutions were filtered and diluted to 50 mL with distilled water. The blank
solution was taken as the same procedure without addition of the sample (15). Reagents and Chemicals All chemicals are of analytical grade purchased from S.D. Fine-Chem. Ltd. and Qualigens, Fischer Scientific, India. The ultrapure deionised water (Millipore S.A., France) was used for the preparation of standards and modifier solutions. The stock standard solutions were purchased from Sigma Aldrich chemical company for calibration by preparing standard solutions.

Intrumentation

An Analytik Jena AAS Vario-6 Graphite furnace spectrometer furnished with PC-controlled 6-piece lamp turret, where hollow cathode lamps are mounted as line radiator along with a deuterium hollow cathode lamp for compensation of the background absorption and argon gas supply, was used for all of the absorption measurements. The hollow cathode lamps fitted for specific element that has to be analyzed with their respective wavelength and the slit width adjusted accordingly. Signal measurement was done in peak area/peak height and calibration was in linear mode. The sample injection volume is 20 µL. The typical heating program of GF-AAS is drying (injection of the sample into the filter furnace), pyrolysis, atomization, and cleansing.

RESULT AND DISCUSSION

Analysis of the eight trace elements, namely, Mg, Ca, Cr, Mn, Fe, Ni, Cu and Zn, was performed in triplicate samples of the rhizomes of *Kaempferia rotunda*, Costus speciosus and *Alpinia galanga* collected from Manipur. The elemental level analysed in samples of *Kaempferia rotunda*, Costus speciosus and *Alpinia galanga* were given in Table 1.

Nickel

Present in the three samples ranges in the increasing order 0.038±0.009 ppm, 0.053±0.004 ppm and 0.096±0.002 ppm respectively in *Alpinia galanga*, Costus speciosus and *Kaempferia rotunda*. These values are below the permissible limit. Toxicity of Ni in human being is not very common occurrence as its absorption by the body is very low (16).

Magnesium

The amount of magnesium present in these three species is 0.17±0.007ppm, 0.58±0.003 and 0.87±0.005 ppm respectively in *Alpinia galanga*, Costus speciosus and *Kaempferia rotunda*. These minerals play a role in the therapeutic properties of this plant as claimed by the traditional practitioners.

Chromium

Chromium present in *Kaempferia rotunda*, *Alpinia galanga* and Costus speciosus are at the concentrations 0.07±0.002ppm, 0.14±0.009ppm and 0.26±0.008ppm respectively. Chromium is an important trace mineral that is necessary for normal functioning of insulin, a hormone that maintains blood sugar levels and is also essential for metabolism of carbohydrates, proteins and fats. Deficiency of chromium causes insulin resistance, impairments in glucose tolerance and may be a risk factor in atherosclerotic disease (18).

Iron

Iron concentration is highest in *Alpinia galanga* (5.40±0.003 ppm), lowest in *Costus speciosus* (0.86±0.003 ppm) and *Kaempferia rotunda* content 1.22±0.005 ppm of iron. These concentrations are beyond the permissible level. Permissible level of iron in edible plants is 20ppm (WHO). Iron is essential for formation of hemoglobin, which carry oxygen around the body (19). Deficiency of iron causes anemia, weakness, depression, poor resistance to infections (20).

Calcium

The level of calcium in *Alpinia galanga*, Costus speciosus and *Kaempferia rotunda* are in the decreasing order, 0.53±0.13ppm, 0.46±0.21 ppm and 0.46±0.01 respectively. Calcium is the main component of bones and teeth. It takes important role on cell membranes and on 7muscles, by regulating endo-endoxenones and blood pressure (21). Calcium fluxes are also important mediators of hormonal effects on target organs through several intracellular signalling pathways (22). Deficiency of calcium causes rickets, back pain, osteoporosis, indigestion, irritability, premenstrual tension and cramping of uterus (23).

Zinc

Zinc level on the three samples, *Alpinia galanga*, Costus speciosus and *Kaempferia rotunda* are in the order 0.23±0.001ppm, 0.16±0.001ppm and 0.14±0.003ppm respectively. Zinc takes part a central role in the immune system, affecting a number of aspects of cellular and hormonal immunity (24). It is a constituent of many enzymes like lactate dehydrogenase, alcohol dehydrogenase, glutamic dehydrogenase, DNA and RNA polymerase etc. zn dependent enzymes are involved in macronutrient metabolism and cell replication (25). Vitamins A and E metabolism and bioavailability are dependent on zinc status (26).

Copper

Copper is a component of the metalloenzymes, which take part in the catecholaminergic pathway-monoamine oxidase, dopamine β-hydroxylase, and tyrosine hydroxylase (27). Cu deficiency has been associated with cardiac abnormalities in human and animal; causes anaemia and neutropenia (28). The concentration of Cu in *Alpinia galanga*, Costus speciosus and *Kaempferia rotunda* are; 0.12±0.03 ppm, 0.11±0.03ppm and0.9±0.003 ppm respectively.

Manganese

Manganese content in the plant samples ranges from 0.23±0.001 (Alpinia galanga), 0.26±0.002 (Kaempferia rotunda) and 0.36±0.007 (Costus speciosus). Mn is an essential ubiquitous trace element required for normal growth, development, and cellular homeostasis (29).

The presence of these mineral elements could thus indicate that these plants could be useful in the management of diseases where deficiencies of these metal ions are an important mechanism for the disease pathogenesis and progression. It is thus possible that these minerals play a role in the therapeutic properties of this plant as claimed by the traditional practitioners.

ACKNOWLEDGEMENT

I would like thanks the Director, Head SAIF, Nehu, for performing trace element analysis. Once again I would like thanks all the staffs of AAS section.

Table 1. Concentration of elements in ppm of *Alpinia galanga*, Costus speciosus and *Kaempferia rotunda*

<table>
<thead>
<tr>
<th>Elements</th>
<th>Samples</th>
<th>Ni</th>
<th>Mg</th>
<th>Cr</th>
<th>Fe</th>
<th>Ca</th>
<th>Zn</th>
<th>Cu</th>
<th>Mn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Kaempferia rotunda</em></td>
<td>0.096±0.002 (ppm)</td>
<td>0.38±0.005 (ppm)</td>
<td>0.72±0.002 (ppm)</td>
<td>0.46±0.001 (ppm)</td>
<td>0.14±0.003 (ppm)</td>
<td>0.9±0.003 (ppm)</td>
<td>0.26±0.002 (ppm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Costus speciosus</em></td>
<td>0.053±0.004 (ppm)</td>
<td>0.58±0.003 (ppm)</td>
<td>0.26±0.008 (ppm)</td>
<td>0.86±0.008 (ppm)</td>
<td>0.4±0.01 (ppm)</td>
<td>0.16±0.001 (ppm)</td>
<td>0.11±0.003 (ppm)</td>
<td>0.36±0.007 (ppm)</td>
</tr>
<tr>
<td></td>
<td><em>Alpinia galanga</em></td>
<td>0.038±0.009 (ppm)</td>
<td>0.17±0.007 (ppm)</td>
<td>0.14±0.009 (ppm)</td>
<td>0.54±0.003 (ppm)</td>
<td>0.5±0.13 (ppm)</td>
<td>0.23±0.001 (ppm)</td>
<td>0.12±0.003 (ppm)</td>
<td>0.23±0.001 (ppm)</td>
</tr>
</tbody>
</table>

Not: 1ppm = 1mg/kg
Fig. 1 Graph showing diff. concentration of element present in Alpinia galanga, Costus speciosus and Kaempferia rotunda

REFERENCES


