MINERAL CONTENT OF SOME EDIBLE MEDICINALLY IMPORTANT LEAFY VEGETABLES OF KAMRUP DISTRICT OF ASSAM, INDIA

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INTRODUCTION

Plants have been of great importance to mankind due to their medicinal as well as nutritional properties. In 1985, World Health Organization (WHO) estimated that around 80% of the population depends on medicinal plants for their primary healthcare needs in developing countries [1]. Medicinal plants contain some secondary metabolites like alkaloid, glycosides, saponins, essential oils, bitter principles, tannins and mucilages in different parts like root, stem, leaves, bark, fruit and seed, which can cure various ailments in humans and other animals [1]. Epidemiological studies indicate that plants have been of great importance to mankind due to their medicinal as well as nutritional properties. In 1985, World Health Organization (WHO) estimated that around 80% of the population depends on medicinal plants for their primary healthcare needs in developing countries [1]. Medicinal plants contain some secondary metabolites like alkaloid, glycosides, saponins, essential oils, bitter principles, tannins and mucilages in different parts like root, stem, leaves, bark, fruit and seed, which can cure various ailments in humans and other animals [1]. Epidemiological studies indicate that increased intake of leafy vegetables is associated with decreased risk of cancers, cardiovascular disease, cataract, and other age-related diseases [2]. In India, several traditional systems of medicines have evolved such as Ayurveda, Siddha and Unani [1].

From the very beginning of time plants have been used as an important source of food and medicine [3]. In recent years, people have acknowledged the wide range of interest in the field of medicinal plants especially those uses in the AYURVEDA. The number of workers tried to determine the nutritive value and mineral composition of medicinal plants, which were also being used as dietary supplements [4]. The wild edible medicinal leafy vegetables occupy an important place among food crops as these provide adequate amount of crude fiber, fats, carbohydrates, proteins, water and mineral elements like Ca, Na, Fe, P, Mg, Zn etc, in addition to vitamins and certain hormone precursors [5]. Studies have shown that vegetarians are less susceptible to disease and live longer, healthier and having stronger immunity [6], [7].

Micronutrients deficiency affects over two billion people worldwide, which results in poor health, high rate of mortality etc [8]. According to the World Health Organization (2008) iron deficiency is the most common and widespread nutritional disorder in the world [9]. Adequate intake of the edible medicinal plants is necessary as they have potential to provide nutrients present in them to the consumers and utilization of these plants can provide a solution to the problem of malnutrition to a great extent [10]. Hence, in my present study an attempt has been made to determine macro and microelements of 5 edible medically important leafy vegetables of Kamrup District in order to provide necessary information for their wider utilization and contribution to food security.

MATERIALS AND METHODS

Plant sample collection and Processing: All the selected plant species were collected in March 2014, from four different localities of the Kamrup district of Assam and identified by a plant taxonomist of Botany Department, Gauhati University. The fresh vegetables were washed and the edible parts were dried in the shade and then ground to fine powder. The dried powdered samples were used for determination of mineral components.

Procedure for mineral analysis

Estimation of Fe, Zn, Cu, Mn, Na, K: 0.5 gm of powdered dried plant material was taken in a crucible and converted to ash in the muffle furnace at 580°C for 3 hrs. After cooling in a desiccator 10 ml of concentrated Nitric acid, 4 ml of Perchloric acid and 1 ml of concentrated Sulphuric acid was added and digestion at high temperature was carried out until the contents of test tube become clear, then the tube was cooled and solution was transferred quantitatively to 50 ml volumetric flask and the final volume was adjusted to 50 ml by adding distilled water. The solution was used for determination of each metal with certified AAS standards of 1000 mg/L (Merck, Germany). Na and K was estimated by using Flame photometry (FPM).

Estimation of Ca & Mg: Total hardness is defined as the sum of the calcium and magnesium concentrations in the water sample and is expressed as milligram calcium carbonate per liter. Total hardness of the water extract of plant sample was determined by EDTA complexometric titration using Erichrome Black T indicator. Ethylenediaminetetraacetic acid (EDTA, sodium salt) forms a chelated soluble complex when added to a solution of certain metal cations. A small amount of a dye Erichrome Black T was added to an aqueous solution containing calcium and magnesium ions at pH of 10.0 ± 0.1, the solution becomes wine red. When EDTA was added as a titrant, calcium and magnesium were complexed, and when they were completely complexed, the solution turns from wine red to blue, marking the end point of the titration. Magnesium ion must be present to yield a satisfactory end point. To ensure this, a small amount of complexometrically neutral magnesium salt of EDTA was added to the buffer; this automatically introduced sufficient...
magnesium and obviates the need for a blank correction. For calcium hardness, the same procedure was followed but the indicator used to be Murexide.

In this case, the endpoint was determined with change of color from purple to pink. Magnesium hardness was calculated by subtracting the value of calcium hardness from total hardness.

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\text{Total hardness} (\text{as } \frac{\text{mg}}{\text{l}} \text{CaCO}_3) = \frac{\text{ml of EDTA used} \times 1000}{\text{ml of sample}}
\]

Where, \( A \) = volume of EDTA used in ml

\[
\text{Calcium, mg/l} = \frac{A \times 400.8}{\text{ml of sample}}
\]

Where, \( B = \) EDTA used for hardness (both Ca and Mg) determination.

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\text{Magnesium, mg/l} = \frac{(B - A) \times 400.8}{\text{ml of sample} \times 1.645}
\]

RESULTS AND DISCUSSION

The edible parts of the 5 selected plants contain minerals like Na, K, Zn, Cu, Fe, Ca, Mg & Mn in varying amount and are shown in the following Table 1. Considering the recommended dietary allowance (RDA) for minerals: calcium (1000 mg/day); magnesium (400 mg/day) and iron (8 mg/day), these leafy vegetables could cover RDA and contribute substantially for improving human diet (FND, 2005) [2]. The edible medicinal leafy vegetables under investigation contained high amount of K (4570.0-16030.0 mg/kg) and Na (1380.0-5010.0 mg/kg) with highest value (16030.0 mg/kg; 5010 mg/kg) for \( P. \) foetida and \( B. \) monnieri respectively. All the analysed plants were excellent sources of Ca, ranging from 414.7 mg/kg (\( O. \) corniculata) to 1347.1 mg/kg (\( A. \) spinosus). Mg was quantified high in \( C. \) asiatica (614.8 mg/kg) while high amount of Mn was detected in \( P. \) foetida. Zn was detected higher in \( A. \) spinosus (172.4 mg/kg) when compared to other leafy vegetables under investigation. The Fe content of the medicinal leafy vegetables varied from 1841.4 mg/kg (\( C. \) asiatica) to 518.2 mg/kg (\( O. \) corniculata). The medicinal plants contained relatively less amount of Cu (7.0 mg/kg – 54.7 mg/kg) when compared to other minerals. Mg & Ca content in \( Ipomoea \) aquatica, \( Alternanthera \) sessilis, \( Amaranthus \) viridis and \( Houttuynia \) cordata was reported higher than the above mentioned plants [8]. Na, Zn, Cu & Mn content was found to be less when compared to studied plants [8]. In an earlier study, it was found that amount of Cu in \( C. \) asiatica was 7.8 mg/kg, but in my present investigation 14.2 mg/kg Cu was detected. However, Ca content in this plant was found to be less when compared to earlier study [8].

CONFLICT OF INTERESTS

Declared None

REFERENCES