

Determination of mineral levels in various seeds used as foodstuff in Mangalore Region, Karnataka, India

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ABSTRACT

Minerals play a vital role in human body, aiding in cellular body processes from rebuilding tissue to maintaining ion gradients. Source of minerals for humans is through diet. Hence this report presents a comparative study of the determination of calcium, potassium and sodium in a wide variety of seeds used as foodstuff in Mangalore region, Karnataka, India. In the present study it is found that, Calcium is most abundant in Cardamom seed (142.62mg/100g), Potassium in Soya bean (1072.17mg/100g) and Sodium in Cardamom seed (25.41mg/100g). The results showed that the all seeds have safe and adequate dietary nutrients if consumed in right proportion. Present work to determine mineral is based on flame photometry and it is very simple, inexpensive and less time consuming.

Key words: Sodium, Potassium, Calcium, Flame photometry, Food, Mangalore region -Karnataka.

INTRODUCTION

Minerals are quantitatively minor compounds essential for the life because they contribute to multiple and different vital functions in the organism, like bone structure, homeostasis, muscular contraction, metabolism via the enzymatic systems, etc. The regular consumption of the standard recommended daily intake levels of the vitamins, mineral and other nutrients for our body needs is the first step in keeping a healthy physic and mind. Because of today's lifestyle and diet, it is very hard therefore to intake the proper daily amount of minerals necessary for a normal life [1]. For this concern, the proper knowledge about the minerals present in the variety of food is essential.

In human body, the monovalent cations namely Na^+ and K^+ are present mainly in the free form and to a limited extent in the form of ion pairs. The divalent cations, Ca^{2+} and Mg^{2+} , play the role in physicochemical properties of casein micelles such as gelation induced by acid and rennet, heat stability, ethanol stability and sediment formation.

Calcium plays the role in the physicochemical properties of casein micelles, such as gelation induced by acid and rennet, heat stability, ethanol stability and sediment formation [2]. Human body gets calcium through diet. Over a long term, inadequate intake of dietary calcium can result in porous and fragile bones, tooth decay, muscle cramps and irritability. Osteoporosis in adults is one of the most serious complications of chronic calcium deficiency [3]. In India, one out of two women over the age of 45 years is affected by osteoporosis. It is known that the highest demands for this element occur during the periods of maximum growth such as in childhood and adolescence, and also during lactation and in the elderly. Milk is the best but expensive source while green leafy vegetables are the cheapest natural source of calcium. Food rich calcium should be consumed for better calcium intake [4,5].

Sodium and potassium concentrations in the body are 1.4 g/kg and 2 g/kg, respectively. Sodium is present mostly as an extracellular constituent and maintains the osmotic pressure of the extracellular fluid. In addition, it activates some enzymes, such as amylase. From the nutritional standpoint, only the excessive intake of sodium is of importance because it can lead to hypertension [6]. Potassium is the most common cation found inside of cells. The proper level of Potassium is essential for normal cell function. An abnormal increase of potassium (hyperkalemia) or

decrease of potassium (hypokalemia) can profoundly affect the nervous system and heart, and when extreme, can be fatal.

Keeping in view of the necessity for required amount of calcium, sodium and potassium in biological system, recently we have reported the estimation of calcium, sodium and potassium content in commonly consumed food of Karnataka coastal belt region, India [7]. In continuation of our work, in the present study it is decided to determine the amount of calcium, sodium and potassium in seeds used as foodstuff in Mangalore region, Karnataka, India.

MATERIALS AND METHODS

Materials and Reagents

A total of twenty different varieties of seeds used as foodstuff in Mangalore region, Karnataka, India were analyzed. Seed Samples were purchased from the retail market of Mangalore. Materials used for sample preparation include perchloric acid and Nitric acid were purchased from Merck, India. Materials for standard preparations include 1000ppm standard solutions of sodium, potassium and calcium from Sigma Aldrich. The determination of calcium, sodium and potassium was carried out by flame photometry using Systronics Type 130 flame photometer.

Standard Preparations

Through dilutions of 1000ppm standard stock solutions of each mineral, dilute standards of 20 ppm calcium, 20 ppm potassium, and 10 ppm sodium were made.

Sample Preparation

Samples were analyzed in triplicate in di-acid mixture (4 parts HNO₃ and 1 part HClO₄) according to the procedure of Johnson and Ulrich [8]. For digestion, one gram of each seed sample was taken with 20ml of di-acid mixture in a 100ml conical flask and was covered by a watch glass to prevent contamination and kept overnight. The samples were digested at low temperature on hot plate. The digestion was continued till the liquid turns into colorless. The digested sample was diluted to 100 ml using double distilled water.

RESULTS AND DISCUSSION

The prepared seed samples are analyzed for calcium, potassium and sodium contents using flame photometry and data is converted to mg/100g of seed (Table 1). Each value is the mean value of triplicate analysis.

Table 1

S.No.	Local Name	Botanical Name	Calcium (mg/100g)	Potassium (mg/100g)	Sodium (mg/100g)
1	Dolichos bean	<i>Lablab purpureus</i>	106.24±8.3	993.76±20.7	6.87±0.58
2	Black chick pea	<i>Cicer arietinum</i>	85.08±7.5	776.21±19.8	11.46±0.92
3	Pea	<i>Pisum sativum</i>	82.46±7.1	691.97±13.4	6.77±0.56
4	Black eyed pea (white)	<i>Vigna unguiculata</i>	98.65±8.2	884.49±16.0	8.92±0.75
5	Horse gram	<i>Dolichos biflorus</i>	77.62±6.5	660.04±17.2	7.12±0.64
6	Soya bean	<i>Glycine max</i>	117.08±9.4	1072.17±12.4	6.76±0.51
7	Jackfruit seed	<i>Artocarpus heterophyllus</i>	64.02±2.4	524.93±15.6	9.77±0.84
8	Bitter gourd seed	<i>Momordica charantia</i>	40.37±3.2	308.97±12.5	8.86±0.71
9	Cucumber seed	<i>Cucumis sativus</i>	68.23±2.6	493.18±13.7	22.59±1.25
10	Pea nut	<i>Arachis hypogaea</i>	67.08±5.2	508.00±14.9	17.91±1.14
11	Black eyed pea (black)	<i>Vigna unguiculata</i>	109.07±9.6	874.01±16.5	8.24±0.73
12	Poppy seeds	<i>Papaver somniferum</i>	88.25±7.0	444.36±14.9	23.34±1.59
13	Rajma	<i>Phaseolus vulgaris</i>	105.91±8.4	893.16±16.5	4.69±0.35
14	Chick pea	<i>Cicer arietinum</i>	87.71±7.6	690.58±17.8	7.88±0.67
15	Watermelon seed	<i>Citrullus lanatus</i>	71.39±6.4	445.85±14.7	7.99±0.94
16	Tamarind seed	<i>Tamarindus indica</i>	71.63±6.7	525.37±15.3	6.41±0.58
17	Sweet pumkin seed	<i>Cucurbita pepo</i>	103.30±9.6	758.64±15.4	10.85±0.85
18	Cardamom seed	<i>Elettaria cardamomum</i>	142.62±8.9	1065.54±19.8	25.41±1.78
19	Cashew seed	<i>Anacardium Occidentale</i>	69.61±5.8	471.67±14.4	11.05±0.96
20	Sesame seed	<i>Sesamum indicum</i>	118.99±8.7	505.91±15.6	8.70±0.86

In analyzed food, Calcium ranged from 142.62 to 40.37mg/100g, Potassium from 1072.17 to 308.97mg/100g and Sodium from 25.41 to 4.69mg/100g of the sample. The top five seeds in the rank order of higher calcium content are Cardamom seed (142.62mg/100g), Sesame seed (118.99mg/100g), Soya bean (117.08mg/100g), Black eyed pea (109.07mg/100g) and Dolichos bean (106.24mg/100g). In cardamom seed, the sodium content found to be 25.41mg/100g, where as in poppy seed 23.34mg/100g, in cucumber seed 22.59mg/100g, in Peanut 17.91mg/100g and in Black chick pea 11.46mg/100g of sample. The top five potassium rich foods are Soya bean

(1072.17mg/100g), cardamom seed (1065.54mg/100g), Dolichos bean (993.76mg/100g), Black eyed pea (white) (884.49mg/100g) and Black eyed Pea (black) (874.01mg/100g).

However, the mineral contents in the food may vary sample to sample due to different factors. The change could have been attributed by sampling measurement errors, changes in cultivation or agricultural methods [9]. Soil conditions including fertilizer application and storage and marketing conditions also influence mineral contents of vegetables and fruits [10]. The plant state of maturation, genetic variance and environmental factors were also the possible explanation for discrepancies observed.

CONCLUSION

In this comparative study, a total of twenty wide seed variety of foodstuff used in Mangalore region, Karnataka, India have been analysed for calcium, potassium and sodium by flame photometry. It is found that Cardamom is the calcium rich (142.62mg/100g), Soyabean is the potassium abundant (1027.17mg/100g) and Cardamom having the highest content of sodium (25.41mg/100g). The results showed that the all food stuffs have safe and adequate dietary nutrients if consumed in right proportion. This study helps to know the better food selection which is required to maintain the normal mineral level in human body.

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