Mineral Content in Common Fruits of Bangladesh

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Abstract

Thirty different common fruits of Bangladesh have been analysed for their content of essential minerals, such as calciuim, magnesium, phosphorus, sodium, potassium, iron, zinc and copper. Calcium and phosphorus content in fruits analysed varied from 4 to 61 mg and 8.9 to 102 mg per 100 g EP respectively. Magnesium content in some fruits was found to be relatively high and ranged between 9.8 –58 mg per 100 g EP. Banana contains fairly good amount of magnesium. Fruits are good sources of potassium. Banana and zizyphus were found to be outstandingly rich in potassium. Sodium content of fruits was found relatively low (0.09 - 10.0 mg / 100 g EP). Fruits analyzed were low in their content of iron, zinc and copper. Thus, fruits cannot be suggested as the good sources for trace minerals.

Key Words: Fruits, Essential Minerals, Calcium, Magnesium, Iron and Zinc.

Introduction

Fruits are known to have been included in the human diet since prehistoric time and are now widely used and enjoyed throughout the world. Fruits as a class are valuable chiefly for their content of vitamins. Fruits also contain appreciable amount of essential minerals [1]. At least fourteen mineral elements are essential for normal functioning of human body processes, each of which has its specific role to play [2]. Mineral deficiency does not occur in normal person eating a variety of the traditional wholesome foods. Potassium is plentiful in many fresh fruits. Potassium deficiency may occur in diarrhoea and vomiting. PEM and surgery may also lead to potassium deficiency [3]. Fruits are generally low in natural sodium [4]. High sodium intake has been proved to induce high blood pressure [5]. Fruits are not considered to be the sources of calcium but some fruits contain appreciable amount of calcium [6]. Magnesium content of fruits is relatively high. Evidence is accumulating that magnesium does have anticancer effects [2]. Fruits are very poor in their content of trace minerals. Foodstuffs have been analyzed for a considerable period of time in order to develop a food composition table for Bangladesh. Data showing essential mineral content of fruits are quite scarce in

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literatures. The present study is an attempt to fill this gap of our knowledge and accordingly the study concerns with the analysis of essential minerals in some common fruits of Bangladesh. The minerals that have been priorised for analysis in present study are calcium, magnesium, phosphorus, sodium, potassium iron, zinc and copper.

Materials and methods
Collection of fruits

Thirty different fruits were collected from different markets of Dhaka city. Whole fruits were thoroughly washed with deionized water. Edible portion of the fruits were separated carefully and used for all analytical investigations. All the analyses were done in triplicate, and the results are presented on a fresh weight basis.

Analytical technique.

The edible portion of fruits (5.0 g) were taken in a dried crucible and the moisture content was determined by drying the sample in an oven at 105 $^{\circ}$ C for 5 h [7]. For the estimation of minerals, 5.0 g of sample was wet ashed using a mixture of 18 M sulfuric acid, 12 M perchloric acid and 16 M nitric acid (0.5: 1.0: 0.5 by vol) [8]. After proper dilution, the concentration of Fe, Zn, Cu, Ca and Mg were determined by measuring atomic absorption while sodium and potassium were determined by measuring atomic emission [9]. An appropriate dilution was done with 0.4% lanthanum (w/w) to overcome ionic interference during the estimation of calcium and magnesium. Estimation of phosphorus was done colorimetrically using the method of Fiske and Subbarow [10].

Results

Table 1 shows the major mineral content in fruits analyzed. Calcium present in different fruits ranged from 4 to 61 mg per 100 g EP. Elephant apple contained the highest amount of calcium. The highest amount of magnesium was present in banana (58 mg/ 100 gm EP). Phosphorus present in different fruits ranged from 9 to 92 mg per 100 g EP. Sodium present in fruits was found to be in the range of 0.9 to 10 mg per 100 g EP. Trace mineral content in fruits analyzed is presented in Table 2. The iron content in different fruits ranged from 0.01 to 0.87 mg per 100 g EP. Iron was not detected in orange, musk melon and banana (Sagarkala). Zinc present in fruits ranged between 0.03 to 0.7 mg per 100 g EP. Copper content in different fruits analysed ranged from 0.01 to 0.74 mg per 100 g EP.

Table- 1. Major mineral content in some fruits of Bangladesh

Common name	Scientific name	Moisture	Ca	Mg	P	Na	K
Tomato	*Lycopersicon lycopersicum*	94.6±0.2	29±1.5	16±2.0	30±2.5	6±1.0	180±4.5
Amla	*Phyllanthus embelica*	82.4±0.9	28±2.0	28±2.65	25±2.6	4±2.6	150±3.7
Papaya	*Carica papaya*	91.3±1.1	28±3.5	14±1.0	92±0.5	4±1.5	140±1.3
Pine apple	*Ananas sativa*	85.3±1.2	16±1.0	39±2.0	22±1.5	3±0.5	237±1.5
Olive	*Elaeocarpus robustus*	81.2±0.3	24±4.0	11±2.0	25±1.7	3±0.1	198±1.5
Persimmon	*Diospyros phillippensis*	89.4±0.6	59±2.0	24±1.0	16±2.5	3±0.1	172±4.0
Zizyphus (green)	*Zizyphus jujuba*	87.8±1.1	7±1.65	17±2.7	28±3.0	10±1.5	382±5.0
Zizyphus (ripe)	*Zizyphus jujuba*	91.9±2.5	27±1.2	32±2.7	38±1.7	3±0.05	325±6.0
Carambola	*Averrhoa carambola*	89.2±1.3	5±1.0	18±3.0	23±1.85	4±0.01	116±4.5
Custard apple	*Anona sqamosa*	77.8±1.2	15±0.5	25±1.5	Trace	Trace	9±1.7
Orange	*Citrus aurantium*	86.0±0.8	26±1.5	17±1.8	25±1.6	30.01	103±2.3
Golden apple	*Spondius magnifera*	86.6±0.7	51±2.0	41±1.3	9±1.0	1±0.01	155±4.5
Elephant apple	*Feronia limonia*	80.0±1.0	61±1.5	4 0±1.5	64±3.5	2±0.02	18±1.37
Cucumber	*Cucumis sativa*	96.0±1.0	10±1.0	12±1.3	17±1.2	2±0.01	105±2.6
Wood apple	*Aegle marmelos*	60.4±0.6	30±1.0	10±1.0	102±2.8	Trace	106±3.5
Black berry	*Syzygium cumini*	87.6±0.9	23±1.5	51±1.3	20±4.4	4±0.5	132±3.0
Mango (green)	*Mangifera indica*	89.2±0.9	19±2.5	27±1.8	17±1.3	2±0.1	134±3.5
Mango (ripe)	*Mangifera indica*	84.0±1.1	24±3.0	21±1.0	17±2.0	1±0.2	110±1.5
Guava (green)	*Psidium guajava*	80.0±2.5	19±1.7	23±2.0	17±1.0	Trace	194±2.0
Guava (ripe)	*Psidium guajava*	85.6±1.3	20±1.5	28±1.5	17±0.5	1±0.2	206±1.0
Jack fruit	*Artocarpus heterophyllus*	86.9±1.5	25±1.5	34±2.7	13±0.3	0.2±0.01	207±2.3
Water melon	*Citrullus vulgaris*	93.9±0.4	12±1.0	18±1.5	12±1.2	3±0.01	104±1.5
Musk melon	*Cucumis melo*	95.8±1.5	10±1.5	20±3.0	35±2.7	7±0.1	130±2.65

Table 1. Major mineral content in some fruits of Bangladesh[1] (cont'd)

Common name	Scientific name	Moisture	Ca	Mg	P	Na	K
Litchi	*Litchi chinensis*	81.7±1.2	10±0.7	24±1.5	19±4.4	0.8±0.2	91±2.0
Star apple	*Eugenia javonica*	91.6±1.5	4±1.0	22±2.5	18±2.5	3±0.5	65±1.5
Shaddock	*Citrus grandis*	90.9±0.7	34±3.5	15±1.8	21±1.5	1±0.01	229±5.5
Palmyra fruit	*Borsossus flabellifer*	95.6±1.1	39±1.0	15±1.0	30±1.8	2±0.2	102±1.0
Banana (Sabri)	*Musa sp.*	64.3±0.8	14±2.0	53±1.0	64±2.5	0.0	339±1.2
Banana (Sagar)	*Musa arnata*	66.5±0.3	14±1.0	58±2.3	63±1.7	20.2	302±3.5
Banana (Champa)	*Musa sp.*	72.6±0.3	16±2.3	58±1.7	65±1.3	1.02	310±4.5

[1]Results were expressed as mean ± SD of triplicate determination and as mg/100g EP except moisture which was expressed as g/100g EP.

Discussion

In this study, thirty different kinds of locally available common fruits were analyzed for their content of essential minerals. The minerals under study comprised five major minerals (Ca, Mg, P, Na and K) and three trace minerals

Table-2.Trace mineral content in some fruits of Bangladesh[1]

Common name	Scientific name	Fe	Zn	Cu
Tomato	*Lycopersicon lycopersicum*	0.06±0.01	0.20±0.03	0.07±0.01
Amla	*Phyllanthus embilica*	0.22±0.03	0.30±0.04	0.12±0.03
Papaya	*Carica paaya*	Trace	0.20±0.01	0.04±0.01
Olive	*Elaeocarpus robustus*	0.19±0.02	0.20±0.02	0.12±0.05
Persimmon	*Diospyros phillippensis*	0.01±0.0	0.04±0.01	0.19±0.02
Zizyphus(green)	*Zizyphus jujuba*	0.03±0.01	0.20±0.01	0.12±0.01
Zizyphus(ripe)	*Zizyphus jujuba*	0.04±0.01	0.30±0.03	0.12±0.01
Carambola	*Averrhoa carambola*	0.18±0.03	0.70±0.04	0.22±0.02
Custard apple	*Anona sqamosa*	0.87±0.05	0.40±0.01	0.08±0.01
Orange	*Citrus aurantium*	0.39±0.03	0.50±0.05	0.21±0.05
Golden apple	*Spondius magnifera*	Trace	0.20±0.01	0.12±0.03
Elephant apple	*Feronica limonia*	0.81±0.04	0.10±0.01	0.08±0.01
Cucumber	*Cucumis sativa*	0.19±0.03	0.70±0.05	0.23±0.07
Wood apple	*Aegle marmelos*	0.15±0.03	0.20±0.01	0.20±0.05
Pine apple	*Ananas sativa*	0.02±0.01	0.25±0.02	0.19±0.04

Table-2.Trace mineral content in some fruits of Bangladesh[1] (cont'd)

Common name	Scientific name	Fe	Zn	Cu
Black berry	*Syzygium cumini*	0.16±0.01	0.30±0.02	0.08±0.02
Mango (green)	*Magnifera indica*	0.03±0.01	0.30±0.01	0.25±0.02
Mango (ripe)	*Magnifera indica*	0.01±0.0	0.09±0.03	0.12±0.03
Guava (green)	*Psidium guajava*	0.14±0.02	0.30±0.01	0.20±0.02
Guava (ripe)	*Psidium guajava*	0.19±0.03	0.50±0.01	0.15±0.01
Jack fruit	*Artocarpus heterophyllus*	0.04±0.01	0.20±0.02	0.01±0.00
Water melon	*Citrullus vulgaris*	Trace	0.10±0.01	0.07±0.01
Musk melon	*Cucumis melo*	Trace	0.30±0.02	0.09±0.01
Litchi	*Litchi chinensis*	0.13±0.01	0.30±0.02	0.12±0.01
Star apple	*Eugenia javonica*	0.11±0.02	0.20±0.02	0.74±0.02
Shaddock	*Citrus grandis*	0.15±0.01	0.03±0.01	0.08±0.02
Palmyra fruit	*Borsossus flabellifer*	0.03±0.01	0.30±0.01	0.08±0.02
Banana (Sabri)	*Musa sp.*	0.07±0.01	0.50±0.05	0.21±0.01
Banana (Sagar)	*Musa aranta*	Trace	0.50±0.01	0.23±0.05
Banana (Champa)	*Musa sp.*	0.15±0.02	0.80±0.02	0.12±0.03

[1] Results were expressed as mean ± SD of triplicate determination and as mg/100g EP except moisture which was expressed as g/100g .

(Fe, Zn and Cu). The composition of fruits, especially their mineral content, may vary largely due to topographical variations. This variation may be due to climatic condition, nature of soil and sometimes rainfall. Maturity of fruits may also be partly responsible for this variation.

In general, fruits are not good sources of calcium. In this study, it was found that only few fruits contained a significant amount of calcium. These are elephant apple (61 mg / 100 g EP), persimmon (59 mg / 100 g E P) and golden apple (51 mg / 100 g EP). These values are very close to that reported by other studies [6, 11]. Among the fruits analyzed, all the three varieties of banana contained good amount of magnesium. Both sagar and champa varieties of banana contain 58 mg of magnesium while sabri variety contains 51 mg of magnesium per 100 g EP. On the other hand, the Indian study reported that banana contains 41 mg of magnesium per 100 g EP [6]. Fruits are not good sources of phosphorus as found in this study and also as reported by Indian study [6]. In this study, sodium content in fruits analyzed was found negligible (0.09 to10 mg / 100g EP). An Indin study [6] also reported the same values with some exceptions. Potassium is found to be plentiful in fruits. All the varieties of banana, zizyphus, guava, shaddock and other fruits analyzed were found to contain good amount of potassium except elephant apple and custard apple. Fruits are very poor sources of iron, zinc and copper as found in this study. Gopalan and Sastri also reported the same

with few exceptions [6]. In this study iron was not detected in water melon and musk melon while the Indian study reported that water melon and musk melon contain 7.9 mg and 1.4 mg of iron per 100 g EP respectively [6]. Evidences are accumulating that fruits are not the good sources of iron [1]. Data derived from present study will contribute enormously in updating the already existing food composition table of Bangladesh.

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