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Nutritional evaluation of different mango varieties available in Bangladesh

[1, 2]Ara, R., [3]Motalab, M., [4]Uddin, M. N., [1]Fakhruddin, A. N. M. and [3*]Saha, B. K.

[1]*Department of Environmental Sciences, Jahangirnagar University, Dhaka 1342, Bangladesh*
[2]*Department of Food Engineering and Tea Technology, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh*
[3]*Institute of Food Science & Technology, Bangladesh Council of Scientific and Industrial Research, Dhanmondi, Dhaka 1205, Bangladesh*
[4]*BCSIR Laboratories, Bangladesh Council of Scientific and Industrial Research, Dhanmondi, Dhaka 1205, Bangladesh*

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Abstract

The study was carried out to evaluate the nutritional properties of ten varieties (Amrapali, Chausa, Fazlee, Gopalbhog, Guti, Himsagor, Khirsapat, Kohitoor, Langra, and Mallika) of mango. Nutritional properties were significantly ($p < 0.05$) varied among the different mango varieties. The highest edible portion (79.49%), titratable acidity (0.75%) and calcium (30.56 mg/100 gm) were found in Gopalbhog. Highest amount of potassium (64.04 mg/100 gm) and magnesium (7.54 mg/100 gm) were found in Chausa while highest protein (1.18 gm/100 gm), crude fiber (4.78 gm/100 gm) and sodium (91.15 mg/100 gm) were found in Langra. Mango varieties contain significant amount of vitamin C (46.53- 26.53 mg/100 gm), total sugar (5.48 - 4.27%) and total carbohydrate (27.33 - 4.49 gm/100 gm). The maximum calorific value (112.12 kcal/100 gm) was found in Amrapali. Heavy metal analysis was also done but no significant amounts were found. Present study thus strongly suggests that different varieties of mango can provide higher amount of vitamin C and important minerals that will be a sustainable health benefit.

Introduction

Mango (*Mangifera indica* L.) is commonly cultivated in many tropical and subtropical regions and distributed worldwide. There are over 500 classes of mango varieties; some of them have evolved and have been described throughout the world. The genus of *Mangifera* consists of 69 species and mostly restricted to tropical Asia (Gulcin *et al.*, 2004). The main mango producing countries of the world are India, Pakistan, Mexico, Brazil, Haiti, Philippines and Bangladesh. Mangoes grow widely throughout Bangladesh and are raised mostly as homestead plantations. The soil and climatic conditions of Bangladesh especially northern regions are suitable for mango cultivation. Bangladesh produces a large number of superior varieties of mango namely Fazlee, Langra, Gopalbhog, Himsagar, Khirsapat, Kohitoor, Laksmanbhog, Chausa, Amrapali, Mallika, Mohanbhog, Misribhog etc. These mango varieties have their own demand and have commercial importance in food industries.

Mango is not only delicious but also rich in pre-biotic dietary fiber, vitamins, minerals and poly-phenolic flavonoid antioxidant compounds. It also contains sugar, small amount of protein, fats and other nutrients. Mango is mostly eaten fresh as a dessert also processed as juices, jams, jellies, nectars as well as crisp mango chips (Hamdard *et al.*, 2004). Generally, mango is consumed at all stages of fruit development from the tiny imperfectly set fruits, that shed abundantly on to develop beyond the initial stage to the fully mature ones and the nutritional value of mango varies from variety to variety and developmental stages of the fruit including mature and ripened stage (Leghari *et al.*, 2013).

Some works has been reported on the physico-chemical characteristics of different mango varieties (Bhuyan *et al.*, 1990; Abser *et al.*, 1993; Saha *et al.*, 1994; Rajput *et al.*, 1997; Sarder *et al.*, 1998; Hamdard *et al.*, 2004; Akhter *et al.*, 2010). But the physico-chemical and nutritional characteristics of most of the varieties of mango grown in Bangladesh are not addressed based on variety, maturity and ripening. Considering these, we therefore have designed the present study by evaluating the nutritional status of ten different mango varieties (Amrapali, Chausa, Fazlee, Gopalbhog, Guti, Himsagor, Khirsapat, Kohitoor, Langra, and Mallika) grown in Bangladesh to recommend their use in daily life and commercial

*Corresponding author.
Email: *bksbcsir@yahoo.com*
Tel: 880 2 9670101 4/Ext. 312; Fax: 880 2 9672645.

level.

Materials and Methods

Sample collection

The experiment was carried out on in the laboratory of Fruit Technology Research Section, Institute of Food Science and Technology, BCSIR, Dhaka. Ten popular varieties of mangoes were analyzed in this study. These include Amrapali, Chausa, Fazlee, Gopalbhog, Guti, Himsagor, Khirsapat, Kohitoor, Langra, and Mallika. Selected mangoes were collected from five local markets in Dhaka city.

Sample preparation

The freshly collected samples were free from insect's bites and washed with deionized water to eliminate visible dirt and removed the water quickly with a blotting paper. Those were then cut into small pieces, homogenized. Accurate quantity was weighed as required for different analysis. Every experiment was replicated nine times to have a result for each parameter.

Determination of nutritional properties

The edible portion of whole fruit was determined by subtracting the weight of indigestible parts of fruits from the weight of whole fruits. Moisture content was determined by digital moisture analyzer (AnD MX-50). The pH of fruit extract was determined with a digital pH meter (Type H1 98106 by HANNA) and titratable acidity was estimated with the visual acid base by digital method (Ranganna, 1986). The total soluble solid (TSS) was determined with a hand refract-meter (Type ATAGO, Model-9099). Reducing sugar and total sugar were determined by Lane and Eynon method (Ranganna, 1986). The estimation of total protein was made by Kjeldahl method (AOAC, 2005). The total fat and crude fiber content of samples were determined by AOAC method (AOAC, 2005). Ash was determined by heating sample at 6000C for six hours until a constant weight was reached (Ranganna, 1986). The content of total carbohydrate was determined by the following equation (Pearson, 1976):

$$\text{Total Carbohydrate (\%)} = 100 - \{\text{Moisture (\%)} + \text{Protein (\%)} + \text{Fat (\%)} + \text{Ash (\%)}\}$$

The gross food energy was estimated (Edeoga *et al.*, 2003), using equation:

$$FE = \{(\%TC - \%CF) \times 4\} + (\%TF \times 9) + (\%TP \times 4)$$

Where, FE = Food Energy in Kcal/g, TC = Total Carbohydrate, CF = Crude Fiber, TF = Total Fat and TP = Total Protein.

Determination of vitamin C, minerals and heavy metals

Vitamin C was estimated by 2, 6-Dichlorophenolindophenol visual titration method according to AOAC (2005). All the mineral solutions were prepared according to AOAC method (AOAC, 2005). All the minerals and heavy metals were estimated by Flame Atomic Absorption Spectrometric method (Thermo-Scientific iCE 3000 series, Atomic Absorption Spectrometer) and vapor hydride generation system used in case of As and Hg analysis (Kirk and Sawyer, 1991).

Statistical analysis

The data were statistically analyzed using SPSS (Statistical Package for Social Sciences, now popularly used in every sector) of its version 16.0 to assess and compare of physico-chemical, nutritional properties of the mango varieties.

Results and Discussion

Outcome of nutritional properties, minerals and heavy metals content in ten different mango varieties are described. Each value represents the average from nine replications and the results expressed as mean values ± standard deviations (SD). After performing ANOVA (Analysis of variance) test it is evident that two physical properties (edible portion and moisture content) are significantly different ($p < 0.05$). It is also found that chemical properties (pH, Titratable acidity, TSS, Total Sugar, Reducing Sugar, Total protein, Total fat, Crude fiber, Ash, Total carbohydrate and Total energy of different varieties of mango varied significantly ($p < 0.05$). Similar results were obtained for vitamin C and minerals. Duncan Multiple Rank Test (DMRT) was used to see the individual difference of the parameters among the varieties of mango.

Nutritional properties

Maturity stage, taste and colour of different mango varieties were depicted in table 1. Amrapali, Chausa, Fazlee, Khirsapat, Kohitoor and Langra were found in over ripe stage but Gopalbhog, Himsagor, Mallika and Guti were found in ripe stage. The tastes of mango varieties were found to be varied from sweet to very sweet. Amrapali, Gopalbhog, Khirsapat and Kohitoor were categorized as very sweet while Fazlee, Chausa, Guti Himsagor, Langra and Mallika

Table 1. Maturity stage, taste, colour, edible portion, moisture content of mango varieties

Mango variety	Maturity Stage	Taste	Colour	Edible Portion (%)	Moisture content (%)
Amrapali	Over Ripe	Very Sweet	Green	71.86±2.24^{c}	70.83±2.95^{g}
Chausa	Over Ripe	Sweet	Green	69.68±2.42^{c}	73.51±2.49^{fg}
Fazlee	Over Ripe	Sweet	Green	78.48±3.36^{a}	90.26±1.34^{ab}
Gopalbhog	Ripe	Very Sweet	Green	79.49±2.74^{a}	83.52±1.38^{cd}
Guti	Ripe	Sweet	Green	70.42±5.24^{c}	94.59±2.24^{a}
Himsagor	Ripe	Sweet	Yellow	65.61±4.42^{d}	85.75±3.17^{cd}
Khirsapat	Over Ripe	Very Sweet	Yellowish green	76.21±4.03^{ab}	75.46±1.90^{fg}
Kohitoor	Over Ripe	Very Sweet	Green	77.65±4.69^{a}	88.02±0.97^{bc}
Langra	Over Ripe	Sweet	Yellowish green	71.22±1.40^{c}	78.23±1.74^{ef}
Mallika	Ripe	Sweet	Yellowish green	72.93±5.87^{bc}	80.42±1.96^{ef}

Note: Values followed by different letters are significantly ($p < 0.05$) different from each other (Result expressed as per 100 gm of edible portion).

Table 2. pH, Titratable acidity, total soluble solid, total sugar, reducing sugar of mango varieties

Mango variety	p^{H}	Titratable acidity (%)	Total soluble solid (TSS) (%)	Total sugar (%)	Reducing sugar (%)
Amrapali	4.50±0.12^{d}	0.32±0.04^{cd}	20.55±1.68^{a}	5.17±0.12^{b}	4.02±0.18^{b}
Chausa	4.70±0.05^{a}	0.32±0.02^{cd}	20.25±3.47^{a}	4.82±0.48^{cd}	3.04±0.45^{f}
Fazlee	4.67±0.09^{ab}	0.34±0.02^{c}	18.11±0.49^{b}	4.27±0.15^{e}	3.23±0.12^{f}
Gopalbhog	4.56±0.01^{cd}	0.75±0.00^{a}	14.68±0.20^{c}	4.95±0.28^{c}	3.82±0.22^{bc}
Guti	4.42±0.15^{e}	0.56±.04^{b}	18.37±0.73^{b}	4.89±0.31^{cd}	3.61±0.21^{de}
Himsagor	4.66±0.01^{ab}	0.27±0.02^{f}	15.39±0.04^{c}	4.43±0.11^{e}	3.64±0.12^{cd}
Khirsapat	4.71±0.06^{a}	0.56±0.01^{b}	21.05±0.85^{a}	4.86±0.07^{cd}	3.61±0.10^{de}
Kohitor	4.35±0.05^{f}	0.30±0.04^{de}	15.41±1.19^{c}	5.48±0.13^{a}	4.61±0.16^{a}
Langra	4.45±0.00^{e}	0.26±0.01^{f}	15.54±0.16^{c}	4.70±0.07^{d}	3.84±0.07^{bc}
Mallika	4.60±0.07^{b}	0.30±0.02^{de}	12.87±4.40^{d}	4.75±0.10^{cd}	3.44±0.17^{e}

Note: Values followed by different letters are significantly ($p < 0.05$) different from each other (Result expressed as per 100 gm of edible portion).

were found as sweet. Colour of different mango varieties was visually observed and categorized as green (Amrapali, Chausa, Fazlee, Gopalbhog, Guti and Kohitoor), yellow (Himsagor) and yellowish green (Khirsapat, Langra and Mallika),

Edible portion and moisture content of different mango varieties were differed significantly ($p < 0.05$) as shown in Table 1. The highest amount of edible portion was found in Gopalbhog (79.49%) and the lowest amount of edible portion was found in Himsagor (65.61%). Gopalbhog, Fazlee, Kohitoor and Khirsapat showed higher (above 75%) edible portion while other varieties ranged from72.93% to 65.61%. Moisture content was observed more than 70% in all varieties. The highest and lowest moisture content was found in Guti (94.59%) and Amrapali (70.83%), respectively. It was reported that most fruits are composed of 70% to 90% of water (Ueda *et al*., 2000; Haque *et al.*, 2009). Our observations agree with the above reported results. However, maximum moisture content was observed in Guti (94.59%).

pH, titratable acidity, total soluble solids, total sugars and reducing sugars of different varieties of mangoes are presented in the Table 2 . All values were found to be varied significantly ($p < 0.05$) among all the mango varieties. It is observed that pH value of mango varieties ranged from 4.35 to 4.71. Khirsapat was found with highest pH (4.71) and Kohitoor with the lowest pH (4.35) value. It was reported that pH value of Fazlee is 4.64 (Kumar and Singh, 1993) which is very close to the value observed in the present study. Abser *et al*. (1993) reported that the pH value of Khirsapat was 5.2, but we have found 4.71. This difference is considerable due to different climatic condition of the regions.

Titratable acidity was found to be maximum in Gopalbhog (0.75%) followed by Guti and Khirsapat (0.56%) and minimum in Langra (0.26%). It was reported, higher pH (4.2 to 5.7) and lower acidity (0.05 to 0.22%) in mango grown in Mediterranean subtropical climate (Pleguezuelo *et al*., 2012). It was also observed that pH and titratable acidity in Langra was 3.35 and 0.68% and in Chausa was 3.75 and 0.63%, respectively (Akhter *et al*., 2010). Hamdard *et al*. (2004) also reported that titratable acidity varies from 0.25 to 0.60%. Because of the maturity stage and taste of mango varieties we observed it from 0.26% to 0.75%. The variation in pH value and titratable acidity of mangoes and mango products due to the ripening of the mango and the storage has reported earlier (Prusky *et al*., 1993). Therefore numerous studies support our findings.

Total soluble solids content was also differed significantly ($p < 0.05$) and found maximum in Khirsapat (21.05%) followed by Amrapali (20.55%) and it was minimum in Mallika (12.87%). Total soluble solids (TSS) are directly correlated with the acidity of fruit. Generally, acidity of fruit decreases and total soluble solids increases during maturity and ripening stage of fruit (Padda *et al.*, 2011; Sajib *et al*., 2014). It was also reported Total soluble solids more than 15% in Chausa and 14% in Langra at maturity stage (Akhter *et al*., 2010). The total soluble solid content in Langra is 21.6% and Gopalbhog is 20.6% reported by Sarder *et al.* (1998). We have found the total soluble solid content in Langra is 15.54% and Gopalbhog is 14.68%, which indicates that our mango varieties contain less sugar in the pulp compared to the varieties observed by Sarder *et al.* (1998). The amount of total sugar and reducing sugar of different mango varieties varied significantly ($p < 0.05$). Total sugar ranged from 4.27% to 5.48% and reducing sugar ranged from 4.61% to 3.04%. The maximum amount of both the total sugar and reducing sugar were found in Kohitoor, 5.48% and 4.61%, respectively and minimum amount of total sugar and reducing sugar in Fazlee (4.27%) and Chausa (3.04%), respectively.

Significant variation ($p < 0.05$) of total protein, total fat, crude fiber, ash, total carbohydrate and total energy content was observed among the different varieties of mango (Table 3). It is seen that the total protein content ranged between 0.07 gm/100 gm and 1.18 gm/100 gm. The highest amount of total protein was found in Langra (1.18 gm/100 gm) and lowest amount of total protein (0.07 gm/100 gm) was found in both the Gopalbhog and Guti. Maximum protein content (varies from 1.57 to 5.42%) in fruits and Maximum protein content in the different varieties

Table 3. Total protein, total fat, crude fiber, ash, total carbohydrate and total energy of mango varieties

Mango variety	Total protein (gm)	Total fat (gm)	Crude fiber (gm)	Ash (gm)	Total carbohydrate (gm)	Total energy (Kcal)
Amrapali	0.14±0.01^{e}	1.20±0.13^{a}	2.14±0.17^{e}	0.50±0.05^{a}	27.33±1.84^{a}	112.12±3.03^{a}
Chausa	0.26±0.03^{c}	0.86±0.04^{b}	2.28±0.10^{d}	0.22±0.02^{de}	25.15±2.28^{b}	100.26±1.53^{b}
Fazlee	0.21±0.01^{d}	0.42±0.02^{f}	2.02±0.10^{f}	0.49±0.03^{a}	8.62±0.35^{h}	31.02±1.49^{i}
Gopalbhog	0.07±0.00^{g}	0.56±0.02^{d}	2.32±0.04^{d}	0.28±0.06^{c}	15.56±1.19^{e}	58.32±1.89^{g}
Guti	0.07±0.00^{g}	0.62±0.04^{c}	1.08±0.05^{h}	0.28±0.03^{c}	4.49±0.72^{i}	19.50±2.95^{j}
Himsagor	1.11±0.07^{b}	0.14±0.02^{i}	2.72±0.11^{c}	0.17±0.02^{e}	12.83±1.98^{f}	46.14±1.41^{g}
Khirsapat	0.19±0.02^{d}	0.49±0.03^{e}	3.16±0.08^{b}	0.46±0.03^{ab}	23.40±2.65^{c}	86.13±3.61^{c}
Kohitor	0.09±0.02^{f}	0.36±0.06^{g}	1.91±0.24^{f}	0.45±0.02^{ab}	11.08±1.80^{g}	40.28±2.95^{h}
Langra	1.18±0.02^{a}	0.13±0.04^{i}	4.78±0.04^{a}	0.26±0.01^{cd}	20.20±1.81^{d}	67.57±1.78^{e}
Mallika	0.08±0.03^{f}	0.23±0.04^{h}	1.76±0.12^{g}	0.42±0.02^{b}	18.84±1.17^{d}	70.75±1.48^{d}

Note: Values followed by different letters are significantly ($p < 0.05$) different from each other (Result expressed as per 100 gm of edible portion).

Table 4. Vitamin C and mineral contents of mango varieties

Mango variety	Vitamin C (mg)	Na (mg)	K (mg)	Ca (mg)	Mg (mg)	Fe (mg)	Mn (mg)
Aamrupali	34.96±3.62^{c}	7.99±0.76^{h}	15.28±0.68^{g}	9.95±1.62^{f}	3.34±0.32^{e}	ND	7.76±0.69
Chausa	33.19±3.82^{cd}	26.10±3.37^{d}	64.04±3.13^{a}	12.37±0.59^{f}	7.54±0.81^{a}	ND	7.69±0.75
Fazlee	28.23±1.21^{de}	10.24±1.66^{h}	18.52±2.46^{f}	6.45±0.69^{g}	3.27±0.60^{e}	ND	ND
Gopalbhog	26.53±2.69^{e}	42.05±1.81^{b}	41.12±1.44^{c}	30.56±1.81^{a}	5.56±0.46^{c}	8.43±0.69	ND
Guti	28.28±2.54^{de}	30.55±1.55^{c}	12.99±1.07^{h}	22.90±1.44^{c}	4.52±0.42^{d}	0.30±0.09	ND
Himsagor	46.53±3.25^{a}	32.92±3.68^{c}	10.29±1.14^{i}	19.44±2.60^{d}	1.54±0.14^{g}	0.63±0.04	ND
Khirsapat	41.26±2.59^{b}	15.31±1.39^{f}	20.59±1.82^{f}	27.59±5.04^{b}	6.41±0.52^{b}	ND	ND
Kohitor	41.37±3.60^{b}	22.05±2.26^{e}	32.74±1.75^{d}	15.71±2.15^{e}	7.33±1.12^{a}	ND	ND
Langra	32.56±3.68^{cd}	91.15±5.25^{a}	45.78±4.32^{b}	16.24±3.72^{e}	2.65±0.06^{f}	0.74±0.03	ND
Mallika	30.10±2.60^{de}	11.85±1.97^{g}	25.22±1.76^{e}	10.42±3.05^{f}	3.34±0.41^{e}	ND	2.96±0.38

Note: Values followed by different letters are significantly ($p < 0.05$) different from each other (Result expressed as per 100 gm of edible portion).

Table 5. Heavy metal contents of the mango varities.

Mango variety	Pb (ppm)	Cr (ppm)	Cd (ppm)	Ash (ppm)	Hg (ppm)
Aamrupali	ND	ND	ND	ND	ND
Chausa	ND	ND	ND	ND	ND
Fazlee	ND	ND	ND	ND	ND
Gopalbhog	0.02±.0.00	ND	ND	ND	ND
Guti	ND	ND	ND	0.005±0.00	ND
Himsagor	ND	0.02±0.00	ND	ND	ND
Khirsapat	ND	ND	ND	ND	ND
Kohitor	ND	ND	ND	ND	ND
Langra	ND	0.01±0.00	ND	ND	ND
Mallika	ND	ND	ND	ND	ND

ND-Not Detected, ppm-parts per million

tropical fruits (varies from 0.4 to 0.8%) has been reported (Gopalan *et al*., 1993). It was reported (Jahan *et al.*, 2011) that the Fazlee contains 1.23% total proteins. But we have found the total protein in Fazlee is 0.21%. The total fat ranged from 0.13 gm/100 gm to 1.20 gm/100 gm. Amrapali was found rich in total fat content (1.20 gm/100 gm) and Langra (0.13 gm/100 gm) was found with low amount of fat content. It was reported that usually fat content of different fruits is not greater than 1% (Norman, 1976). Crude fiber and ash contents vary significantly ($p < 0.05$) in different mango varieties. The maximum amount of crude fiber was found in Langra (4.78 gm/100 gm) followed by Khirsapat (3.16 gm/100 gm) and Himsagor (2.72 gm/100 gm). Lowest amount of crude fiber was found in Guti (1.08 gm/100 gm). The highest amount of ash was found in Amrapali (0.50 gm/100 gm) and lowest in Himsagor (0.17 gm/100 gm).

Regarding ash content, Gardner *et al*. (1939) reported that the total content of mineral salt as ash in fruits varied from 0.2% to 1.5%, which range is almost similar to our observed findings. Almost similar results were also reported by Akhter *et al.* (2010). Total carbohydrate and total energy of different mango varieties were also significantly ($p < 0.05$) varied (Table 3). Generally, carbohydrate of fruit is less concentrated than cereals because of their high water content. Fruits rich in carbohydrate provides high amount of energy. In our study, Amrapali showed the highest amount of energy (112.12 Kcal/100 gm) due to its high carbohydrate content (27.33 gm/100 gm) and the lowest amount of energy showed in Guti (19.50 Kcal/100 gm) due to its low carbohydrate content (4.49 gm/100 gm).

Vitamin C and minerals

Significant variation ($p < 0.05$) was found for vitamin C and mineral contents of analyzed mango varieties (Table 4). The highest amount of Vitamin C was observed in Himsagor (46.53 mg/100 gm) and lowest amount of Vitamin C was observed in Gopalbhog (26.53 mg/100 gm). Sodium (Na), Potassium (K), Calcium (Ca) and Magnesium (Mg) contents of mango varieties were significantly ($p < 0.05$) differed. It was observed that sodium present in different varieties ranges between 7.99 mg/100 gm and 91.15 mg/100 gm of edible portion. The highest amount of sodium was found in Langra (91.15 mg/100 gm) and lowest amount was found in Aamrapali (7.99 mg/100 g). In our study, it was observed that potassium content in different varieties ranges between 10.29 mg/100 g to 64.04 mg/100 g of edible portion. The highest amount of potassium was found in Chausa (64.04 mg/100 gm) and lowest amount was found in Himsagor (10.29 mg/100 gm). Calcium amount of different varieties was observed between 6.45 mg/100 g and 30.56 mg/100 g. The highest amount of calcium was found in Gopalbhog (30.56 mg/100 gm) and the lowest amount was in Fazlee (6.45 mg/100 gm). Among the mango varieties, the highest amount of Magnesium was found in Chausa (7.54 mg/100 gm) and lowest amount was found in Himsagor (1.54 mg/100 gm). Iron (Fe) was found in four varieties; Gopalbhog (8.43 mg/100 gm), Langra (0.74 mg/100 gm), Himsagor (0.63 mg/100 gm) and Guti (0.30 mg/100 gm). Manganese (Mn) was found in Amrapali (7.76 mg/100 gm), Chausa (7.69 mg/100 gm) and Mallika (2.96 mg/100 gm). Zinc (Zn) was not detected in any varieties of mango. Regarding mineral contents of different varieties of mango, it was found that Langra, Chausa and Gopalbhog had more sodium (91.15 mg/100 gm), potassium (64.04 mg/100 gm) and calcium (30.56 mg/100 gm), respectively. It was reported that in tropical fruits, calcium content varies from 4 to 50 mg/100 gm and potassium content varies from 45 to 450 mg/100 g (Gopalan *et al.*, 1993). Therefore it is clear that the present findings are in good agreement with the

reported study.

Heavy metals

Heavy metals namely lead (Pb), chromium (Cr), cadmium (Cd), arsenic (As) and mercury (Hg) were analyzed (Table 5). Among the heavy metals cadmium and mercury were not found in mango varieties but lead was found only in Gopalbhog (0.02 ppm), Chromium was found in Langra (0.01 ppm) and Himsagor (0.02 ppm). Arsenic was found only in Guti (0.005 ppm). It was reported that plants were capable of absorbing heavy metals from soil and that some plants naturally absorb (Ona *et al.*, 2006). Further, metals accumulation in plants depends on plant species, growth stages, type of soil and metals, soil condition, weather and environment (Domergue and Vedy, 1992).

Conclusion

Present study indicates that all varieties of mango are rich sources of vitamin C, fiber and important minerals and safe from heavy metal contamination. Amrapali contains high carbohydrate hence provides more energy. Himsagar contains highest vitamin C and Gopalbhog contains high calcium. Khirsapat contains high total soluble solids and Kohitoor contains high total sugar and reducing sugar. Therefore, these varieties may be suitable for dietary recommendation. Langra contains high protein, fiber and sodium and hence it is nutritious variety. Chausa contains high potassium, magnesium and low reducing sugar. Fazlee contains low total sugar and Mallika contains low total soluble solids. These varieties and their fruit products may be suitable for diabetic personnel. Finally, nutritional status of popular ten mango varieties of Bangladesh were systematically addressed and recommended their nutritional parameters, which will help the consumers, dietitian and industry policy makers. So far we know, this type of work has partially been done in our country. Further analysis like vitamin profile will be required for complete nutritional information of these mango varieties.

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