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Physico-chemical Properties Comparison between Released Varieties and Local Germplasm of Sapota (*Manilkara zapota*)

Shekh Tanjina Islam Dola[1], Md. Shahidul Islam[1], Mahbub Robbani[2] and Md. Sharifur Rahman[3*]

[1]Department of Post-Harvest Technology and Marketing, Patuakhali Science and Technology University, Patuakhali-8602, Bangladesh.
[2]Department of Horticulture, Patuakhali Science and Technology University, Patuakhali-8602, Bangladesh.
[3]Department of Food Technology and Engineering, Patuakhali Science and Technology University, Patuakhali-8602, Bangladesh.

Authors' contributions

This work was carried out in collaboration among all authors. Authors STID, MSI and MR designed the study and managed the literature searches. All authors performed the laboratory work and statistical analysis. Authors MSI and MR supervised this work. All authors read and approved the final manuscript.

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ABSTRACT

Aim: Comparison of physico-chemical properties between released varieties and local germplasm of Sapota with a view to selecting the superior germplasm/variety in respect of nutritional quality.
Study Design: A laboratory experiment was done by the following Completely Randomized Design (CRD) with 4 replications.
Sample Collection: Local germplasms were collected from different homestead of Dumki upazila and six released varieties were collected from Germplasm Center, Department of Horticulture, PSTU and Bangladesh Agricultural Research Institute, Gazipur, Bangladesh.

**Corresponding author: Email: sharif@pstu.ac.bd;*

Place and Duration of Study: The study was conducted during March, 2018 to February, 2019 at the Plant Biotechnology Lab and Postharvest Lab, Department of Horticulture, Patuakhali Science and Technology University, Bangladesh.

Results: The highest fruit length (4.85 cm), width (4.93 cm), weight (115.33 g), edible portion (92.33%), phenolic content (2.537 mg/100 g) and anthocyanin content (1.807 µg/100 g) were exhibited in local germplasm (G_3). The highest carotenoid content (5.320 µg/100 g) was found in local germplasm G_3 followed by G_1 (5.173 µg/100 g). On the other hand the highest vitamin-C content (11.42 mg/100 g) and carbohydrate percentage (22.99%) were observed in local germplasm G_1 and G_2 respectively. BARI-3 (V_{10}) exhibited the highest percentage of TSS (21.28%) along with highest peel weight (6.80 g) and the highest percentage of antioxidant (95.80 mg/100 g) was traced in BARI-2 (V_9).

Conclusion: Based on the selected physico-chemical properties it was revealed that local germplasm (G_3) was superior than the other germplasm/varieties. G_1, G_2, V_9 and V_{10} germplasm/variety were identified as good source of phytochemicals. Based on Physico-chemical properties local germplasm (G_3) was better for eating fresh fruit as well as processing than the other germplasms/varieties considered in this research.

Keywords: Local germplasm; physico-chemical properties; released varieties; Sapota.

1. INTRODUCTION

Sapodilla (*Manilkara zapota* L.) which belongs to the family Sapotaceae, is a tropical fruit commonly known as "Sapota". Generally in Bengali it is known by the people as Sofeda. Immature fruits are hard, gummy and rich in tannin, while the ripe fruits are soft and juicy with good source of nutrient and a sweet taste, which makes them wonderful dessert fruit [1]. It grows well throughout the country, as we are in the tropical environment. It yields two times a year. Sapota is an important minor fruit crop and can be considered as one of the healthy fruits because of the presence of various nutritious components. Sapota fruit contains sugar, acids, protein, amino acid, phenolics, gallic acid, catechin, chlorogenic acid and Leucopelargonidin, carotenoids, ascorbic acids, and minerals like potassium, calcium and iron [2]. Fruits contain carbohydrate (50.49 g/100 g), protein (0.7 g /100 g), fat (1.1 g /100 g), fiber (2.6 g /100 g), and minerals nutrient such as calcium (28 mg /100 g), iron (2.0 mg /100 g), phosphorus (27 mg /100 g), ascorbic acid (6.0 mg /100 g) [3]. People of Bangladesh are generally poorly nourished. Most of the people suffer from malnutrition and resultant diseases. If the minor fruits can be utilized, they may help to contribute in food security, nutrition, health, and income generation [4]. In this study an attempt has been made to assess the physico-chemical properties of local germplasm and released varieties and proper categorization of the released varieties and local germplasm of Sapota according to their nutritional quality which help in selection of superior germplasm with higher nutritional qualities from among the existing local germplasm.

2. MATERIALS AND METHODS

2.1 Duration and Location

The study was conducted during March, 2018 to February, 2019 at the Plant Biotechnology Lab and Postharvest Lab, Department of Horticulture, Patuakhali Science and Technology University, Bangladesh.

2.2 Sample Collection

With a view to selecting the local germplasm and released varieties of mature Sapota (120 days from fruit setting), four local germplasms were collected from different homestead of Dumki upazila and six released varieties were collected from Germplasm Center, Department of Horticulture, PSTU and Bangladesh Agricultural Research Institute, Gazipur (BARI). Samples were named as G_1, G_2, G_3, G_4= Germplasm, V_5= BAU-1, V_6= BAU-2, V_7= BAU-3, V_8= BARI-1, V_9=BARI-2 and V_{10}= BARI-3 were used for study.

2.3 Treatments and Their Combinations

Each selected plant was considered as a treatment. Each treatment was replicated for 4 times by selecting 4 branches randomly. The experiment was comprised of 10 treatments with 4 replications.

2.4 Design and Layout of the Experiment

The laboratory experiment was done in a Completely Randomized Design (CRD) with 4 replications.

2.5 Experimental Observations

Physical characteristics: The fruit shape was observed through eye estimation.

Fully matured 40 (1 fruits × 4 branches × 10 plants) fruits were gradually collected to find out the mean weight and other measurement. The weight was taken in gram with the help of an electrical balance.

Number of seeds per fruit was manually counted after the fruit's ripeness. Ripe fruits were used to calculate the number of seeds per fruit.

Fully ripe and soft fruit was used to collect the seeds. Seeds were detached from pulp and washed away thoroughly with distilled water. Then the attached water was removed with the help of tissue paper. After that the weight of seeds was measured in gram with the help of a balance.

Peel weight data was measured by, {fruit weight – (seed weight+ pulp weight)}.

Colour of pulp was observed through eye estimation.

Length of the fruits was measured by basal to polar by using slide calipers and a total of 40 (1 fruits × 4 branches × 10 plants) matured fruits were used to determine the length of fruits in cm.

Diameter of the fruits was measured by using slide calipers and a total of 40 (1 fruits × 4 branches × 10 plants) fully matured fruits were used to determine the width of fruits in cm.

The percentage of edible (pulp) portion was measured by using the following formula [5],

Percent of edible portion = (Weight of edible parts/ Weight of whole fruit) ×100

The percentage of weight loss after 7 days was measured by using the following formula:

$$\text{Weight loss (\%)} = \frac{W1 - Wn}{W1} \times 100$$

Where,

W_1 = Initial weight of Sapota fruit
W_n = Weight of Sapota fruit after 7 days

Chemical characteristics: For chemical evaluation, 9 different chemical characteristics (TSS, TA, Vitamin C, pH, Carbohydrate, antioxidant, phenol, Anthocyanin, Carotenoid) were observed.

The TSS of Sapota pulp was determined by using a digital refractometer (BOECO, Germany). The remaining of the filtrated juice from TA determination was used to measure the TSS of the fruit pulp. Before measurement, the refractometer was calibrated with distilled water to give a 0% reading. About 1-2 drops of the filtrate was placed on the prism glass of the refractometer to obtain the % TSS reading. The readings were multiplied by dilution factor to obtain an original % TSS of the pulp tissues. Since difference in sample temperature could affect the measurement of TSS, each of the reading was standardized to a temperature of 20ºC by adding 0.28% to obtain % TSS at 26 ± 1ºC.

Titratable acidity (TA) was determined according to a standard method [6].

Ascorbic acid content was determined according to a standard method [6].

The remainder of the filtrated juice from TA determination was used to measure the pH of the fruit pulp. The pH was determined by using a glass electrode pH meter (GLP 21, Crison, Barcelona, EEC). The pH meter was calibrated with buffers at pH 4.0 followed by pH 7.0. After that, the glass electrode was kept into the filtrate solution to measure the pH and stabilized reading was noted. For correctness of the reading, the glass electrode was washed with distilled water after each reading and dry with tissue paper.

Total soluble carbohydrate was estimated by phenol sulphuric acid method [7].

Phenolic content and antioxidant content were measured by the following method.

Sample preparation: At first 6 g sample was taken in Petridis and kept in oven at 3 hours in 60ºC temperature. Then 2 g sample was dissolved in 50 mL methanol in a falcon tube to

prepare a stock solution. The solutions was vortexes and solicited for several minutes (20-30 minute). The stock solution was preserved in room temperature and diluted to necessary concentration when needed.

Chemical and reagents: Folin-Ciocalteau reagent, Gallic cacid, Rutin Hydrate, TPTZ, ferric chloride, sodium hydroxide and methanol were purchased from Merck, Germany, 2, 2-diphenyl-l-picrylhydrazyl (DPPH) from Sigma Aldrich Co. Ascorbic acid and NBT were purchased from BDH Co. and Ferrozine from Loba India. All the chemicals and reagents were analytical grade.

Phenols, sometimes called phenolic are one of the main secondary metabolites present in the plant kingdom. Phenolic content was determined by the following method.

Reagents: Folin-Ciocalteu reagent (0.5 N), saturated sodium carbonate (20%), Gallic acid (10 µg/mL)

Procedure: The amount of total phenolic content was determined following the established method [8] with some modifications. A 0.5 mL of extract (concentration of extract is 1.0 mg/mL) and 0.5 mL of Folin Ciocalteu reagent (0.5 N) were mixed and incubated at room temperature for 5 minutes. Then 2.0 mL saturated sodium carbonate was added and further incubated for 30 minutes at room temperature.

Determination of total antioxidant activity was done as per as the phosphor molybdenum method with some modification [9]. The basic principle of this determination is centered on the reduction of Mo (VI) to Mo (V) by the extract and subsequent development of a green phosphate Mo (V) complex at acidic pH.

Reagent: 6 M sulfuric acid, 28 mM sodium phosphate, 4 mM ammonium molybdate.

Procedure: 1 mL extract was combined with a mixture of 3 mL of reagent solution (0.6 M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate). The tubes containing the reaction solution were then capped and incubated at 95ºC for 90 minutes. After the samples had cooled to room temperature, the absorbance of the solution was then measured at 695 run against blank. Methanol (1 mL) in the place of extract was used as the blank. The total antioxidant content was calculated from a calibration curve y = 256.11x - 12.645, R2 = 0.9974, where x is absorbance and y is concentration of Gallic acid. The antioxidant activity was expressed as the mg of equivalents of Gallic acid.

Total anthocyanin content of leather was determined by a standard method [10].

The total carotenoids of the leather pulp was determined by a standard method [10].

2.6 Statistical Analysis

The collected data on various parameters under this study were compiled and tabulated in proper form for statistical analysis. Analysis of variance was done with the help of MSTAT-C computer package program. The mean differences among the treatments were calculated with the help of Duncan's Multiple Range Test (DMRT) at 1% and 5% levels of probability [11]. The correlation among the measured parameters were analysed using Statistical Package for Social Sciences (SPSS) version 15.

3. RESULTS AND DISCUSSION

3.1 Physical Characteristics

Significant variation was observed among the selected local germplasm and released varieties in respect of fruit length. The longest fruit length was obtained from local germplasm G_3 and varieties V_9 and V_7 (4.87, 4.85 and 4.60 cm) whereas the shortest fruit was found in G_4 (3.13 cm) (Table 1). This variation could be the because of the maturity and the germplasm/variety.

Statistically significant variation was observed among the selected local germplasm and released varieties in respect of fruit width. The highest fruit width was obtained from local germplasm G_3 (4.93 cm) whereas the lowest fruit width was recorded from variety V_{10} (3.60 cm) (Table 1). The average diameter and length of the half-ripe Sapota fruit could be 7.5 and 6.4 [12]. Our observed germplasms/varieties' length and width were comparatively small.

Significant difference was observed in respect of fruits weight among the selected varieties and local germplasm of Sapota. The highest fruit weight was recorded in local germplasm G_3 (115.33 g) whereas the lowest fruit weight was recorded from the local germplasm G_4 (61.33 g)

which was statistically identical with V_7 (63.17 g) (Table 1). From the mature green to the half-ripe stage there was a significant increase in the weight of the fruit; from an average of 91.9 to 198.4 g [12] Fruits of Itapirema-31 were smaller than the three Mexican available cultivars [13]. Our studied germplasms/varieties' weight is lighter because of small size of the Safota fruit.

Significant difference was observed in respect of peel weight among the selected local germplasm and released varieties. The highest peel weight was recorded in germplasm G_1 and variety V_9 (6.80 and 6.76 g) whereas the lowest peel weight was recorded from the variety V_7 (5.10 g) which was statistically identical with G_2 (5.20 g) (Table 1). This variation can be the because of the various thickness of peel of the specific germplasm/variety.

Significant variation was observed among the selected released varieties and local germplasm of Sapota in respect of edible portion. The highest pulp edible portion was exhibited in G_3 and V_{10} (92.33 and 92.00 g) whereas the lowest edible portion was recorded in variety V_6 (56.00 g) (Table 1). There was a medium correlation between seed weight with edible portion (Table 3).If the seed weight increased then the edible portion decreased. The weight of fruits were correlated with edible portion of Sapota, r=0.81, which could be considered a large effect.

Table 1. Length of fruit, width of fruit, weight of fruit, weight of peel and edible portion of selected local germplasm and released varieties of Sapota

Sl. No.	Length of fruit (cm)	Width of fruit (cm)	Weight of peel (g)	Weight of fruit (g)	Edible portion (%)
G_1	4.10	4.60	6.80	87.33	88.67
G_2	3.97	4.40	5.20	96.00	91.00
G_3	4.87	4.93	6.47	115.33	92.33
G_4	3.13	3.88	5.77	61.33	62.00
V_5	4.13	4.85	5.60	72.00	65.33
V_6	3.55	4.40	5.30	67.83	56.00
V_7	4.60	4.75	5.10	63.17	64.33
V_8	3.50	4.85	6.46	77.50	84.67
V_9	4.85	4.77	6.76	65. 00	81.00
V_{10}	4.17	3.60	6.50	112.67	92.00
Level of Sig.	**	**	**	**	**
CV (%)	4.10	1.07	1.48	1.69	2.04

Means in a column followed by the same letter (s) do not differ significantly by DMRT.
*** Significant at 1% level of probability, Here, G1, G2, G3, G4= Local germplasm, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BARI-1, V9=BARI-2 and V10= BARI-3*

Table 2. Number of seed, weight of seed, weight loss after 7 days and fruit shape of selected germplasm and released varieties of Sapota

Sl. No.	Number of seed	Weight of seed (g)	Weight loss after 7 days (%)	Fruit shape
G_1	3.00	1.26	25.44	Round
G_2	2.67	1.60	29.86	Round
G_3	2.67	1.63	25.33	Round
G_4	3.33	1.67	21.67	Round
V_5	2.67	1.56	24.33	Round
V_6	3.00	1.66	25.07	Round
V_7	3.33	1.96	26.00	Round
V_8	2.67	1.40	25.00	Round
V_9	2.67	1.53	21.67	Flat
V_{10}	3.33	1.77	27.33	Round
Level of Sig.	NS	NS	NS	
CV (%)	14.96	14.95	13.07	

Means in a column followed by the same letter (s) do not differ significantly
By DMRT, NS= Non significant, Here, G1, G2, G3, G4= Local germplasm, V5= BAU-1, V6= BAU-2, V7= BAU3, V8= BARI-1, V9=BARI-2 and V10= BARI-3

There was no significant difference found in case of number of seed of selected sapota germplasm and varieties (Table 2). The round fruits had higher number of seeds than oval fruits, conversely the shape index was higher for oval fruits than round fruits. They also noticed that seeds were uniformly distributed in round fruits than oval [14].

There was no significant difference found in case of weight of seed, weight loss after 7days and fruit shape of selected local germplasm and released varieties of sapota (Table 2).

No significant difference found in case of fruit shape. The observed Sapota fruit shape was round except V_9. Cricket Ball have round shaped fruit While cvs. Hybrid 7 1, Jharsgram local and Guthi have oval shaped and cv. PKM -3 have egg shaped fruits [15].

3.2 Chemical Characteristics

No significant variation was observed in case of pH content among the local germplasm and released varieties of Sapota. The highest pH was found in V10 verity (6.66) while the lowest pH was found in V5 verity (6.14). pH of sapota increased from 5.9 to 6.67. But pH value decreased when it was over ripened. The pH value decreased due to turning sour to fermentation sugar [16, 17].

No significant variation was observed in case of TA content among the local germplasm and released varieties of Sapota. The highest TA was found in V6 (0.277) while the lowest TA was in V7 (0.019).The value was lower than the standard value. It could be the over maturation of the Sapota. Acidity of sapota decreased from 1.92 to .74 [17]. The TA decrease because of soluble sugar which is increase during the course of ripening [18].

The percentage of total soluble solids (TSS) showed significant variation among different released varieties and local germplasm of Sapota. The highest percentage of TSS was found in V_{10} variety (21.28%) while the lowest percentage was found in local germplasm G_1 (7.53%) (Fig. 1). Lower percentage of TSS will supply lower percentage of nutrient. TSS concentration significantly vary from 19% to 24% .The total soluble solids increases in all fruits as the fruit ripens [18].

The ascorbic acid content of fruits varied significantly among the released varieties and local germplasm of Sapota. It was found that, the vitamin-C content was higher in local germplasm G_1 and G_2 (11.42 and 11.33 mg/100 g) whereas the lower vitamin-C content was found in V_7 variety (3.38 mg/100 g) (Fig. 2). Vitamin-C of Sapota decrease from 13.2-5.34 in control. This decrease trend of Vitamin-C occurs due to increase in total soluble sugar present in the fruit. [16, 17]. Vitamin-C content was largely correlated with TSS content (Table 4). If the TSS increased, the vitamin-C content was decreased.

Significant variation was observed in case of carbohydrate content among the selected local germplasm and released varieties. It was found that, the carbohydrate content was higher in local germplasm G_2 (22.99%) whereas the lower carbohydrate content was counted in V_5 variety (11.68%) (Fig. 3). In fresh Sapota fruit the percentage of carbohydrate per 100 g was about 19,9 g, percentage of RDA 15% [19].

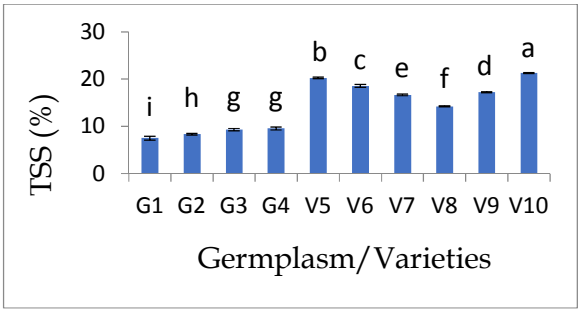

Fig. 1. TSS content of selected Sapota fruits

Vertical bar represent error bar with standard deviation

Here, V1= Local verity, V2= Local verity, V3= Local verity, V4= Local verity, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BAR-1, V9=BARI-2 and V10= BARI-3

Table 3. Correlation among the measured physical parameters of selected germplasm and released varieties of Sapota

	Fruit length	Fruit width	Fruit weight	Peel weight	Edible portion	Seed number	Seed weight	Weight loss after 7 days
Fruit length	1	.77 (.00)	-.17 (.37)	.26 (.17)	.36 (.05)	-.21 (.26)	-.16 (.39)	-.09 (.64)
Fruit width	.77 (.00)	1	-.22 (.25)	.06 (.74)	.17 (.37)	.02 (.93)	-.05 (.78)	.03 (.88)
Fruit weight	-.17 (.37)	-.22 (.25)	1	.36 (.05)	.69 (.00)	-.08 (.67)	-.04 (.82)	.17 (.38)
Peel weight	.26 (.17)	.06 (.74)	.36 (.05)	1	.62 (.00)	-.10 (.59)	-.37 (.04)	-.05 (.78)
Edible portion	.36 (.05)	.17 (.36)	.69 (.00)	.62 (.00)	1	-.19 (.30)	-.26 (.16)	.09 (.62)
Seed number	-.21 (.27)	.02 (.93)	-.08 (.67)	-.10 (.59)	-.19 (.30)	1	.66 (.00)	.30 (.11)
Seed weight	-.16 (.39)	-.05 (.78)	-.04 (.82)	-.37 (.04)	-.26 (.16)	.66 (.00)	1	.04 (.84)
Weight loss after 7 days	-.09 (.64)	.03 (.88)	.17 (.38)	-.05 (.78)	.09 (.62)	.30 (.11)	.04 (.85)	1

Table 4. Correlation among the measured chemical parameters of selected germplasm and released varieties of Sapota

	TSS	pH	TA	Vitamin-C	Anthocyanin	Carotenoid	Antioxidant	Phenol	Carbohydrate
TSS	1	.04 (.84)	.06 (.76)	-.50 (.01)	-.35 (.32)	-.17 (.63)	.03 (.94)	-.35 (.32)	-.35 (.32)
pH	.04 (.84)	1	-.08 (.68)	.09 (.63)	-.22 (.53)	.34 (.33)	.16 (.67)	-.42 (.23)	-.12 (.75)
TA	.06 (.76)	-.08 (.68)	1	-.13 (.50)	.06 (.87)	.50 (.14)	.17 (.63)	-.30 (.39)	.03 (.94)
Vitamin-C	-.50 (.01)	.09 (.62)	-.13 (.50)	1	.27 (.46)	-.18 (.61)	-.24 (.51)	.30 (.39)	-.01 (.97)
Anthocyanin	-.35 (.32)	-.22 (.53)	.06 (.87)	.27 (.46)	1	.48 (.16)	.35 (.32)	.52 (.12)	.32 (.36)
Carotenoid	-.17 (.63)	.34 (.33)	.5 (.14)	-.18 (.61)	.48 (.16)	1	.39 (.26)	.16 (.65)	.44 (.20)
Antioxidant	.03 (.94)	.16 (.67)	.17 (.63)	-.24 (.51)	.35 (.32)	.39 (.26)	1	.63 (.05)	.16 (.67)
Phenol	-.35 (.32)	-.42 (.23)	-.30 (.40)	.30 (.40)	.52 (.12)	.16 (.65)	.63 (.05)	1	.17 (.64)
Carbohydrate	-.35 (.32)	-.12 (.75)	.03 (.94)	-.01 (.97)	.32 (.36)	.44 (.20)	.16 (.66)	.17 (.64)	1

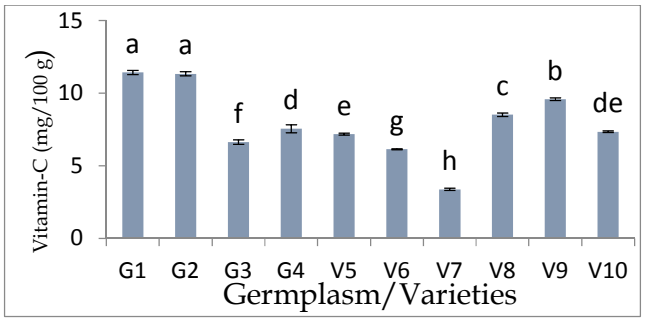

Fig. 2. Vitamin-C content of selected Sapota fruits

Vertical bar represent error bar with standard deviation

Here, V1= Local verity, V2= Local verity, V3= Local verity, V4= Local verity, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BARI-1, V9=BARI-2 and V10= BARI-3

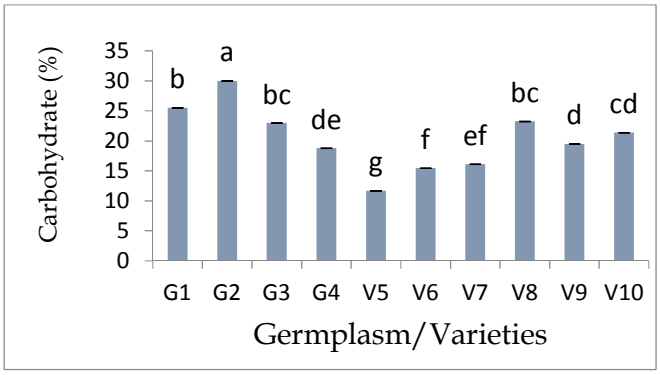

Fig. 3. Carbohydrate content of selected Sapota fruits

Vertical bar represent error bar with standard deviation

Here, V1= Local verity, V2= Local verity, V3= Local verity, V4= Local verity, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BARI-1, V9=BARI-2 and V10= BARI-3

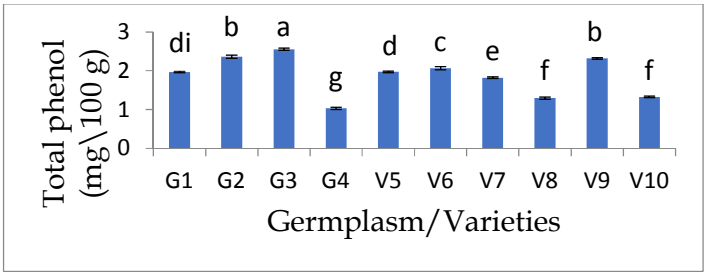

Fig. 4. Total Phenolic content of selected Sapota fruits

Vertical bar represent error bar with standard deviation

Here, V1= Local verity, V2= Local verity, V3= Local verity, V4= Local verity, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BARI-1, V9=BARI-2 and V10= BARI-3

The total sugars increased with the maturity of the fruit due to the increase in the non-reducing sugars [12]. This carbohydrate content variation could be the variation of maturity of the Sapota fruits.

Significant variation was observed in case of total phenolic content among the selected Sapota germplasm and released varieties. It was found that, the phenolic content was higher in local germplasm G_3 (2.537 mg\100 g), whereas the lower phenolic content was found in local germplasm G_4 (1.033 mg\100 gm) (Fig. 4). This variation could be the variation of maturity, the germplasm/variety and the overestimation of the phenolic compounds, because other agents

present in food, such as carotenoids, amino acids, sugars and vitamin C, can interfere [20, 21].

Significant variation was observed in case of total antioxidants content among the selected germplasm and released varieties. It was found that, the antioxidant was higher in V_9 variety (95.80 mg\100 g), whereas the lower antioxidant content was found in local germplasm G_4 (80.64 mg\100 g) (Fig. 5). Fruit and vegetable are a good sources of nutrients and antioxidants that might be ingested in form of edible films made from them [21]. There was no correlation was found between TSS and antioxidant content (Table 4). But there was a large correlation was found between the antioxidant and phenolic content.

Significant variation was observed in case of anthocyanin content among the selected Sapota germplasm and released varieties. It was found that, the anthocyanin content was higher in germplasm G_3 (1.807 µg\100 g), whereas the lower anthocyanin content was found in V_6 (.6667 µg\100 g), G_4 (.6100 µg\100 g), and V_7 (.5867 µg\100 g) (Fig. 6). Anthocyanin is well known because of their antioxidant properties and their pigmenting power that makes them attractive to be used as food colorants [22]. There was a small correlation was found between TSS and anthocyanin content (Table 4). With the increase of TSS content, the anthocyanin content was decreased. But a large correlation was found between the anthocyanin and phenolic content (Table 4).

Carotenoids are widely distributed in nature and they are liposoluble antioxidants [22]. Significant variation was observed in case of carotenoids content among the selected Sapota germplasm and released varieties. It was found that, the carotenoids content was higher in germplasm G_1 (5.173 µg\100 g) and G_3 (5.320 µg\100 g), whereas the lower carotenoids content was found in V_5 variety (1.277 µg\100 g) (Fig. 7). There was a small correlation was found between TSS and caroteniod content (Table 4). With the increase of TSS content, the carotenoid content was decreased.

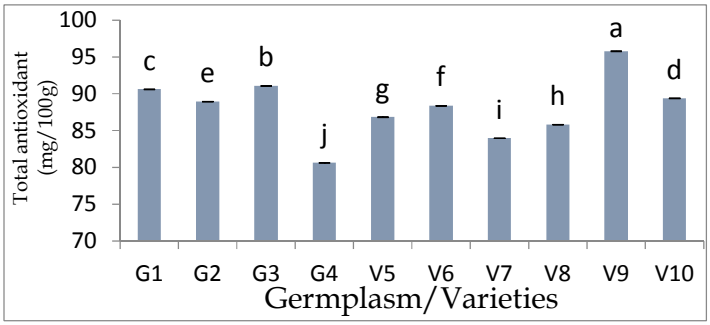

Fig. 5. Total antioxidant content of selected Sapota fruits

Vertical bar represent error bar with standard deviation

Here, V1= Local verity, V2= Local verity, V3= Local verity, V4= Local verity, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BARI-1, V9=BARI-2 and V10= BARI-3

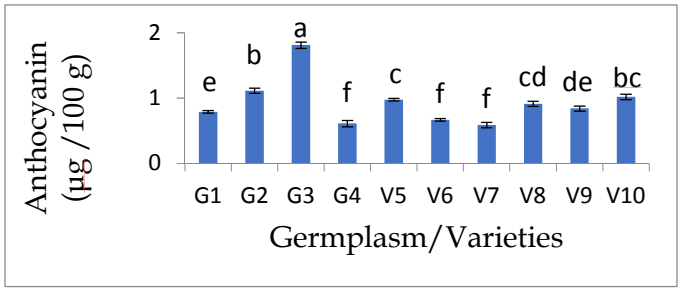

Fig. 6. Anthocyanin content of selected Sapota fruits

Vertical bar represent error bar with standard deviation

Here, V1= Local verity, V2= Local verity, V3= Local verity, V4= Local verity, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BARI-1, V9=BARI-2 and V10= BARI-3

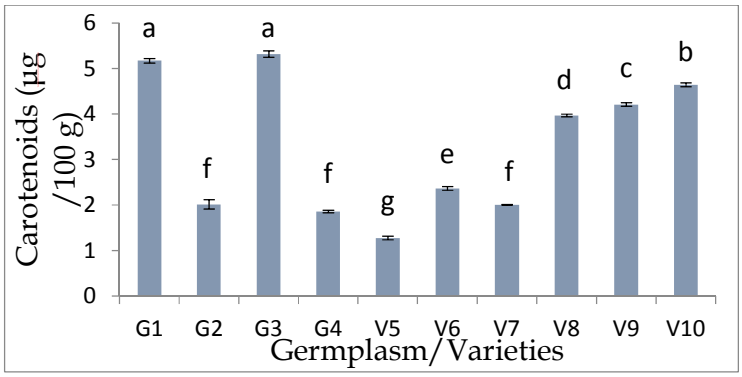

Fig. 7. Carotenoids content of selected Sapota fruits

Vertical bar represent error bar with standard deviation

Here, V1= Local verity, V2= Local verity, V3= Local verity, V4= Local verity, V5= BAU-1, V6= BAU-2, V7= BAU-3, V8= BARI-1, V9=BARI-2 and V10= BARI-3

4. CONCLUSION

From the above study nutritional contents varied among the selected germplasm and varieties. G_3 was superior with the highest length, width, weight, edible portion, phenolic and anthocyanin content among the studied germplasm and varieties. G_1, G_2, V_9 and V_{10} were also identified as a good source of phytochemicals. If people cultivate this fruit in their homestead, they will be economically benefited as well as get a good source of nutrients. As Sapota is a high nutritious fruit, it will help to mitigate the existing malnutrition in Bangladesh. This study was conducted based on the few germplasm and varieties. More research was needed on the existing germplasm in Bangladesh. That could be encouraged in further production, processing and marketing of Safoda.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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