The Bioscan 11(4): 2303-2305, 2016 (Supplement on Agronomy)
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.com

EFFECT OF DIFFERENT LEVEL OF INGREDIENTS USED IN READY-TO-USE SAPOTA POWDER MIXTURE ON ITS NUTRITIONAL STATUS

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KEYWORDS
sapota
sapota powder
ready-to-use
nutritional quality

Received on :
17.07.2016

Accepted on :
19.11.2016

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ABSTRACT
The main aim of this study was to make use of sapota powder which is good in nutrients more or less to that of raw sapota fruits, in the preparation of ready-to-use (RTU) sapota powder mixture and to know the effect of added ingredients such as sugar powder, cocoa powder, skimmed milk powder (SMP), almond powder and nutmeg powder at different concentrations, on the nutritional level of prepared RTU sapota powder mixture. The level of total sugars and non-reducing sugar content increased with the increase in the addition of cane sugar in the treatments. The higher amount of crude fibre (8.21 %), crude fat (4.77 %) and total ash (2.66 %) content were found in the RTU powder that was prepared by using lesser amount of sugar and higher amount of cocoa powder, skimmed milk powder and almond powder. Thus the higher amount of cocoa powder, skimmed milk powder and almond powder with lesser added cane sugar made the ready-to-use sapota powder mixture nutritionally superior.

INTRODUCTION

Sapota (*Manilkara zapota*) is a tropical fruit native to Central America and belongs to family Sapotaceae. India is the largest producer of sapota in the World followed by Mexico, Guatemala and Venezuela. The fruit is much valued for its sweet and delicious nature which is primarily used as dessert fruit. But is has short span of post harvest life. Even though shelf life of the fruits can be increased by checking the rate of transpiration, respiration and microbial infection, all these efforts may help to extend the shelf life of fresh fruit by a couple of weeks and may not provide answer to heavier supply of fruits to market during the peak season leading to slash in price.

Due to perishable nature of fruits, they require immediate processing to avoid Post Harvest losses (Sharma, 2014). But there is a need to develop low cost and practicable technology for processing sapota fruits into value added products. Thus, sapota fruit was processed through dehydration in to powder form which is practically feasible. Moreover, there is always a demand from the consumers all over the world for new products, which should be nutritious and delicately flavoured (Sharma, 2014). Therefore, the present investigation was undertaken to standardize the procedure for preparation of ready-to-use sapota powder mixture using different ingredients and to know the effect of added ingredients on the nutrient status of the prepared RTU sapota powder. Laxmi (2014) similarly standardized the technique for RTU banana powder mixture. The mixture of sapota powder, cane sugar powder, cocoa powder, skimmed milk powder, almond powder and nutmeg powder at definite proportions made the RTU sapota powder mixture more nutritious as the nutrients of added ingredients pooled together. Karanjalker *et al.* (2013) blended soya milk and guava nectar to mix the nutrients present in guava nectar and soya milk. Thus the paper deals with the standardisation of procedure for RTU sapota powder mixture which is good in nutrients.

MATERIALS AND METHODS

The study was conducted in the Department of Post Harvest Technology, College of Horticulture, Bagalkot, Karnataka. The sapota fruits were made into slices and then dried at 60ºC in a tray drier for a period of 21 hours. The dehydrated sapota slices were powdered with the help of mixer-grinder. Sapota powder so obtained was sieved in a stainless steel sieve to get fine powder of uniform particle size. For every 100g of sapota powder so obtained, the other ingredients *viz*., sugar powder, cocoa powder, skimmed milk powder, almond powder and nutmeg powder were mixed at different proportions as mentioned below.

Total sugars,in table 1 reducing sugars and non-reducing sugars were estimated as per the Di-nitro salicylic acid (DNS) method (Miller, 1972). The values obtained are expressed as per cent.

Crude fibre was estimated by acid-alkali digestion method. During acid treatment and subsequent alkali treatment oxidative hydrolytic degradation of native cellulose and considerable degradation of lignin occurs. The residue obtained after filtration was weighed, incinerated, cooled and

weighed again. The loss in weight gives the crude fibre content (Neubert *et al.*, 1940).

$$\text{Crude fibre}(\%) = \frac{\text{Weight of the fibre in the sample(g)}}{\text{Weight of the sample(g)}} \times 100$$

Total ash content was determined by burning the pre-weighed sample in a muffle furnace at 550°C for 6 hours (Rao and Bingren, 2009). After drying the residue ash weight was recorded and calculated by using the formula given below.

$$\text{Total ash}(\%) = \frac{\text{Weight of the ash(g)}}{\text{Weight of the sample taken(g)}} \times 100$$

Crude fat was determined by the soxhlet extraction technique followed by AOAC (2005). Fat content of the dried samples was easily extracted into organic solvent (petroleum ether) at 60 to 80°C and followed to reflux for 6 h. Percentage of fat content was calculated using the following formula:

$$\text{Crude fat}(\%) = \frac{\text{Weight of the fat in the sample (g)}}{\text{Weight of dry sample (g)}} \times 100$$

Statistical analysis

The Experimental design adopted was Completely Randomized Block Design with number of replications as three. Statistical analysis was performed using Web Agri Stat Package (WASP) Version 2 (Jangam and Thali, 2010). Significant differences among means at $P \leq 0.05$ were determined by post hoc tests using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The total sugar level in the RTU sapota powder mixture was found significantly different among the treatments due to the use of cane sugar at different levels in it (Table 2). The maximum level of total sugar was recorded in T_4 (68.78%) (100g sapota powder, 200g sugar, 25g cocoa powder, 15g skimmed milk powder, 10g almond powder and 1g nutmeg powder) followed by T_8 (67.22%) (100g sapota powder, 250g sugar, 50g cocoa powder, 25g skimmed milk powder, 15g almond powder and 2g nutmeg powder). The variation observed in the total sugar content, though the quantity of sugar added was more in T_8 (250g) than in T_4 (200g), may owe to the quantitative differences in the other ingredients used in the RTU sapota powder mixture. Laxmi (2014) also noticed similar differences in total sugars among the treatments in RTU banana powder mixture and she has attributed it to the variation in the quantity of table sugar added. Non-reducing sugar content

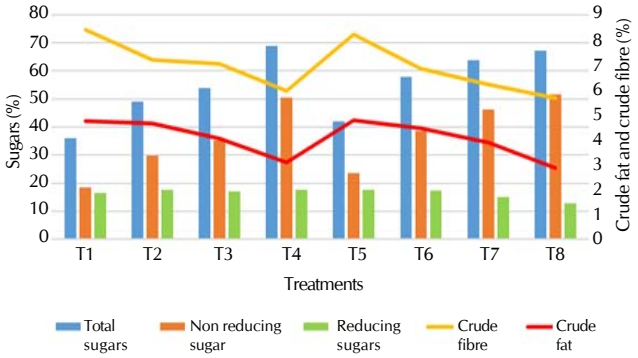

Figure 1: Effect of different levels of powder of sugar, cocoa, SMP, almond and nutmeg on total sugars (%), reducing sugars (%), non-reducing sugars (%), crude fat (%) and crude fibre (%) of RTU sapota powder mixture

was higher in T_8 (51.59%) followed by T_4 (50.44%) where the level of added sugar was maximum.

The data with respect to crude fibre, crude fat and total ash content were shown in Table 3. Crude fibre content in RTU sapota powder mixture was found to be higher in T_1 (8.42%) followed by T_5 (8.21%). This may be attributed to the presence of higher proportion of sapota powder which was in turn caused by lower level of added sugar in them. Other ingredients used in the present study that also contributed to the total crude fibre content include cocoa powder, almond and nutmeg powder. Thus, minimum crude fibre was recorded in T_4 (5.95%) followed by T_8 (5.99%) which possessed higher sugar concentration in them. El-Sharnouby *et al.* (2012) reported increase in fibre content in the biscuits supplemented with increased level of wheat bran: date powder. Ajila *et al.* (2008) also reported similar change in fibre with the addition of mango peel powder in biscuits. For similar reason, higher crude fat content was recorded in T_5 (4.77%) and T_1 (4.73), where as, lower per cent of crude fat was seen in T_8 (2.86%) followed by T_4 (3.09%). Addition of mango peel powder (MPP) and mango kernel powder (MKP) to biscuits significantly increased the fibre content and marginally increased the crude fat content; the increase in these parameters was proportional to the increase in the addition of MPP and MKP (Aslam *et al.*, 2014). Similar type of variation in fat was also reported by Mishra *et al.* (2014) in weaning food.

Ash is a measure of total amount of minerals within the food (Shahnawaz *et al.*, 2009). The maximum ash was found in T_5 (2.66%). The higher proportion of cocoa powder, skimmed milk powder, almond and nutmeg powder and lower level of sugar might have resulted in higher ash content observed in

Table 1 :

Treatments	Sapota (g)	Sugar (g)	Cocoa powder (g)	Skimmed milk powder (g)	Almond (g)	Nutmeg (g)
T_1	100	50	25	15	10	1
T_2	100	100	25	15	10	1
T_3	100	150	25	15	10	1
T_4	100	200	25	15	10	1
T_5	100	100	50	25	15	2
T_6	100	150	50	25	15	2
T_7	100	200	50	25	15	2
T_8	100	250	50	25	15	2

Table 2 : Effect of different levels of sugar, skimmed milk powder, cocoa, almond and nutmeg powder on total sugars, reducing sugars, and non-reducing sugars of ready-to-use sapota powder mixture

Treatments	Total sugars (%)	Reducing sugars (%)	Non -reducing sugars (%)
T_1	36.00^{g}	16.53^{ab}	18.49^{e}
T_2	49.00^{e}	17.52^{ab}	29.90^{d}
T_3	53.93^{d}	16.97^{ab}	35.04^{c}
T_4	68.78^{a}	16.37^{ab}	50.44^{ab}
T_5	42.13^{f}	18.01^{a}	23.54^{e}
T_6	57.96^{c}	17.25^{ab}	38.73^{c}
T_7	63.87^{b}	15.08^{bc}	46.34^{b}
T_8	67.22^{ab}	12.90^{c}	51.59^{a}
Mean	54.86	16.32	36.54
S E m ±	1.178	0.84	1.53
CD at 5%	3.537	2.525	4.587

Note: Values with the same superscripts in same column are not significantly different by Duncan Multiple Range Test at $P \leq 0.05$

Table 3 : Effect of different levels of sugar, skimmed milk powder, cocoa, almond and nutmeg powder on crude fibre, crude fat, total ash and water activity of ready-to-use sapota powder mixture

Treatments	Crude fibre (%)	Crude fat (%)	Total ash content (%)	Water activity
T_1	8.42^{a}	4.73^{a}	1.92^{bc}	0.22
T_2	7.19^{ab}	4.66^{a}	1.53^{cde}	0.22
T_3	7.02^{ab}	4.03^{ab}	1.10^{e}	0.23
T_4	5.95^{b}	3.09^{bc}	1.31^{de}	0.23
T_5	8.21^{a}	4.77^{a}	2.66^{a}	0.23
T_6	6.85^{ab}	4.46^{a}	1.92^{bc}	0.23
T_7	6.20^{b}	3.88^{abc}	2.10^{b}	0.21
T_8	5.99^{b}	2.86^{c}	1.61^{bcd}	0.23
Mean	6.87	4.06	1.76	0.22
S E m ±	0.5	0.35	0.16	0.01
CD at 5%	1.74	1.069	0.512	NS

Note: Values with the same superscripts in same column are not significantly different by Duncan Multiple Range Test at $P \leq 0.05$

this treatment (T_5). Similar variations in ash content has been reported by several workers (Mishra *et al.,* 2014, in weaning food sample of banana flour supplemented with pineapple pomace powder and moong bean flour; Dachana *et al*., 2010 in moringa leaves powder supplemented biscuits; and El-Sharnouby *et al*., 2012, in biscuits supplemented with wheat flour and wheat bran: date powder). Hence from the above discussion T_5 (100g sapota powder, 100g sugar, 50g cocoa powder, 25g skimmed milk powder, 15g almond powder and 2g nutmeg powder) was found to be nutritionally superior when compared to the other treatments. Fig 1 represents the amount of sugars, crude fibre and crude fat content in the RTU sapota powder mixture.

ACKNOWLEDGMENT

The authors are grateful to the Department of Post Harvest Technology, College of Horticulture, University of Horticultural Sciences, Bagalkot, Karnataka for providing all the necessary facilities required to carry out the present investigations.

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