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Effect of Different Concentrations of Sugar Syrup, Dipping Time and Drying Temperatures on Chemical Characteristics of Aonla Candy Fortified with Pomegranate Juice

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ABSTRACT: An experiment entitled "Effect of Different Concentrations of Sugar Syrup, Dipping Time and Drying Temperatures on Chemical Characteristics of Aonla Candy Fortified with Pomegranate Juice" was carried out in College of Horticulture at Fruit Science Laboratory, Rajendranagar during the year 2022-2023. The experiment was carried out with Completely Randomized Design (CRD) with 12 treatments and three replications. The purpose of this study was to determine how the quality of aonla candy was affected by the following factors: drying temperature (DT) (50°C, 60°C, and 70°C), time of dipping (TD) of aonla segments in pomegranate juice (30, 60, and 90 min), and sugar syrup concentration (SSC) (30 and 60 °Brix (°B). The observations in respect of chemical analysis was recorded from periodically at an interval of 90 days. During the storage period of 0, 30, 60, and 90 days, total soluble solids, total sugars, reducing sugars, titratable acidity showed an increasing pattern while, non-reducing sugars, brix acid ratio, total phenols, ascorbic acid, anti-oxidant activity showed decreasing pattern. Based on the data acquired in organoleptic evaluation and total acceptability, T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying) was found to be best treatment when the taste is concerned. Based on the data acquired in acidity and sugar content, T_2 – 30 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying) can be assumed to be most suitable for all groups of consumers (like children and diabetic patients).

Keywords: Aonla, candy, pomegranate juice, fortification, sensory and chemical properties.

INTRODUCTION

Aonla or Indian Gooseberry (*Emblica officinalis* Gaertn.) is an indigenous perennial fruit of Indian subcontinent. Due to its nutraceutical properties, improvement of elite varieties and hardy nature, aonla cultivation is spreading rapidly in the semi-arid regions of Maharashtra, Gujarat, Rajasthan, Tamil Nadu, Karnataka, Telangana and Andhra Pradesh. Aonla is chiefly known for its high concentration of vitamin C, next to Barbados cherry. The demand for aonla processed products is increasing day by day in domestic as well as in global market. Among the various processed products of aonla, aonla candy is most popular product. Aonla candy is usually prepared by dipping in sugar syrup followed by cabinet drying, which results in loss of nutritional quality. Hence, there is need to fortify it with nutrition-rich sweeteners.

Fortification is the practice of deliberately increasing the content of one or more micronutrients (*i.e.,* vitamins and minerals) in a food or condiment to improve the nutritional quality of the food and provide a public health benefit with minimal risk to health. Aonla candy is usually prepared by dipping in sugar syrup followed by cabinet drying, which results in loss of nutritional quality. Therefore, use of pomegranate juice in the preparation of aonla candy will increase its nutritional value as well as colour acceptability.

Pomegranate (*Punica granatum* L.) has high medicinal and nutritional value and one of the richest sources of antioxidants. Though aonla candy is nutritious, it is not gaining popularity as it is astringent in taste and has no flavor. The medicinal, nutritional and organoleptic quality of aonla candy can be improved to make it acceptable by all sections of consumers including children by fortifying it with natural resources like extracts, fruit juices etc. Such attempts were being made in the past to produce candy which is not only nutritionally delicious but also highly acceptable among the consumers, but very little work had been done in standardization.

MATERIAL AND METHODS

The raw material utilized for conducting the experiment consisted of fruits of aonla (*Emblica officinalis*) and pomegranate (*Punica granatum*). Aonla fruits were collected from the local market of Rajendranagar,

Hyderabad and pomegranate variety 'Bhagwa' was procured from Godoor, Mahabubabad district. Fresh fruits were used to analyze the assessment of quality and storability of aonla candy fortified with pomegranate juice. The experiment was carried out with Completely Randomized Design (CRD) with 12 treatments and three replications. In this study, the effects of drying temperature (DT) (50°C, 60°C, and 70°C), time of dipping (TD) of aonla segments in pomegranate juice (30, 60, and 90 min), and sugar syrup concentration (SSC) (30 and 60 °Brix (°B) were investigated in relation to the quality of aonla candy. Data on total soluble solids (TSS), total sugars, reducing sugars, non-reducing sugars, sugar acid ratio, total phenols, anti-oxidant activity, titratable acidity, ascorbic acid concentration, and organoleptic evaluation were recorded.

Flowchart for Preparation of Aonla Candy Fortified with Pomegranate Juice

A: Preparation of Aonla Segments

Fresh aonla fruits of uniform size are selected and washed with tap water
↓
Washed aonla fruits are blanched in hot water at a temperature of 85°C–90°C (8–10 min)
↓
Dipping in cold water
↓
Segments are separated manually and dipped in 2.5% salt solution for 24 hrs atambient temperature
↓
Segments are taken out and dipped in different concentrations of sugar syrup (30°, 60° Brix)

B: Pomegranate Juice Preparation

Pomegranate fruits are taken and washed with tap water
↓
The fruits are cut in half and arils are removed manually
↓
Arils used to prepare juice are placed in juice extractor

C: By Combining A+B

Samples are dipped in pomegranate juice for different time periods (30, 60 min)
↓
The pomegranate juice is allowed to drain for 2 min
↓
Drying of aonla segments at various temperatures (50°C, 60°C and 70°C)
↓
Packed in airtight glass jars

Aonla candies (dipped in 30° Brix) fortified with pomegranate juice

Aonla candies (dipped in 60° Brix) fortified with pomegranate juice

RESULTS AND DISCUSSION

Quality parameters

Total sugars (%): The data related to Total sugars (%) for 0, 30, 60 and 90 days storage was presented in Table 1. Fortification of aonla candy with pomegranate juice resulted in the decrease in total sugars (%) during 90 days storage. At 0^{th} day of storage, the maximum total sugars (62.8 %) was observed in T_8 – 60 °Brix (sugar

syrup) + 60min (dipping) + 50°C (drying) and minimum total sugars (21.23 %) was recorded in T_5 – 30 °Brix (sugar syrup) + 60min (dipping) + 70°C (drying). At 90 days of storage, the maximum total sugars (66.5 %) was observed in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying) and minimum total sugars (23.79 %) was recorded in T_5 – 30 °Brix (sugar syrup) + 60min (dipping) + 70°C (drying).

Increase of sugar syrup concentration and increased time of dipping in pomegranate juice might have resulted in increased total sugars content. This could be due to osmosis which causes decrease in moisture content (Muzzaffar *et al*., 2016). The similar findings of increase in total sugars with increase in storage period were observed by Bhatia (1985) in pear candy.

Reducing sugars (%): The data related to reducing sugars (%) for 0, 30, 60 and 90 days storage was presented in Table 1. Fortification of aonla candy with pomegranate juice resulted in the decrease in reducing sugars (%) during 90 days storage. At 0^{th} day of storage, the maximum reducing sugars (61.10 %) was observed in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum reducing sugars (19.41 %) was recorded in T_5 – 30 °Brix (sugar syrup) + 60min (dipping) +70°C (drying). At 90 days of storage, the maximum reducing sugars (65.6 %) was observed in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum reducing sugars (22.58 %) was recorded in T_5 – 30 °Brix (sugar syrup) + 60min (dipping) + 70°C (drying).

Higher sugar syrup concentration and increased dipping time of treatment T_8 might be the reason for increase in reducing sugars content which is due to conversion of increased amounts of sucrose to reducing sugars. Increase in reducing sugar during storage of products was also reported by Nayak *et al.* (2012) in amla candy, Vijay *et al*. (2005) in amla squash, Muzzaffar *et al.* (2016) in pumpkin candy.

Non-Reducing sugars (%): The data related to non-reducing sugars (%) for 0, 30, 60 and 90 days storage was presented in Table 1. Fortification of aonla candy with pomegranate juice resulted in the decrease in non-reducing sugars (%) during 90 days storage. At 0^{th} day of storage, the maximum non-reducing sugars (1.97 %) was observed in T_7 – 60 °Brix (sugar syrup) + 30min (dipping) + 50°C (drying), and minimum non-reducing sugars (1.70 %) was recorded in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) +50°C (drying). At 90 days of storage, the maximum non-reducing sugars (1.38%) was observed in T_6 – 30 °Brix (sugar syrup) + 60min (dipping) + 70°C (drying) and minimum non reducing sugars (0.80 %) was observed in T_{11} – 60 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying).

The non-reducing sugars was found to be decreased with the advancement of storage period. Decrease in non-reducing sugars might be due to inversion of non reducing sugars to reducing sugars due to the presence of acid in product (Divya *et al*., 2014); Rani and Bhatia (1985) in pear candy.

Total soluble solids (°Brix): The data related to total soluble solids (°Brix) for 0, 30, 60 and 90 days storage was presented in Table 2. Fortification of aonla candy with pomegranate juice resulted in the increase in total soluble solids (°Brix) during 90 days storage. At 0^{th} day of storage, the maximum TSS (68.96 °Brix) was observed in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum TSS (32.52 °Brix) was recorded in T_5 - 30°B (sugar syrup) + 30min (dipping) + 70°C (drying). At 90 days of storage, the maximum TSS (72.69°Brix) was observed in T8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum TSS (34.17 °Brix) was recorded in T_5 – 30 °Brix (sugar syrup) + 60min (dipping) +70°C (drying).

The effect of increase in sugar syrup concentration, time of dipping as well as drying temperature led to an increase in TSS. This might be due to conversion of polysaccharides into sugars during hydrolysis process. Increase in TSS might also be attributed to the reduction in moisture contents of the product with the advancement of storage. Increase in TSS with storage period was also reported by Tandon *et al.* (2003); Kumar and Singh (2001) in aonla candy, Manivasagan *et al.* (2006) in Karonda candy, Rani and Bhatia (1985) in pear candy.

Titratable Acidity (%): The data related to titratable acidity (%) for 0, 30, 60 and 90 days storage was presented in Table 2. Fortification of aonla candy with pomegranate juice resulted in the increase in titratable acidity (%) during 90 days storage. At 0^{th} day of storage, minimum titratable acidity (0.39 %) was recorded in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and the maximum titratable acidity (1.93 %) was observed in T_5 – 30 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying). At 90 days of storage, minimum titratable acidity (0.63 %) was recorded in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and the maximum titratable acidity (2.44 %) was observed in T_5 – 30 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying).

Increase in acidity can be attributed to the degradation of cell wall components to produce organic acids. Sandhu *et al.* (1994) also observed an increasing trend in acidity of papaya candy stored at ambient temperature.

Brix acid ratio: The data related to brix acid ratio for 0, 30, 60 and 90 days storage was presented in Table 2. Fortification of aonla candy with pomegranate juice resulted in the increase in brix acid ratio during 90 days storage. At 0^{th} day of storage, the maximum brix acid ratio (176.82) was observed in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum brix acid ratio (16.84) was observed in T_5 – 30 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying). At 90 days of storage, the maximum brix acid ratio (115.38) was observed in T_8 – 60 °Brix (sugar syrup) + 60 min (dipping) + 50°C (drying), followed by 110.70 in T_{10} – 60 °Brix (sugar syrup) + 60 min (dipping) + 60°C (drying) and minimum sugar acid ratio (14.00) was observed in T_5 – 30 °Brix (sugar syrup) + 30 min (dipping) + 70°C (drying).

Similar results have been recorded in pear candy by Rani

and Bhatia (1985); Manivasagan *et al.* (2006) in karonda candy.

Ascorbic acid content (mg/100g): The data related to ascorbic acid content (mg/100g) for 0, 30, 60 and 90 days storage was presented in Table 3. Fortification of aonla candy with pomegranate juice resulted in the increase in ascorbic acid content (mg/100g) during 90 days storage. At 0th day of storage, the maximum ascorbic acid content (210.22 mg/100g) was observed in T_2 – 30 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum ascorbic acid content (87.42 mg/100g) was recorded in T_{11} – 60 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying). At 90 days of storage, the maximum ascorbic acid content (175.71 mg/100g) was observed in T_2 – 30 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying) and minimum ascorbic acid content (54.58 mg/100g) was recorded in T_{11} – 60 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying).

Reduction in ascorbic acid content could be due to oxidation by trapped oxygen in the jars which results in formation of dehydroascorbic acid. The reduction in ascorbic acid content due to the oxidation of ascorbic acid was observed by Rani and Bhatia (1985) in pear candy. Loss in ascorbic acid content was also reported by Kumar and Singh (2001) in aonla products. The results obtained by Kumar and Singh (2001); Tripathi *et al*. (1988) in aonla products.

Total phenols (mg GAE/g): The data related to total phenols (mg GAE/g) for 0, 30, 60 and 90 days storage was presented in Table 3. Fortification of aonla candy with pomegranate juice resulted in the decrease in total phenols (mg GAE/g) during 90 days storage. At 0th day of storage, the maximum total phenols (109.46 mg GAE/g) was observed in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum total phenols (94.55 mg GAE/g) was observed in T_5 – 30 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying). At 90 days of storage, the maximum total phenols (101.46 mg GAE/g) was observed in T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum total phenols (65.02 mg GAE/g) was recorded in T_5 – 30 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying).

Thus, it was found that irrespective of treatments, total phenols decreased with the advancement of storage period. The decrease in total phenols could be resulted from oxidation, degradation of phenolic compounds and the polymerization of phenolic compounds with proteins (Varela-Santos *et al*., 2012). Kim and Padilla-Zakour (2004) noted that the decrease in total phenolics could be due to disruption in cell structure during processing. Similar findings were reported by Muzzaffar *et al.* (2016) in pumpkin candy.

Anti-oxidant Activity (% inhibition): The data related to anti-oxidant activity (% inhibition) for 0, 30, 60 and 90 days storage was presented in Table 3. Fortification of aonla candy with pomegranate juice resulted in the decrease in anti-oxidant activity (% inhibition) during 90 days storage. At 0 days of storage, the maximum anti-oxidant activity (82.91 %) was observed in T_2 – 30 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), and minimum anti-oxidant activity (60.10 %) was recorded in T_{11} – 60 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying). At 90 days of storage, the maximum anti-oxidant activity (79.30 %) was observed in T_2 – 30 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), followed by 78.25 % in T_4 – 30 °Brix (sugar syrup) + 60min (dipping) + 60°C (drying) and minimum anti-oxidant activity (55.86 %) was recorded in T_{11} – 60 °Brix (sugar syrup) + 30min (dipping) +70°C (drying).

Table 1: Effect of different concentrations of sugar syrup, dipping time and drying temperatures on total sugars (%), reducing sugars (%) and non-reducing sugars (%) of aonla candy fortified with pomegranate juice.

Treatments	Total sugars (%)				Reducing sugars (%)				Non-reducing sugars (%)			
	0	30	60	90	0	30	60	90	0	30	60	90
T_1	22.04	23.03	24.00	24.50	20.20	21.27	22.29	23.30	1.84	1.76	1.71	1.20
T_2	27.03	29.13	31.09	32.13	25.14	27.45	29.61	30.93	1.89	1.68	1.48	1.20
T_3	21.54	22.98	23.61	24.07	19.60	21.26	22.18	22.76	1.94	1.72	1.43	1.31
T_4	26.90	28.50	30.39	31.28	25.19	26.93	29.08	30.01	1.71	1.57	1.31	1.27
T_5	21.23	22.69	23.32	23.79	19.41	21.10	21.95	22.58	1.82	1.59	1.37	1.21
T_6	24.00	26.31	27.61	28.01	22.19	24.64	26.08	26.63	1.81	1.67	1.53	1.38
T_7	55.77	57.11	58.51	59.40	53.80	55.32	57.00	58.17	1.97	1.79	1.51	1.23
T_8	62.80	63.90	64.70	66.50	61.10	62.50	63.50	65.60	1.70	1.40	1.20	0.90
T_9	55.01	56.67	57.09	57.26	53.10	54.93	55.60	56.05	1.91	1.74	1.49	1.21
T_{10}	59.17	62.20	63.10	64.24	57.38	60.69	61.79	63.23	1.79	1.51	1.31	1.01
T_{11}	54.41	56.10	57.31	58.07	52.69	54.73	56.30	57.27	1.72	1.37	1.01	0.80
T_{12}	57.25	59.13	60.92	62.15	55.44	57.44	59.51	60.88	1.81	1.69	1.41	1.27
SEm	0.84	0.62	0.64	0.56	0.73	0.73	0.75	1.05	0.12	0.16	0.14	0.15
CD 5%	2.47	1.83	1.87	1.64	2.13	2.13	2.20	3.07	0.36	0.48	0.43	0.45

Table 2: Effect of different concentrations of sugar syrup, dipping time and drying temperatures on total soluble solids (°Brix), titratable acidity (%), brix acid ratio, of aonla candy fortified with pomegranate juice.

Treatments	Total Soluble Solids (°Brix)				Titratable Acidity (%)				Brix Acid Ratio			
	0	30	60	90	0	30	60	90	0	30	60	90
T_1	32.96	33.90	34.56	35.00	1.72	1.84	1.88	1.91	19.16	18.42	18.38	18.32
T_2	34.96	36.51	38.73	39.67	1.31	1.42	1.54	1.64	26.68	25.71	25.14	24.18
T_3	32.86	33.27	33.67	34.79	1.83	1.92	2.12	2.30	17.95	17.32	15.88	15.12
T_4	34.93	36.33	38.13	39.38	1.43	1.54	1.63	1.70	24.42	23.59	23.39	23.16
T_5	32.52	32.72	33.27	34.17	1.93	2.00	2.28	2.44	16.84	16.36	14.59	14.00
T_6	33.06	34.33	38.00	39.29	1.50	1.60	1.68	1.76	22.05	21.45	22.61	22.32
T_7	66.18	67.07	68.00	68.32	0.70	0.78	0.80	0.85	94.54	85.98	85.00	80.37
T_8	68.96	69.38	71.93	72.69	0.39	0.41	0.51	0.63	176.82	169.21	126.19	115.38
T_9	65.85	65.93	67.07	68.81	0.80	0.87	0.95	0.98	82.31	75.78	70.60	70.21
T_{10}	68.17	68.62	70.00	71.96	0.49	0.51	0.61	0.65	139.12	134.54	114.75	110.70
T_{11}	65.69	65.85	66.01	67.48	0.95	0.98	1.06	1.10	69.14	67.19	62.27	61.34
T_{12}	67.10	68.41	69.26	70.12	0.51	0.63	0.73	0.81	131.56	108.58	94.87	86.56
SEm	0.54	0.67	0.64	0.45	0.01	0.01	0.02	0.02	1.33	1.23	0.83	0.50
CD 5%	1.59	1.97	2.22	1.31	0.04	0.04	0.07	0.08	3.90	3.61	2.44	1.46

Table 3: Effect of different concentrations of sugar syrup, dipping time and drying temperatures on ascorbic acid (mg/100g), total phenols (mg GAE/g), anti-oxidant activity (% inhibition) of aonla candy fortified with pomegranate juice.

Treatments	Ascorbic acid (mg/100g)				Total phenols (mg GAE/g)				Anti-oxidant Activity (% inhibition)			
	0	30	60	90	0	30	60	90	0	30	60	90
T_1	181.11	178.25	165.07	153.46	155.97	145.00	130.95	127.53	77.13	76.34	74.74	73.53
T_2	210.22	201.31	193.27	175.71	156.44	146.98	139.39	133.30	82.91	81.28	80.39	79.30
T_3	167.12	158.81	143.55	134.59	154.66	143.43	130.01	126.68	76.26	75.23	73.90	72.68
T_4	194.96	185.43	175.71	173.36	156.25	146.31	137.53	132.25	81.84	80.48	79.02	78.25
T_5	151.01	142.18	139.22	125.14	154.55	143.01	127.77	125.02	75.23	74.33	73.78	72.02
T_6	188.81	178.11	167.38	155.94	155.99	145.52	137.02	130.14	79.98	77.68	76.53	75.14
T_7	98.28	86.51	77.02	66.57	167.11	165.94	161.68	157.88	61.93	60.69	59.68	57.88
T_8	116.28	109.58	94.22	89.30	169.46	167.93	164.93	161.46	64.60	63.08	62.93	61.46
T_9	92.07	84.92	75.16	66.83	166.77	165.06	161.39	156.86	60.49	58.90	58.47	56.81
T_{10}	106.46	98.49	89.92	75.26	169.33	167.37	164.54	160.93	64.06	63.37	62.54	61.43
T_{11}	87.42	77.41	68.45	54.58	165.12	164.72	157.47	155.81	60.10	59.48	57.39	55.86
T_{12}	100.41	90.56	81.05	73.48	168.78	167.22	163.70	160.37	63.41	62.52	61.70	60.37
SEm	0.84	0.62	0.64	0.56	1.59	1.19	1.14	1.00	0.87	0.54	0.19	0.23
CD 5%	2.47	1.83	1.87	1.64	4.64	3.49	3.34	2.93	2.54	1.58	0.57	0.70

T_1 - 30 °Brix (sugar syrup) + 30min (dipping) + 50°C (drying), **T_2** - 30 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), **T_3** - 30 °Brix (sugar syrup) + 30min (dipping) + 60°C (drying), **T_4** - 30 °Brix (sugar syrup) + 60min (dipping) + 60°C (drying), **T_5** - 30 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying), **T_6** - 30 °Brix (sugar syrup) + 60min (dipping) + 70°C (drying), **T_7** - 60 °Brix (sugar syrup) + 30min (dipping) + 50°C (drying), **T_8** - 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying), **T_9** - 60 °Brix (sugar syrup) + 30min (dipping) + 60°C (drying), **T_{10}** - 60 °Brix (sugar syrup) + 60min (dipping) + 60°C (drying), **T_{11}** - 60 °Brix (sugar syrup) + 30min (dipping) + 70°C (drying), **T_{12}** - 60 °Brix (sugar syrup) + 60min (dipping) + 70°C (drying).

The decrease in total anti-oxidant activity during storage is due to the loss of ascorbic acid. It might be due to the pattern of decline in anti-oxidant activity which was found to be directly proportional to the decline in ascorbic acid content. The decrease in anti-oxidant activity could be due to degradation of total phenolic compounds and vitamin C during storage. Antioxidant activity found to be strongly correlated with total phenolic content which have been found to be strongly correlated (Nisar *et al*., 2015). Similar findings were reported by Muzzaffar *et al*. (2016).

CONCLUSIONS

Based on the data acquired from the organoleptic evaluation and total acceptability, T_8 – 60 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying) was found to be best treatment when the taste is concerned. Based on the best data acquired in acidity and sugar content, T_2 – 30 °Brix (sugar syrup) + 60min (dipping) + 50°C (drying) can be assumed to be most suitable for all groups of consumers (like children and diabetic patients). Based on the results obtained this fortified candy can be recommended, as this product has a greater nutritive value which may also attract more market attention.

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Conflict of Interest. None.

REFERENCES

Divya, A. R., Jayashree, S. and Bhogi, B. (2014). Effect of storage methods on the nutritional quality of sapota candy. *Asian Journal of Dairy and Food Research*, *33*(2), 104-108.

Kim, D. O. and Padilla Zakour, O. I. (2004). Jam processing effect on phenolics and anti-oxidant capacity in anthocyanin rich fruits: cherry, plum, and raspberry. *Journal of Food Science*, *69*(9), 95-400.

Kumar, S. and Singh, I. S. (2001). Storage studies of aonla fruit products at ambient temperature. *Progressive Horticulture*, *33*(2), 169-173.

Manivasagan, S., Rana, G. S., Kumar, S. and Joon, M. S. (2006). Qualitative changes in Karonda (*Carissa carandas* Linn) candy during storage at room temperature. *Haryana Journal of Horticultural Sciences*, *35*, 19-21.

Muzzaffar, S., Baba, W. N., Nazir, N., Masoodi, F. A., Bhat, M. M. and Bazaz, R. (2016). Effect of storage on physicochemical, microbial and antioxidant properties of pumpkin (*Cucurbita moschata*) candy. *Cogent Food and Agriculture*, *2*(1), 1163650.

Nayak, P., Tondon, D. K., Bhatt, D. K. (2012). Study on changes of nutritional and organoleptic quality of flavored candy prepared from aonla (*Emblica officinalis* G.) during storage. *International Journal of Nutrition and Metabolism*, *4*(7), 100-106.

Nisar, S., Tahir, I and Ahmad, S. S. (2015). Modulation of flower senescence in *Nicotiana plumbagoinifolia* L. by polyamines. *Indian Journal of Plant Physiology*, *20*(2), 186–190.

Rani, U. and Bhatia, B. S. (1985). Studies on pear candy processing *Indian Food Packer*, *29*, 40-46.

Sandhu, G. S. (1994). Development of sugar coated candied products (M.Sc. thesis). Punjab Agricultural University, Ludhiana.

Tandon, K. S., Baldwin, E. A, Scott, J. W. and Shewfelt, R. L. (2003). Linking sensory descriptors to volatile and non-volatile components of fresh tomato flavor. *Journal of Food Science*, *68*, 2366–2371.

Tripathi, V. K., Singh, M. B. and Singh, S. (1988). Studies on comparative compositional changes in different preserved products of amla (*Emblica officinalis* Gaertn.) var. Banarasi. *Indian Food Packer*, *42*(4), 60-66.

Varela-Santos, E., Ochoa-Martinez, A., Tabilo-Munizaga, G., Reyes, J. E., Pérez-Won, M., Briones-Labarca, V. and Morales-Castro, J. (2012). Effect of high hydrostatic pressure (HHP) processing on physicochemical properties, bioactive compounds and shelf-life of pomegranate juice. *Innovative Food Science and Emerging Technologies*, *13*, 13-22.

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