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RESEARCH ARTICLE

PROCESSING AND STORAGE STUDIES OF AMLA SQUASH

[1]Sivakumar, K.P., [2]Nallakurumban, B. and [3]Balaji, T.

[1]Assistant Professor, Dept., of Family Resource Management & Consumer Science, Community Science College & Research Institute, TNAU, Madurai; [2] Associate Professor, Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Aruppukotai, Virudhunagr District-623 107; [3] Assistant Professor, Krishi Vigyan Kendra, Tamil Nadu Agricultural University Aruppukotai, Virudhunagr District-623 107

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ABSTRACT

Amla fruit is known for its antioxidant activity (Vitamin C) and medicinal properties. Value added products make the fruit available throughout the year and helps to promote the use of amla among the public. Hence an attempt was made to standardized squash with different treatments. The prepared amla squash were standardized on the basis of sensory evaluation. The chemical components and sensory evaluation of amla squash was analysed during storage period. The shelflife studies of amla squash was also done at room temperature and it has more shelflife with high organoleptic scores.

Corresponding author:** ***Sivakumar, K.P.,

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INTRODUCTION

Amla is a rich source of vitamin C, Which rank second next to Barbados cherry which has maximum vitamin C. It is found to posses anti-aging, expectorant, purgative, antibacterial, antioxidant, hypoglycemic activity (Rastogi RP and Mehrotra BN, 1993). Many different products have been reported from amla like ready – to- serve beverage, candy, jam, powder, Amla bar (Deka etal , 2001). Amla berries can be used as a valuable ingredient for the production of an herbal fermented beverage. The Indian gooseberry is native to India and also grows in tropical and subtropical regions. In addition of being an important medicinal herbs, it has potent antioxidant, several active tannoid principles (Emblicannin A, Emblicannin B, Punigluconin and Pedunculagin) have been identified which to account for its health benefits like antioxidant activity, antiaging property (Pater SS and Goyal RK , 2012). The Amla fruit, because of its high acidity and astringent taste is not preferred for direct consumption; hence it is consumed mainly after processing, as processed product. Present study was done to prepare preserved product utilizing bioactive rich underutilized fruit amla.

MATERIALS AND METHODS

Selection of Amla fruit: Fully matured and fresh Amla fruit (Kanchan Var.) were procured from the local market of Madurai city, Tamilnadu, India.

Standardization of Amla squash: Amla squash was standardization as per the FPO specification with addition of mint extract (1, 1.5 and 2%), honey (10, 15 and 20%) and date syrup (10, 15 and 20). The prepared amla squash samples were poured in to a sterilized bottle (cap.680 ml) leaving one inch head space and capped air tightly. The prepared amla squash was organoletpically evaluated using a 9 point hedonic scale by panel of 20 semi trained judges of Department of Food Science and Nutrition, Home Science College and Research Institute, Madurai.

CHEMICAL ANALYSIS

The methods adopted to analysis the various bioactive components of the amla squash before and during storage at regular intervals are given below.

Methods of chemical analysis

S.NO.	Chemical components	*Methods*	Reference
1.	Moisture	Hot air oven	AOAC (1995)
2.	Titrable acidity	Titrating against 0.01 N NaOH using phenolphthalein	Ranganna (1995)
3.	pH	pH meter	Hart and Fisher (1971)
4.	TSS	Hand refractometer	Saini *et al.*(2001)
5.	Reducing sugar and total sugars	Shaffer somogyi micro method	McDonlad and Foley (1960)
6.	Vitamin – C	2,6 dichlorophenol indophenol visual titration	Sadasivam and Manickam (1996)

STORAGE STUDY

The storage studies of prepared squash was analysis by noting the changes in the bioactive components and sensory evaluation at regular intervals before and during storage.

STATISTICAL ANALYSIS

The data obtained were subjected to statistical analysis to find out the impact of storage period and packaging materials on the quality of amla squash during storage. Factorial Completely Randomized Design (FCRD) was applied for the analysis (Rangaswamy.1995).

RESULTS AND DISCUSSION

Shelf life studies of amla squash during storage period

Amla squash: Data on the changes in chemical composition of amla squash during the storage is given in Table 1 and 2. The freshly prepared amla squash had 1.04g / 100 ml of acidity in control (T_1), 1.06,1.04 and 1.01 g of acidity in 100 ml of amla squash treated with 1,1.5 and 2% of mint extract (T_2), 1.04, 1.03 and 1.01g / 100 ml of acidity treated with 10, 15 and 20% of honey (T_3) and 1.05, 1.03 and 1.02 g of acidity in 100 ml of the amla squash treated with 10, 15 and 20% of date syrup (T_4). A slight variation was observed between the treatments during storage period. A gradual increase of acid content was observed during storage. After nine month of storage, the acidity was increased to 1.24 g per cent in control (T_1) 1.20, 1.19 and 1.21 g / 100 ml of acidity in amla squash treated with 1, 1.5, and 2% of mint extract (T_2), 1.21, 1.20 and 1.19 g per cent acid content treated with honey (T_3) and 1.20, 1.20 and 1.21 g / 100 ml of acidity treated with 10, 15 and 20% of date syrup (T_4) respectively. Saravanakumar and Manimegalai (1999) reported that the strawberry squash showed an increasing trend in acid content from 1.20 to1.43 percent during storage period. The patharnakh pear juice had 0.44 per cent acid content after 3 month of storage (Saini and Grewal, 2000). Similar trend was noted in the present study during storage.

Table 2. Summarizes the changes noted in the vitamin C content of the amla squashes during the study period. A slight variation was observed between the squashes throughout the storage period. The initial vitamin C content of amla squashes were 535.16 mg /100 ml in control (T_1) which had decreased to 528.08 mg/100ml after nine month of storage. Amla squash treated with mint extract samples (T_2) initially had 537.12, 537.20 and 537.21 mg/100 ml which had changed to 533.18, 532.94 and 532.68 mg per cent in 1, 1.5 and 2% respectively after nine month of storage at room temperature. Similarly the vitamin C content was 534.72, 534.86 and 535.13 mg/100ml in 10, 15 and 20% at initially. After nine month of storage, it was (honey treated amla squash) decreased to 532.15, 532.89 and 531.44 mg/100 ml in 10, 15 and 20% respectively. Likewise date syrup treated amla squash contained 534.33, 534.55 and 535.20 mg/ 100 ml in 10, 15 and 20% in freshly prepared samples at room temperature. After nine month of storage, it was decreased to 530.69, 531.48 and 531.77 mg of vitamin C per 100 ml in 10, 15 and 20% of date syrup treated samples. The vitamin C content of the stored sample showed a very slight difference between treatments throughout the study period. The vitamin C content of the mango squash was 2.10, 2.08 and 2.05mg/100ml in T_1, T_2 and T_3 during storage (Sivakumar and Malathi, 2004).

Total sugar and tannin content of amla squashes were decreased during storage period. Total sugar was 40.02 g per cent in control (T_1) 40.30, 40.28 and 40.26 in amla squash treated with 1, 1.5 and 2% mint extract (T_2), 40.22, 40.10 and 40.12 g per cent in amla squash treated with 10, 15 and 20% honey (T_3) and 40.10, 40.13 and 40.12 g per cent in amla squash treated with 10, 15 and 20% of date syrup (T_4) at end of the storage. The same result was observed from Sudhagar and Manimegalai (2001) reported that the total sugar content was decreased in pear squash (35.05 to 34.52%) and pear and pineapple blended squash (35.19 to 34.06%) during the storage period (6 months). Likewise the tannin content of amla squash was 3.40 mg/100 ml in T_1, 3.29, 3.23 and 3.23 mg/100 ml in amla squash treated with 1, 1.5 and 2% of mint extract (T_2), 3.25, 3.26 and 3.24 mg/100 ml in amla squash treated with 10, 15 and 20% honey (T_3) and 3.28, 3.23 and 3.18 mg/100 ml in amla squash treated with 10, 15 and 20% of date syrup (T_4) at end of the storage. Seshadri *et al.* (1994) revealed that tannin content decreased after storing for 60 days. The statistical examination of the data concluded that there was a significant difference in the bio active components between treatments and storage period.

ORGANOLEPTIC CHARACTERISTICS OF AMLA SQUASH

The amla squash was stored at room temperature (nine months) and their organoleptic characteristics viz., colour, appearance, texture, taste and overall acceptability were also evaluated using a 9 point hedonic scale as per the procedure given by watts *et al.,* (1989).

Amla squash: Neither the storage period nor the packaging materials had influenced the organolpetic evaluation score of the amla squash. Initially the amla squash had strong organoleptic scores at the end of the storage period, slight changes were observed. The score value were 8.5 (colour), 8.3 (appearance), 8.4 (texture), 8.4 (taste and overall acceptability), at the end of the storage (Table 3).

Table 1. Changes in chemical components of Amla squash during storage period

Treatments	Percentage levels	Acidity (g/100ml)					pH					Tannin (mg/100ml)				
		Storage period (in month)					Storage period (in month)					Storage period (in month)				
		Initial	1	3	6	9	Initial	1	3	6	9	Initial	1	3	6	9
Control (T_1)	-	1.04	1.05	1.10	1.17	1.24	3.38	3.37	3.34	3.29	3.20	3.85	3.82	3.75	3.65	3.40
Amla + Mint extract (T_2)	1%	1.06	1.08	1.12	1.17	1.20	3.41	3.40	3.37	3.33	3.25	3.69	3.68	3.60	3.51	3.29
	1.5%	1.04	1.06	1.10	1.15	1.19	3.46	3.44	3.43	3.36	3.27	3.68	3.66	3.55	3.46	3.23
	2%	1.01	1.05	1.09	1.14	1.21	3.47	3.46	3.44	3.37	3.24	3.69	3.66	3.59	3.45	3.23
Amla + Honey (T_3)	10%	1.04	1.08	1.10	1.16	1.21	3.50	3.48	3.46	3.41	3.27	3.72	3.70	3.61	3.47	3.25
	15%	1.03	1.05	1.10	1.17	1.20	3.52	3.52	3.49	3.40	3.26	3.71	3.68	3.61	3.48	3.26
	20%	1.01	1.03	1.06	1.12	1.19	3.55	3.54	3.51	3.40	3.25	3.74	3.70	3.65	3.51	3.24
Amla + Date syrup (T_4)	10%	1.05	1.05	1.10	1.16	1.20	3.51	3.50	3.47	3.37	3.25	3.61	3.59	3.53	3.45	3.28
	15%	1.03	1.08	1.10	1.15	1.20	3.52	3.50	3.47	3.40	3.24	3.65	3.62	3.53	3.41	3.23
	20%	1.02	1.03	1.09	1.14	1.21	3.57	3.55	3.53	3.40	3.25	3.69	3.64	3.55	3.40	3.18

Acidity

	SED	CD (0.01)
t	0.01451	0.03887 **
s	0.01026	0.02748 **
ts	0.03243	0.08691 NS

pH

	SED	CD (0.01)
t	0.00767	0.02055 **
s	0.00542	0.001453 **
ts	0.01715	0.04595 **

Tannin

	SED	CD (0.01)
t	0.00477	0.01280 **
s	0.00338	0.00905 **
ts	0.01068	0.02861 **

Table 2. Changes in chemical components of Amla squash during storage period

Treatments	Percentage levels	Total sugar (g/100ml)					Reducing sugar (g/100ml)					Vitamin C (mg/100ml)				
		Storage period (in month)					Storage period (in month)					Storage period (in month)				
		Initial	1	3	6	9	Initial	1	3	6	9	Initial	1	3	6	9
Control (T_1)	-	41.04	41.00	40.88	40.35	40.02	2.93	2.99	3.27	3.66	3.96	535.16	535.10	534.82	533.45	528.08
Amla + Mint extract (T_2)	1%	40.95	40.93	40.80	40.52	40.30	2.80	2.85	2.99	3.42	3.81	537.12	537.03	536.81	535.64	533.18
	1.5%	40.91	40.87	40.71	40.56	40.28	2.76	2.81	2.97	3.32	3.79	537.20	537.15	536.88	535.11	532.94
	2%	40.90	40.87	40.75	40.58	40.26	2.71	2.80	2.94	3.27	3.77	537.21	537.11	536.84	535.05	532.68
Amla + Honey (T_3)	10%	40.70	40.64	40.58	40.38	40.22	2.92	2.97	3.19	3.54	3.92	534.72	534.58	534.31	533.79	532.15
	15%	40.74	40.66	40.41	40.22	40.10	2.95	3.01	3.22	3.58	3.95	534.86	534.80	534.54	533.22	532.89
	20%	40.80	40.70	40.52	40.31	40.12	2.97	3.05	3.23	3.60	3.95	535.13	535.08	534.85	533.85	531.44
Amla + Date syrup (T_4)	10%	40.72	40.70	40.53	40.30	40.10	3.05	3.10	3.25	3.64	3.99	534.33	534.25	533.99	532.66	530.69
	15%	40.75	40.66	40.54	40.32	40.13	3.09	3.19	3.38	3.72	4.05	534.55	534.43	534.17	533.33	531.48
	20%	40.85	40.80	40.62	40.34	40.12	3.15	3.21	3.50	3.81	4.18	535.20	535.09	534.79	533.59	531.77

Total sugar

	SED	CD (0.01)
t	0.00687	0.1841 **
s	0.00486	0.1302 **
ts	0.01536	0.04117 **

Reducing sugar

	SED	CD (0.01)
t	0.80706	2.16268 NS
s	0.57068	1.52925 NS
ts	1.80465	4.83590 NS

Vitamin C

	SED	CD (0.01)
t	32.91136	88.19215 NS
s	23.27184	62.36127 NS
ts	73.59203	197.20364 NS

Table 3. Organoleptic evaluation of amla squash during storage

Storage period (in days)	Organoleptic characteristics				
	Colour	Appearance	Texture	Taste	Overall acceptable
Initial	8.8	8.5	8.6	8.5	8.5
90	8.6	8.6	8.5	8.5	8.5
180	8.5	8.5	8.4	8.4	8.4
270	8.5	8.3	8.4	8.4	8.4

CONCLUSION

It can be concluded that amla squash is highly nutritious and medicinal properties because of the amla squash can be prepared with substitute of date syrup and mint extract. The shelflife of amla squash was found to be highly acceptable at ambient conditions.

FUTURE SCOPE

The several investigations was made on nutraceuticals properties of amla has to be retaining for curing of different diseases. There is a possibility that it will lead to the development of new food based drugs for control of disease management for humans in the future.

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