

Standardization of processing technology and sensory evaluation of avocado squash blended with sapota and aloe

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SUMMARY : Different recipes of avocado squash blended with sapota and aloe was prepared with 30 and 35 per cent juice, 40°B and 45°B TSS with 1 per cent acidity. The product was subjected to chemical analysis at an interval of 30 days during the storage period of 120 days. The chemical parameters viz., TSS, pH, total and reducing sugars increased whereas, the acidity and non-reducing sugar content decreased throughout the storage period. Product was free from microbial spoilage because of the addition of sodium benzoate (600 ppm) as a preservative during storage. Sensory evaluation data showed that the blended avocado squash with 30 per cent juice, 45°B TSS and 1.0 per cent acidity was a best recipe and scored high for overall acceptability during the storage period of four months.

Key Words : Processing, Avocado, Squash blending, Sapota and aloe

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Avoocado (*Persea americana* Mill.) is a subtropical and highly nutritious fruit also known as butter fruit. It belongs to the family Lauraceae. 100g of edible portion of fruit consists of fat (26.40g), protein (1.70 g), vitamin A (0.04 mg), vitamin B (0.21 mg), vitamin C (14 mg) and minerals like potassium (460 mg), phosphorus (29 mg), calcium (29 mg), magnesium (22 mg) but low in carbohydrate (5.10 g) and can be recommended as a high energy food for diabetic patients. Sapota is mainly consumed as a fresh fruit is a good source of fat, fibre and minerals. Aloe leaf contains a semisolid gel is a

rich source of vitamins, minerals, amino acids, sterols *etc.*, Because of its immense health benefits, it is used as a nutraceutical in the form of juice, emulsion and syrup. In order to utilize the enormous nutritional and medicinal properties of these fruits along with aloe leaf, present investigation was carried out to develop and evaluate the avocado squash blended with sapota and aloe in terms of various chemical parameters and sensory evaluation.

EXPERIMENTAL METHODS

The research was carried out at the Division of Horticulture, Gandhi Krishi Vignana Kendra, University of Agricultural Sciences, Bengaluru. The avocado and sapota fruits were procured from local vendors and aloe leaves were obtained from Sanjivini Vatika of the Division of Horticulture.

Juice from avocado and sapota fruits was extracted after the fruits were washed, cut into two halves and the pulp was scooped out from the fruits manually, removing the seeds. The pulp was blended in a wearing blender with equal amount of

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water (1:1 w/v) and the juice was filtered with muslin cloth.

Extraction of aloe juice:

The leaves were washed, cut transversely and the yellow juice was allowed to drip down and the traces of it were removed by wiping with a cloth. The leaves were washed thoroughly again and the upper thorn tips, rind and lower epidermal layers were removed with the help of stainless steel knife. The leaves were given transverse cut and the pulp/gel was extracted by scooping with the help of a stainless steel knife and was blended in a wearing blender with equal amount of water and the juice was filtered with muslin cloth.

Blended avocado juice with sapota and aloe was prepared in the ratio of 50:30:20. Afterwards the recipes for avocado squash was prepared with 30 and 35 per cent blended juice and TSS 40^oB and 45^oB with 1.0 per cent acidity.

Preparation of blended avocado squash and chemical analysis:

The squash was prepared by using the blended juice of avocado, sapota and aloe in the ratio of 50: 30: 20. Sugar syrups having TSS Of 40^oB and 45^oB were prepared by dissolving sucrose in warm water and the required amount of blended juice was added to two sets of these sugar solutions as per the requirement. As the TSS values were dropped due to the

addition of juice, TSS values were readjusted by addition of sucrose while, acidity was adjusted by adding citric acid. Sodium benzoate (600 ppm) was added as a preservative to the product. The final product was filtered with muslin cloth and was filled into pre-sterilized glass bottles of 200 ml capacity each. The bottles were corked using leg operated crown corking machine. The sealed bottles were then kept in boiling water for half an hour for pasteurization and were stored at room temperature.

The TSS was analyzed by using Erma-hand refractometer, titratable acidity and sugars were estimated by using the method described by Ranganna (1997). Organoleptic evaluation of the product was done by a panel members of 5 judges by hedonic rating scale method (Amerine *et al.*, 1965).

EXPERIMENTAL FINDINGS AND ANALYSIS

The product samples were analyzed for changes in their chemical constituents at an interval of 30 days during the storage period. Throughout the storage period a continuous increasing trend was observed in the total soluble solids (Table 1). The maximum (45^oB to 46.93^oB) increase in TSS content was observed in the treatment with 35 per cent juice, 45^oB TSS while, the minimum (40^oB to 41.53^oB) TSS content was noticed

Table 1 : Changes in TSS, pH and acidity of avocado squash blended with sapota and aloe during the storage period of 120 days

Treatments	TSS (^o B)					pH					Acidity (%)				
	Storage period (days)														
	Fresh	30	60	90	120	Fresh	30	60	90	120	Fresh	30	60	90	120
Juice (%)															
30 (C ₁)	42.50	42.88	43.48	43.73	44.08	3.01	3.04	3.05	3.07	3.09	1.00	0.93	0.90	0.87	0.84
35 (C ₂)	42.50	42.98	43.68	43.98	44.23	3.01	3.03	3.04	3.06	3.08	1.00	0.97	0.94	0.91	0.88
F- test	NS	*	*	*	*	NS	*	*	*	*	NS	*	*	*	*
S.E.±	0.08	0.03	0.03	0.03	0.03	0.01	0.003	0.003	0.003	0.003	0.01	0.003	0.003	0.003	0.003
C.D. (P=0.05)	-	0.09	0.09	0.10	0.10	-	0.010	0.010	0.009	0.010	-	0.010	0.010	0.011	0.009
TSS (^o B)															
40 ^o B (T ₁)	40.00	40.33	41.08	41.38	41.68	3.01	3.02	3.03	3.05	3.07	1.00	0.94	0.91	0.88	0.85
45 ^o B (T ₂)	45.00	45.53	46.08	46.33	46.63	3.01	3.04	3.05	3.07	3.09	1.00	0.97	0.94	0.91	0.88
F-test	*	*	*	*	*	NS	*	*	*	*	NS	*	*	*	*
S.E.±	0.08	0.03	0.03	0.03	0.03	0.01	0.003	0.003	0.003	0.003	0.01	0.003	0.003	0.003	0.003
C.D. (P=0.05)	0.24	0.09	0.09	0.10	0.10	-	0.010	0.010	0.010	0.010	-	0.009	0.010	0.010	0.010
Interaction															
C ₁ T ₁	40.00	40.33	41.03	41.33	41.83	3.01	3.02	3.03	3.05	3.07	1.00	0.91	0.88	0.85	0.82
C ₁ T ₂	45.00	45.43	45.93	46.13	46.33	3.00	3.05	3.06	3.08	3.10	1.00	0.95	0.92	0.89	0.86
C ₂ T ₁	40.00	40.33	41.13	41.43	41.53	3.00	3.03	3.04	3.05	3.07	1.00	0.96	0.93	0.90	0.88
C ₂ T ₂	45.00	45.63	46.23	46.53	46.93	3.01	3.03	3.04	3.06	3.08	1.00	0.98	0.95	0.92	0.89
F-test	NS	*	*	*	*	NS	*	*	*	*	NS	*	*	*	*
S.E.±	0.11	0.04	0.04	0.05	0.05	0.01	0.003	0.003	0.003	0.003	0.01	0.003	0.003	0.003	0.003
C.D. (P=0.05)	-	0.13	0.13	0.15	0.15	-	0.010	0.009	0.010	0.010	-	0.010	0.009	0.010	0.010

*indicates significance of value at P=0.05;

NS = Non-significant

C₁T₁: 30% juice and 40^oB TSS, C₁T₂: 30% juice and 45^oB TSS, C₂T₁: 35% juice and 40^oB TSS, C₂T₂: 35% juice and 45^oB TSS.

Table 2 : Changes in total, reducing and non-reducing sugars content of avocado squash blended with sapota and aloe during the storage period of 120 days

Treatments	Total sugars (%)					Reducing sugars (%)					Non-reducing sugars (%)				
	Storage period (days)														
	Fresh	30	60	90	120	Fresh	30	60	90	120	Fresh	30	60	90	120
Juice (%)															
30 (C ₁)	4.59	5.10	6.50	7.91	10.57	2.97	2.25	3.73	5.26	8.34	2.97	2.85	2.78	2.65	2.23
35 (C ₂)	4.76	5.17	6.86	7.93	11.63	3.14	2.27	4.16	5.33	9.11	3.14	2.90	2.69	2.60	2.52
F- test	*	*	*	*	*	NS	*	*	*	*	*	*	*	*	*
S.E.±	0.01	0.01	0.01	0.01	0.02	0.01	0.006	0.006	0.003	0.003	0.001	0.006	0.003	0.006	0.02
C.D. (P=0.05)	0.02	0.02	0.02	0.02	0.08	-	0.02	0.02	0.010	0.010	0.003	0.020	0.010	0.020	0.08
TSS (⁰ B)															
40 ⁰ B (T ₁)	4.54	4.95	6.41	6.75	11.32	2.99	2.07	3.68	4.12	9.09	2.99	2.88	2.74	2.63	2.23
45 ⁰ B (T ₂)	4.81	5.32	6.95	9.09	10.88	3.12	2.44	4.21	6.46	8.37	3.12	2.87	2.73	2.62	2.51
F- test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.E.±	0.01	0.01	0.01	0.01	0.02	0.01	0.006	0.006	0.003	0.003	0.001	0.006	0.003	0.006	0.02
C.D. (P=0.05)	0.02	0.02	0.02	0.02	0.08	0.02	0.020	0.020	0.010	0.010	0.003	0.020	0.010	0.020	0.08
Interaction															
C ₁ T ₁	4.46	5.00	6.25	6.56	10.73	1.55	2.20	3.54	3.93	8.84	2.91	2.81	2.72	2.63	1.89
C ₁ T ₂	4.71	5.20	6.75	9.25	10.41	1.68	2.30	3.92	6.58	7.85	3.03	2.90	2.84	2.67	2.56
C ₂ T ₁	4.62	4.90	6.57	6.94	11.91	1.55	1.95	3.82	4.31	9.33	3.07	2.95	2.76	2.63	2.58
C ₂ T ₂	4.90	5.43	7.14	8.92	11.36	1.70	2.59	4.51	6.34	8.90	3.20	2.84	2.63	2.58	2.46
F- test	NS	*	*	*	*	NS	*	*	*	*	*	*	*	*	*
S.E.±	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.006	0.006	0.001	0.01	0.006	0.01	0.02
C.D. (P=0.05)	0.03	0.03	0.03	0.03	0.12	-	0.03	0.03	0.020	0.021	0.003	0.03	0.021	0.03	0.11

* indicates significance of value at P=0.05; NS = Non-significant

C₁T₁: 30% juice and 40⁰B TSS, C₁T₂: 30% juice and 45⁰B TSS, C₂T₁: 35% juice and 40⁰B TSS, C₂T₂: 35% juice and 45⁰B TSS.

in 35 per cent Juice, 40⁰B TSS during the storage period of 120 days. This might be due to the increase in total sugars by inversion of polysaccharides like starch and cellulose into simpler soluble molecules in the presence of organic acids and also due to the inversion of added sucrose into simpler soluble substances in the course of time. There was a gradual increase in the pH content of the blended avocado nectar samples throughout the storage period (Table 1). The treatment with 30 per cent juice, 45⁰B showed the maximum (3.0 to 3.10) increase in pH was recorded in the treatment 30 per cent juice, 40⁰B TSS. A corresponding decrease in acidity of these products could be the reason for the changes in pH. These results are in confirmation with the reports of Ramajayam and Jaganath (2001) in kokum blended simarouba squash and Cabrera *et al.* (2009)

in campbell grape juice.

Acidity of the prepared products gradually delined during storage. The maximum (1% to 0.82%) reduction in acidity was noticed in the treatment with 30 per cent juice, 40⁰B TSS and the minimum (0.89%) reduction was observed in the treatment with 35 per cent juice 45⁰ B TSS as shown in Table1. The decrease in acidity might also be due to the hydrolysis of polysaccharides and non-reducing sugars where an organic acid is utilized for converting it into reducing sugars. Similar results were obtained by Thripathi *et al.* (1988) in most fruit beverages, Attri *et al.* (1998) in apricot pulp blended with sand pear juice and Gajanana (2002) in aonla juice.

The concentrations of total sugars of blended squash increased gradually during storage (Table 2). At the end of the

Table 3 : Mean sensory scores of avocado squash blended with sapota and aloe when fresh and at the end of 120 days of storage

Treatments	Colour		Taste		Aroma and flavor		Overall acceptability	
	Fresh	120 days	Fresh	120 days	Fresh	120 days	Fresh	120 days
C ₁ T ₁	3.4	3.0	3.6	3.0	3.4	3.2	3.5	3.0
C ₁ T ₂	4.0	3.6	4.6	3.4	3.8	3.4	4.1	3.5
C ₂ T ₁	3.6	3.2	3.8	3.2	3.2	3.0	3.5	3.1
C ₂ T ₂	3.6	3.2	4.0	3.2	3.4	3.2	3.7	3.1

C₁T₁: 30% juice and 40⁰B TSS,C₁T₂: 30% juice and 45⁰B TSS,C₂T₁: 35% juice and 40⁰B TSS,C₂T₂: 35% juice and 45⁰B TSS.

storage the maximum (11.91%) increase was observed in the treatment with 35 per cent juice 40°B TSS. The minimum (10.41%) increase was noticed in the treatment with 30 per cent juice and 45°B TSS. This could be due to the acid hydrolysis of polysaccharides and also due to increase in the total soluble solids and ultimate decrease in non-reducing sugars.

Continuous increase in reducing sugar content was observed in the blended squash as shown in Table 2 during 120 days of storage. The maximum (9.33%) increase was observed in the treatment with 35 per cent juice, 40°B TSS while, the treatment with 35 per cent juice, 40°B TSS showed the minimum (7.85%) increase in the reducing sugar content. This could be due to the inversion of non-reducing sugars to reducing sugars caused by acids present in the products.

Significant decrease in non-reducing sugar content was observed in the blended avocado squash (Table 2). The maximum (1.89%) reduction was observed in the treatment with 35 per cent juice, 40°B. The treatment with 35 per cent juice, 40°B showed the minimum (2.58%) reduction in non-reducing sugar content. Similar results were obtained by Singh (2005) in blended bael RTS, Jain *et al.* (2006) in aonla squash and Garg *et al.* (2008) in blended juices of aonla, apple and ginger.

Sensory evaluation data showed that the recipe with 35 per cent juice, 45°B TSS and 1.0 per cent acidity scored the highest score for overall acceptability as shown in Table 3.

Conclusion:

The recipe with 30 per cent juice, 45° B TSS and 1.0 per cent acidity recorded as the best recipe as per the organoleptic evaluation.

LITERATURE CITED

Amerine, M.A., Pangborn, R.M. and Roesster, E.B. (1965). *Principles of sensory evaluation of foods*, Academic press, LONDON (UNITED KINGDOM).

Attri, B.L., Lal, B.B. and Joshi, V.K. (1998). Physico-chemical characteristics, sensory quality and storage behaviour of temperate fruit juices/pulps. *Indian Food Packer*, **52** (6): 36-38.

Cabrera, G.S., Jang, J., Kim, T.S., Lee, R.Y., Lee, H., Caung, S.H. and Moon, D.K. (2009). Effects of processing time and temperature on the quality components of campbell grape juice. *J.Food Processing & Preservation*, **33** (3): 133-138.

Gajanana, K. (2002). Processing of aonla (*Emblca officinalis* Gaerth.) fruits. M.Sc (Hort.) Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Garg, V., Barwal, B.S. and Sarera, S. (2008). Preparation and evaluation of vitamin-C enriched drink. *J.Food Sci. Technol*, **45** (6): 524-526.

Jain, Vijay, Singh, P. and Singh, A.K. (2006). Screening of aonla cultivars for making squash. *Indian J. Arid Hort.*, **1** (1): 44-46.

Ramajayam, D. and Jaganath (2001). Studies on the value added simarouba-kokum and simarouba squash blends. *South Indian Hort.*, **51** (1-6): 122-125.

Ranganna, S. (1997). *Manual of analysis of fruit and vegetable products*. IInd edition. Tata McGraw-Hill Publishing Company Ltd., NEW DELHI, India.

Surendar Singh, R.K., Godara, R.S., Saini and Sharma, J.R. (2005). Standardization of processing technology for bael/ blended bael (*Aegle marmelos*) ready-to-serve beverages. *Har.J. Hort Sci.*, **34** (3-4): 263-265.

Tripathi, V.K., Sing, M.B. and Singh, S. (1998). Studies on comparative compositional changes in different preserved products of aonla. *Indian food packer*, **42** (4): 60-66.

