

QUALITY EVALUATION AND STORAGE STABILITY OF BLENDED ALOE VERA-JAMUN JUICE

VINOD WANCHOO, JAGMOHAN SINGH AND DEEP SHIKHA SHARMA*

Division of Food Science and Technology, Chatha, S.K.U.A.S.T., Jammu - 180 009 (J&K), INDIA

e-mail: deepshikha20202@yahoo.com

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*Corresponding author

ABSTRACT

Aloe vera as well as jamun fruit were worldwide novel valuable ingredient for food industry. An attempt has been made in this study to prepare blended Aloe vera- jamun juice to explore the possibility of its utilization in beverage industries as these serve as dietary supplements and are rich in vitamins, minerals, vital micronutrients. The Aloe vera and jamun juice were blended in the ratio of 100:00, 90:10, 80:20, 70:30, 60:40, 50:50 and 40:60. Juice prepared was stored under ambient conditions in 250 ml pre-sterilized glass bottles and subjected to physico-chemical and sensory evaluation at 30 days interval for a period of 90 days. Highest total soluble solids (7.90 °Brix), reducing sugar (2.77%) and acidity (0.973%) were recorded in treatment T₇ (60:40:: Aloe vera: Jamun). The maximum ascorbic acid content of 12.57mg/100g was found in treatment T₇ (60:40:: Aloe vera: Jamun) blended juice. The result shows that sensory evaluation of the treatment T₆ (50:50: Aloe vera: Jamun) recorded highest scores for colour (8.26) and flavour (7.92) followed by treatment by T₅ (60: 40: Aloe vera: Jamun). On the basis of storage studies all the treatments does not show any change in quality attributes for a period of three months.

INTRODUCTION

Aloe vera (*Aloe barbadensis* Miller) is a vitally important plant that has been used in folklore for different purposes, such as for healing boils, wounds, burns and treatment of different ailments. It has been used for its medicinal value for several thousand years. Its applications have been recorded in ancient cultures of India, Egypt, Greece, Rome and China. Aloe vera leaves are formed by a thick epidermis (skin) covered with cuticle surrounding the mesophyll, which can be differentiated into chlorenchyma cells and thinner walled cells forming the parenchyma (fillet). The parenchyma cells contain a transparent mucilaginous jelly which is referred to as Aloe vera gel. The leaf exudate contains anthraquinones, particularly barbaloin which appear to be responsible for its bitter taste and cathartic effect (Dagne *et al.*, 2000).

As per the statistical figures obtained from J&K Department of Horticulture Jammu, the present area under Aloe vera is about 261.52 ha with an annual production of 6024 metric tonnes (Anonymous, 2014). Many attempts have been reported on utilization of aloe vera in the formulation of various products but still there is a lot of scope to explore the possibility of its utilization in beverage industries.

Jamun (*Syzygium cumini* L.) fruit belongs to the family Myrtaceae and has been valued in Ayurveda and Unani system of medication for possessing variety of therapeutic properties (Chitnis *et al.*, 2012). World production of Jamun is estimated at 13.5 million tonnes out of which 15.4 % is contributed by India. India ranks second in production of Jamun in the world. Jamun fruit has long been used for the treatment of diabetes

prior to the discovery of insulin and possess various pharmacological properties such as antibacterial, antifungal, antiviral, anti-genotoxic, anti-inflammatory, anti-ulcer genic, cardio protective, anti-allergic, anticancer, anti-diarrheal and hypoglycaemic (Baliga *et al.*, 2011). In spite of high nutritive value not much break through seems to have been made in efficient utilization of jamun fruit in the field of beverage industry. Aloe vera being bitter and unpleasant in taste, its palatability can be enhanced with addition of some other fruit juices. Thus, blending of jamun juice with aloe vera juice offers many opportunities to develop balanced health product high in quality in respect of both sensory and nutritional aspects

Therefore keeping these aspects in view, present study was conducted with the objectives for the development of blended aloe vera-jamun juice.

MATERIALS AND METHODS

The present investigation entitled, "Quality evaluation and storage stability of blended Aloe vera-jamun juice" was carried out in the Division of Food Science and Technology, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences & Technology Jammu during 2013-14. The jamun fruits and aloe vera leaves were obtained from the orchards of Raipur village, Block –Marh, District Jammu. Aloe vera juice was extracted by hand filleting method. Care was taken to avoid contact with alion and aloe-emodin (Bitter-tasting and harsh laxatives) which is present in outer part of leaf. The fully expanded, mature, healthy and fresh leaves of aloe vera having

length of approximately 55 to 80 cm were selected from the plant and washed with tap water. The top and the bottom rinds were removed and then the aloe vera gel was obtained and it was pulverized for 10-20 minutes in order to avoid enzymatic browning to convert gel into free flowing juice. The juice was filtered through muslin cloth, heated to 85 °C for 30 seconds and then cooled. Sodium benzoate @ 500 ppm was added and mixed thoroughly. The juice was filled in pre sterilized coloured glass bottles, crown corked and pasteurized for 30 minutes in boiling water. After pasteurization aloe vera juice was cooled, labelled and stored at ambient temperature for further processing.

The defected and injured fruits of Jamun were sorted out and healthy ones were retained washed with clean water for juice extraction. The jamun juice filtered through muslin cloth and heated to 80°C for 30 seconds followed by immediate cooling at room temperature. Sodium Benzoate @ 500 ppm was added and then filled in pre-sterilized glass bottles in 250 ml capacity. Bottles were crown corked and pasteurized for 30 min in boiling water, cooled immediately, labelled and stored at room temperature for further processing. The aloe-vera and Jamun juice were blended with each other in different ratios: (T₁:100:00::aloe vera:jamun), (T₂:90:10::aloe vera:jamun), (T₃:80:20::aloe vera: jamun), (T₄:70:30:: aloe vera: jamun), (T₅:60:40:: aloe vera: jamun), (T₆:50:50:: aloe vera: jamun), (T₇:40:60:: aloe vera: jamun). The final product was packed in pre sterilized 250 ml glass bottles and stored under ambient conditions for further studies. Samples were drawn periodically for their physico-chemical and organoleptic analysis during 90 days of storage at an interval of 30 days.

Physico chemical analysis

Total soluble solids (TSS)

Total soluble solids (TSS) of fresh aloe vera gel/juice, jamun fruit and blended products were determined by using hand refract meter (Erma, Japan) and expressed as degree Brix (°B) at 20°C using reference table (Ranganna, 1986).

Titrateable acidity

Titrateable acidity was determined by titrating a known quantity of sample (10 mL) against standard solution of 0.1 N Sodium hydroxide to a faint pink colour using phenolphthalein as an indicator. The results were expressed as percent citric acid (Ranganna, 1986).

Sugars

Lane and Eynon's volumetric method as detailed by Ranganna (1986) was followed. Measured quantity of sample (20 ml) was taken in 250 mL volumetric flask to which 100 ml distilled water was added and neutralized with 40 percent sodium hydroxide using phenolphthalein as indicator and clarified with 2 mL neutral lead acetate (45%) for about 30 minutes. Excess of lead was removed with 5 mL potassium oxalate (22%). The volume was made to 250 mL and filtered through Whatman no. 4 filter paper. The filtrate was titrated against 10 ml of standardized Fehling's solution using methylene blue as an indicator to a brick-red precipitate for determination of reducing sugars.

Ascorbic acid

Ascorbic acid was determined using 2, 6-Dichlorophenol-

indophenol visual titration method (A.O.A.C, 2002).

Preparation of sample

10g of sample was taken and blended with 4% oxalic acid and volume was made up to 100 ml with oxalic acid and filtered.

Procedure

10 mL of the prepared sample was taken in a titration flask and titrated against standard dye to a pink coloured end-point, which persisted for at least 15 seconds. The results were expressed as mg/100g of sample.

$$\text{Ascorbic acid (mg / 100g)} = \frac{\text{Titre} \times \text{Dy factor} \times \text{Volume made up}}{\text{Aliquot of extract taken} \times \text{Weight of sample}} \times 100$$

Tannin

Colorimetric method of Folin-Denis was followed for estimating tannins as per the procedure described by Ranganna (1986). A known quantity of sample (5ml/gm.) was taken into 100 ml volumetric flask containing 75 ml distilled water. To this 5ml Folin-Denis reagent and saturated sodium carbonate (10ml) were added and volume was made to 100 ml with distilled water. The contents were shaken well and allowed to stand undisturbed for colour development for 30 minutes and filtered through whatman filter paper no 4. The colour absorbance of the filtrate was recorded at 760nm wave length using UV spectrophotometer. A standard curve was plotted by taking known amount of tannic acid solution standard. Results were expressed as mg/100 ml tannic acid.

Minerals

Estimation of iron was done as per the protocol described in AOAC (2002).

Iron

A known quantity 5 ml of pre-digested aliquot was taken, to which 0.5 ml H₂SO₄, 1.0 ml potassium per sulphate, 2 ml potassium thiocyanate and was added and volume was made to 15 ml with double distilled water. After 20-30 minutes the absorbance was recorded at 480 nm on UV spectrophotometer. The iron content was calculated by plotting against the standard curve obtained by taking known amounts of potassium iron solutions. Results were expressed as mg/100g.

Sensory evaluation

To assess consumer preference, sensory evaluation of experimental samples was conducted at different intervals of storage by semi trained taste panel of 7-8 judges using 9 point hedonic scale assigning scores 9-like extremely to 1-dislike extremely. A score of 5.5 and above was considered acceptable (Amerine *et al.*, 1965).

Economics of the products

The cost of production of the product was determined by taking into consideration the cost of raw materials, chemicals and packaging materials etc. used in the preparation of the product.

Statistical analysis

The data recorded were analyzed statistically using factorial Completely Randomized Design (CRD) for interpretation of results through analysis of variance for 90 days at an interval of 30 days given by Cochran and Cox (1985).

RESULTS AND DISCUSSION

Table 1 showed a significant increase in the total soluble solids of blended aloe vera-jamun juice and the mean value of storage period showed an increase from initial value of (4.66 °Brix) to (5.37 °Brix), there was a significant increase in the total soluble solids of blended aloe vera-jamun juice after 90 days of storage, which might be due to hydrolysis of polysaccharides into monosaccharides. Increase in total soluble solids content with the increase in storage period was observed in the juice of mandarian, sweet orange and lemon (Mehta and Bazaz (1993). Highest reducing sugars (2.77%) were found in T₇ (40:60: Aloe vera: Jamun) followed by T₆ (50:50:: Aloe vera: Jamun) as 2.36%. The mean value of reducing sugars increased from the initial level of 1.38 to 1.61 % during 3 months of storage. The increase may be attributed due to the hydrolysis of starch from sucrose into sugar. Similar results were also reported by Attri *et al.* (1998) in pear- apple juice or

apple juice concentrate.

With the increase in storage period the acidity percentage of different treatments decreased significantly from 0.571 to 0.548 per cent. This might be attributed to chemical interaction between the organic constituents of the juice induced by the temperature and action of enzymes. The decrease in acidity during storage was also observed by Deka *et al.*, (2005) in mango pineapple spiced beverage. There was significant decrease in the ascorbic acid content in blended aloe vera - jamun juice from the initial mean value of 7.27g to 6.78g during three months of storage (table-2). It might have been destroyed during processing and subsequently during storage period due to its oxidation. Similarly reduction in ascorbic acid content was recorded in Litchi (Reshi, *et al.*, 2013).

The data pertaining to tannin content of different treatments in table-3 depicted a significant decrease of tannin content in blended aloe vera-jamun juice from the initial mean value of

Table 1: Effect of treatments and storage period on total soluble solids (°Brix) and reducing sugar (%) of blended aloe vera-jamun juice

Treatment	Total soluble solids (°Brix)				Mean	Reducing sugar (%)				Mean
	Storage period (days)					Storage period (days)				
	0	30	60	90		0	30	60	90	
T ₁ (100:00::Aloe vera: Jamun)	1.91	2.12	2.23	2.32	2.15	0.26	0.35	0.41	0.42	0.36
T ₂ (90:10:: Aloe vera: amun)	2.90	3.10	3.19	3.44	3.16	0.62	0.72	0.80	0.85	0.75
T ₃ (80:20:: Aloe vera: Jamun)	3.82	4.10	4.12	4.33	4.09	1.01	1.11	1.18	1.22	1.13
T ₄ (70:30:: Aloe vera: Jamun)	4.53	4.62	4.84	5.52	4.88	1.37	1.47	1.55	1.60	1.50
T ₅ (60:40:: Aloe vera: Jamun)	5.43	5.74	6.08	6.41	5.91	1.76	1.86	1.94	2.02	1.89
T ₆ (50:50:: Aloe vera: Jamun)	6.61	6.81	7.12	7.71	7.06	2.12	2.23	2.30	2.36	2.25
T ₇ (40:60:: Aloe vera: Jamun)	7.40	7.52	7.84	7.90	7.67	2.50	2.61	2.71	2.77	2.65
Mean	4.66	4.86	5.06	5.37		1.38	1.48	1.56	1.61	

CD at 0.05% (Treatment) 0.02: 0.01, CD at 0.05% (Storage) 0.04: 0.01, CD at 0.05% (Treatment x Storage) 0.04: 0.03

Table 2: Effect of treatments and storage period on titratable acidity (%) and ascorbic acid (mg/100gm) of blended aloe vera-jamun juice

Treatment	Titratable acidity (%)				Mean	Ascorbic acid (mg/100gm)				Mean
	Storage period (days)					Storage period (days)				
	0	30	60	90		0	30	60	90	
T ₁ (100:00::Aloevera: Jamun)	0.124	0.123	0.115	0.115	0.119	1.61	1.39	1.24	1.14	1.35
T ₂ (90:10:: Aloe vera: amun)	0.262	0.263	0.267	0.267	0.265	3.31	3.10	2.93	2.83	3.04
T ₃ (80:20::Aloe vera: Jamun)	0.442	0.427	0.413	0.413	0.424	5.27	5.07	4.91	4.81	5.01
T ₄ (70:30::Aloe vera: Jamun)	0.582	0.577	0.550	0.550	0.565	7.36	7.16	6.85	6.89	7.07
T ₅ (60:40::Aloe vera: Jamun)	0.721	0.713	0.680	0.680	0.699	9.02	8.79	8.61	8.53	8.74
T ₆ (50:50::Aloe vera: Jamun)	0.841	0.840	0.841	0.841	0.841	11.26	10.95	10.85	10.67	10.93
T ₇ (40:60::Aloe vera: Jamun)	1.024	1.018	0.973	0.973	0.997	13.07	12.84	12.70	12.57	12.80
Mean	0.571	0.566	0.548	0.548		7.27	7.04	6.87	6.78	

CD at 0.05% (Treatment) 0.005: 0.01, CD at 0.05% (Storage) 0.004: 0.01, CD at 0.05% (Treatment x Storage) 0.011: 0.03

Table 3: Effect of treatments and storage period on tannin (mg/100ml) and Iron mg/100ml) of blended aloe vera-jamun juice

Treatment	Tannin (mg/100ml)				Mean	Iron (mg/100ml)				Mean
	Storage period (days)					Storage period (days)				
	0	30	60	90		0	30	60	90	
T ₁ (100:0::Aloe vera: Jamun)	4.31	4.14	3.89	3.78	4.03	0.71	0.67	0.67	0.65	0.68
T ₂ (90:10::Aloe vera:jamun)	41.87	41.07	40.35	39.79	40.77	0.75	0.72	0.71	0.66	0.71
T ₃ (80:20::Aloe vera: Jamun)	87.47	83.27	82.11	80.71	83.39	1.94	1.86	1.83	1.80	1.86
T ₄ (70:30::Aloe vera: Jamun)	129.06	127.43	126.26	124.24	126.75	2.58	2.55	2.53	2.50	2.54
T ₅ (60:40::Aloe vera: Jamun)	169.89	169.40	167.00	163.00	167.32	3.21	3.18	2.95	2.91	3.06
T ₆ (50:50::Aloe vera: Jamun)	209.11	208.47	207.23	205.00	207.45	3.85	3.82	3.76	3.73	3.79
T ₇ (40:60::Aloe vera: Jamun)	253.00	249.33	238.00	235.16	243.87	4.51	4.45	4.13	4.08	4.29
Mean	127.82	126.16	123.55	121.67		2.51	2.46	2.37	2.33	

CD at 0.05% (Treatment) 0.49: 0.008, CD at 0.05% (Storage) 0.37: 0.006, CD at 0.05% (Treatment x Storage) 0.99: 0.016

Table 4: Effect of treatments and storage period on colour and flavour/aroma of blended aloe vera-jamun juice

Treatment	Colour				Mean	Flavour/aroma				Mean
	0	Storage period (days)				0	Storage period (days)			
		30	60	90		0	30	60	90	
T ₁ (100:00::Aloe vera:Jamun)	7.01	6.56	6.51	6.41	6.62	7.62	7.32	7.23	7.05	7.31
T ₂ (90:10:: Aloe vera: amun)	7.31	7.12	7.01	6.91	7.09	7.64	7.43	7.32	7.15	7.39
T ₃ (80:20::Aloe vera: Jamun)	7.61	7.41	7.21	7.01	7.31	7.71	7.54	7.43	7.34	7.51
T ₄ (70:30::Aloe vera: Jamun)	7.81	7.62	7.41	7.21	7.51	7.82	7.62	7.46	7.36	7.57
T ₅ (60:40::Aloe vera: Jamun)	8.33	8.12	7.81	7.61	7.97	7.92	7.65	7.58	7.42	7.64
T ₆ (50:50::Aloe vera: Jamun)	8.51	8.31	8.21	8.01	8.26	8.40	7.87	7.80	7.61	7.92
T ₇ (40:60::Aloe vera: Jamun)	8.11	8.01	7.72	7.41	7.81	7.90	7.70	7.54	7.39	7.63
Mean	7.81	7.59	7.41	7.22		7.86	7.59	7.48	7.33	

CD at 0.05% (Treatment) 0.011: 0.025, CD at 0.05% (Storage) 0.008: 0.019, CD at 0.05% (Treatment x Storage) 0.023: 0.051

127.82 mg/100ml to 121.67 mg/100ml during three months of storage. Tannin content decreased significantly with increase in the storage period might be due to the formation of precipitates with organic constituents. Tannins are also well known to have their influence on the flavour of the product as they are astringent in taste. Similar results have been found in jamun mango blended jam by Sharma (2014). As is evident from table 3 the iron content decreased slightly in blended aloe vera-jamun juice from the initial mean level of 2.51 to 2.33 mg/100ml after three months of storage this could be due to chemical interaction between organic constituents of the juice induced by temperature and action of enzymes. Similar finding have been reported by Vidhya and Narain (2010) while working on wood apple fruit.

Colour score of blended aloe vera-jamun juice decreased significantly as for treatments and entire storage periods (Table-4). At initial day the maximum score of 8.51 was observed in T₆ (50:50:: Aloe vera: Jamun). The highest overall mean score of 8.26 was recorded in T₆(50:50:: Aloe vera: Jamun) followed by treatment T₅ (60:40::Aloe vera: Jamun) having value of 7.97. Attri *et al.*(1998) in pear- apple juice or apple

juice concentrate reported a decreases trend in the scores during storage may be due to loss of volatile aromatic substances during storage and ambient conditions flavour. The sensory scores of flavour decreased significantly in all the treatments up to 90 days of storage time but scores were found to be within acceptable limits. The mean values of flavour showed decrease from initial value of 7.86 to 7.33 per cent after 90 days of storage. Similar results have been found in blended sugarcane, lemon and ginger juice by Kaur *et al.* (1995).

Cost of production

The cost of production of aloe vera-jamun blended juice comes to Rs 14.52 /250 ml. the calculated cost of juice was much less as compared to market brands.

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