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Effect of banana pseudostem sap with apple, pomegranate and *Aloe vera* juice on organoleptic properties of blended nectar

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Abstract

The present investigation entitled "effect of banana pseudostem sap with apple, pomegranate and *Aloe vera* juice on organoleptic properties of blended nectar" was at the Department of Post Harvest Technology, ASPEE College of Horticulture and Forestry and Banana Pseudostem Processing Unit, Soil and Water management Research Unit, Navsari Agricultural University, Navsari, Gujarat during April 2019 to October 2019. The prepared blended nectar was filled in PET bottles and stored at room temperature for a period 0 month (initial), 2, 4 and 6 months. The Results revealed that maximum colour score (8.07), taste value (7.91) and texture score (7.75) were recorded in treatment T₆. While maximum flavour score (7.71) was observed in treatment T₇. The maximum overall acceptability value (7.75) was observed in treatment T₆ with no microbial growth up to 6 month of storage period with high economical returns.

Keywords: Banana, nectar, storage period and organoleptic properties

Introduction

The banana pseudostem has been reported to contain high quality starch including digestible and non-digestible (resistant) starch (Ho *et al.*, 2012) [3]. The banana pseudostem juice also contains rich amount of calcium, potassium, sodium, magnesium and chlorine; all of them are essential for maintaining body fluid and electrolyte balance. Moreover, in many parts of India, the banana pseudostem has been used as food (Mohapatra *et al.*, 2010) [8]. Banana is one of the major fruit crop grown in India and ranks second in area as well as production next to mango. In India, it is cultivated over an area of 8.98 lakh ha with a production of 317.47 lakh metric ton and productivity of 34.33 MT/ha. In Gujarat, banana is cultivated over an area of 68.15 lakh ha with the production of 44.72 lakh metric tones (NHB, 2018) [4]. In India, the area under banana increasing steadily because of higher returns as compared to other crops. Similarly, with the technological development in banana cultivation, its productivity trend is also rising. In Gujarat, Grand Nine is commercial cultivar of banana covering more than 90 per cent of banana cultivating area. Grand Nine variety in banana cultivation is more popular because of its early yield as compared to other varieties. Average yield of banana in Gujarat is about 65 t/ha (NHB, 2018) [4]. Banana is rich source of nutrients and energy, which majorly consumed as table food in India. 100 g of banana fruit contains water 75 per cent, energy compositions 85 Kcal, protein 1.1 per cent, fat 0.2 per cent and carbohydrates 12.6 per cent. The mineral contents are calcium (8 mg/100 g), phosphorous (26 mg/100 g), Iron (0.7 mg/100 g) and magnesium (33 mg/100 g). The vitamin compositions are (vitamin A 190 IU), (thiamine 0.05 mg/100g), nicotinic acid (0.7 mg/100 g) and ascorbic acid (10m g/100 g) (Mustaffa and Kumar, 2012) [9]. Apples are known to have high polyphenol antioxidants (only second after cranberries) representing 20–25% of total fruit polyphenols consumed in the US as well as 10–30% of daily need of fiber and potassium (Drogoudi *et al.*, 2008) [1]. Pomegranate (*Punica granatum* L.) fruit crop has wider adaptability and is grown in tropical and subtropical regions of the world. The total area under cultivation of pomegranate in India is 233.93 thousand ha and production is around 2844.52 thousand tones (NHB, 2018) [4]. Pomegranate is not only used for consumption but also used as medicine. The edible portion of pomegranate fruit was 52 per cent of total fruit weight which contained 78 per cent juice and 22 per cent seeds. The fresh juice contained 85.4 per cent moisture, 10.6 per cent total sugars, 1.4 per cent pectin, 0.19 per cent total acidity and 19.6 mg free amino nitrogen per 100 ml juice. The pomegranate can be processed into various products like juice, carbonated drinks, syrup, jelly, wine, anar-

rub, anardana and canned beverage. The *Aloe vera* leaf gel contains about (98%) water. The total solid content of *Aloe vera* gel is (0.66%) and soluble solids are (0.56%) with some seasonal fluctuation. On dry matter basis *Aloe* gel consists of polysaccharides (55%), sugars (17%), minerals (16%), proteins (7%), lipids (4%) and phenolic compounds (1%). The acceptability of fruit beverages may be improved by blending two or more different fruits pulp or natural flavours. Blending of banana pseudostem juice with fruit which not only improving nutrients but also enhancing flavour, taste and pleasant. Nectar is one of the refreshing beverages having zero carbonation, relatively few preservatives and excellent source of several important vitamins and minerals and is used as health drink (Khurdiya and Sagar, 1991) [5].

Material and Method

Site Location

The experiment was conducted at the Banana Pseudostem Processing Unit and Department of Post Harvest Technology, N.A.U, Navsari. Navsari Agricultural University is located

three kilometers away in the south-west direction from Navsari station (22°57' N latitude and 72°54' E longitude at an altitude of ten meters above the mean sea level) and twelve kilometers away in the east from the Arabian sea-shore and the historic place 'Dandi'.

The prepared samples were evaluated for sensory qualities on the basis of colour, texture, taste, flavour and overall acceptability on a 9 point hedonic scale. The blended nectar was stored in PET bottles of 200 ml capacity. The packed bottles were kept in darkened, cool and dry place at room temperature which ranged from 20 to 35 °C temperatures. These were then subsequently used for periodical observations for further study pertaining to chemical changes up to 6 months (April to October) at every two months interval.

Treatment details

Preparations of blended banana pseudostem sap with apple, pomegranate and *Aloe vera* in the following given proportion:

Treatments	Banana pseudostem Sap (%)	Apple Juice (%)	Pomegranate Pulp (%)	<i>Aloe vera</i> Juice (%)
T ₁	5	5	5	5
T ₂	10	5	5	0
T ₃	10	5	0	5
T ₄	10	0	5	5
T ₅	10	10	0	0
T ₆	10	0	10	0
T ₇	10	0	0	10
T ₈	15	5	0	0
T ₉	15	0	5	0
T ₁₀	15	0	0	5
T ₁₁	20	0	0	0

Effect of different treatments and storage on sensory characteristics of blended nectar like colour, texture, flavour, taste and overall acceptability were evaluated by the panellists during initial and as well as at 2, 4, and 6 months of storage. The prepared samples were evaluated for sensory qualities on the basis of colour, texture, taste, flavour and overall acceptability on a 9 point hedonic scale. For the accurate results, a panel of faculty members and PG students of Department of Post Harvest Technology, NAU, Navsari were used for sensory analysis throughout the storage period interval. A taste breaker like murmura with normal tap water was provided to the panelists for mouth rinsing in between the sensory test.

Statistical analysis

Experiment data were statistically analysed using Completely Randomized Design. Data collected on quality aspects of fresh product and during storage were statistically analysed by adopting analysis of variance techniques as described by Panse and Shukatme (1995) [10]. The appropriate standard error (S.Em.) was calculated in each case. The critical

difference (C.D.) at 5 per cent level of probability was worked out.

Result and discussion

Colour

Based on 9 point hedonics' rating the score given by panelists, the maximum score (8.07) was recorded in the treatment T₆ (banana pseudostem sap: apple: pomegranate: *Aloe vera* 10:0:10:0) and the minimum colour score (7.15) in treatment T₈ (banana pseudostem sap: apple: pomegranate: *Aloe vera* 15:5:0:0) in table 1. The maximum colour score in treatment T₆ might be due to light redness of juice preferred by the panelists and minimum colour score in T₈ due to colorless nature and higher concentration of banana pseudostem juice. During the storage period colour score value was decreased slightly and higher color score remained highest in mean value as well as lower colour score remained lowest in mean value. However colour score was found acceptable above 7.00 i.e. all treatments found acceptable except T₁ and T₁₁ accordance with results obtained by Mishra *et al.* (2012) [7] in aonla-grape juice.

Table 1: Effect of banana pseudostem sap with apple, pomegranate and *Aloe vera* juice on colour (%) of blended nectar during storage

Treatments	Storage Period (P)				Mean (T)
	P1 (Initial)	P2 (2 month)	P3 (4 month)	P4 (6 month)	
T ₁	8.03	7.91	6.83	6.54	7.33
T ₂	8.74	7.67	6.84	6.77	7.50
T ₃	7.77	7.03	7.80	7.17	7.44
T ₄	7.03	7.83	6.80	7.07	7.18
T ₅	8.73	7.97	7.83	7.24	7.94
T ₆	8.80	8.14	7.90	7.43	8.07

T ₇	8.03	7.40	7.83	6.10	7.34
T ₈	7.67	7.43	7.06	6.44	7.15
T ₉	7.44	7.53	7.60	7.23	7.45
T ₁₀	7.00	8.00	7.43	6.50	7.23
T ₁₁	8.70	7.40	7.57	7.30	7.74
Mean (P)	7.99	7.66	7.40	6.89	-
C.V. %	-	-	-	-	2.498
C.D. at 5 %	-	-	-	-	0.158

Texture

Texture score of blended nectar (Based on 9 point Hedonic rating) given by the panelist recorded maximum (7.75) in treatment T₆ (banana pseudostem sap: apple: pomegranate: *Aloe vera*: 10:0:6:0) and the minimum (7.12) texture value was recorded in the treatment T₇ (banana pseudostem juice: apple: pomegranate: *Aloe vera*: 10:0:0:10) in table 2. The

highest texture score might be due to the consistency preferred by the panelists in the blended nectar and the lowest texture score might be due to juicy nature of banana pseudostem juice. Texture value of blended nectar showed decreasing trend during 6 months storage period. Similar results were recorded by Hare and Attri (2016) [2] in health based beverage from bayberry and raspberry.

Table 2: Effect of banana pseudostem sap with apple, pomegranate and *Aloe vera* juice on texture of blended nectar during storage

Treatments	Storage Period (P)				Mean (T)
	P1 (Initial)	P2 (2 month)	P3 (4 month)	P4 (6 month)	
T ₁	8.07	7.90	7.53	7.43	7.73
T ₂	8.04	7.73	6.94	7.30	7.50
T ₃	7.80	6.97	7.73	7.66	7.54
T ₄	7.80	7.60	6.77	7.07	7.31
T ₅	8.40	7.40	7.77	6.13	7.42
T ₆	8.60	7.84	7.36	7.20	7.75
T ₇	7.96	7.20	7.19	6.13	7.12
T ₈	7.73	7.40	6.97	6.37	7.12
T ₉	7.40	7.47	7.96	7.03	7.46
T ₁₀	7.03	7.99	7.40	6.47	7.22
T ₁₁	8.20	7.13	7.57	7.17	7.52
Mean (P)	7.91	7.51	7.38	6.90	-
C.V. %	-	-	-	-	3.562
C.D. at 5 %	-	-	-	-	0.222

Flavour

According to the flavour score of blended nectar (Based on 9 point Hedonic rating) the maximum flavor value (7.71) was recorded in treatment T₅ (banana pseudostem juice: apple: pomegranate: *Aloe vera* 10:10:0:0) and the minimum flavour score was recorded in the treatment T₁ (6.98) (banana pseudostem juice: apple: pomegranate: *Aloe vera* 5:5:5:5) in table 3. These results were due to blended flavour of fruits in treatment T₅ which was preferred more by the panelists and

the lower flavour score in treatment T₁ was due to less flavour in banana pseudostem juice. During 6 months storage the flavour value of blended nectar resulted decreasing trend this might be due to loss of flavour compounds during storage of blended nectar. Similar result were also observed by Sree and Vanajalata (2015) [12] in blending sweet orange and pomegranate juice for RTS beverage Mishra *et al.* (2012) [7] for aonla-grape juice.

Table 3: Effect of banana pseudostem sap with apple, pomegranate and *Aloe vera* juice on flavour of blended nectar during storage

Treatments	Storage Period (P)				Mean (T)
	P1 (Initial)	P2 (2 month)	P3 (4 month)	P4 (6 month)	
T ₁	6.97	6.77	7.04	7.13	6.98
T ₂	8.00	7.03	6.77	7.23	7.26
T ₃	7.73	7.20	7.70	7.77	7.60
T ₄	7.36	7.53	7.30	7.43	7.40
T ₅	8.04	7.77	7.60	7.44	7.71
T ₆	7.67	7.43	6.67	7.44	7.30
T ₇	7.67	7.40	7.66	7.67	7.60
T ₈	8.00	7.44	7.66	7.60	7.67
T ₉	7.06	7.50	7.60	7.37	7.38
T ₁₀	6.77	7.13	7.27	7.57	7.18
T ₁₁	7.00	7.74	7.50	7.40	7.41
Mean (P)	7.47	7.35	7.34	7.46	-
C.V. %	-	-	-	-	3.107
C.D. at 5 %	-	-	-	-	0.193

Taste

Looking at the taste score of blended nectar (According to 9 point Hedonic rating) showed the maximum (7.91) taste score

in the treatment T₆ (banana pseudostem sap: apple: pomegranate: *Aloe vera* 10:0:10:0) and the minimum (6.83) score in T₁ (banana pseudostem sap: apple: pomegranate:

Aloe vera 5:5:5:5) in table 4. The maximum taste score was obtained in T₆ which might be due to proportion of pomegranate juice which was preferred more by panelists. However, the lowest taste score value was found in T₁ during

the storage period. The taste score of the product was decreased slightly during storage up to 6 months. These findings were in accordance with results obtained by Mingire *et al.* (2010) [6] in blended nectar.

Table 4: Effect of banana pseudostem sap with apple, pomegranate and *Aloe vera* juice on taste of blended nectar during storage

Treatments	Storage Period (P)				Mean (T)
	P1 (Initial)	P2 (2 month)	P3 (4 month)	P4 (6 month)	
T ₁	7.00	7.00	6.50	6.83	6.83
T ₂	7.07	6.70	6.27	7.80	6.96
T ₃	6.70	7.07	7.30	7.07	7.03
T ₄	7.83	8.03	7.17	7.40	7.60
T ₅	8.03	7.83	7.43	7.73	7.75
T ₆	8.20	7.93	7.67	7.83	7.91
T ₇	7.10	7.40	7.63	7.40	7.38
T ₈	7.54	7.10	7.47	7.60	7.43
T ₉	7.70	7.70	7.57	7.37	7.59
T ₁₀	7.37	7.44	7.54	7.63	7.50
T ₁₁	6.96	7.83	6.97	7.70	7.36
Mean (P)	7.41	7.46	7.23	7.49	-
C.V. %	-	-	-	-	3.727
C.D. at 5 %	-	-	-	-	0.234

Overall acceptability

Overall acceptability is one of the important sensory attribute that determine the product preference by the consumer. Based on the previous results of colour, texture, flavour and taste of blended nectar the maximum overall acceptability (7.75) was recorded for treatment T₆ (banana pseudostem juice: apple: pomegranate: *Aloe vera* 10:0:10:0) and the minimum overall acceptability value (7.22) was recorded for the treatment T₁

(banana pseudostem juice: apple: pomegranate: *Aloe vera* 5:5:5:5) in Fig. 1. During storage overall acceptability of blended nectar recorded decreasing trend, this might be due to decreased colour, texture, flavour and taste scores of blended nectar. However, the product found acceptable score above 7.00 *i.e.* all the treatments are acceptable except T₁ and T₁₁. These findings were in accordance with results obtained Ravi *et al.* (2011) [11] in plantain-grape crush.

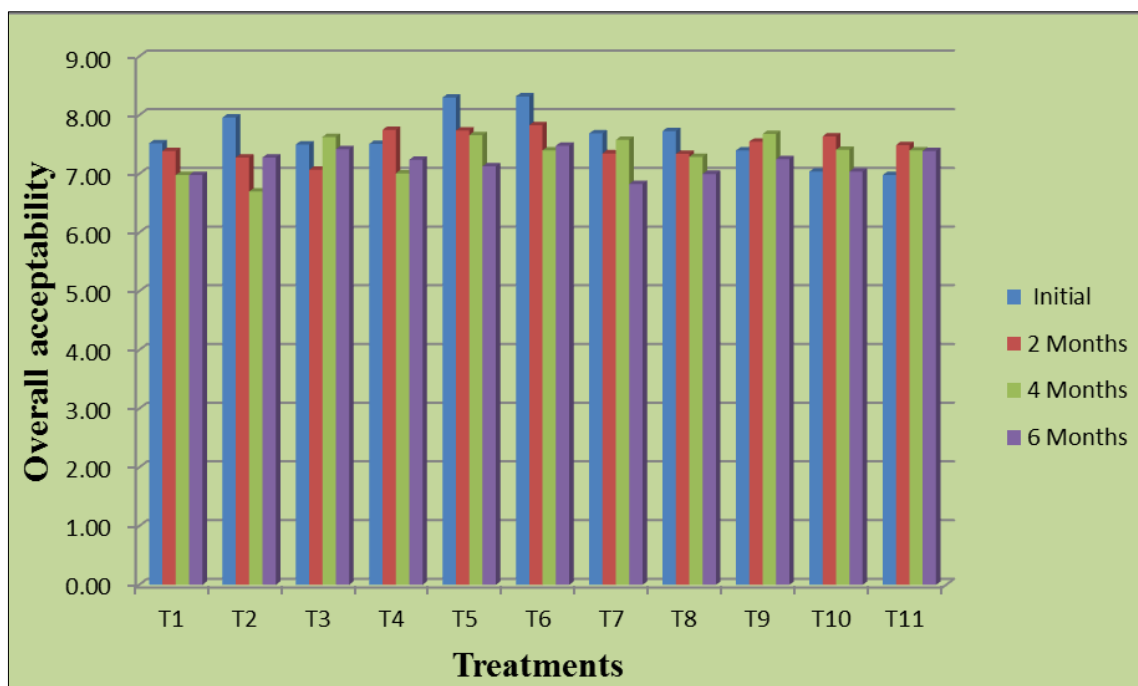


Fig. 1: Effect of banana pseudostem sap with apple, pomegranate and *Aloe vera* juice on overall acceptability of blended nectar during storage

Conclusion

Present study revealed that sensory evaluation of blended nectar, treatment T₆ (banana pseudostem sap: apple: pomegranate: *Aloe vera* 10:0:10:0) gained maximum overall acceptance score at initial, 2, 4 and 6 months of storage which might be due to higher proportion of pomegranate juice which was preferred more by sensory panellists. It can be conclude from the conducted study results that best quality blended

nectar with higher sensory acceptability and stable nutritional quality can be prepared using 10 per cent pseudostem sap and 10 per cent pomegranate juice. Thus, prepared combination can be commercially utilized by food processing industry for the production of nutritive and qualitative blended nectar to ensure better returns to growers, processors and consumers as well.

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