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Acceptability and storage studies of guava - Aloe nectar blends

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ABSTRACT : A study was undertaken during 2011 at post harvest technology laboratory, College of Horticulture, Rajendranagar, Hyderabad, to prepare value added products from guava blended with Aloe vera and assess their storage behaviour and acceptability. By following a standardized protocol, nectar blends of guava and aloe were prepared. Pulps were extracted separately, blended at desired proportions, homogenized and used for making nectar blends. Products were preserved by pasteurization and packed in 200 ml glass bottles. In order to study storage stability and consumer acceptability, products were stored for a period of three months at 10 + 10°C and analyzed for physico chemical quality and overall acceptability at monthly intervals. Results depict that there was slight increase in total soluble solids and acidity, and a considerable increase in reducing sugars but, slight decrease in pH, total sugars and a considerable decrease in ascorbic acid and antioxidant activity during storage of 90 days. All the blends were acceptable at all the storage intervals. However, blending G:A at 70:30 was found highly acceptable with higher sensory score. In any blend, as the storage period increased, ascorbic acid and antioxidant activity declined but there was minimum decrease noticed in G:A at 60:40 which was found more shelf stable.

KEY WORDS : Aloe, Ascorbic acid, Guava, Storage studies, Total anti-oxidant activity, Per cent TBARS, Per cent inhibition of peroxidation

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Most of the fruits are seasonal crops and perishable in nature. Some fruits are highly perishable and require immediate processing. Among such fruits include guava which is common, highly nutritious and rich flavoured fruit but have recorded huge post harvest losses. Fresh fruit has limited shelf-life. It is, therefore, necessary to utilize this fruit for making different products to increase its availability. Guava is a rich source of ascorbic acid and pectin. Ascorbic acid content in guava and guava products ranges from 75-260 mg/100 g. The ripe fruits contain moisture (77.9-86.9 %), dry matter (12.3-26.3 %), ash (0.51-1.02 %), crude fat (0.10-0.70 %), crude protein (0.82-1.45 %) and crude fibre (2.0-7.2 %). Aloe is one of the most popular naturally occurring plants with superb therapeutic uses. The leaves of aloe vera contains protein (3.2 g), fibre (15.2 g), iron (9.4 g) and also contains good amount of vit. B_{12}, vit. C, E and carotene – a precursor or vitamin A. Aloe has a wide range of medicinal applications immune response against cancer. Sangeetha *et al*. (2005) blended aloe juice in combination with lime juice, pineapple, papaya, grape, and tomato pulps. Aloe vera extract and fruit juices in the ratio of 1:1 were found most acceptable. Zhi *et al.* (2008) produced a health care compound juice containing aloe and apple, a new type of juice, which was not as bitter as pure aloe juice and proved to have increased nutritional value. Keeping the above facts in view, an attempt has been made to

prepare acceptable range value added product 'nectar'.

RESEARCH METHODS

The present investigation on acceptability and storage studies of guava - aloe nectar blends was carried out at post harvest technology laboratory, College of Horticulture, Rajendranagar, Hyderabad. Nectar products were prepared with 20 per cent pulp (guava and aloe), 25 °Brix and 0.3 per cent acidity. Five treatments and four days of storage were adopted in Completely Randomized Design with Factorial concept (Factorial CRD). Treatments comprised as T_1 - guava and aloe 90:10 ratio, T_2 - guava and aloe 80:20 ratio T_3 - guava and aloe 70:30 ratio T_4 - guava and aloe 60:40 ratio and T_5 - guava nectar100:0 ratio. Four storage days were 0, 30, 60, and 90th day of product preparation. Fruits were washed thoroughly with clean water, cut into small pieces and crushed in mixer grinder with addition of 25 per cent water to have uniform consistency. Aloe has to be processed within six hours of harvesting. Leaves were thoroughly washed. Lower 1 inch leaf bases were cut transversely and kept aside vertically for 30 minutes to remove yellow latex (Aloin, an alkaloid of characteristic bitterness). The tapering point, short, sharp spines and rind were removed. Thick fillet of mucilage layer is separated from rind. Fillet is made into homogenized pulp with the help of a mixie. Thus, obtained pulps were strained and filtered separately. The pulp of aloe was blended with fruit pulp in the desired ratios. Sugar syrup was prepared separately, strained, cooled and added to the calculated quantity of pulp. Pre-standardized amount of citric acid was mixed. The mixture was boiled for 15 minutes and tested for desired TSS with hand refractometer. The prepared product was filled immediately into clean, sterilized and dried bottles of 200 ml capacity leaving one inch head space. The bottles were crown corked, heat processed for 30 minutes, cooled to room temperature, labelled and stored at 10 + 1 °C in an incubator. Total soluble solids was determined using ERMA hand refractometer. Titrable acidity was determined as per the method described by Ranganna (2001). Ascorbic acid was determined by 2, 6 – diclorophenol indophenol visual titration method. Reducing sugars were determined by the method of Lane and Eyon method. Thiobarbituric acid reaction substances (% TBARS) method by Nickos *et al.* (1994) was followed to determine the antioxidant activity and percentage inhibition of peroxidation. The organoleptic evaluation of processed products was carried out since appeal to the consumers is the basic requirement for commercial products. The organoleptic scoring was done by a panel of 10 members using a score card developed for the purpose. Sensory attributes like appearance, colour, flavour, taste etc. were scored individually. Numerical scores were assigned to each attribute (Peryam and Pilgrim, 1957). A five point scale was adopted to score each of attribute. While scoring highest score (5) was assigned to most preferred characteristic and least score (1) to the least desired. The overall rating was obtained by calculating the average of the scores. Observations on various parameters were recorded with three replications and the data were subjected to statistical scrutiny by the method of ANOVA outlined by Panse and Sukhatme (1978).

RESEARCH FINDINGS AND DISCUSSION

Nutritional qualities of blended guava aloe nectar are presented here under.

TSS (°Brix) :

Retention or slight increase of TSS in the blends during storage is desirable for preserving beverage quality. Increased TSS with advancement of storage may be attributed to hydrolysis of polysaccharides like starch, cellulose and pectin substances into simpler substances (Table 1). This indicates that during storage there was change in pulp composition in the products. However, no change noticed upto 30 days. Similar results were observed by Pandey and Singh (1999) in guava RTS beverage. The mean TSS among blends ranged from 20.24 to 20.41 °Brix which was at par due to the standard brix (20 °Brix) maintained in all the blends while processing.

Acidity :

Acidity of the guava blends witnessed an increasing trend on storage. However, there was no change noticed in any product upto 30 days. Degradation of pectic substances of guava pulp into soluble solids might have contributed towards an increase in acidity. This might also be due to the formation of organic acids by ascorbic acid degradation or addition of extra acid while processing. Similar findings were reported by Panday and Singh (1999) for guava RTS beverage. The mean acidity among different blends ranged from 0.31 to 0.33. Though considerable increase noticed in all the blends

during storage, less increase of acidity was noticed in 60:40 and 70:30 blends.

Reducing sugars (%) :

Gradual increase in reducing sugar content of blends in storage might be due to hydrolysis of sugars by increased acidity, resulted in degradation of disaccharides to monosaccharides. Changes in sugars may also be due to slight increase in acidity due to addition of citric acid to the products during preparation, which might cause inversion of non-reducing sugars to reducing sugars as reported by Roy and Singh (1979) in bael squash and nectar. With significant variation, the mean reducing sugars ranged from 27.09 per cent to 33.75 per cent. Reducing sugars content decreased as aloe concentration increased with guava nectar exhibiting the highest. Beside least reducing sugar content, 60:40 blend was also found more stable due to minimum change (25.07 to 28.72) during storage.

Ascorbic acid :

Ascorbic acid content in guava and guava products ranges from 75-260 mg/100 g. Ascorbic acid content decreased during storage (Table 2) probably due to thermal degradation during processing and subsequent oxidation (Brock *et al*., 1998). Both ascorbic acid and dehydroascorbic acid are highly volatile and unstable forms of vitamin C. Hence, throughout the storage period degradation of ascorbic acid was noticed. Similar trend of decline of ascorbic acid was noticed in guava RTS beverage (Pandey and Singh, 1999). Ascorbic acid content was markedly higher in control, over the blends. This might be due to the fact that, guava is a rich source of ascorbic acid content.

Total antioxidant activity (% TBARS and % inhibition of peroxidation) :

Measurement of bioactivity such as antioxidant capacity becomes more use full for assessing the overall healthiness of foods than measurement of specific micro nutrients (Van Beckel and Jongen, 1997). Processed fruits and vegetables are expected to have a lower health protecting capacity than fresh ones. Preservation methods are generally believed to be responsible for depletion of naturally occurring antioxidants in foods. As noticed in the present study (Table 2) of processed guava and aloe blends, as the storage period increased from 0 day to 90th day, percentage TBARS increased and

Table 1 : Effect of storage period on TSS, acidity and reducing sugars (%)in aloe blended guava nectar beverages

Treatments/ day	TSS(°Brix)				Acidity				Reducing sugars (%)			
	0day	30day	60day	90 day	Mean	0day	30 day	60 day	90 day	Mean	0day	30 day	60 day	90 day	Mean
G:A (90:10)	20.00	20.00	20.33	20.66	20.25	0.30	0.30	0.34	0.35	0.32	29.51	29.85	30.03	30.54	29.97
G :A(80:20)	20.00	20.00	20.33	20.66	20.24	0.30	0.30	0.32	0.34	0.32	28.36	28.36	28.60	29.84	28.79
G :A (70:30)	20.00	20.00	20.00	21.00	20.33	0.30	0.30	0.32	0.34	0.31	25.13	28.48	29.46	30.04	28.28
G :A (60: 40)	20.00	20.00	20.33	20.66	20.24	0.30	0.30	0.32	0.33	0.31	25.07	26.48	28.08	28.72	27.09
G nectar(100: 0)	20.00	20.00	20.66	21.00	20.41	0.30	0.33	0.34	0.36	0.33	28.85	33.87	35.53	36.76	33.75
Mean	20.00	20.00	20.40	20.80		0.30	0.30	0.33	0.34		27.38	29.41	30.34	31.18	
	S.E. ±		C.D. (P=0.05)			S.E.±		C.D. (P=0.05)			S.E. ±		C.D. (P=0.05)		
Days	0.15		0.31*			0.0038		0.0078			1.53		NS		
Treatment	0.17		NS			0.0043		0.0087*			1.71		3.47*		
T x D	0.34		NS			0.0086		NS			3.43		NS		

G- Guava, A- Aloe NS = Non-significant; * indicate significance of value at P=0.01

Table 2 : Effect of storage period on ascorbic acid, %TBARS and % inhibition of peroxidation in aloe blended guava nectar

Treatments/ days	Ascorbic acid (mg/100ml)					%TBARS					% inhibition of peroxidation				
	0 day	30 day	60 day	90 day	Mean	0 day	30 day	60 day	90 day	Mean	0 day	30 day	60 day	90 day	Mean
G:A (90:10)	46.60	45.87	42.50	38.99	43.49	290.32	341.34	360.97	374.24	341.22	60.96	54.16	52.20	50.70	54.50
G :A(80:20)	43.64	41.88	43.27	40.42	42.30	295.89	356.87	380.57	395.88	357.30	60.20	53.46	51.46	49.96	53.77
G :A (70:30)	38.20	37.23	36.23	35.48	36.79	306.29	343.02	363.16	381.02	348.37	59.23	55.10	53.16	52.50	55.00
G :A (60: 40)	29.68	29.60	29.13	29.10	29.38	320.63	335.03	355.00	369.55	345.05	58.40	56.23	54.50	54.00	55.78
G nectar(100:0)	49.46	45.69	39.86	39.48	43.62	286.09	354.90	374.78	388.21	351.00	62.06	55.13	53.03	52.23	55.61
Mean	41.50	40.06	38.19	36.69		299.84	346.23	366.90	381.38		60.17	54.82	52.87	51.87	
	S.E.±		C.D. (P=0.05)			S.E.±		C.D. (P=0.05)			S.E.±		C.D. (P=0.05)		
Days	0.95		1.92*			3.75		7.59*			0.57		1.16*		
Treatments	1.06		2.15*			4.20		8.49*			0.64		1.30*		
T × D	2.13		4.31*			8.40		16.98*			1.29		NS		

NS = Non-significant; * indicate significance of value at P=0.01

Table 3: Effect of storage period on Acceptability in aloe blended guava nectar beverages

Treatments/days	Acceptability				
	0day	30 day	60 day	90 day	Mean
G:A (90:10)	4.16	4.10	3.96	3.86	4.02
G :A(80:20)	4.40	4.26	4.03	3.96	4.16
G :A (70:30)	4.90	4.70	4.36	4.10	4.51
G :A (60: 40)	4.82	4.60	4.40	4.00	4.45
G nectar(100: 0)	4.60	4.40	4.13	3.93	4.26
Mean	4.57	4.41	4.18	3.97	
	S.E.±		C.D. (P=0.05)		
Days	0.05		0.10*		
Treatments	0.05		0.11*		
T x D	0.11		NS		

NS=Non-significant; * indicate significance of value at P=0.01

percentage inhibition of peroxidation otherwise antioxidant activity declined significantly. Though, in any blend, significant reduction antioxidant activity at successive intervals of storage noticed, it can be said that antioxidant activity was almost stable due to the fact that, reduction was only minimal (around 10 %) from 0 to 90th day. These results could be attributed to the loss of naturally occurring antioxidants (Chew, 1995). It was noticed in blends as the concentration of guava decreased antioxidant activity decreased. Antonio *et al*. (2002) reported that both the pulp and peel portions contribute to the antioxidant activity in guava. Among all nectar blends, control *i.e.*, guava nectar exhibited higher antioxidant activity which indicates high antioxidants of guava followed by 60:40. Similar trend of decline in antioxidant activity in storage was noticed by Fathima (2004) in watermelon processed products on storage and by Sadiya (2003) on storage of tomato and Amaranth processed products.

Organoleptic evaluation :

Overall acceptability is an expression of individual sensory parameters like appearance, colour, taste, flavour, consistency and overall acceptability. Therefore, a change in individual parameters is reflected on the change in overall acceptability of the products. A considerable decrease in the organoleptic mean score was observed in all the products and at all the intervals of storage (Table 3). The organoleptic scores were higher upto 30 days of storage there after decreased further by the end of the storage. This is in conformation with the work of Mahadeviah (1996) that the acceptability rate decreased due to colour range and the product was slightly acceptable might be due to conversion of vitamin C and polyphenol into di or poly carbonyl compounds. Similar findings were observed by Tiwari (2000) in guava and papaya blends. Among all blends, 70:30 blend was most acceptable over control rating (4.51) and was at par with 60:40 blend rating (4.45). This might be due to better viscosity, consistency and acceptable sugar acid ratio.

Conclusion :

Value added products, guava - aloe nectar blends were prepared, as fresh fruits of guava has limited shelf-life and more over fruit based beverages are easily digestible, appetizing and nutritionally far superior to many synthetic drinks. Aloe vera gel is considered to be harmless and non-toxic even for internal consumption as health food. Among all guava nectar blends prepared with 20 per cent pulp, 25 ^{o}Brix and 0.3 per cent acidity, guava and aloe in the ratio of 70:30 was found best physico chemically and organoleptically. Blends prepared guava and aloe were free from the visual microbial growth. This was due to the application of heat processing and due to aloe, which has antimicrobial properties. Hence, all the products can be stored without deterioration and are acceptable upto 3 months.

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