RESEARCH ARTICLE

PULP COCENTRATION AND STORAGE CONDITIONS AFFECT LEVEL OF ASCORBIC ACID AND ORGANOLEPTIC PROPERTIES OF GUAVA NECTAR

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Abstract: An experiment was carried out during the year 2015-16 in Post Harvest Technology Laboratory, Section of Horticulture, College of Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola. Experiment was conducted by using Lalit cv. of Guava under FCRD statistical design having two factors viz. Factor A and factor B. Factor A consists of five different pulp concentrations viz. 14% guava pulp, 16% guava pulp, 18% guava pulp, 20% guava pulp, 22% guava pulp and factor B consists of storage conditions viz. refrigerated and ambient conditions. Guava nectar prepared from 18% pulp concentration showed minimum changes in ascorbic acid and organoleptic properties viz. colour, taste, flavour and overall acceptability under both refrigerated and ambient storage condition.

Keywords: Guava, Nectar, Pulp concentration, Ascorbic acid, Organoleptic quality

INTRODUCTION

Guava (*Psidium guajava* L.) is most important fruit crop of India known as 'Poor man's apple of tropics (Kamath *et al.*, 2008). It is originated from tropical America but in this sub-continent, guava has been in cultivation since early 17th century (Mitra and Bose, 1990). Guava has sweet aroma and a pleasant sour- sweet taste. Guava is rich source of fiber and ascorbic acid. It is normally consumed fresh as a dessert fruit or processed into puree, juice, concentrate, jam, jelly, nectar or syrup (Jagtiani *et al.*, 1988).

Guava pulp contains plenty of minerals like phosphorus (23 - 37 mg/100 g), calcium (14 - 30 mg/100 g), iron (0.6 - 1.4 mg/100 g) and vitamins like niacin, thiamine, riboflavin and carotene (Mahendran, 2010). Storage life of guava is very less due to its high physiological processes. Postharvest losses are very high during storage and lack of cold stores also triggers this loss. During market glut, price of fresh produce goes down so farmers fetch very less price. Processing is the best way to minimizing these losses. Nectar is non carbonated drink and contains about 20 per cent fruit juice/pulp and 15 per cent total soluble solids and about 0.3 per cent titratable acidity. It is excellent source of phytonutrients and mostly used as health drink (Khurdiya and Sagar, 1991). Quality and shelf life of nectar is affected by different concentration of pulp as well as storage conditions. Different biochemical changes takes place in nectar during storage. As Lalit is red pulp colour cultivar has great demand in market due to its suitability for processing. A limited research work has been carried out on effect of pulp and storage on nectar of Lalit cultivar with respect to ascorbic acid and organoleptical changes. So objective of our study was to elucidate the effect of pulp concentration and storage condition on ascorbic acid and organoleptic properties of nectar.

MATERIAL AND METHOD

The present investigation was carried out in Post Harvest Technology Laboratory Section of Horticulture, College of Agriculture, Dr. P.D.K.V. Akola during the year 2015-16 with factorial randomized design. For the experimentation, fully ripe, uniform size guava fruits were selected. The fruits were cut into pieces with stainless steel knife. Pulp from the fruits was obtained by homogenizing the pieces into homogenizer with addition of small quantity of water. The seeds and pulp were separated by passing juice through 60 mm stainless steel sieve. Thus extracted pulp was used for preparation of guava nectar with following recipe.

Guava pulp : As per treatment
Sugar : 600 g per kg of pulp
Sodium Benzoate: 300 ppm

Thus extracted pulp was used for preparation of nectar with following treatments:

Treatments details

P_1 - 14% Guava pulp
P_2 - 16% Guava pulp
P_3 - 18% Guava pulp
P_4 - 20% Guava pulp
P_5 - 22% Guava pulp

Storage conditions

S_1 - Refrigerated storage (7ºC± 1ºC)
S_2 - Ambient storage (33°C± 1ºC)

Guava nectar will be filled into the pre-sterilized bottles of 300 ml capacity and sealed air tight using crown corks and stored as per treatment for further observations.

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Biochemical analysis

The processed product was stored under two different storage viz. refrigerated condition and ambient condition. Biochemical analysis carried out at interval of 30 days up to 120 days under refrigerated condition and up to 90 days under ambient condition.

Ascorbic acid content was determined by 2, 6-dichloroindophenol titrimetric method. Results of ascorbic acid were presented in mg/100ml of juice. Organoleptic properties viz- colour, taste, flavour and overall acceptability were evaluated with 10 trained panelist based on 9 point hedonic scale (Like extremely: 9, Like very much: 8, Dislike moderately: 3, Like moderately: 7, Like slightly: 6, Neither like nor dislike: 5, Dislike slightly: 4, Dislike very much: 2, Dislike extremely: 1) with maximum score considered as the best (Ranganna, 1986).

Statistical analysis

The experiment was laid out for analysis of variance by using Factorial Completely Randomized Design (FCRD) with 3 replications (Panse and Sukhantme, 1985).

RESULT AND DISCUSSION

Ascorbic acid (mg/100 ml juice)

Effect of pulp along with storage conditions was significantly affected ascorbic acid content and it was showed decreasing pattern in all treatments (Table 1). Treatment combination P_3S_1 exhibited optimum results among all treatments and storage combinations. Minimum loss in ascorbic acid (0.33mg/100ml) on 120th day of refrigerated storage was recorded in treatment P_3S_1. Under ambient storage minimum reduction in ascorbic acid (0.40mg/100ml) was exhibited by P_3S_2. The decreasing pattern of ascorbic acid in both storage conditions might be due to exposure of nectar to light and oxygen. This exposure triggers oxidation of ascorbic acid into dehydroascorbic acid (Murari and Verma, 1989; Chakraborthy *et al.,* 1991; Reddy and Chikkasubbanna, 2009).

Colour score

Likewise ascorbic acid, colour also showed decreasing trends in all treatments in both storage conditions (Table 2). After 120 days of cold storage, maximum colour score (8.32) was recorded in P_3S_1 whereas it was highest (8.30) in P_3S_2 under ambient condition. It is well known that millard reaction and caramelization change the colour of food products. Reduction in colouring compounds in nectar might be due to reaction of phenolic compounds with enzymes which lead discoloration (Murari and Verma, 1989; Kalra and Tandon, 1984).

Taste score

The data exhibited significant differences in respect of taste score of guava nectar depicted in Table 3. Maximum score for taste (8.71– like extremely) on 120th day of observation under refrigerated condition was recorded by treatment combination P_3S_1 whereas it was highest in P_3S_2 under ambient storage. Balanced ratio of recipes, TSS, acidity, processed condition and storage conditions affect quality and taste of final product. Maximum taste score in P_3S_1 and P_3S_2 might be due to proper ratio of pulp, TSS and acidity (Mall and Tondon, 2007; Pandey, 2004).

Flavour score

The data exhibited significant differences in respect of flavour score of guava nectar during storage period (Table 4). Maximum score for flavour (8.71 – like extremely) under refrigerated conditions was recorded in treatment combination P_3S_1 (18% Guava pulp + stored at refrigerated condition) whereas it was minimum (7.07 – like moderately) in treatment combination P_1S_1 (14% Guava pulp + stored at refrigerated condition).

Among the ambient storage condition of guava nectar on 90th day, significantly maximum score for flavour (8.69– like extremely) was recorded in treatment combinations P_3S_2 (18% Guava pulp + stored at ambient condition) (Murari and Verma, 1989; Chakraborthy *et al.,* 1991).

Overall acceptability

From the result it was observed that, there was progressive decrease in overall acceptability of guava nectar during storage (Table 5). The storage temperature had significant effect on overall acceptability of guava nectar in both ambient and refrigerated conditions. The guava nectar stored at refrigerated storage conditions with 18 per cent pulp had highest overall acceptability score (8.33) on 120th day of storage. Under ambient condition of storage also acceptability score was maximum (8.33) in treatment P_3S_2. It is reported that, phalsa beverage was acceptable up to 120 days in cold temperature but acceptability score decreased continuously during storage period (Waskar and Khurdiya, 1987). Kotecha and Kadam (2003) noted that, there was gradual decrease in the overall acceptability score of syrup stored at room temperature during the storage period of 180 days (Kumar and Manimegalai, 2001).

Table 1. Effect of pulp concentrations and storage conditions on ascorbic acid of guava nectar

Treatments	Ascorbic acid (mg/100ml)						
	Storage period (Days)						
	Initial	30	60	90	Decrease in ascorbic acid after 90 days	120	Decrease in ascorbic acid after 120 days
P_1S_1	15.62	15.53	15.44	15.25	0.37	15.07	0.55
P_2S_1	18.29	18.22	18.14	17.99	0.29	17.84	0.45
P_3S_1	22.23	22.17	22.11	22.01	0.22	21.89	0.33
P_4S_1	23.54	23.47	23.40	23.28	0.26	23.15	0.39
P_5S_1	27.42	27.35	27.28	27.13	0.29	26.99	0.43
P_1S_2	15.62	15.49	15.35	15.01	0.61	*	*
P_2S_2	18.29	18.18	18.05	17.75	0.54	*	*
P_3S_2	22.23	22.12	22.02	21.82	0.40	*	*
P_4S_2	23.54	23.40	23.30	23.06	0.48	*	*
P_5S_2	27.42	27.30	27.18	26.92	0.51	*	*
F test	Sig	Sig	Sig	Sig	Sig	-	-
SE(m)±	0.051	0.059	0.066	0.079	0.028	-	-
CD at 5 %	0.149	0.173	0.191	0.231	0.082	-	-

Each value is presented as mean of three replication (n=3)

Table 2. Effect of pulp concentrations and storage conditions on colour score of guava nectar

Treatments	Colour score						
	Storage period (Days)						
	Initial	30	60	90	Decrease in colour score after 90 days	120	Decrease in colour score after 120 days
P_1S_1	6.70	6.61	6.55	6.41	0.29	6.24	0.46
P_2S_1	7.50	7.43	7.36	7.22	0.28	7.15	0.35
P_3S_1	8.53	8.49	8.45	8.39	0.14	8.32	0.22
P_4S_1	8.00	7.96	7.90	7.80	0.20	7.70	0.30
P_5S_1	7.80	7.75	7.68	7.57	0.23	7.44	0.36
P_1S_2	6.70	6.59	6.51	6.33	0.37	*	*
P_2S_2	7.50	7.41	7.33	7.17	0.33	*	*
P_3S_2	8.53	8.47	8.41	8.30	0.23	*	*
P_4S_2	8.00	7.93	7.86	7.71	0.29	*	*
P_5S_2	7.80	7.71	7.64	7.48	0.32	*	*
F test	Sig	Sig	Sig	Sig	Sig	-	-
SE(m)±	0.114	0.107	0.103	0.100	0.014	-	-
CD at 5 %	0.331	0.312	0.300	0.291	0.040	-	-

Each value is presented as mean of three replication (n=3)

Table 3. Effect of pulp concentrations and storage conditions on taste score of guava nectar

Treatments	Taste score						
	Storage period (Days)						
	Initial	30	60	90	Decrease in Taste score after 90 days	120	Decrease in Taste score after 120 days
P_1S_1	6.47	6.40	6.33	6.19	0.27	6.07	0.40
P_2S_1	6.80	6.74	6.69	6.55	0.25	6.45	0.35
P_3S_1	8.23	8.19	8.14	8.06	0.17	7.98	0.26
P_4S_1	7.85	7.79	7.74	7.63	0.21	7.55	0.30
P_5S_1	7.24	7.18	7.12	7.02	0.23	6.90	0.34
P_1S_2	6.47	6.38	6.27	6.07	0.40	*	*
P_2S_2	6.80	6.73	6.64	6.45	0.35	*	*
P_3S_2	8.23	8.19	8.11	8.00	0.23	*	*
P_4S_2	7.85	7.78	7.71	7.55	0.30	*	*
P_5S_2	7.24	7.17	7.09	6.92	0.32	*	*
F test	Sig	Sig	Sig	Sig	Sig	-	-
SE(m)±	0.146	0.148	0.149	0.147	0.003	-	-
CD at 5 %	0.427	0.432	0.433	0.429	0.010	-	-

Each value is presented as mean of three replication (n=3)

Table 4. Effect of pulp concentrations and storage conditions on flavour score of guava nectar

Interactions	Flavour score						
	Storage period (Days)						
	Initial	30	60	90	Decrease in flavour score after 90 days	120	Decrease in flavour score 120 days
P_1S_1	7.46	7.38	7.31	7.12	0.34	7.07	0.39
P_2S_1	7.63	7.57	7.50	7.31	0.32	7.27	0.36
P_3S_1	8.95	8.90	8.86	8.79	0.15	8.71	0.24
P_4S_1	8.60	8.54	8.50	8.41	0.19	8.30	0.30
P_5S_1	7.96	7.89	7.84	7.73	0.23	7.61	0.35
P_1S_2	7.46	7.35	7.26	7.06	0.40	*	*
P_2S_2	7.63	7.52	7.45	7.26	0.37	*	*
P_3S_2	8.95	8.87	8.80	8.69	0.26	*	*
P_4S_2	8.60	8.51	8.45	8.29	0.31	*	*

P_5S_2	7.96	7.85	7.77	7.58	0.38	*	*
F test	Sig	Sig	Sig	Sig	Sig	-	-
SE(m)±	0.066	0.058	0.053	0.053	0.013	-	-
CD at 5 %	0.193	0.171	0.156	0.155	0.039	-	-

Each value is presented as mean of three replication (n=3)

Table 5. Effect of pulp concentrations and storage conditions on overall acceptability score of guava nectar

Treatments	**Overall acceptability score**						
	Storage period (Days)						
	Initial	**30**	**60**	**90**	**Decrease in overall acceptability score after 90 days**	**120**	**Decrease in overall acceptability score after 120 days**
P_1S_1	6.88	6.82	6.73	6.57	0.30	6.46	0.42
P_2S_1	7.31	7.27	7.18	7.03	0.28	6.95	0.36
P_3S_1	8.57	8.54	8.49	8.42	0.16	8.33	0.24
P_4S_1	8.15	8.12	8.05	7.95	0.20	7.85	0.30
P_5S_1	7.67	7.63	7.55	7.44	0.23	7.32	0.35
P_1S_2	6.88	6.80	6.68	6.49	0.39	*	*
P_2S_2	7.31	7.24	7.14	6.96	0.35	*	*
P_3S_2	8.57	8.52	8.44	8.33	0.24	*	*
P_4S_2	8.15	8.10	8.01	7.85	0.30	*	*
P_5S_2	7.67	7.60	7.50	7.33	0.34	*	*
F test	NS	Sig	Sig	Sig	Sig	-	-
SE(m)±	0.072	0.070	0.071	0.075	0.003	-	-
CD at 5 %	0.211	0.206	0.207	0.219	0.009	-	-

Each value is presented as mean of three replication (n=3)

CONCLUSION

Ascorbic acid and organoleptic properties were significantly affected by pulp quantity as well as storage conditions. Guava nectar prepared from different concentration of pulp showed that pulp concentration of 18% was found best with minimum alteration in ascorbic acid and organoleptic properties under both refrigerated as well ambient conditions. Refrigerated pulp had higher shelf life up to 120th days whereas it was 90 days under ambient condition.

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