Indian J. Hort. 70(3), September 2013: 452-454

Short communication

Studies on preservation of guava pulp

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ABSTRACT

Guava pulp was prepared from cv. Sardar (L-49) from winter season fruits. Potassium sorbate and potassium metabisulphite were added @ 0.1% in both heated and non-heated pulp and then packed in food grade plastic jars (200 g) and polythene bags (150 guage) and stored at low temperature (2-5°C) for three months. The best storage was recorded with potassium metabisulphite in food grade plastic jars upto 3 months. Non-enzymatic was significantly less in pulp treated with KMS 0.1% upto 90 days of storage. The preserved guava pulp showed higher SO_2 retention (494.82 ppm) in pulp treated with heat + KMS 0.1% as compared to non-heated pulp (426.40 ppm).

Key words: Guava, packaging, pulp, storage.

Guava is an important fruit crop of Punjab and Haryana known for its pleasant flavour and quality. The guava fruits are highly perishable in nature and cannot be stored for more than a week in winter and 2-3 days in rainy season. Guava fruits can be processed and preserved in the form of pulps which can be converted into juice, ready-to-serve beverages, nectar etc. during off-season. Bottled guava pulp of cv. Allahabad Safeda and Banarasi Surkha stored at room temperature with 2000 ppm potassium metabisulphite (KMS) retained its highly acceptable quality up to 6 months after which it can be utilized for the preparation of ready-to-serve drink and guava leather (Sandhu *et al*., 7). The present study was aimed to standardize the method for preservation of guava pulp with chemical preservatives and packaging material and also to evaluate its keeping quality after low temperature storage.

Guava fruits of cv. Lucknow-49 (Sardar) were taken from winter season crop. Ripe fruits were washed thoroughly and crushed in a mill for obtaining smooth pulp. The crushed material was mixed with about 20% water and passed through a paddle type baby pulper with stainless sieve to screen a fine pulp. After extraction of uniform pulp, the pulp was divided into two lots. One lot was heated to 85°C for 5 min. and other lot was kept as such. Potassium sorbate and potassium metabisulphite was added @ 0.1% in both heated and non-heated lots of pulp. Heated and non-heated pulp was packed in food grade plastic jars (200 g) and polythene bags (150 guage) and stored at low temperature (2-5°C) for three months. Titrable acidity, browning, free sulphur dioxide, ascorbic acid and reducing sugars were estimated by the methods outlined in AOAC (1). The data was analysed following standard method.

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The guava pulp preserved by potassium sorbate 0.1% (PS 0.1%) and packed in polybag spoilt at low temperature after 60 days. Reducing sugars (Table 1) were observed more in pulp treated with PS as compared to pulp treated with KMS. Heated samples had significantly lower sugars as compared to non-heated samples. Reducing sugars showed increasing trend (5.04-6.52%) in both the packing materials during 90 day storage. Tandon and Kalra (8), Kalra *et al*. (9), and Kadam *et al*. (6) also noticed increasing trend in reducing sugars in guava pulp during storage. Inversion of non-reducing sugars to reducing sugars might have caused increase in reducing sugars, which are correlated with the decrease in non-reducing sugars. An increase in reducing sugar content was also reported by Bhuvaneswari and Tiwari (3), and Tandon *et al.* (9) in guava pulp at room temperature upto 60 days further they explained that it might be due to breakdown of some of the hemi-celluloses and other saccharides into simple soluble sugars. Among packaging materials, pulp packed and stored in poly jars was found superior as it retained higher reducing sugars (6.52%) as compared to pulp stored in polybags (5.84%) after 90 days. Kalra *et al*. (9) also noticed an increase in reducing sugars during storage of fruit products in food grade HDPE, LDPE, PVC and glass containers, but the rate of inversion was faster in plastic than glass containers.

The ascorbic acid retention (Table 1) was significantly higher in the heated pulp as compared to non-heated pulp. In general, ascorbic acid content decreased from 173 to 77.17 mg/100 g during storage. Hayati (5) also reported a decrease in ascorbic acid content of guava pulp during storage. Ascorbic acid is more sensitive to oxidation and destroys very quickly in presence of oxygen, hence, it might have been destroyed during

Table 1. Effect of treatments and packaging material on reducing sugar (g/100 g) and ascorbic acid (mg/100 g) of guava pulp during storage.

Treatment	Reducing sugar (g/100 g)									Ascorbic acid (mg/100 g)								
	Storage period (days)									Storage period (days)								
	0		30		60		90		Mean	0		30		60		90		Mean
	PJ	PB	PJ	PB	PJ	PB	PJ	PB		PJ	PB	PJ	PB	PJ	PB	PJ	PB	
Control	4.59	4.59	5.89	5.21	6.09	5.43	6.86	5.48	5.52	140.7	140.70	127.80	102.60	108.00	63.20	76.00	32.80	99.49
PS 0.1%	5.07	5.07	6.09	5.68	6.56	6.42	6.90	-	5.22	153.9	154.65	127.70	99.75	107.65	65.75	86.55	-	144.27
KMS 0.1%	4.79	4.79	5.68	5.54	6.02	5.61	6.49	6.29	5.65	182.6	183.20	174.15	161.30	139.40	126.50	100.65	86.35	147.73
Heat	5.07	5.07	5.21	5.14	5.48	5.28	6.29	5.61	5.39	185.6	185.60	165.15	154.65	153.40	116.50	128.00	86.90	146.97
Heat + PS 0.1%	5.52	5.52	5.68	5.48	6.22	5.35	6.70	6.22	5.84	184.0	184.00	171.15	154.80	143.50	128.55	133.20	95.20	149.3
Heat + KMS 0.1%	5.21	5.21	5.34	5.30	5.62	5.55	5.88	5.61	5.47	191.2	191.50	181.35	164.90	174.35	103.50	148.50	84.60	154.98
Mean	5.04	5.04	5.65	5.39	6.00	5.61	6.52	5.84		173.0	173.28	157.88	139.67	137.72	100.66	112.15	77.17	
CD at 5%					Treatment =		0.25								Treatment =	0.03		
					Packaging =		NS								Packaging =	NS		
					Treatment × packaging =		NS								Treatment × packaging =	NS		

processing and subsequently during storage. Higher retention was observed in pulp packed in poly jars as compared to polybags. This may be due to higher permability of polyethylene as compared to food grade plastic jar which might have caused oxidation of ascorbic acid leading to losses during storage Crosby (4). Maximum ascorbic acid retention was observed in pulp packed in polyjars (112.15 mg) as compared to polybags (77.17 mg) after 90 days of storage.

Total acidity in the pulp showed increasing trend during storage (Table 2). The acidity was comparatively higher in the pulp treated with KMS than PS. There was an increase in acidity from 0.37 to 0.67% upto 90 days of storage. The increase in acid content was more in pulp stored in polybag (0.63%) after 90 days of storage. Barmanray *et al.* (2) also reported a significant increase in acidity of guava nectar with increase in storage period. The increase in acidity during storage of guava pulp might be due to certain TCA activities still going on and part of sugars were utilized to yield various organic acids which resulted in its increase (Barmanray *et al*., 2).

Non-enzymatic browning of guava pulp expressed in terms of OD at 440 nm (Table 2) indicate that browning was significantly less in pulp treated with KMS 0.1% upto 90 days of storage. Untreated pulp has significantly higher browning (0.066-0.152) than treated pulp. There was an increase in browning of stored guava nectar was also observed by Barmanray *et al.* (2). Increase in browning during storage was mainly due to non-enzymatic reaction of organic acid with sugars or oxidation of phenols, which leads to the formation of brown pigments. Loss of sulphur-di-oxide and ascorbic acid also indicated the chances of increased browning. Among packaging materials, poly jars (0.109) were found superior to polybags (0.116) with respect to less browning. Hayati (5) also observed that pulp packed in glass get brown earlier than in PVC, the light might have affected the colour of products. Sulphur-di-oxide content (Fig. 1) of preserved guava pulp showed higher retention (494.82 ppm) in pulp treated with heat + KMS as compared to non-heated pulp (426.40 ppm). In general, free SO_2 decreased from 526.4 to 348.8 ppm by end of storage. Decrease in SO_2 of guava pulp was also reported by Tandon and Kalra (8), and Hayati (5). The reduction in free SO_2 content during storage might be due to the oxidation and destruction during storage. The retention of SO_2 was maximum in poly jars as compared to polybags. The more loss of SO_2 carboys may be ascribed to their more permeability to oxygen.

It may be concluded that guava pulp of good quality can be preserved with potassium metabisulphite and stored in food grade plastic jars at low temperature (2-5°C) for 3 months.

Table 2. Effect of treatments and packaging material on total acidity (%) and non enzymatic browning of guava pulp during storage.

Treatment	Total acidity (%)								
	Storage period (days)								
	0		30		60		90		Mean
	PJ	PB	PJ	PB	PJ	PB	PJ	PB	
Control	0.28	0.28	0.36	0.36	0.44	0.41	0.66	0.69	0.44
PS 0.1%	0.35	0.35	0.38	0.44	0.46	0.47	0.58	-	0.38
KMS 0.1%	0.32	0.32	0.42	0.47	0.55	0.57	0.63	0.66	0.49
Heat	0.42	0.42	0.46	0.48	0.55	0.58	0.66	0.66	0.53
Heat + PS 0.1%	0.42	0.42	0.46	0.44	0.52	0.52	0.62	0.66	0.51
Heat + KMS0.1%	0.42	0.42	0.46	0.44	0.52	0.52	0.62	0.66	0.51
Mean	0.37	0.37	0.42	0.44	0.51	0.51	0.63	0.67	
CD at 5%					Treatment =		2.12		
					Packaging =		NS		
			Treatment × packaging =				NS		

Treatment	Non enzymatic browning (OD at 420nm)								
	Storage period (days)								
	0		30		60		90		Mean
	PJ	PB	PJ	PB	PJ	PB	PJ	PB	
Control	0.066	0.071	0.084	0.086	0.128	0.134	0.144	0.152	0.108
PS 0.1%	0.066	0.068	0.076	0.084	0.108	0.113	0.125	-	0.080
KMS 0.1%	0.068	0.071	0.045	0.046	0.060	0.081	0.070	0.088	0.066
Heat	0.058	0.056	0.066	0.076	0.086	0.105	0.110	0.116	0.084
Heat + PS 0.1%	0.060	0.061	0.084	0.086	0.099	0.111	0.123	0.128	0.094
Heat + KMS0.1%	0.027	0.036	0.031	0.031	0.049	0.054	0.079	0.094	0.050
Mean	0.058	0.061	0.064	0.068	0.088	0.099	0.109	0.116	
CD at 5%					Treatment =		0.007		
					Packaging =		NS		
			Treatment × packaging =				NS		

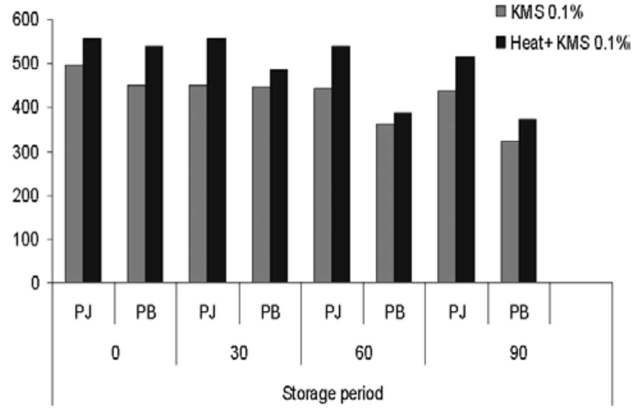

Fig. 1. Effect of treatments and packaging material on sulphur-di-oxide (ppm) of guava pulp during storage.

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Received: March, 2012; Revised: June, 2013; Accepted: July, 2013