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Reduction In Post-Harvest Losses of Winter and Summer Crops of Guava

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Guava (*Psidium guajava*) is a perishable commodity and has a very short shelf-life at ambient temperature. Extension in shelf-life of fruits by reducing enzymic activity, rate of respiration [1] temperature and humidity control, chemical treatment [2], gamma radiation [3] and proper packaging [4] had been reported by various workers. However, the present investigations were undertaken to ascertain nutritional losses and physical changes that may occur during storage of fresh guavas under different conditions. Six varieties (Mehu, Hafsi, Karela, "Chittidar", and "Thad Aram") of guava, which are commonly grown in Pakistan [5] were stored at ambient temperature and relative humidity conditions, shelf-life of guavas was also studied by using pyramidal structure [6]. A pyramid structure of card board (3 mm thickness, 1.5 meter height and 1.2 meter base having 0.72 m^3 volume) was fabricated. Porosity of the card-board was reduced by painting outside of the pyramid with plastic emulsion. The structure was placed on a smooth flat surface and made airtight by using cellophane tape. Sixty percent of the pyramid volume was packed with the fruit. The remaining 40% was left for gases produced during storage.

Fresh and stored guavas were analysed (Table 1) for moisture, sugar and acidity content by A.O.A.C. methods [7], and ascorbic acid by Bajaj and Kaur method [8]. Organoleptic evaluation of guavas was carried out by a panel of 10 judges following a 10 point hedonic scale procedure [9].

Storage life of guavas was extended by 6 days in winter (Table 2) and 4 days in summer by pyramidal storage (p.s.) (Table 3). This was probably due to restricted air flow in the pyramidal structure, which produced a high carbon dioxide and low oxygen atmosphere resulting in low respiratory activity. This observation is in conformity with the work of Roberts and Mason [6]. Open stored (o.s.) guavas remained acceptable upto 8 days and 6 days in winter and summer respectively, whereas those stored under pyramidal structure remained acceptable upto 14 and 10 days (Tables 2-3). Weight loss during winter and summer was also observed under o.s. and p.s conditions (Table 2 & 3). Variation in weight reduction might be either due to varietal characteristics or due to variation in cultural treatment. Changes in other constituents like acidity, ascorbic acid and sugars are also reported in Tables 2 - 3.

It is evident from the data (Table 4) that Mehu and Chittidar, cultivars, when stored in p.s., remained acceptable upto a storage period of 14 days in winter and 10 days in summer. Safeda variety showed considerable decrease in the acceptability after 10 days in winter and 8 days in summer under p.s. Hafsi, Karela and Thad Aram cultivars also indicated slight decrease in their acceptability. However, guavas stored in open were acceptable only upto 8 days in winter and 4 days in summer. Hafsi and Safeda showed larval growth after 4 days of o.s. during summer which might be due to infection on the trees at the flowering stage of fruit.

It may be concluded from the data (Tables 2-4) that p.s. helped not only in reducing the deterioration of fruit by chemical degradation but also contributed in preserving the orga-

TABLE 1. CHEMICAL COMPOSITION OF FRESH GUAVAS

Constituents		Varieties					
		"Mehu"	"Hafsi"	"Karela"	"Chittedar"	"Safeda"	"Thad Aram"
Moisture(%)	W	74.3	74.6	76.7	72.8	75.6	74.2
	S	72.7	72.8	71.2	71.5	69.6	71.3
Acidity(%)	W	0.72	0.64	0.63	0.87	0.71	0.77
	S	0.66	0.60	0.68	0.80	0.73	0.72
Ascorbic Acid	W	302	300	156	286	275	270
(mg/100g)	S	242	240	161	246	295	240
Non-reducing	W	4.30	3.91	3.80	4.49	4.56	4.18
Sugars(%)	S	4.41	4.02	4.55	4.35	5.35	4.56
Reducing	W	4.82	4.23	4.10	5.25	5.02	4.62
Sugars(%)	S	4.74	4.43	5.60	5.13	6.08	5.11

W = Winter Crop, S = Summer Crop.

TABLE 2. PERCENT DECREASE IN VARIOUS CONSTITUTE ON STORAGE* OF WINTER SEASON GUAVA FRUIT.

Constituents		Varieties																									
		"Mehu"				"Hafsi"				"Karela"				"Chittedar"				"Safeda"				"Thad Aram"			
		2+	4+	8+	14+	2	4	8	14	2	4	8	14	2	4	8	14	2	4	8	14	2	4	8	14
Weight	O	5.5	10.1	20.0	(a)	6.0	12.7	25.9	(a)	5.6	10.2	20.4	(a)	5.9	9.5	22.0	(a)	8.1	15.2	30.8	(a)	5.4	10.1	21.2	(a)
	P	3.0	5.1	10.4	20.0	3.7	6.8	14.7	25.8	3.3	6.2	12.6	25.9	3.0	5.3	10.2	19.9	4.3	7.9	15.5	25.4(b)	3.3	6.0	12.4	24.5
Activity	O	0.57	0.90	1.52	(a)	0.61	1.02	1.47	(a)	0.54	0.86	1.56	(a)	0.60	0.93	1.52	(a)	0.51	1.10	2.12	(a)	0.34	0.72	1.54	(a)
	P	0.28	0.46	0.87	1.72	0.38	0.53	0.99	1.70	0.33	0.51	0.98	1.86	0.41	0.54	0.84	1.28	0.44	0.86	1.20	1.32(b)	0.26	0.44	0.96	1.91
Ascorbic Acid	O	1.44	2.49	5.50	(a)	1.50	2.77	6.02	(a)	1.33	2.33	4.89	(a)	1.41	2.83	5.63	(a)	1.71	3.64	6.93	(a)	1.57	2.99	5.65	(a)
	P	0.67	1.26	3.32	5.78	1.04	1.96	3.71	5.94	0.96	1.44	3.03	5.73	1.09	1.85	2.91	5.49	1.05	1.73	3.32	4.88(b)	1.03	1.37	3.10	6.06
Non-Reducing	O	0.41	0.80	1.21	(a)	0.46	0.91	1.45	(a)	0.42	0.61	1.03	(a)	0.41	0.68	1.09	(a)	0.49	0.85	1.46	(a)	0.36	0.62	1.03	(a)
Sugars	P	0.28	0.49	0.82	1.59	0.28	0.61	1.22	1.83	0.30	0.49	0.93	1.54	0.33	0.49	0.92	1.55	0.36	0.73	1.15	1.64(b)	0.26	0.52	0.90	1.34
Reducing	O	0.44	0.85	1.29	(a)	0.56	0.97	1.50	(a)	0.44	0.70	1.12	(a)	0.46	0.73	1.22	(a)	0.51	0.90	1.54	(a)	0.41	0.67	1.14	(a)
Sugars(c)	P	0.33	0.44	0.75	1.47	0.30	0.66	1.32	1.96	0.30	0.47	1.00	1.61	0.38	0.63	1.01	1.67	0.56	0.95	1.22	1.71(b)	0.31	0.52	0.93	1.47

*Temperature Range = 8.40 - 25.50° C, Relative humidity = 51.83%, + = Days of Storage, O = Open storage, P = Pyramidal storage, a = Experiment discontinued, b = After 12 days storage, c = % Increase.

TABLE 3. PERCENT DECREASE IN VARIOUS CONSTITUTE ON STORAGE* OF SUMMER SEASON GUAVA FRUIT.

Constituents		Varieties																									
		"Mehu"				"Hafsi"				"Karela"				"Chittedar"				"Safeda"				"Thad Aram"			
		2+	4+	6+	10+	2	4	6	10	2	4	6	10	2	4	6	10	2	4	6	10	2	4	6	10
Weight	O	9.8	16.8	24.9	(a)	10.6	19.9	29.9	(a)	12.3	20.9	31.0	(a)	8.1	14.3	22.8	(a)	12.4	22.4	32.9	(a)	8.2	16.9	24.9	(a)
	P	5.6	10.8	15.7	26.8	7.6	12.8	17.9	30.9	7.7	12.0	17.5	29.1	4.4	7.9	11.8	23.1	8.5	13.7	20.0	30.2	4.5	9.6	14.7	26.4
Activity	O	0.76	0.96	1.58	(a)	0.64	1.12	1.63	(a)	0.75	1.15	1.90	(a)	0.57	1.14	1.80	(a)	0.91	1.46	2.37	(a)	0.75	1.38	2.07	(a)
	P	0.55	0.79	0.98	1.69	0.48	0.84	1.22	2.03	0.55	1.04	1.41	2.13	0.40	0.71	1.11	2.00	0.76	1.19	1.67	2.89	0.69	1.09	1.52	2.76
Ascorbic Acid	O	2.54	5.13	7.24	(a)	2.13	3.94	6.27	(a)	2.16	4.58	7.46	(a)	3.02	5.64	7.67	(a)	3.19	6.05	9.00	(a)	3.04	4.88	6.77	(a)
	P	1.88	2.79	4.29	7.70	1.55	2.87	4.47	7.11	1.61	3.51	5.18	8.27	1.91	3.28	4.85	7.90	1.92	3.50	5.08	8.66	1.18	3.24	5.08	8.32
Non-Reducing	O	1.26	1.75	2.24	(a)	1.17	1.65	2.11	(a)	1.27	1.81	2.59	(a)	1.43	1.94	2.48	(a)	1.64	2.22	2.77	(a)	1.26	1.84	2.85	(a)
Sugars	P	0.76	1.31	1.80	3.00	1.27	1.70	2.21	2.74	0.72	1.24	2.07	2.68	1.54	1.82	2.62	3.08	1.73	2.37	2.74	3.01	1.32	1.78	2.73	3.07
Reducing	O	1.04	1.26	1.45	(a)	0.99	1.32	1.73	(a)	1.07	1.53	1.96	(a)	0.66	1.23	1.74	(a)	1.49	1.55	2.22	(a)	1.21	1.64	2.12	(a)
Sugars(c)	P	1.20	1.58	1.80	3.22	1.09	1.47	1.83	2.79	1.41	1.64	2.07	2.82	0.71	1.28	1.82	3.34	1.52	1.79	2.37	3.04	1.15	1.72	2.26	3.21

*Temperature Range = 8.40 - 25.50 C, Relative humidity = 51.83%, + = Days of storage, O = Open storage, P = Pyramidal storage, a = Experiment discontinued, b = After 12 days storage, c = % Increase.

TABLE 4. EFFECT OF STORAGE* ON ORGANOLEPTIC ACCEPTABILITY** OF DIFFERENT VARIETIES OF GUAVAS

Storage Time (Days)		Varieties											
		"Mehu"		"Hafsi"		"Karela"		"Chittedar"		"Safeda"		"Thad Aram"	
		W	S	W	S	W	S	W	S	W	S	W	S
2	O	9.0	8.6	9.0	8.7	9.1	8.7	9.1	8.2	9.0	8.5	8.8	8.5
	P	9.4	9.0	9.4	9.0	9.3	9.3	9.4	9.3	9.4	8.9	9.3	8.9
4	O	8.5	8.1	8.6	8.2	8.5	8.1	8.8	8.4	8.5	7.6	8.3	7.7
	P	9.0	8.6	8.7	8.5	9.1	8.6	9.1	8.6	9.0	8.4	9.0	8.0
6	O	7.6	7.0	8.2	6.1	7.1	6.6	8.2	7.2	8.0	6.3	7.9	6.6
	P	8.5	8.0	8.6	8.0	8.6	8.0	8.5	8.0	8.5	8.0	8.6	7.5
8	O	7.2	(a)	7.6	(a)	7.0	(a)	7.6	(a)	7.4	(a)	7.2	(a)
	P	8.0	7.3	8.2	7.2	8.1	7.5	8.1	7.4	8.1	7.2	8.0	7.0
10	O	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
	P	7.6	7.0	7.7	6.5	7.7	6.5	7.9	7.0	7.6	(a)	7.4	6.5
12	O	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
	P	7.4	(a)	7.2	(a)	7.0	(a)	7.4	(a)	6.6	(a)	7.0	(a)
14	O	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
	P	7.1	(a)	6.6	(a)	6.4	(a)	7.1	(a)	(a)	(a)	6.6	(a)

W = Winter season, S = Summer season, * = Temperature range : W = 8.4-26.5°C, S = 24.0-39.0°C, Relative humidity range : W = 51.83%, S = 41-78%, ** = The values of organoleptic acceptability are averages of colour, flavour, taste and texture values, O = Open storage, P = Pyramidal storage, (a) = Experiment discontinued.

noleptic attributes of guava fruit cultivars included in these studies.

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