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**BD Patel**

Department of Horticulture,  
B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat, India

**DD Parekh**

College of Horticulture, Anand  
Agricultural University, Anand,  
Gujarat, India

**Rakesh Jangid**

Department of Horticulture,  
B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat, India

**AO Thakor**

Department of Horticulture,  
B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat, India

## Effect of different chemicals on physical parameters of sapota (*Manilkara achras* (Mill.) Fosberg) cv. Kalipatti under cold storage condition

**BD Patel, DD Parekh, Rakesh Jangid and AO Thakor**

**Abstract**

An investigation held on "Effect of different chemicals on physical parameters of sapota cv. Kalipatti under cold storage condition" was conducted during May, 2019. The experiment was laid out in Completely Randomized Design with repetitions three times and seven treatments *viz.*, Control, Menadione (1000 and 2000 mg/l), Cycocel (0.250 and 0.500 ml/l) and Calcium Chloride (10000 and 20000 mg/l). The present investigation obtained results that the post-harvest dip treatment with CaCl<sub>2</sub> 20000 mg/l showed significantly maximum physical parameters *viz.*, fruit firmness and marketable fruits with, while minimum physical parameters *viz.*, physiological loss in weight and fruit spoilage up to 24 days of storage under cold storage. The sapota fruits treated with CaCl<sub>2</sub> 20000 mg/l (24.43 days) showed highest shelf life which was at par with CaCl<sub>2</sub> 10000 mg/l (23.67 days). The study suggested that post-harvest dip treatment with calcium chloride (10000 to 20000 mg/l) was improves the physical parameters up to 24 days of storage period of the sapota fruits.

**Keywords:** Chemicals, shelf life, sapota, calcium chloride

**Introduction**

Sapota (*Manilkara achras* (Mill.) Fosberg) is one of the most important fruit in southern and western part of the country due to its wide range of adaptability and reasonable economic returns with very low pest and disease susceptibility. Sapota is a tropical fruit, belongs to family sapotaceae. Sapota commonly known as 'chiku' is an evergreen fruit tree originated from Tropical America especially South Mexico. In India, it was introduced probably in 1898 in Maharashtra in village name "Gholwad" in Thane district by Irani brothers (Parsi) from where it spread to the nearer states and now it occupies a significant position among the fruit crops in India. Sapota fruit is berry, variable in shape like round, globular, with a size of 5.00 to 8.00 cm length, 3.5 to 7.00 cm in diameter and 75 to 100 g weight. The fruit has rusty brown scurfy skin and the pulp is soft, sweet and crumbling with a granular structure having particular aroma and high nutritive value.

**Materials and Methods**

The study was carried out at Anand Agricultural University, Anand during May, 2019. The handpicked, uniform size and optimum stage of maturity develops sapota cv. Kalipatti fruits were selected for the study. The fruits were dipped for 5 minutes in solution of menadione (1000 and 2000 mg/l), cycocel (0.250 and 0.500 ml/l) and calcium chloride (10000 and 20000 mg/l) and the fruits under control were dipped in distilled water. After dipping, fruits surface was air dried in open air for 30 minutes, then treated fruits were stored in the cold storage. The experimental data was analysed in CRD (Completely Randomized Design) with three repetitions. The twenty fruits from each treatment of each three repetitions were selected and marked for storage study. Different quantitative characters were then recorded from them and replaced the fruits in their respective boxes. The physical parameters *viz.*, physiological loss in weight (%), fruit spoilage (%), fruit firmness (kgcm<sup>-2</sup>), marketable fruits (%) and shelf life (Days) were recorded on 6<sup>th</sup>, 9<sup>th</sup>, 12<sup>th</sup>, 15<sup>th</sup>, 18<sup>th</sup>, 21<sup>st</sup> and 24<sup>th</sup> days of storage period.

**Results and Discussion**

The treatment with CaCl<sub>2</sub> 20000 mg/l recorded the minimum PLW (%), respectively which was at par with CaCl<sub>2</sub> 10000 mg/l treated fruits, at 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> day of storage respectively. Based on mean data, the sapota fruits treated with CaCl<sub>2</sub> 20000 mg/l recorded the minimum PLW (%) at 15<sup>th</sup>, 18<sup>th</sup>, 21<sup>st</sup> and 24<sup>th</sup> days of storage.

**Corresponding Author:****BD Patel**

Department of Horticulture,  
B. A. College of Agriculture,  
Anand Agricultural University,  
Anand, Gujarat, India

The lowest PLW recorded in treatment with CaCl<sub>2</sub> 20000 mg/l might be due to the maintains of fruits by calcium as it decreases the enzyme activity which responsible for cell wall strenthening, which decreased the gaseous exchange. Similar results on post-harvest treatment of calcium chloride were also reported by Tsomu and Patel (2014) [9] and Gondaliya (2016) [3] in sapota and Gupta *et al.*, (2011) [4] in peach.

The treatment with CaCl<sub>2</sub> 20000 mg/l recorded the maximum fruit firmness at 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> day of storage, respectively. Based on mean data, the sapota fruits treated with CaCl<sub>2</sub> 20000 mg/l was recorded the maximum fruit firmness at 15<sup>th</sup>, 18<sup>th</sup>, 21<sup>st</sup> and 24<sup>th</sup> days of storage. Maximum fruit firmness was reported in CaCl<sub>2</sub> 20000 mg/l. Thus, calcium improved the mechanical strength perhaps as a consequence of calcium pectate in the cell wall. Similar results were also observed by Sudha *et al.*, (2007) [8] in sapota, Barot (2014) [1], Ramesh *et al.*, (2014) [6] and Srinu *et al.*, (2017) in papaya, and Desai (2010) [2] in mango.

The treatment CaCl<sub>2</sub> 20000 mg/l recorded the maximum marketable fruits at 9<sup>th</sup> and 12<sup>th</sup> day of storage respectively. Based on mean data, the sapota fruits treated with CaCl<sub>2</sub> 20000 mg/l was recorded the maximum marketable fruits at 15<sup>th</sup>, 18<sup>th</sup>, 21<sup>st</sup> and 24<sup>th</sup> days of storage. Maximum marketable fruits reported in fruits treated with CaCl<sub>2</sub> 20000 mg/l, which may be due to the higher skin calcium content, retardation

process of ripening and rigidified cell wall. These findings are in agreement with those obtained by Shivpuje (1998) and Gondaliya (2016) [3] in sapota.

The treatment with calcium chloride 20000 mg/l recorded minimum fruit spoilage at 9<sup>th</sup> and 12<sup>th</sup> day of storage respectively. Based on mean data, the sapota fruits were treated with CaCl<sub>2</sub> 20000 mg/l recorded the minimum fruit spoilage at 15<sup>th</sup>, 18<sup>th</sup>, 21<sup>st</sup> and 24<sup>th</sup> days of storage, respectively. Lower fruit spoilage% in CaCl<sub>2</sub> 20000 mg/l treated fruits may be due to the higher fruit flesh and skin calcium content, which resulted in stronger intercellular organization and rigidified cell wall. Similar results have been also reported by Tsomu and Patel (2014) [9] and Gondaliya (2016) [3] in sapota and Gupta *et al.*, (2011) [4] in peach.

The shelf life determines their keeping quality of fruits. The maximum shelf life (24.43 days) was recorded with CaCl<sub>2</sub> 20000 mg/l followed by CaCl<sub>2</sub> 10000 mg/l *i.e.* 23.67 days as compared to the rest of the treatments. Increase the shelf life of fruits might be due to calcium is important in the maintenance of cell wall integrity, results to delay in ripening processed to reduction in enzyme activity that are closely related to ethylene production. The results conformed to the findings of Tsomu and patel (2014) [9] and Gondaliya (2016) [3] in sapota, Rajkumar (2005) in papaya and Desai (2016) in mango.

**Table 1:** Effect of different chemicals on physiological loss in weight (%) of sapota fruits cv. Kalipatti under cold storage condition

Treatment code	Treatments	Physiological loss in weight (%)						
		6 <sup>th</sup> day	9 <sup>th</sup> day	12 <sup>th</sup> day	15 <sup>th</sup> day	18 <sup>th</sup> day	21 day	24 <sup>th</sup> day
T <sub>1</sub>	Control	3.58	6.26	10.20	-	-	-	-
T <sub>2</sub>	Menadione (1000 mg/l)	2.78	4.34	6.11	8.06	10.14	-	-
T <sub>3</sub>	Menadione (2000 mg/l)	2.66	4.18	5.94	7.86	9.93	-	-
T <sub>4</sub>	Cycocel (0.250 ml/l)	3.13	5.38	7.96	10.46	-	-	-
T <sub>5</sub>	Cycocel (0.500 ml/l)	2.96	5.12	7.75	10.25	-	-	-
T <sub>6</sub>	Calcium chloride (10000 mg/l)	2.39	3.31	4.57	5.92	7.98	10.76	-
T <sub>7</sub>	Calcium chloride (20000 mg/l)	2.30	3.15	4.41	5.64	7.07	8.65	10.59
	S.Em. ±	0.05	0.10	0.13				
	C.D. at 5%	0.16	0.29	0.37				
	C.V.%	3.36	3.83	3.34				

**Table 2:** Effect of different chemicals on fruit firmness (kgcm<sup>-2</sup>) of sapota fruits cv. Kalipatti under cold storage condition

Treatment code	Treatments	Fruit firmness (kgcm <sup>-2</sup> )						
		6 <sup>th</sup> day	9 <sup>th</sup> day	12 <sup>th</sup> day	15 <sup>th</sup> day	18 <sup>th</sup> day	21 <sup>st</sup> day	24 <sup>th</sup> day
T <sub>1</sub>	Control	2.07	1.60	0.79	-	-	-	-
T <sub>2</sub>	Menadione (1000 mg/l)	2.93	2.45	1.96	1.32	0.68	-	-
T <sub>3</sub>	Menadione (2000 mg/l)	3.14	2.58	2.08	1.45	0.74	-	-
T <sub>4</sub>	Cycocel (0.250 ml/l)	2.59	2.09	1.07	0.69	-	-	-
T <sub>5</sub>	Cycocel (0.500 ml/l)	2.74	2.12	1.16	0.72	-	-	-
T <sub>6</sub>	Calcium chloride (10000 mg/l)	3.17	2.97	2.63	2.31	1.88	0.91	-
T <sub>7</sub>	Calcium chloride (20000 mg/l)	3.30	3.11	2.71	2.37	2.03	1.48	1.09
	S.Em. ±	0.10	0.10	0.05				
	C.D. at 5%	0.31	0.30	0.15				
	C.V.%	6.23	7.16	4.89				

**Table 3:** Effect of different chemicals on marketable fruits (%) of sapota fruits cv. Kalipatti under cold storage condition

Treatment code	Treatments details	Marketable fruits (%)						
		6 <sup>th</sup> day	9 <sup>th</sup> day	12 <sup>th</sup> day	15 <sup>th</sup> day	18 <sup>th</sup> day	21 <sup>st</sup> day	24 <sup>th</sup> day
T <sub>1</sub>	Control	100	75.00	51.67	-	-	-	-
T <sub>2</sub>	Menadione (1000 mg/l)	100	85.00	75.00	60.00	43.33	-	-
T <sub>3</sub>	Menadione (2000 mg/l)	100	90.00	85.00	68.33	56.67	-	-
T <sub>4</sub>	Cycocel (0.250 ml/l)	100	81.67	60.00	43.33	-	-	-
T <sub>5</sub>	Cycocel (0.500 ml/l)	100	85.00	70.00	53.33	-	-	-
T <sub>6</sub>	Calcium chloride (10000 mg/l)	100	90.00	86.67	75.00	66.67	48.33	-
T <sub>7</sub>	Calcium chloride (20000 mg/l)	100	96.67	90.00	85.00	73.33	61.67	48.33
	S.Em. ±	-	0.89	0.89				
	C.D. at 5%	-	2.70	2.70				
	C.V.%	-	1.79	2.08				

**Table 4:** Effect of different chemicals on fruit spoilage (%) of sapota fruits cv. Kalipatti under cold storage condition

Treatment code	Treatments	Fruit spoilage (%)						
		6 <sup>th</sup> day	9 <sup>th</sup> day	12 <sup>th</sup> day	15 <sup>th</sup> day	18 <sup>th</sup> day	21 <sup>st</sup> day	24 <sup>th</sup> day
T <sub>1</sub>	Control	0	25.00	48.33	-	-	-	-
T <sub>2</sub>	Menadione (1000 mg/l)	0	15.00	25.00	40.00	56.67	-	-
T <sub>3</sub>	Menadione (2000 mg/l)	0	10.00	15.00	31.67	43.33	-	-
T <sub>4</sub>	Cycocel (0.250 ml/l)	0	20.00	40.00	56.67	-	-	-
T <sub>5</sub>	Cycocel (0.500 ml/l)	0	15.00	30.00	46.67	-	-	-
T <sub>6</sub>	Calcium chloride (10000 mg/l)	0	10.00	13.33	25.00	33.33	51.67	-
T <sub>7</sub>	Calcium chloride (20000 mg/l)	0	3.33	10.00	15.00	26.67	38.33	51.67
S.Em. ±		-	0.63	0.89				
C.D. at 5%		-	1.91	2.70				
C.V.%		-	7.77	5.95				

**Table 5:** Effect of different chemicals on shelf life (days) of sapota fruits cv. Kalipatti under cold storage condition

Treatment Code	Treatment	Shelf life (Days)
T <sub>1</sub>	Control	14.15
T <sub>2</sub>	Menadione (1000 mg/l)	20.42
T <sub>3</sub>	Menadione (2000 mg/l)	21.28
T <sub>4</sub>	Cycocel (0.250 ml/l)	16.10
T <sub>5</sub>	Cycocel (0.500 ml/l)	17.63
T <sub>6</sub>	Calcium chloride (10000 mg/l)	23.67
T <sub>7</sub>	Calcium chloride (20000 mg/l)	24.43
S.Em. ±		0.77
C.D. at 5%		2.32
C.V.%		6.75

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## Conclusion

It is inferred from the present study that post-harvest 5-minute dip treatment of calcium chloride 10000 mg/l to 20000 mg/l was found best with regards to minimum fruit spoilage percent, higher marketable fruits and shelf life (23.67 and 24.43 days) of fruits.

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