Research Paper

Volume : 3 | Issue : 8 | Aug 2014 • ISSN No 2277 - 8179

Preservation of Sapota (*Manilkara zapota*) by Edible Aloe Vera Gel Coating to Maintain its Quality

Food Science

KEYWORDS : Sapota, Aloe vera gel, shelf life, organo leptic, physico chemical

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ABSTRACT

Over ripening of Sapota (Manilkara zapota) fruits at the post harvest stage usually results in a dramatic decline in quality. Aloe vera gel which has been known for its therapeutic, antibacterial and antifungal properties is used as an edible coating to prolong the storage life of tropical and sub tropical fruits, which would be an innovative and interesting means for commercial application as a means of preservation. An attempt has been made to optimize the post harvest dip treatment for shelf life extension maintaining and organo leptic characteristics of Sapota. Aloe vera gel coating of 1:2, 7 minutes and packaged in LDPE film has extended the storage life of Sapota to 20 days at 15± 2°c by maintaining initial characteristics of fruits while the untreated Sapota lost its quality attributes after 10 days.

INTRODUCTION

Sapota is a climacteric (16) fruit and is very much appreciated for its taste and nutritional value but the production and commercialization of the fruit is limited. The sweet tasting fruit possesses a delicate characteristic aroma, sometimes slightly astringent. India is the largest producer of Sapota in the world (13.08 lakh tonnes), Indian horticulture database,2009,Ministry of agriculture. It is widely grown in the states of Gujarat, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh and Kerala. Export constituted only a very minor fraction of production, 0.2 per cent in 2001-02 as this fruit ripens within 9 days at ambient (273°C) temperatures and spoils within about 13 days after harvest(1). So far many attempts has been made to extend the shelf life which include Calcium salts dip treatment(2,14), GA_3(3), Waxol(4) and hot water(30) treatments. But these were not able to increase the storage life to appreciable level as the MAP (1) does which was expensive and need technical expertise.

Aloe vera gel has been used as an edible coating in fruits (6,10,24,28), which would be an innovative and interesting means for commercial application and an alternative to the use of postharvest treatments. *Aloe Vera* has been used for centuries for its medicinal and therapeutic properties(15,17) anti-inflammatary(5) and antimicrobial activities(18) apart from the antioxidant capacity(26).

Pectin has wide applications in a variety of food formulations as jellying and thickening agent. Since it sets into Jelly in sugar-acid solution, it is regularly used in the preparation of jams, jellies and marmalades. On account of its ever-increasing use and demand, pectin has become an indispensable ingredient in food industry. Low density poly ethylene has wide applications in the food industry as packaging material to avoid weight loss(1), dust, contamination of micro organisms.

Edible coatings play an important role in the quality, safety, transportation, storage, and display of a wide range of fresh and processed foods(19,21). Edible films and coatings, while preventing moisture loss and maintaining quality, prevent spoilage and microbial contamination of foods(23). They act as barriers to moisture and oxygen during processing, handling(30) and storage and do not solely retard food deterioration but also enhance its safety due to their natural biocide activity or the incorporation of antimicrobial compounds(27).

The present study was carried out with the objectives to optimize the gel concentration for Sapota and to analyze the effect of aloe vera gel in maintaining the quality of Sapota fruits.

MATERIALS AND METHODS

Plant Material & Experimental Design. The fresh fruits were selected to obtain homogeneous batches based on color,size and absence of injuries. The aloe vera juice of food grade was obtained from PSSGT EXPORT, Tuticorin,Tamilnadu.

Standardization of gelling temperature of pectin:

Pectin was taken in different percentagesi.e., 0.5%, 0.75%, 1%, 1.25%, 1.5% in distilled water of 20 ml and heated to boiling until it would get gelled (Table-1). The percentage of pectin which got best consistency of gelling is taken to mix with aloe vera gel (Padmaja & Bosco.,2014).

Table 1- Pectin gelling at various temperatures

Pectin %	Wt of pectin in g	Vol. of Water (ml)	Temperature			
			40^0 C	50^0 C	60^0 C	70^0 C
0.5	0.1	20	No significant gelling	No significant gelling	No significant gelling	No significant gelling
0.75	0.15	20	No significant gelling	No significant gelling	No significant gelling	Partial
1.00	0.2	20	Partial	Partial	Better	Better
1.25	0.25	20	Better	Better	Good	Good
1.5	0.3	20	Good	Good	Best	Best

The gelation at various temperatures of pectin to gel the aloe vera juice during optimization process

Standardization of Edible coating:

Aloe juice was made to three different concentrations i.e., 1:1(200 ml of Water: 200 ml of aloe vera gel), 1:2 (133.3 ml of Water: 266.6 ml of aloe vera gel), 1:3 (100 ml of Water: 300 ml of aloe vera gel), with distilled water in increasing concentration of aloe vera gel and three different dipping periods for each concentration. The details of treatment were as given in the Table-2. Thus giving rise to two variants i.e., concentration of aloe juice and dipping time. Pectin, which got best gelling temperature in the process of standardization was selected and heated to the required temperature with the amount of water that was going to mix with aloe vera gel. The untreated fruits were considered as control. The samples were allowed to air dry, then were packaged into LDPE bags with a hole punctured of 0.5 cm for air passage and finally stored under refrigerated temperature of 15.These treatments were performed to standardize the concentration and

to observe the control of respiration rate. The samples were observed visually with a time interval of two days for visual aspect, shrinkage, colour change of the skin, softening nature until the fruit's shelf life ended. The best treatments with less shrinkage, uniform color development and visually good in appearance were selected for the final treatment.

Table. 2 ***Treatment details of Sapotaaccess this article under your organization's agreement with Elsevier.***

Treatment No:	Ratio of water to Aloe vera	Duration in minutes
ST1	CONTROL	-
ST2	1:1	3
ST3	1:1	5
ST4	1:1	7
ST5	1:2	3
ST6	1:2	5
ST7	1:2	7
ST8	1:3	3
ST9	1:3	5
ST10	1:3	7

The various treatments performed during optimization of the Sapota treatment with edible aloe vera gel and pectin

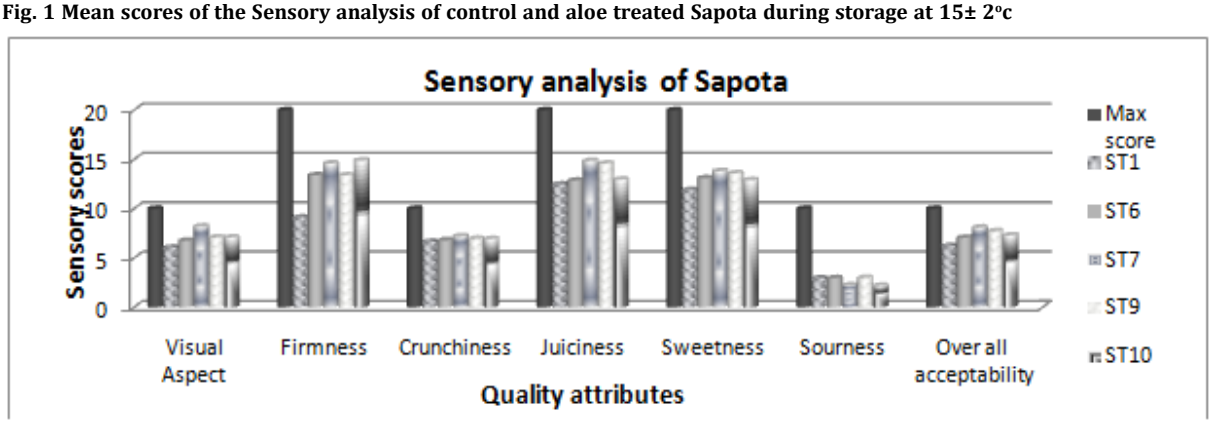
Process of edible coating for Sapota

The treatments (ST6,ST7,ST9,ST10) which got less shrinkage and better visual aspect when compared to control(ST1) were selected for the final process of edible coating. A total of 100 Sapota fruits were grouped as 20 fruits for each sample to obtain 5 samples ranging from 40 to 70 g of each fruit. Each fruit was coated with prepared aloe vera juice and pectin of different selected concentrations and time periods (Table-2). Then they were allowed to air dry for 30-40 min. and kept at 15. The sensory analysis was carried out on the last day of observation to find out which treatment is having best organoleptic characteristics.

Statistical Analysis: Data for sensory parameters were subjected to analysis of variance (ANOVA). Sources of variation were time of storage and treatments with significance level $P < 0.05$ using SPSS software package.

Sensory analysis: Sensory analyses to compare the quality of treated and control table grapes were carried out by 30 individuals in the age group of 21-25yrs. Evaluation was be done by composite scoring test as specific characteristics are rated separately by asking each of the panel members to give scores based on the quality of the fruits as below mentioned. The resulting scores were compounded for the panelists. This analysis was carried out for the fruits on the last day of shelf life. These were the characteristics considered with the following maximum scores: Visual aspect - 10, Firmness - 20, Crunchiness – 10, Juciness- 20, Sweetness – 20, Sourness- 10, Over all acceptability – 10 for a total of 100. Panelists evaluated the quality attributes of Sapota for visual aspect, firmness, crunchiness, juiciness, sweetness, sourness and had given the overall acceptability of the fruit. Basing on the sensory scores obtained ST7 (1:2-7min) is the best in all aspects including over all acceptability (Fig.10) (6).The mean of the sensory analysis shows that the quality was maintained better in ST7 and ST9 were less deviated from the standard. $P < 0.05$ for both storage time and treatment so there was significant difference between the treatments and with increase in storage period regarding sensory attributes.

Fig. 1 Mean scores of the Sensory analysis of control and aloe treated Sapota during storage at 15± 2°c



The ST7 treatment had scored the highest overall acceptability, showing it is the best of the treatments performed

CONCLUSION: The shelf life of the climacteric fruit Sapota has been extended to 20 days with the aloe vera dip treatment 1:2, 7 minutes which was found to be the most effective treatment on fruit sensory quality attributes. Moreover dip treatment is less cumbersome technique compared to MAP and CAP and it is at ease to follow as well as cost effective.

ACKNOWLEDGEMENTS: I express my deepest gratitude to our beloved Head of the Department, Dr. H. PRATHAP KUMAR SHETTY for providing all the facilities to carry out my project work. I greatfully acknowledge Mr. P.S.S.G. THIVAKAR, PSSGT Export, Tuticorin, Tamil nadu for sponsoring me Aloe vera gel required for the entire project work.

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