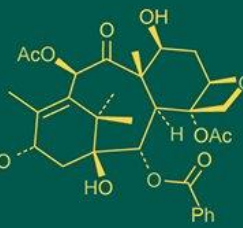
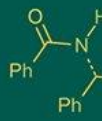
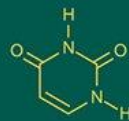
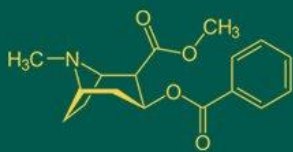


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To study the effect of edible coating materials on shelf-life and storage behaviour of custard apple (*Annona squamosa* L.) under ambient condition

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Abstract

The present investigation entitled “To study the effect of edible coating materials on shelf-life and storage behaviour of custard apple (*Annona squamosa* L.) under ambient condition” was conducted during 2025-26 at the Processing Laboratory, Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The experiment was laid out in a Completely Randomized Design (CRD) with three replications comprising thirteen treatments of edible coating materials including Aloe vera gel, bee wax, sago starch and chitosan at different concentrations along with an untreated control.

The coated fruits were stored under ambient condition and evaluated at two-days interval up to the eighth days of storage for bio-chemical parameters. Significant differences were observed among the treatments with respect to total soluble solids (TSS), titratable acidity, ascorbic acid, total sugar, reducing sugar, non-reducing sugar TSS: acid ratio and Sugar: acid ratio. Based on the overall bio-chemical characteristics Chitosan @ 2% (T₀) was identified as the most promising edible coating treatment for preserving quality and enhancing consumer acceptability of custard apple fruits under ambient storage condition.

Keywords: Custard apple, edible coating, chitosan, bio-chemical parameters, quality attributes, storage

1. Introduction

Custard apple (*Annona squamosa* L.), belonging to the family Annonaceae, is one of the important tropical fruits grown in India. It is widely consumed in fresh form due to its pleasant flavour, sweet taste and high nutritional value. The fruit is characterized by a creamy white pulp rich in carbohydrates, vitamins and minerals, making it a valuable dietary fruit (Rathore, 2018) [8].

Custard apple is considered one of the most important arid and semi-arid fruit crops and is extensively cultivated in Maharashtra, Chhattisgarh, Madhya Pradesh, Andhra Pradesh, Telangana and Rajasthan. India is among the leading producers of custard apple, and the crop contributes significantly to the livelihood of small and marginal farmers in many regions (Reddy *et al.*, 2014) [9]. Custard apple is an excellent source of energy and nutrients. The pulp contains appreciable amounts of sugars, vitamin C, dietary fibre and essential minerals. Owing to its unique flavour and nutritional richness, the fruit has gained considerable consumer preference and commercial importance in recent years (Dash *et al.*, 2021) [2].

However, custard apple is highly perishable in nature due to its climacteric pattern of ripening, high respiration rate and rapid softening after harvest. Under ambient conditions, the fruits undergo rapid physiological and bio-chemical changes, leading to deterioration in quality, reduced shelf-life and increased post-harvest losses. The fruits are also highly susceptible to microbial spoilage, which further limits their storage and marketability (Rathore, 2018) [8]. Edible coatings are eco-friendly post-harvest treatments that form a thin protective layer on the fruit surface and help regulate moisture loss and gas exchange. These coatings reduce respiration rate, delay ripening and maintain the bio-chemical and sensory quality of fruits during storage. Among the various edible coating materials, Aloe vera gel, bee wax, sago starch and chitosan have shown promising results in preserving fruit quality and extending shelf life (Mahajan *et al.*, 2005) [6].

An edible coating acts as a semi-permeable barrier between the fruit and the surrounding environment, thereby reducing water loss and delaying senescence. Due to their bio-degradable, non-toxic and safe nature, edible coatings are increasingly being used as an effective alternative to synthetic chemicals for maintaining post-harvest quality and extending the storage life of fruits (Khaliq *et al.*, 2015) [5].

Therefore, the present investigation was undertaken to study the effect of edible coating materials on shelf-life and storage behaviour of custard apple (*Annona squamosa* L.) under ambient condition. The study was aimed at evaluating the influence of different edible coating materials on biochemical parameters and identifying the most effective treatment for maintaining fruit quality and extending shelf-life under ambient storage condition.

2. Materials and Methods

Fresh, mature and uniform-sized custard apple fruits were procured for the experiment and brought to the Processing Laboratory, Department of Fruit Science, College of

Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The fruits were carefully sorted to remove damaged, diseased and injured fruits. Healthy and uniform fruits were selected and subjected to different edible coating treatments. The experiment was conducted during the year 2025-26 in a Completely Randomized Design (CRD) with thirteen treatments and three replications. Different edible coating materials comprising Aloe vera gel, bee wax, sago starch and chitosan at their respective concentrations were prepared and applied uniformly on the fruit surface. After coating, the fruits were allowed to dry at room temperature and subsequently stored under ambient condition.

The fruits were evaluated for bio-chemical parameters viz., total soluble solids (°Brix), titratable acidity (%), ascorbic acid (mg/100 g), total sugars (%), reducing sugars (%), non-reducing sugars (%), TSS: acid ratio and Sugar:acid ratio were recorded at 2 days interval during storage. The experimental data were subjected to statistical analysis following the procedures of Completely Randomized Design (CRD).

Table 1: Details of Treatments

S. No.	Treatment details	Notations used
1.	Control (No coatings)	T0
2.	Aloevera gel @ 10%	T1
3.	Aloevera gel @ 20%	T2
4.	Aloevera gel @ 50%	T3
5.	Chitosan @ 1%	T4
6.	Chitosan @ 1.5%	T5
7.	Chitosan @ 2%	T6
8.	Sago starch @ 5%	T7
9.	Sago starch @ 10%	T8
10.	Sago starch @ 20%	T9
11.	Bee wax @ 1%	T10
12.	Bee wax @ 1.5%	T11
13.	Bee wax @ 2%	T12

3. Results and Discussions

3.1 Bio-chemical parameters of custard apple fruits

The bio-chemical characteristics of custard apple fruits were determined by recording total soluble solids (°Brix), titratable acidity (%), ascorbic acid content (mg/100 g pulp), total sugars (%), reducing sugars (%), non-reducing sugars (%), TSS: acid ratio and sugar: acid ratio.

3.1.1 Total Soluble Solids (°Brix)

The variation in total soluble solids of custard apple fruits during storage revealed that T₆ (Chitosan @ 2%) maintained the maximum TSS (20.65, 24.50, 27.05 and 27.80 °Brix) at 2nd, 4th, 6th and 8th days after storage, respectively. The minimum TSS (16.82 and 20.02 °Brix) was noticed in T₀ (control) at 2nd and 4th days, respectively, whereas at 6th day, the minimum value (23.45 °Brix) was recorded in T₁₀ (Bee wax @ 1%). At 8th day, fruits were retained only under T₆. The similar findings are in close conformity with those reported by Golhani *et al.* (2013) [4] in custard apple.

3.1.2 Titratable acidity (%)

The minimum titratable acidity (0.29, 0.24 and 0.21%) was recorded in T₆ (Chitosan @ 2%) at 2nd, 4th and 6th days after storage, respectively. On the other hand, the maximum acidity (0.46 and 0.41%) was observed in T₀ (control) at 2nd and 4th days, respectively, while at 6th day, the maximum value (0.38%) was registered under T₁₀ (Bee wax @ 1%). At 8th day, fruits were available only in T₆. The similar findings are in close conformity with those reported by Padmaja *et al.* (2014) [7] in sapota, Valero *et al.* (2013) [10] in table grapes and Ali *et al.* (2011) [1] in papaya.

3.1.3 Ascorbic acid (mg/100 g)

The ascorbic acid content exhibited a decreasing trend with advancement of storage period. The maximum ascorbic acid content (42.36, 41.56, 39.03 and 36.75 mg/100 g) was recorded in T₆ (Chitosan @ 2%) at 2nd, 4th, 6th and 8th days, respectively. The minimum values (34.42 and 27.08 mg/100 g) were observed in T₀ (control) at 2nd and 4th days, respectively, while at 6th day, the minimum value (30.49 mg/100 g) was recorded under T₁₀ (Bee wax @ 1%).

3.1.4 Total sugars (%)

The total sugar content of custard apple fruits varied considerably during storage. The maximum total sugar content (21.82, 22.35 and 24.78%) was obtained under the treatment T₆ (Chitosan @ 2%) at 2nd, 4th and 6th days after storage, respectively. The minimum values (17.24 and 18.98%) were recorded under T₀ (control) at 2nd and 4th days, respectively, whereas at 6th day, the minimum value (21.54%) was observed in T₁₀ (Bee wax @ 1%). At 8th day, T₆ recorded 19.00% total sugars. Similar findings have been reported by Vahdat *et al.* (2010) [11] in strawberry.

3.1.5 Reducing sugar (%)

A gradual change in reducing sugar content was observed during the storage period. The maximum reducing sugar content (16.32, 16.53, 18.74 and 20.04%) was recorded under the treatment T₆ (Chitosan @ 2%) at 2nd, 4th, 6th and 8th days after storage, respectively. The minimum reducing sugar content (13.12 and 14.82%) were registered in T₀ (control) at 2nd and 4th days, respectively, while at 6th day, the minimum reducing sugar content (16.16%) was found under the treatment T₁₀ (Bee wax @ 1%).

3.1.6 Non-reducing sugar (%)

The non-reducing sugar content of the fruits differed among the treatments throughout the storage period. The maximum non-reducing sugar content (5.50, 5.82, 6.08 and 6.12%) was recorded under the treatment T₆ (Chitosan @ 2%) at 2nd, 4th, 6th and 8th days after storage, respectively. The minimum non-reducing sugar content (4.12 and 4.16%) were noted under the treatment T₀ (control) at 2nd and 4th days, respectively, whereas at 6th day, the minimum non-reducing sugar content (5.38%) was recorded under T₁₀ (Bee wax @ 1%). At 8th day, fruits were retained only under T₆.

3.1.7 TSS: acid ratio

The TSS: acid ratio of custard apple fruits varied significantly among the treatments during storage. The maximum TSS: acid ratio (71.20, 102.08, 128.80 and 163.52) was recorded under the treatment T₆ (Chitosan @ 2%) at 2nd, 4th, 6th and 8th days after storage, respectively. The minimum TSS: acid ratio (36.56 and 48.82) were recorded under the treatment T₀

(control) at 2nd and 4th days, respectively, whereas at 6th day, the minimum value (61.71) was observed under T₁₀ (Bee wax @ 1%). At 8th day, fruits were retained only under T₆. The present findings are close conformity with the findings reported by Golhani and Bisen *et al.* (2012) [3] in custard apple, Padmaja *et al.* (2014) [7] in sapota and Vyas *et al.* (2014) [12] in papaya.

3.1.8 Sugar: acid ratio

The sugar: acid ratio showed considerable variation among the treatments throughout the storage period. The maximum sugar: acid ratio (75.24, 93.12, 117.61 and 153.88) was recorded under the treatment T₆ (Chitosan @ 2%) at 2nd, 4th, 6th and 8th days after storage, respectively. The minimum sugar: acid ratio (37.47 and 46.29) were observed under the treatment T₀ (control) at 2nd and 4th days. At 6th day, the minimum value (56.68) was recorded under the treatment T₁₀ (Bee wax @ 1%). At 8th day, only T₆ retained fruits.

Table 2: Effect of edible coating materials on Total soluble solids (°Brix) of custard apple during storage under ambient condition

Notations	Treatments	Total soluble solids (°Brix)			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coatings)	16.82a	20.02a	0.00*	0.00*
T ₁	Aloe vera gel @ 10%	19.70de	23.42de	26.53de	0.00*
T ₂	Aloe vera gel @ 20%	19.73def	23.68ef	26.68de	0.00*
T ₃	Aloe vera gel @ 50%	19.82defg	23.72ef	26.72de	0.00*
T ₄	Chitosan @ 1%	20.54efg	24.42f	27.00e	0.00*
T ₅	Chitosan @ 1.5%	20.60fg	24.45f	27.02e	0.00*
T ₆	Chitosan @ 2%	20.65g	24.50f	27.05e	27.80
T ₇	Sago starch @ 5%	18.68b	21.72bc	25.69cd	0.00*
T ₈	Sago starch @ 10%	18.74bc	22.57bcd	25.72d	0.00*
T ₉	Sago starch @ 20%	19.61cd	22.62cd	25.75d	0.00*
T ₁₀	Bee wax @ 1%	17.42a	20.35a	23.45a	0.00*
T ₁₁	Bee wax @ 1.5%	17.48a	20.66a	24.51ab	0.00*
T ₁₂	Bee wax @ 2%	18.56b	21.64b	24.58bc	0.00*
	SEm (±)	0.29	0.32	0.37	NS
	CD at 5%	0.87	0.96	1.11	

DAS: Days after storage, Value marked as * indicates fruits get spoiled, NS: Non-significant, The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means

Table 3: Effect of edible coating materials on titratable acidity (%) of custard apple during storage under ambient condition

Notations	Treatments	Titratable acidity (%)			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coatings)	0.46b	0.41c	0.00*	0.00*
T ₁	Aloe vera gel @ 10%	0.35ab	0.31abc	0.28ab	0.00*
T ₂	Aloe vera gel @ 20%	0.34ab	0.30abc	0.26ab	0.00*
T ₃	Aloe vera gel @ 50%	0.33ab	0.28ab	0.24ab	0.00*
T ₄	Chitosan @ 1%	0.31ab	0.28ab	0.24ab	0.00*
T ₅	Chitosan @ 1.5 %	0.30a	0.28ab	0.22a	0.00*
T ₆	Chitosan @ 2%	0.29a	0.24a	0.21a	0.22
T ₇	Sago starch @ 5%	0.40ab	0.37bc	0.33ab	0.00*
T ₈	Sago starch @ 10%	0.38ab	0.34abc	0.33ab	0.00*
T ₉	Sago starch @ 20%	0.36ab	0.32abc	0.30ab	0.00*
T ₁₀	Bee wax @ 1%	0.44ab	0.40bc	0.38ab	0.00*
T ₁₁	Bee wax @ 1.5 %	0.44ab	0.39bc	0.36ab	0.00*
T ₁₂	Bee wax @ 2%	0.42ab	0.37bc	0.34ab	0.00*
	SEm (±)	0.05	0.04	0.06	NS
	CD at 5%	0.15	0.12	0.18	

1) DAS: Days after storage.

2) Value marked as * indicates fruits get spoiled.

3) NS: Non-significant

4) The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

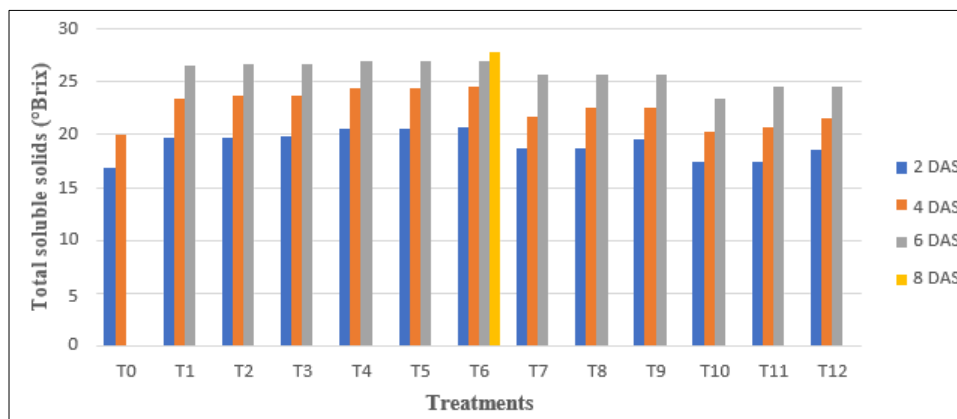


Fig 1: Effect of edible coating materials on Total soluble solids (°Brix) of custard apple during storage under ambient condition

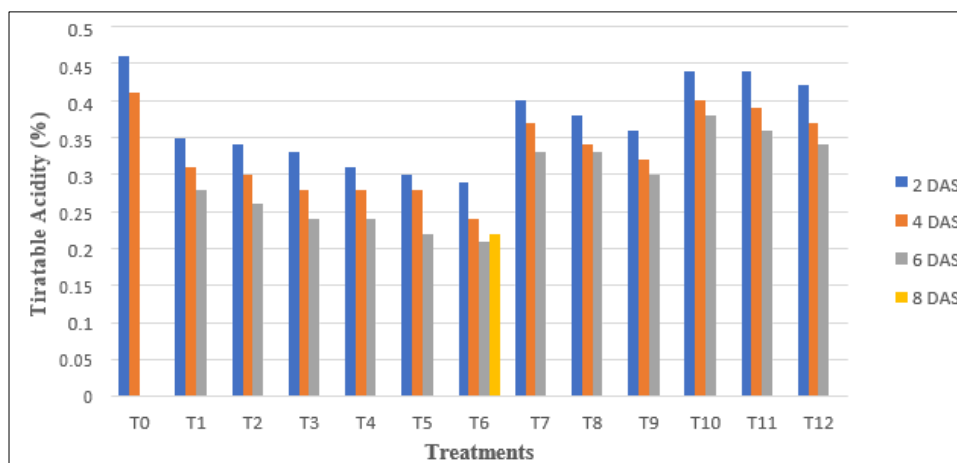


Fig 2: Effect of edible coating materials on titratable acidity (%) of custard apple during storage under ambient condition

Table 3: Effect of edible coating materials on ascorbic acid content (mg/100g) of custard apple during storage under ambient condition

Notations	Treatments	Ascorbic acid content (mg/100g)			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coatings)	34.42a	27.08a	0.00*	0.00*
T ₁	Aloevera gel @ 10%	41.28c	38.46e	34.61c	0.00*
T ₂	Aloevera gel @ 20%	41.36c	38.66e	34.72c	0.00*
T ₃	Aloevera gel @ 50%	41.57c	38.75e	35.00c	0.00*
T ₄	Chitosan @ 1%	42.10c	39.00e	35.02c	0.00*
T ₅	Chitosan @ 1.5%	42.26c	39.03e	35.05c	0.00*
T ₆	Chitosan @ 2%	42.36c	41.56f	39.03d	36.75
T ₇	Sago starch @ 5%	39.26bc	36.48cd	32.39b	0.00*
T ₈	Sago starch @ 10%	40.32bc	36.52cd	32.52b	0.00*
T ₉	Sago starch @ 20%	41.19c	37.42de	34.42c	0.00*
T ₁₀	Bee wax @ 1%	36.16a	32.42b	30.49a	0.00*
T ₁₁	Bee wax @ 1.5%	37.09ab	35.24c	30.62a	0.00*
T ₁₂	Bee wax @ 2%	37.19ab	35.37c	31.54ab	0.00*
	SEm (±)	1.25	0.62	0.43	NS
	CD at 5%	3.75	1.86	1.29	

DAS: Days after storage, Value marked as * indicates fruits get spoiled, NS: Non-significant

The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

Table 4: Effect of edible coating materials on total sugar (%) of custard apple during storage under ambient condition

Notations	Treatments	Total sugar (%)			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coating)	17.24a	18.98a	0.00*	0.00*
T ₁	Aloevera gel @ 10%	20.16de	20.70ef	23.38bcd	0.00*
T ₂	Aloevera gel @ 20%	20.44ef	21.10fg	24.17cde	0.00*
T ₃	Aloevera gel @ 50%	20.54efg	21.29fg	24.27de	0.00*
T ₄	Chitosan @ 1%	21.35fgh	21.64gh	24.68e	0.00*
T ₅	Chitosan @ 1.5%	21.50gh	21.81gh	24.70e	0.00*
T ₆	Chitosan @ 2%	21.82h	22.35h	24.78e	19.00
T ₇	Sago starch @ 5%	19.41bcd	19.76bcd	22.94b	0.00*
T ₈	Sago starch @ 10%	19.60cde	20.03cde	23.15b	0.00*
T ₉	Sago starch @ 20%	20.04de	20.46def	23.25bc	0.00*

T ₁₀	Bee wax @ 1%	18.46b	19.19b	21.54a	0.00*
T ₁₁	Bee wax @ 1.5%	18.59b	19.29bc	21.61a	0.00*
T ₁₂	Bee wax @ 2%	18.75bc	19.40bc	21.80a	0.00*
	SEm (±)	0.32	0.30	0.31	NS
	CD at 5%	0.96	0.90	0.93	

DAS: Days after storage, Value marked as * indicates fruits get spoiled, NS: Non-significant, The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

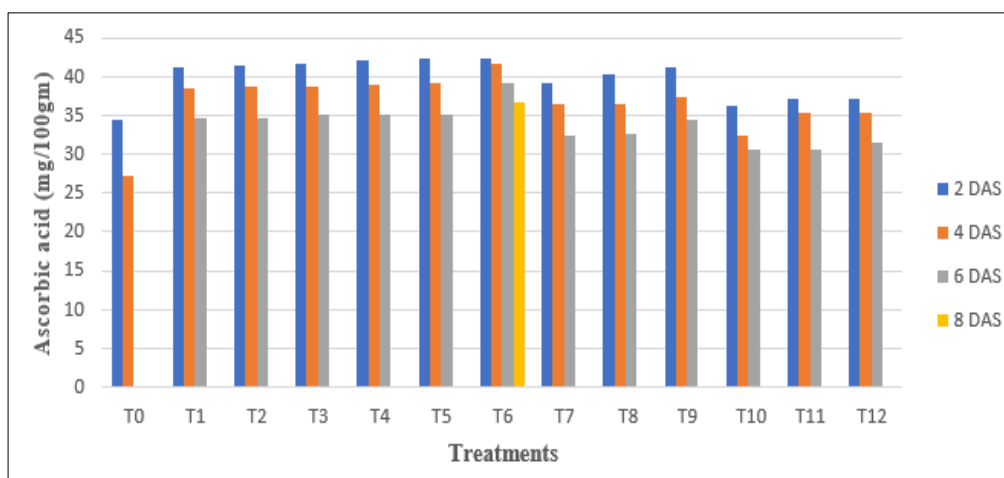


Fig 3: Effect of edible coating materials on ascorbic acid content (mg/100g) of custard apple during storage under ambient condition

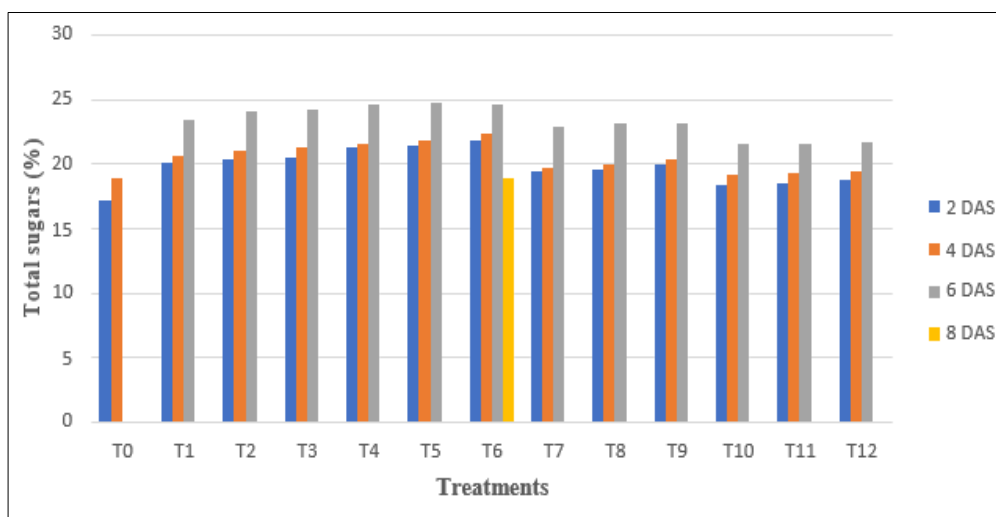


Fig 4: Effect of edible coating materials on total sugar (%) of custard apple during storage under ambient condition

Table 5: Effect of edible coating materials on reducing sugar (%) of custard apple during storage under ambient condition

Notations	Treatments	Reducing sugar (%)			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coatings)	13.12a	14.82a	0.00*	0.00*
T ₁	Aloe vera gel @ 10%	15.51d	15.87cdef	17.62b	0.00*
T ₂	Aloe vera gel @ 20%	15.58de	16.22def	18.39c	0.00*
T ₃	Aloe vera gel @ 50%	15.65def	16.37ef	18.45c	0.00*
T ₄	Chitosan @ 1%	16.25ef	16.41ef	18.62c	0.00*
T ₅	Chitosan @ 1.5%	16.30ef	16.49f	18.66c	0.00*
T ₆	Chitosan @ 2%	16.32f	16.53f	18.74a	20.04
T ₇	Sago starch @ 5%	15.16cd	15.44abcd	17.39b	0.00*
T ₈	Sago starch @ 10%	15.32d	15.67bcde	17.48b	0.00*
T ₉	Sago starch @ 20%	15.49d	15.79bcdef	17.53b	0.00*
T ₁₀	Bee wax @ 1%	14.32b	15.01ab	16.16a	0.00*
T ₁₁	Bee wax @ 1.5%	14.43b	15.04ab	16.20a	0.00*
T ₁₂	Bee wax @ 2%	14.55bc	15.12abc	16.31a	0.00*
	SEm (±)	0.24	0.27	0.22	NS
	CD at 5%	0.72	0.81	0.66	

DAS: Days after storage, Value marked as * indicates fruits get spoiled, NS: Non-significant, The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

Table 6: Effect of edible coating materials on non-reducing sugar (%) of custard apple during storage under ambient condition

Notations	Treatments	Non -reducing sugar (%)			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coatings)	4.12a	4.16a	0.00*	0.00*
T ₁	Aloe vera gel @ 10%	4.65b	4.83bc	5.76cd	0.00*
T ₂	Aloe vera gel @ 20%	4.86c	4.88cd	5.78cde	0.00*
T ₃	Aloe vera gel @ 50%	4.89c	4.92c	5.82def	0.00*
T ₄	Chitosan @ 1%	5.10d	5.23d	6.02efg	0.00*
T ₅	Chitosan @ 1.5%	5.20d	5.32d	6.04fg	0.00*
T ₆	Chitosan @ 2%	5.50e	5.82e	6.08g	6.12
T ₇	Sago starch @ 5%	4.25a	4.32a	5.55abc	0.00*
T ₈	Sago starch @ 10%	4.28a	4.36a	5.67bcd	0.00*
T ₉	Sago starch @ 20%	4.55b	4.67b	5.72cd	0.00*
T ₁₀	Bee wax @ 1%	4.14a	4.18a	5.38a	0.00*
T ₁₁	Bee wax @ 1.5%	4.16a	4.25a	5.41a	0.00*
T ₁₂	Bee wax @ 2%	4.20a	4.28a	5.49ab	0.00*
	SEm (±)	0.06	0.07	0.08	NS
	CD at 5%	0.18	0.21	0.24	

DAS: Days after storage.

Value marked as * indicates fruits get spoiled.

NS: Non-significant

The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

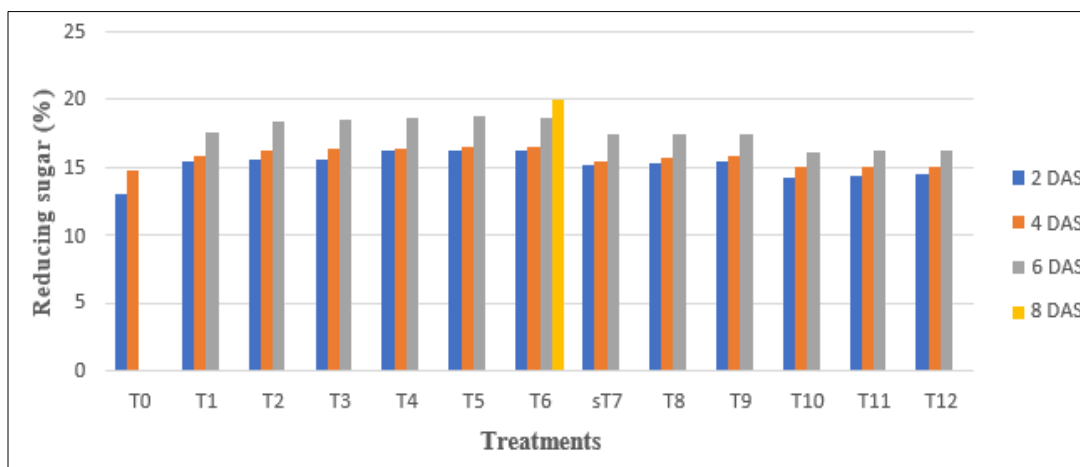
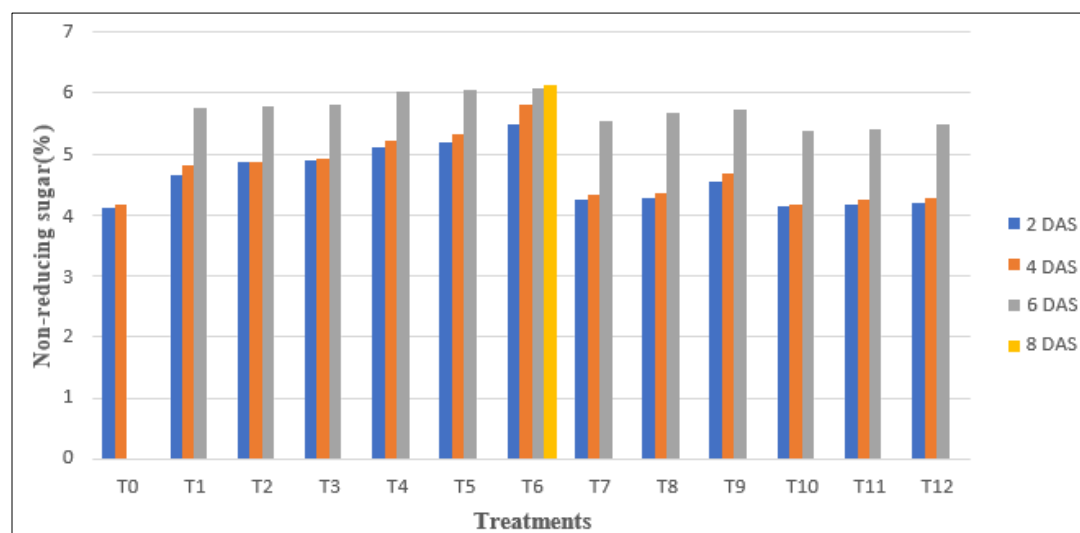
**Fig 5:** Effect of edible coating materials on reducing sugar (%) of custard apple during storage under ambient condition**Fig 6:** Effect of edible coating materials on non-reducing sugar (%) of custard apple during storage under ambient condition

Table 7: Effect of edible coating materials on TSS: acid ratio of custard apple during storage under ambient condition

Notations	Treatments	TSS: acid ratio			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coatings)	36.56a	48.82a	0.00*	0.00*
T ₁	Aloe vera gel @ 10%	56.28ef	75.54f	94.75e	0.00*
T ₂	Aloe vera gel @ 20%	58.02fg	78.93f	102.61f	0.00*
T ₃	Aloe vera gel @ 50%	60.06g	84.71g	111.33g	0.00*
T ₄	Chitosan @ 1%	66.25h	87.21g	112.50g	0.00*
T ₅	Chitosan @ 1.5%	68.66hg	87.32g	122.81h	0.00*
T ₆	Chitosan @ 2%	71.20g	102.08h	128.8i	163.52
T ₇	Sago starch @ 5%	46.7d	58.70c	77.84c	0.00*
T ₈	Sago starch @ 10%	49.31d	66.38d	77.93c	0.00*
T ₉	Sago starch @ 20%	54.47e	70.68e	85.83d	0.00*
T ₁₀	Bee wax @ 1%	39.59b	50.87ab	61.71a	0.00*
T ₁₁	Bee wax @ 1.5%	39.72b	52.97b	68.08b	0.00*
T ₁₂	Bee wax @ 2%	44.19c	58.48c	72.29b	0.00*
	SEm (±)	0.85	1.22	1.54	NS
	CD at 5%	2.55	3.66	4.62	

DAS: Days after storage.

Value marked as * indicates fruits get spoiled.

NS: Non-significant

The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

Table 8: Effect of edible coating materials on sugar: acid ratio of custard apple during storage under ambient condition

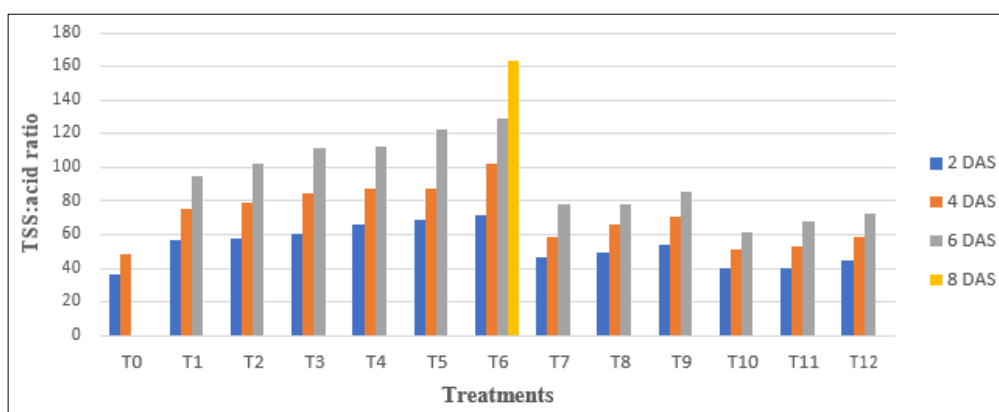
Notations	Treatments	Sugar : acid ratio			
		2 DAS	4 DAS	6 DAS	8 DAS
T ₀	Control (No coatings)	37.47a	46.29a	0.00*	0.00*
T ₁	Aloe vera gel @ 10%	57.60f	66.77f	83.50e	0.00*
T ₂	Aloe vera gel @ 20%	60.11g	70.33g	96.68f	0.00*
T ₃	Aloe vera gel @ 50%	62.24g	76.03h	101.12g	0.00*
T ₄	Chitosan @ 1%	68.87h	77.28h	102.83g	0.00*
T ₅	Chitosan @ 1.5%	71.66i	77.89h	112.63h	0.00*
T ₆	Chitosan @ 2%	75.24j	93.12i	117.61i	153.88
T ₇	Sago starch @ 5%	48.52d	53.40d	69.51c	0.00*
T ₈	Sago starch @ 10%	51.57e	58.91e	70.15c	0.00*
T ₉	Sago starch @ 20%	55.66f	63.93f	77.50d	0.00*
T ₁₀	Bee wax @ 1%	41.95b	47.97ab	56.68a	0.00*
T ₁₁	Bee wax @ 1.5%	42.25bc	49.46bc	60.02ab	0.00*
T ₁₂	Bee wax @ 2%	44.64c	52.43cd	64.11c	0.00*
	SEm (±)	0.83	1.01	1.46	NS
	CD at 5%	2.49	3.03	4.38	

DAS: Days after storage.

Value marked as * indicates fruits get spoiled.

NS: Non-significant

The superscript letters signifies that the treatment means with similar letters are *at par* at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

**Fig 7:** Effect of edible coating materials on TSS: acid ratio of custard apple during storage under ambient condition

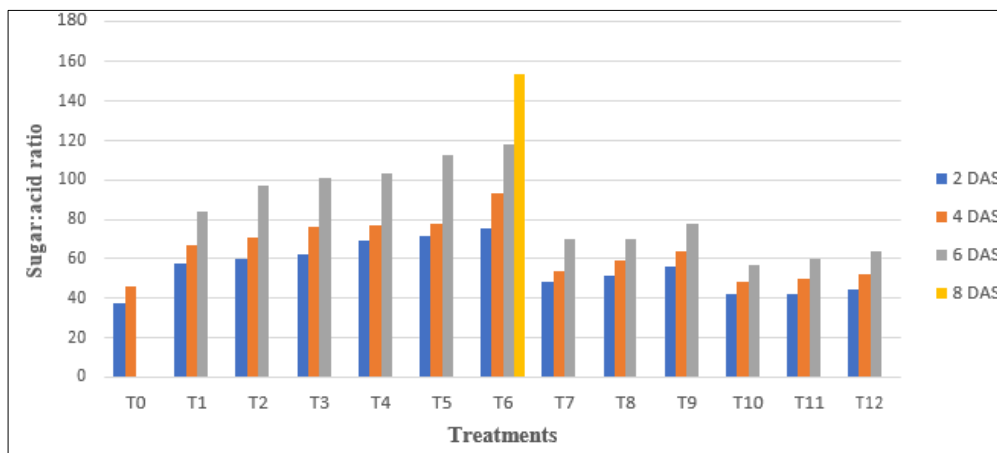


Fig 8: Effect of edible coating materials on sugar: acid ratio of custard apple during storage under ambient condition

Conclusions

The study revealed that edible coating treatments had a significant influence on the bio- chemical parameters of custard apple during ambient storage. Coated fruits showed better retention of bio-chemical quality in terms of TSS, total sugars, reducing sugars, non- reducing sugars, ascorbic acid and TSS: acid ratio and sugar: acid ratio along with comparatively lower changes in acidity as compared to the untreated fruits. Among the different treatments, chitosan @ 2% (T6) was found to be the most effective in maintaining the bio-chemical quality of custard apple, followed by chitosan 1.5% (T5). The untreated fruits (T0) showed comparatively faster deterioration in bio-chemical quality during storage. Thus, chitosan @ 2% coating was found to be the most effective treatment for maintaining the bio-chemical quality of custard apple under ambient storage condition.

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