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Enhancing the Shelf Life of Capsicum Using Aloe Vera Gel and Different Packaging Methods

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Abstract: ***The effect of different edible coatings and packaging material on various characteristics of capsicum was determined during post harvest storage at room temperature. Different coatings used were cornstarch, Aloevera gel, mustard oil and control. After coating, the samples were stored at room temperature under polythene and newspaper wrapping. Various parameters viz. moisture content, weight loss, titrable acidity, color and aroma were analyzed till spoilage. Results revealed that the quality of capsicum was improved by different coatings. Aloevera gel coating performed better than other coatings. It provided good impact on delaying weight loss, maintaining titrable acidity and retention of good color under polythene wrapping ultimately leading to increased shelf life. Therefore, the present study results suggested that shelf life of capsicum can be increased by using aloevera gel coating with polythene wrapping.***

Keywords: Aroma, Capsicum, Coatings, Color, Wrappings, Weight loss

1. Introduction

Capsicum *(Capsicum annum* L.) is a solanaceous vegetable and is very popular for its delicious taste, pleasant flavor and nutritional quality. Like most of the horticultural commodities once harvested capsicum continue to respire and transpire leading to heavy loss of stored metabolites and moisture. Since capsicum is a non-climacteric fruit, the rate of deterioration however, depends on several external factors and sanitation procedures. These losses can be overcome by the use of appropriate postharvest treatments that have the potential to reduce spoilage and respiratory losses. Plant extracts are usually applied as post harvest coating that adheres tightly to the pores on the skin of the fruits/vegetables and thereby impairs the exchange of gases (Kumar *et al*, 2019). The right selection of wrapping material is indispensable for maintaining the quality and freshness of capsicum. The preferences of packaging material mostly vary on nature of produce, duration of storage, distance of transportation, and nature of the display. Among all, plastic bags are the predominant material for fruit and vegetable packaging including capsicums, mostly due to their transparency, affordability, heat and chemical resistivity, and internal atmospheric modification (Paneru 2022).

2. Materials and Methods

Location:
The experiment was conducted at agriculture laboratory, D.A.V. College, Abohar during 2024-25 in the month of September.

Experiment details:
The experiment was conducted to study the effect of different edible coatings and wrapping materials on weight loss, moisture content, titrable acidity, color and aroma of capsicum under room temperature conditions.

Different treatments to be used:
Wrappings:
W_1- Newspaper, W_2- Polythene

Coatings:
T_1- Cornstarch, T_2- Aloevera gel, T_3- Mustard oil, T_4- Control

Preparation of samples:
The capsicums were brought to the agriculture lab, D.A.V. College, Abohar. Capsicums were washed and divided into 8 groups for each treatment and each group consisted of 8 capsicums. Two capsicums of average size and weight were selected from each group to observe the weight loss and rest of the fruits were used to study the other parameters including moisture content, titrable acidity, color and aroma. The whole experiment was conducted at room temperature.

Coatings of cornstarch, aloevera gel, and mustard oil were applied to 16 fruits and 16 fruits were kept untreated. Then out of each 16, 8 were wrapped with newspaper and other 8 were wrapped with polythene, from each 8, two fruits were used for measuring of weight loss.

Moisture content
Chunk of 10 gm capsicum was taken from each group and kept in hot air oven for 72 hours at 70°C, when it was fully dried, it was again measured. The loss in moisture content was calculated using the formula:

$$\frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100\%$$

Weight loss
The weight of two capsicums was measured with the help of weighing machine. Then their average was calculated. The loss in weight % was measured on 3 days interval by using the formula:

$$\frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100\%$$

Titrable acidity

Chunk of 20 gm capsicum was taken from each group and juice is extracted from it, filtered with the help of filter paper and then diluted with 200 ml of water, from this diluted mixture 10 ml sample was taken for titration. Chemical used for titration was NaOH. 0.1 N solution of NaOH was prepared by dissolving 2 g of NaOH in 500 ml of distilled H_2O. In the sample 2 drops of phenolphthalein indicator was added and solution of 0.1 N NaOH was allowed to let in drop by drop, till the sample turned pink. Titrable acidity was calculated using formula:

$$\frac{\text{Volume of NaOH used} \times 0.1\ \text{N} \times 0.064}{\text{Volume of sample}} \times 100$$

Color:

Color was evaluated visually, sensory evaluation was done by 3 judges using the hedonic rating and scores were given according to likability of the judge out of maximum score being 10 and minimum being 0

Aroma:

It was also assessed by sensory evaluation on its characteristic odour it possessed during the storage period. Hedonic rating test was used; scores were given out of 10.

3. Results and Discussion

Moisture content (%)

Table 1: Effect of different post harvest treatments on moisture content of fruit (%)

Treatments	W_1			W_2		
	3 Days	6 Days	10 Days	3 Days	6 Days	10 Days
T_1	94.0	92.0	91.0	96.0	96.0	96.0
T_2	95.0	94.0	91.0	96.0	95.0	95.0
T_3	94.0	93.0	88.0	95.0	95.0	95.0
T_4	95.0	93.0	87.0	95.0	95.0	-
Mean	94.5	93.0	89.2	95.5	95.2	95.3

It has been observed from the table that cornstarch is best among the 4 treatments in retaining maximum moisture content (96%) of fruits under polythene wrapping and least amount of moisture content (87%) has been observed in uncoated capsicums under newspaper wrapping at 10th day. Onyegbula *et al* (2023) found similar results on tomato fruits and Okpara (2024) founded similar results on cucumber. The coatings effectively reduced moisture content.

Weight loss (%)

Table 2: Effect of different post harvest treatments on weight loss of fruits

Treatments	W_1			W_2		
	3 Days	6 Days	10 Days	3 Days	6 Days	10 Days
T_1	14.19	22.21	29.57	10.11	11.3	13.19
T_2	13.61	28.60	36.27	1.61	2.74	4.11
T_3	13.98	33.70	44.21	2.04	2.95	4.71
T_4	17.67	38.95	49.20	2.59	4.46	6.54
Mean	14.86	30.86	39.81	4.08	5.36	7.13

It has been observed that there is maximum weight loss (49.20%) in uncoated capsicums under newspaper wrapping and minimum weight loss (4.11) has been observed in aloevera coated capsicums under polythene wrapping at 10th day. Similar results were founded by Faramitha *et al* (2021) on red chilli, Kumara *et al* (2019) and Ochoa-Reyes *et al* (2013) on bell pepper.

Titrable acidity

Table 3: Effect of different post harvest treatments on Titrable acidity (%) of fruits

Treatments	W_1			W_2		
	3 Days	6 Days	10 Days	3 Days	6 Days	10 Days
T_1	0.03	0.03	0.02	0.03	0.03	0.01
T_2	0.05	0.03	0.02	0.05	0.05	0.03
T_3	0.02	0.01	0.01	0.02	0.01	0.01
T_4	0.02	0.02	0.01	0.02	0.01	-
Mean	0.03	0.02	0.01	0.03	0.02	0.01

The titrable acidity decreased with advancement of storage. Maximum value of titrable acidity (0.05) has been observed in the fruits treated with aloevera gel under polythene wrapping at 3rd and 6th day. At 10th day also it possessed maximum value for titrable acidity (0.03). Minimum value of titrable acidity (0.01) has been observed in mustard coated which was at par with uncoated under both wrappings at last days. The results were similar to the findings of Manoj *et al* (2016), Kumar *et al* (2019) and Chinchkar *et al* (2023) on bell pepper.

Color

Table 4: Effect of different post harvest treatments on color of fruits

Treatments	W_1			W_2		
	3 Days	6 Days	10 Days	3 Days	6 Days	10 Days
T_1	7.16	5.33	1.83	8.83	8.33	4.66
T_2	8.16	6.83	1.83	9.50	9.16	4.50
T_3	7.33	5.66	3.33	8.83	7.00	4.66
T_4	8.00	5.00	1.33	8.83	7.33	4.33
Mean	7.66	5.70	2.08	8.90	7.95	4.52

It has been observed that aloevera gel treated fruits has the highest scores for color (9.50, 9.16) under polythene wrapping at 3rd and 6th day. At last day maximum scores (4.66) were possessed by fruits coated with cornstarch mustard oil under polythene wrapping. Minimum color rating (1.33) was recorded for uncoated fruits under newspaper wrapping. Similar results were obtained by Mohebbi *et al* (2012), Haffez and Gad EL-Rab (2023) on bell pepper and Wijeranthe *et al* (2018) found similar results on leafy vegetables and green chillies.

Aroma

The maximum scores (8.83) for aroma was assigned to aloevera coated fruits under polythene wrapping at 3rd and 6th day. Least scores (1.50, 1.83) were recorded in the fruits treated with the mustard oil followed by uncoated fruits under newspaper wrapping at last day. Although the ranking of treatments differed, our study's findings that aloevera coating

was consistent with Alvarez-Barreto *et al* (2023) on strawberry fruits, Zaidi *et al* (2023) on 'Surahi' guava fruits. Similarly Dang *et al* (2008) founded mango fruit coated with mango carnauba exhibited significantly increased levels of aroma volatiles in the pulp of the ripe fruit as compared to the control and all other coatings.

Table 5: Effect of different post-harvest treatments on aroma of the fruits

Treatments	W_1			W_2		
	3 Days	6 Days	10 Days	3 Days	6 Days	10 Days
T_1	7.83	6.33	1.50	8.00	7.16	5.83
T_2	7.83	6.66	2.60	8.83	8.83	4.16
T_3	7.33	5.83	3.66	8.33	6.50	4.33
T_4	7.66	5.16	1.83	8.33	7.50	3.83
Mean	7.66	5.99	2.39	8.37	7.49	4.53

4. Conclusion

The result of the present investigation reflected the ability of different edible coatings and packaging material on the quality retention and shelf life extension of Capsicum. Minimum weight loss was observed in the fruits treated with aloevera gel with polythene wrapping. Maximum moisture content was observed in the fruits treated with cornstarch with polythene wrapping. Maximum value of titrable acidity was observed in the fruits treated with aloevera gel under polythene wrapping. Maximum rating for color was recorded in the fruits which were treated with aloevera gel with polyhtene wrapping. Maximum rating for aroma was recorded in the fruits treated with aloevera gel with polythene wrapping. The coatings of aloevera gel have a beneficial impact on delaying weight loss, maintaining titrable acidity, moisture content, retention of good color, and aroma. Polythene wrapping have a beneficial impact on weight loss, moisture content, color and aroma. Hence, it can be concluded that coating of aloevera gel and polythene wrapping maintained the best quality fruits and prolonged the shelf life of capsicum.

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