



Effect of Different Coatings on the Quality and Shelf Life of Ber (*Ziziphus mauritiana*)

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

An experiment was conducted to study the effect of post-harvest application of different edible coatings like Aloe vera gel (1.0%, 2.0%, 3.0%), Chitosan (1.0%, 2.0%, 3.0%), Guar gum (1.0%, 2.0%, 3.0%) on shelf life and quality of ber (*Ziziphus mauritiana* L) cv. Apple ber. Fruits of uniform size were harvested at physiological maturity and treated with various edible coatings. After five days of storage, observations on fruit length, diameter, spoilage percentage, TSS, total sugar, reducing sugar, acidity, and ascorbic acid were made. In comparison to the fruits under control, the results showed that coating the fruits led to a lower loss of fruit weight and a higher level of ascorbic acid content, TSS, acidity, total sugar, and decreasing sugar. Guar gum (3%) proved to be the most

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efficient coating, extending the shelf life of ber by up to 15 days. The fruits that were under control hardly lasted for ten days.

Keywords: Ber; aloe vera; chitosan; guar gum; quality; shelf life; fruits; ber fruit.

1. INTRODUCTION

“Ber (*Ziziphus mauritiana* L.) is an economically significant tropical fruit tree in the Rhamnaceae family. *Ziziphus mauritiana*, also known as Indian plum or Indian jujube. Indian jujube (*Ziziphus mauritiana* Lam.) is a shrub or small tree of the dry tropical and subtropical regions that is browsed by livestock. Fruit is very perishable and has a short shelf life (just 2-4 days) at room temperature” [1]. “The edible or surface coatings are defined as thin layer of material that covers the surface of the fruit and can be eaten as part of the whole product. Surface coatings when applied to fruits help in extending their shelf life by acting as a barrier between atmosphere and fruit surface. Edible coatings have long been known to protect perishable food products from deterioration. The edible films and coatings are the primary packaging which is prepared from edible materials. Edible coatings provide a barrier against external elements and therefore increase shelf life by reducing gas exchange, loss of water, flavors and aroma and solute migration towards the cuticle” [2]. Among this most commonly and widely used surface coatings are aloe vera and Chitosan [3]. The objective of this study was to examine the effects of the treatment with aloe vera gel, chitosan, guar gum solution on the quality and shelf life of the ber fruit at ambient temperature.

2. MATERIALS AND METHODS

Source of Fruits and Coating Materials: For the experiment, evenly sized, fresh fruits of cv. Apple ber were collected from Chaudhary Charan Singh University, Hisar Haryana. The fruits were harvested along with some pedicle to avoid spoilage of the fruits during storage. After procurement, the fruits were immediately brought to the laboratory of the department of Horticulture, for further treatments., during the year 2023, for storage after necessary treatments. Uniform sized, defect-free fruits were selected. The fruits after washing in running tap water dried in the shade for few minutes. A set of 3kg fruits with 3 replications were taken each of the following 10 treatments.

Treatments: 1. T₀ Control (without coating), 2. T₁ Aloe vera gel (1.0%), 3. T₂ Aloe vera gel (2.0%),

4. T₃ Aloe vera gel (3.0%), 5. T₄ Chitosan (1.0%), 6. T₅ Chitosan (2.0%), 7. T₆ Chitosan (3.0%), 8. T₇ Guar gum (1.0%), 9. T₈ Guar gum (2.0%), 10. T₉ Guar gum (3.0%). The other material such as guar gum, chitosan, aloe vera gel and other instruments were provided by Post-harvest Laboratory, Department of Horticulture, Naini Agricultural Institute (NAI), Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj and from Local market.

“For preparation of aloe vera coating material, aloe vera gel matrix was separated from the outer cortex of the aloe vera leaf and the colourless hydroparenchyma was blended in a mixer. The resultant matrix was filtered to remove fibers. The liquid obtained contained fresh aloe vera gel. [4]. Chitosan solutions was done according to the method” of [5]. Guar gum coating solution was prepared on the percentage of weight basis with distilled water. 1 gm, 2 gm and 3 gm guar gum powder was mixed with 100 ml of water for the preparation of 1%, 2% and 3% solutions, respectively. Solutions were heated in oven, cooled in air followed by Wijewardane et al. 2013. for using as coating of ber fruit.

“Fruit samples were analysed for physico-chemical properties at 15 days after treatments. The percentage of weight loss was calculated based on initial weight and weight at subsequent intervals. The length and breadth (millimetre scale) of ber fruits were measured with the help of vernier caliper transformation was done following the method” of [6]. and it was measured by vernier callipers at zero time of storage (beginning) and 5 days interval during the storage period. Total soluble solids (TSS), total sugar and reducing sugar were estimated by the method described by [7]. The acidity and ascorbic acid were estimated by the method described by [8].

3. RESULTS AND DISCUSSION

3.1 Physiological Parameters

Table 1 Shows the data of Physiological parameters:

Physiological Loss in Weight: The maximum physiological weight loss at 15 days was

recorded to be 24.54% at T₀ Control (without coating) and the minimum physiological weight loss 15.01% was recorded significantly at T₉ Guar gum 3%. The reduction in weight loss was probably due to the effects of these coatings as a semi permeable barrier against oxygen, carbon dioxide, moisture and solute movement, thereby reducing respiration, water loss and oxidation reaction rates [9].

Fruit Length and Diameter: The maximum fruit length at 15 days of 42.65 mm was recorded significantly at T₉ Guar gum 3% and the minimum fruit length was recorded to be 38.05 mm at T₀ Control (without coating). The maximum fruit breadth at 15 days of 36.79 mm was recorded significantly at T₉ Guar gum 3% and the minimum fruit length was recorded to be 32.48 mm at T₀ Control (without coating).

Spoilage (%): The minimum spoilage at 15 days of 20.06 % was recorded significantly at T₉ Guar gum 3% followed by T₆ Chitosan 3% of 20.14% and the maximum spoilage was recorded to be 38.44% at T₀ Control (without coating).

3.2 Bio-Chemical Parameters

Table 2 Shows the data of Bio-Chemical parameters:

TSS (Total soluble solid): The minimum TSS at 15 days of 12.29 was recorded significantly at T₉ Guar gum 3% and the maximum TSS was recorded to be 16.54 at T₀ Control (without coating).

Total Sugar Content (%): The minimum Total sugar content at 15 days of 12.72% was recorded significantly at T₉ Guar gum 3% followed by T₆ Chitosan 3% of 13.18% and the maximum Total sugar content was recorded to be 14.85 % at T₀ Control (without coating).

Reducing sugar: The maximum Reducing Sugar % at 15 days of 6.85% was recorded significantly at T₀ untreated fruits and the minimum Reducing Sugar % was recorded to be 5.22% at T₉ guar gum 3%. The change of reducing sugar content is occurred due to utilization of sugar as a respiratory substrate [10].

Ascorbic acid: The maximum Ascorbic acid at 15 days of 62.15 mg/100 g was recorded significantly at T₉ Guar gum 3% and the minimum Ascorbic acid was recorded to be 58.14 mg/100g at T₀ Control (without coating). [11] reported that guar gum not only extends the shelf life but also preserves the ascorbic acid content which is associated with antioxidant capacity during storage and also suggests that guar gum is promising as an edible coating.

Acidity: The maximum Ascorbic acid at 15 days of 62.15 mg/100 g was recorded significantly at T₉ Guar gum 3% and the minimum Ascorbic acid was recorded to be 58.14 mg/100 g at T₀ Control (without coating). It is also considered that coatings reduce the rate of respiration and may therefore delay the utilization of organic acids [12].

Table 1. Effect of different coatings on physiological parameter of ber

Treatment	Treatment Combination	Physiological Weight Loss (%) at 15 days	Fruit Length (mm) at 15 days	Fruit Diameter (mm) at 15 days	Spoilage (%) at 15 days
T ₀	Control (without coating)	24.54	38.05	32.48	38.44
T ₁	Aloe vera gel 1%	21.72	40.50	33.05	28.38
T ₂	Aloe vera gel 2%	21.55	39.97	33.25	28.08
T ₃	Aloe vera gel 3%	21.25	41.00	33.85	28.55
T ₄	Chitosan 1%	18.95	40.25	35.25	29.74
T ₅	Chitosan 2%	18.86	39.95	35.12	31.12
T ₆	Chitosan 3%	16.01	42.50	36.30	20.14
T ₇	Guar gum 1%	17.40	41.85	35.42	27.12
T ₈	Guar gum 2%	16.12	42.10	35.16	22.39
T ₉	Guar gum 3%	15.01	42.65	36.79	20.06
	S. Ed. ±	0.418	0.747	0.725	0.743
	CD at 5%	0.878	1.570	1.523	1.562
	CV	2.961	2.239	2.561	2.810

Table 2. Effect of different coatings on Bio-chemical parameter of ber

Treatment	Treatment combination	TSS (°Brix) at 15 days	Total sugar content (%) at 15 days	Reducing Sugar (%) at 15 days	Ascorbic acid (mg/100 g) at 15 days	Acidity (%) at 15 days
T ₀	Control (without coating)	16.54	14.85	6.85	58.14	0.19
T ₁	Aloe vera gel 1%	13.72	14.13	6.23	59.32	0.21
T ₂	Aloe vera gel 2%	13.67	14.12	6.23	59.44	0.22
T ₃	Aloe vera gel 3%	13.51	13.79	6.10	60.24	0.26
T ₄	Chitosan 1%	13.11	14.01	6.15	59.97	0.21
T ₅	Chitosan 2%	12.87	13.60	5.90	60.21	0.26
T ₆	Chitosan 3%	12.39	13.18	5.60	61.35	0.28
T ₇	Guar gum 1%	12.48	13.63	5.95	60.37	0.23
T ₈	Guar gum 2%	12.42	13.36	5.75	60.28	0.27
T ₉	Guar gum 3%	12.29	12.72	5.22	62.15	0.29
	S. Ed. ±	0.085	0.266	0.099	1.495	0.006
	CD at 5%	0.177	0.559	0.191	2.521	0.012
	CV	2.412	2.452	2.507	3.029	2.874

4. CONCLUSION

From the present investigation it is concluded that treatment T₉ (Guar gum 3%) was found to be best in terms of quality, TSS (°Brix) and storage life.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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