Original Research Article

Effect of Different Coatings on the quality and shelf life of Ber (*Ziziphus mauritiana*)

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 ediblecoatings. Observations were recorded at intervals of 5 days from storage on physiological loss in weight, fruitlength, diameter spoilage %, TSS, total sugar, reducing sugar,acidity, and ascorbic acid. The results revealed that coatingof fruits resulted in reduced loss in fruit weight and higher level of ascorbic acid content, TSS, acidity, total sugar,reducing sugar as compared to the fruits under control. The most effective coating was Guar gum (3%) that extendedthe shelf life of ber up to 15 days. Fruits under control had a shelf life of only10 days.

Keywords: Ber, Aloe vera, Chitosan, Guar gum,Quality, Shelf life

INTRODUCTION

Ber (*Ziziphus mauritiana* L.) is an economically significant tropical fruit tree in the Rhamnaceae family.*Ziziphus mauritiana*, also known as Indian plumor 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 ofthis study

was to examine the effects of the treatment with aloe vera gel, chitosan, guar gumsolution on the quality and shelflife of the ber fruit at ambient temperature.

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 afternecessary treatments. Uniform sized, defect-free fruitswere selected. The fruits after washing in running tapwater dried in the shade for few minutes. A set of 3kgfruits with 3replications were taken each ofthe following 10 treatments.

Treatments:1.T_0Control(without coating), 2.T_1Aloe vera gel (1.0%), 3.T_2Aloe vera gel (2.0%), 4. T_3 Aloe vera gel (3.0%), 5. T_4 Chitosan (1.0%), 6. T_5 Chitosan (2.0%),7. T_6 Chitosan (3.0%), 8.T_7 Guar gum (1.0%), 9.T_8 Guar gum(2.0%), 10.T_9 Guargum (3.0%).The other material such as guar gum, chitosan, aloevera 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]. Chitosansolutions was done according to the method of[5].Guar gum coating solution wasprepared on the percentage of weight basis with distilledwater. 1gm, 2gm and 3gm guar gum powderwas mixed with 100ml of water for the preparation of1%, 2% and 3% solutions, respectively. Solutionswere heated in oven, cooled in air followed by Wijewardaneet al. 2013. for using ascoating of ber fruit.

Fruit samples were analysed forphysico-chemical properties at 15 daysafter treatments. The percentage of weight loss wascalculated based on initial weight and weight at subsequentintervals. The length and breadth (millimetre scale) of ber fruits were measured with the help ofvernier calipertransformation was done following the method of [6].and it was measured by vernier callipers at zero time of storage (beginning) and5 days interval during the storage period. Total soluble solids (TSS),total sugar and reducing sugar were

estimated by themethod described by[7].The acidity and ascorbic acid were estimated by themethod described by [8].

RESULTS AND DISCUSSION

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 T_0 Control (without coating) and the minimum physiological weightloss 15.01 % was recorded significantly at T_9 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 T_9 Guar gum 3% and the minimum fruit length was recorded to be 38.05 mm at T_0 Control (without coating). The maximum fruit breadth at 15 days of 36.79 mm was recorded significantly at T_9 Guar gum 3% and the minimum fruit length was recorded to be 32.48 mm at T_0 Control (without coating).

Spoilage (%): The minimum spoilage at 15 days of 20.06 % was recorded significantly at T_9 Guar gum 3% followed by T_6 Chitosan 3% of 20.14% and the maximum spoilage was recorded to be 38.44 % at T_0 Control (without coating).

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	0.418	0.747	0.743
CD at 5%		0	0.878	1.570	1.562
CV		0	2.961	2.239	2.810

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 T_9 Guar gum 3% and the maximum TSS was recorded to be 16.54 at T_0 Control (without coating).

Total Sugar Content (%): The minimum Total sugar content at 15 days of 12.72 % was recorded significantly at T_9 Guar gum 3% followed by T_6 Chitosan 3% of 13.18 % and the maximum Total sugar content was recorded to be 14.85 % at T_0 Control (without coating).

Reducing sugar: The maximum Reducing Sugar % at 15 days of 6.85 % was recorded significantly at T_0 untreated fruits and the minimum Reducing Sugar % was recorded to be 5.22 % at T_9 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/100g was recorded significantly at T_9 Guar gum 3% and the minimum Ascorbic acid was recorded to be 58.14 mg/100g at T_0 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/100g was recorded significantly at T_9 Guar gum 3% and the minimum Ascorbic acid was recorded to be 58.14

mg/100g at T_0 Control (without coating).It is also considered that coatingsreduce the rate of respiration and may thereforedelay the utilization of organic acids [12].

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

Treatment	Treatment Combination	TSS (ºBrix) at 15 days	Total sugar content (%) at 15 days	Reducing Sugar (%) at 15 days	Ascorbic acid (mg/100g) 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

Conclusion

From the present investigation it is concluded that treatment **T_9**(Guar gum 3%) was found to be best in terms of quality,TSS **(ºBrix)** and storage life.

REFERENCES

1. Meena, H. R., Kingsly, A. R. P., Jain, R. K. (2009). Effect post-harvest treatments on shelf life of ber fruits. *Indian Journal of Horticulture*. 66(1): 58-61.

2.Mani, A., Jain, N., Singh, A.K. and Sinha, M., (2017) Effects of Aloe vera Edible Coating on Quality and Postharvest Physiology of Ber (*Zizyphus mauritiana* L.) under Ambient Storage Conditions, *Indian Journal of Pure & Applied Biosciences*. 5(6): 43-53.

3. Milena, P. Francesco, M. Maria, S. P. Luigi, Z. Elvira, N. Giuseppe, C and Marco, S. (2014). Effect of Chitosan Coating on the Postharvest Quality and Antioxidant Enzyme System Response of Strawberry Fruit during Cold Storage. Foods. 4:501- 523.

4.Adetunji C. O, Fawole O. B, Arowora K. A, Nwaubani S. I, Ajayi E. S, Oloke J. K, Majolagbe O. N, Ogundele B. A, Aina J. A, Adetunji J. B (2012). Effects of Edible Coatings from Aloe Vera Gel on Quality and Postharvest Physiology of *Ananas Comosus* (L.) Fruit During Ambient Storage. *Global Journal of Science Frontier Research Bio-Tech & Genetics*12 (5).

5.**Jiang Y., Li Y.,** (2001). Effects of chitosan coating on postharvest life and quality of longan fruit. *Food Chem*.,73: 139-143.

6.Gomez, K. A., Gomez, A. A. (1983). Problem data. Statistical procedures for agricultural research, 2nd edition. Wiley- Inter science Publication (John Wiley and Sons). New York, USA. pp. 275-315.

7.Mazumdar, B. C., and Majumder, K. (2003). Determination of chemical constituents. In: Methods on physiochemical analysis of fruits, Daya publishing House, delhi, pp. 93-139.

8.**Rangana, S. (1977).** Ascorbic acid. In: Manual of analysis of fruits and vegetable products. *Tata and Mc. Graw Hill Publishing company limited*: New Delhi, India, pp. 94-101.

9.Baldwin, E. A., Burns, J. K., Kazokas, W., Brecht, J. K., Hagenmaier, R. D., Bender, R. J. and Peris, E. (1999). Effect of two edible coatings with different permeability characteristics on mango (*Mangifera indica* L.) ripening during storage. *Postharvest Biol Technol*.17:215-226.

10.**Nandane, A. S., Jain, R. K. (2011).** Effect of composite edible coating on physicochemical properties of tomatoes stored at ambient conditions. *Indian Journal of Advanced Engineering Technology*. 2 (4): 211-17.

11.Bhowmick, N., Ghosh, A., Dutta, P. and Dey, K. (2015). Efficacy of edible coatings on the shelf life of ber (*Zizyphus mauritiana* Lamk.) fruits at ambient condition. *International Journal of Agriculture, Environment and Biotechnology*. 8(3): 601-608.

12.**Yamanand, O. and Bayoindirli, L. (2002).** Effects of an edible coating and cold storage on shelf-life and quality of cherries. *Lebnsm. Wiss. Und. Technol*. 35: 46-150.