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Aloe vera gel as a bio preservative for shelf life extension of mature green tomato

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Abstract
The effect of *Aloe vera* gel on the physiological parameters like physiological loss in weight, respiration rate and membrane integrity of mature green tomato were analyzed. The untreated tomato fruits (without *Aloe vera* gel coating) showed highest respiration rate which resulted in higher physiological loss in weight and least membrane integrity for a period of 24 days. In contrary the mature green tomato fruits dipped in 2% *Aloe vera* gel concentration for two minutes recorded the least Oxygen evolution and hence resulted a lower physiological loss in weight and higher membrane integrity for a period of 36 days. Hence the study revealed the use of *Aloe vera* gel as a bio preservative for the shelf life of mature green tomatoes.

Keywords: *Aloe vera*, bio preservative, shelf life, mature green, tomato

Introduction
Tomato (*Solanum lycopersicum L.*) is one of the most widely cultivated warm season crop and extensively consumed horticultural crops globally (Grandillo *et al.,* 1999) [9]. The crop is believed to have been originated from the wild in Peru, Ecuador and other parts of tropical Americas, the nutritional and economic importance of the crop has led to its global production (Rick and Butler, 1956) [12]. Fresh tomatoes are a popular and versatile fruit vegetable throughout the world, making significant contributions to human nutrition. Tomato contains higher amounts of lycopene, a type of carotenoid with antioxidant properties (Arab and Steck, 2000) [3] which is beneficial in reducing the incidence of some chronic diseases like cancer (Basu and Imrhan, 2007) [5] and many other cardio vascular disorders (Burton and Reimers, 2011) [6].

During the peak season there is a high production of tomato fruits, but due to inefficient post-harvest processing and preservation techniques faster spoilage of the produce occurs. Major losses in quality and quantity of fresh tomatoes occur between harvest and consumption.

Bio preservation is a novel food preservation method defined for extension of shelf life and enhanced food safety by the use of natural or controlled micro biota and/or anti-microbial compounds (Baldwin *et al.,* 1996) [4]. *Aloe vera* gel has been one of the promising bio preservatives which has been identified as a novel edible film coating with good antimicrobial properties (Jawadul *et al.,* 2014) [10].

Bio preservation using *Aloe vera* as an edible film coating on fresh tomatoes can provide a modified internal atmosphere for the product and thereby acts as an alternative for reducing the quality and quantity losses, and thus the major post-harvest loss of tomatoes can be reduced.

Edible film coatings on fresh tomatoes can provide a modified internal atmosphere for the product and thereby acts as an alternative for reducing the quality and quantity losses, and thus the major post-harvest loss of tomatoes can be reduced (Dhall, 2013) [8]. The present study was conducted to standardize an efficient post-harvest management practice for shelf life extension of tomato using *Aloe vera* as a bio preservative.

Methodology
A study was conducted at the Department of Post-Harvest Technology, College of Agriculture, Vellayani with the objective to standardise an Aloe vera gel based edible film coating for mature green tomato fruits. Tomatoes (Lycopersicon esculentum) were harvested at mature green stage from the Instructional Farm at College of Agriculture, Vellayani, and Kerala, India. In the laboratory, mature green tomatoes were selected to obtain homogeneous batches based on colour, size, and absence of injuries and healthy. Then the fruits were washed, surface sanitized in 2ppm ozonized water for 5 minutes. Followed by this the fruits were subjected to diffrent treatments as explained below.

Good quality fresh Aloe vera leaves were procured from the local market. Aloe gel matrix which lies underneath the green outer rind was separated and the colorless hydro parenchyma was homogenized in a blender. The resulting mixture was then filtered to remove the fibers to form 100 percent fresh aloe gel. The filtered aloe gel was pasteurized at 70^0C for 45 minutes and then cooled immediately to ambient temperature after maintaining pH at 4.0 by adding citric acid (0.5-1gl^{-1}) and ascorbic acid (0.10-0.50 gl^{-1}). Two different types of gelling agents each at 1% was added to it for increasing the consistency of aloe gel. From this prepared aloe gel two different concentrations of 1% and 2% were taken for the experiment and the fruits were dipped for three different durations as one minute, two minutes and five minutes.

Table 1

	Treatments
T1	Aloe gel + INS 401 (1%, 1 min)
T2	Aloe gel + INS 401 (1%, 2 min)
T3	Aloe gel + INS 401 (1%, 5 min)
T4	Aloe gel + INS 401 (2%, 1 min)
T5	Aloe gel + INS 401 (2%, 2 min)
T6	Aloe gel + INS 401 (2%, 5 min)
T7	Aloe gel + INS 402 (1%, 1 min)
T8	Aloe gel + INS 402 (1%, 2 min)
T9	Aloe gel + INS 402 (1%, 5 min)
T10	Aloe gel + INS 402 (2%, 1 min)
T11	Aloe gel + INS 402 (2%, 2 min)
T12	Aloe gel + INS 402 (2%, 5 min)
Control	Untreated fruit

Physiological loss in weight was determined on initial weight basis by weighing the treated tomato fruits on the first to last day of storage at 12 days interval, using a laboratory level digital electronic weighing balance having 0.01g accuracy. Physiological loss in weight was calculated using the following formula and expressed as percentage.

Physiological weight loss (%) = (IW- FW/IW) x100

Where IW- Initial Weight, FW- Final Weight.

150g of skin coated tomato fruits were packed in 150 gauge LDPE pouches and respiration rate of fruits was measured by noting the concentration of CO_2 and O_2 using a Checkpoint Portable Gas Analyzer by inserting the needle through the septum fixed on the LDPE pouch and expressed in mg/kg /hr.

Uniform sized tomato peel pieces were extracted from skin coated fruits, immersed in 20 ml distilled water for three hours and absorbance was read in a UV spectrophotometer at 273 nm. The immersed peel pieces were heated in a water bath at 100^0C for 20 minutes, filtered; filtrate was made up to 20 ml, the absorbance was read again in UV spectrophotometer at 273 nm. The loss of membrane integrity was expressed in per cent ion leakage which was calculated using the formula and expressed as percentage.

$$\text{Percent Leakage} = \frac{\text{Initial absorbance value of bathing medium}}{\text{Final absorbance value of bathing medium}} \times 100$$

Results and Discussion

On the 24th day of storage, the aloe gel based edible coatings were found superior in maintaining all the physiological parameters compared with untreated fruits. The mature green tomato fruits coated with and without *Aloe vera* gel showed higher weight loss, respiration and loss of membrane integrity during the entire storage period. The mature green fruits not coated with *Aloe vera* gel showed higher weight loss,

Respiration rate and least membrane integrity compared with the aloe gel coated coated mature green fruits.

Table 2

Treatments	Physiological loss in weight (%)			
	0th day	12th day	24th day	36th day
T1	-	4.31	6.24	8.85
T2	-	3.40	4.97	7.75
T3	-	3.32	6.17	10.07
T4	-	3.88	5.30	8.13
T5	-	3.82	5.37	7.85
T6	-	3.03	4.85	8.57
T7	-	2.93	4.43	6.61
T8	-	3.59	4.76	8.31
T9	-	3.21	4.19	7.30
T10	-	2.41	4.18	7.06
T11	-	2.24	3.85	5.92
T12	-	3.17	4.34	6.12
Control (Untreated)	-	5.79	14.23	-
CD (0.05)	-	NS	1.00	0.82

On the 12th and 24th day of storage all the aloe gel based coatings were superior in reducing the weight loss, respiration rate and compared with the control fruits. The membrane integrity was alos superior for the aloe gel coated mature green fruits. On the 36th day of storage, T11 recorded the least weight loss and respiration rate in mature green tomatoes which was on par with T12 and some other treatments also. Similar results reveals that *Aloe vera* gel coating was found effective in controlling water loss from commodities like, sweet cherry (Martinez *et al.,* 2006) [11], Granny Smith and Red Chief apple (Ergun, and Satici, 2012).

Table 3

Treatments	Respiration Rate			
	0 DAS	12 DAS	24 DAS	36 DAS
T1	7.90	6.90	5.50	5.20
T2	8.30	7.00	5.60	5.20
T3	7.30	7.00	5.50	5.00
T4	8.10	7.20	5.60	5.00
T5	7.90	7.10	5.50	4.90
T6	8.20	7.20	5.60	5.20
T7	8.30	6.90	4.90	4.40
T8	7.80	6.70	5.10	4.90
T9	7.70	6.90	5.00	4.40
T10	7.80	6.50	4.50	4.60
T11	7.30	5.40	4.50	3.80
T12	7.70	6.70	4.00	4.30
Control (Untreated)	8.40	9.10	6.90	-
CD (0.05)	NS	1.78	1.09	NS

The least weight loss and respiration rate resulted in more integrity for the membranes and thereby giving a better firmness for the fruits. The loss in firmness or higher membrane integrity of the tomato fruits was due to the delay in softening due to the effect of *Aloe vera* gel. This was Supported by (Aguiar *et al*., 2011) [1] that *A. Vera* gel modified

The internal gas composition of mangoes causing reduction of cell wall degrading-enzymes responsible for mango softening Similar to the present results, *Aloe vera* gel-based edible coatings was effective to prevent loss of moisture and firmness, control respiratory rate in fruits such as table grapes (Castilo *et al.*, 2010) [7], sweet cherries (Martinez *et al.*, 2006) [11] and nectarines (Ahmed *et al.*, 2009) [2]. Sophia *et al*., (2014) revealed that the potential of using *Aloe vera* gel as a coating for improved postharvest shelf life and maintaining quality of mango fruits and hence reduced postharvest losses.

Table 4

Treatments	Percent Leakage (%)			
	0th day	12th day	24th day	36th day
T1	67.83	60.38	83.15	90.20
T2	67.27	60.36	81.61	89.23
T3	66.77	59.64	80.61	92.39
T4	67.02	59.41	80.83	89.22
T5	66.48	59.52	83.17	91.27
T6	66.61	60.21	78.73	90.06
T7	65.18	59.17	76.22	87.44
T8	66.51	59.22	81.83	88.67
T9	63.40	59.16	76.13	87.72
T10	63.08	58.54	77.93	87.82
T11	65.05	57.03	74.76	87.22
T12	65.37	59.16	74.35	87.28
Control (Untreated)	68.18	62.28	86.84	-
CD (0.05)	2.76	1.18	1.92	1.92

Conclusion

Findings of this study demonstrate the potential of using *A. Vera* gel as a coating for improved postharvest shelf life and maintaining quality of mature green tomato fruits. The effect of Aloe vera gel coating resulted in reducing the postharvest losses. The results showed that mature green tomato fruits treated with T11 and T12 significantly increased the shelf life evidenced by reduced percentage weight loss, respiration rate and higher membrane integrity. Since *A. Vera* which is the miracle plant having no environmental hazard and easily available, can be used as a bio preservative to act as an edible fruit coating for extending the shelf life of mature green tomatoes.

References

1. Aguiar RP, Miranda MR, Lima AM, Mosca JL, Moreira RA, Enéas-Filho J. Effect of a galactomannan coating on mango postharvest physicochemical quality parameters and physiology. Fruits. 2011; 66:269-278.
2. Ahmed MJ, Singh Z, Khan AS. Postharvest Aloe vera gel-coating modulates fruit ripening and quality of `Arctic Snow' nectarine kept in ambient and cold storage International Journal of Food Science and Technology. 2009; 44(5):1024-1033.
3. Arab L, Steck S. Lycopene and cardiovascular disease, ”The American Journal of Clinical Nutrition. 2000; 71(6):1691S-1695S.
4. Baldwin EA, Nisperos MO, Baker RA. Edible coatings for lightly processed fruits and vegetables. HortSci. 2005, 30-35.
5. Basu A, Imrhan V. Tomatoes versus lycopene in oxidative stress and carcinogenesis: conclusions from clinical trials, European Journal of Clinical Nutrition. 2007; 61(3):295-303.
6. Burton-Freeman B, Reimers K. Tomato consumption and health: emerging benefits, American Journal of Lifestyle Medicine. 2011; 5(2):182-191.
7. Castillo S, Serrano M. Novel edible coating based on Aloe vera gel tomaintain table grape quality and safety. J. Agric. Food Chem. 2005. 53:7807-7813.
8. Dhall, RK. Advances in Edible Coatings for Fresh Fruits and Vegetables: A Review, Critical Reviews in Food Science and Nutrition. 2010-2013; 53:5, 435-450, DOI: 10.1080/10408398. 541568
9. Grandillo S, Zamir, D, Tanksley SD. Genetic improvement of processing tomatoes: a 20 years perspective. Euphytica. 1999; 110(2):8-97.
10. Jawadul M, Fatema H, Brishti MM. Hoque. Aloe vera gel as a Novel Edible Coating for Fresh Fruits: A Review. American Journal of Food Science and Technology. 2014; 3:93-97.
11. Martinez-Romero D, Alburquerque N, Valverde J, Guillen F, Castillo Valero D, Serrano M. Postharvest sweet cherry quality and safety maintenance by Aloe vera treatment: A new edible coating, Postharvest Biology and Technology. 2006; 39(1):93-100.
12. Rick CM, Butler L. Cytogenetics of the tomato, Advances in Genetics. 1956; 8(1):267-382.