

## INCREASING THE SHELF LIFE OF TOMATO USING *ALOE VERA*

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### Abstract

The process of preservation of fruits and vegetables is necessary for reducing the post harvest losses. The use of natural preservatives is of increasing interest as it is harmless to the health of human beings. Our study aims to preserve tomatoes using Aloe Vera gel as Aloe Vera is one of the most commonly used natural preservative. Aloe Vera gel used in our study is prepared by three distinct methods. The first method used a pure gel without the addition of any chemicals; the second was prepared by adding natural citric acid from lemon juice, and the third was prepared with chemically available citric acid. This gel was coated on tomatoes and was observed for a period of one month. The tomatoes were washed with neem water extract in place of bleaching powder to avoid any microbial action. Weight loss of tomatoes was considered as the deciding factor along with its pH and firmness to judge this method for preserving and increasing the shelf life of tomatoes. The weight loss was found to be least in case of tomatoes coated with pure Aloe Vera gel which is followed by the ones coated with citric acid from lemon juice and chemically available citric acid. Aloe Vera gel was analyzed to be efficient in reducing the weight loss and preventing the tomatoes from microbial action thus increasing its shelf life.

**Keywords:** *Aloe vera gel*, calcium chloride, tomato, citric acid, lemon juice, neem water.

## I. INTRODUCTION

Profits are usually lost in pre harvest, harvest, and post harvest stages. It is essential to prevent post production and transportation losses of fruits, as these adversely affect farmers and impact on country's economic development. These losses are mainly due to weight loss, microbial attack, firmness, oxidation browning etc. Recently it has been discovered that plants products can be used as a natural preservative. These losses can be minimized by edible coating of fruits. Edible coating acts as a barrier and helps reduce water vapor loss hence increasing the shelf life, slowing down the ripening and decay. The concept of using edible coatings to extend shelf life of fresh and minimally processed produce and to protect them from harmful environmental effects has been emphasized based on the need for high quality and the demand for minimal food processing and storage technologies (Tharanathan, 2003)

*Aloe Vera* gel is one of the most commonly used edible coating for fruits. It is efficient as well as cheap and easily available. It prevents the spoilage due to microbial attack, controls respiration rate, prevents the loss of firmness and moisture. It also has antimicrobial and anti fungal properties against gram positive and gram negative bacterial pathogens. *Aloe Vera* gel due to its above mentioned properties has been attracting food industry as one of the fundamental and functional technique for coating and preservation which results into good product quality.

*Aloe Vera* is a tropical and sub tropical plant which has been used for decades for its medicinal and therapeutic properties. It is a perennial plant and belongs to liliaceae family. It is thick has thorn-edged leaves and has two major liquid sources which are a yellow latex and a clear gel that is (mucilage). On doing the transverse section of *Aloe Vera* leaves, 3 distinct layers of colorless, inner gel parenchyma and, green outer leaf are clearly visible. *Aloe vera* plant also has properties against ulcerous, gastrointestinal, kidney and cardiovascular problems.

The aim of this study focuses on the effect of *Aloe Vera* gel as an edible coating for increment of shelf life related to its quality during ambient storage for duration of 1 month.

## 2. MATERIALS AND METHODS

### 2.1. Sample collection

Fresh tomatoes were purchased from local market (All Mart) near VIT University in Vellore, Tamil Nadu, and India. Tomatoes are washed with neem water which is followed by *Aloe Vera* gel coating. Tomatoes were divided into four categories.

Category I- (controlled sample) tomatoes with no aloe vera gel washed with neem water

Category II- (controlled sample) tomatoes washed with neem water, followed by only aloe vera gel coating.

Category III- tomatoes washed with neem water, followed by *Aloe Vera* gel coating and citric acid.

Category IV- tomatoes washed with neem water, followed by aloe vera gel coating and lemon juice.

Fresh *Aloe vera* leaves were collected from VIT University's botanical garden. These leaves were washed properly to remove dust particles followed by its grinding to get its extract.



Image 1: collection of tomatoes from All mart, Vellore

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## 2.2. Preparation of edible coating

### 2.2.1. Preparation of Aloe Vera gel

Fresh and matured leaves of *Aloe Vera* plant were harvested from the botanical garden of VIT university Vellore, India. Aloe vera gel matrix was isolated, blended and sieved to remove the fibers to get the pure gel. This extracted gel matrix was pasteurized at 70 °C, and cooled immediately for the stabilization at ambient temperature.

After these three types of Aloe Vera gels were prepared-

1. Gel mixed with citric acid (chemically powdered form) - in 20 ml of pasteurized gel extract, 0.5gm of CaCl<sub>2</sub> and agar was added, along with 4.5gm/l of citric acid solution.

2. Gel mixed with citric acid (lemon juice acts as natural source of citric acid)-in 20 ml of pasteurized gel extract, 0.5gm of CaCl<sub>2</sub>, 5ml of lemon juice (enough to adjust ph 4.0)

3. Gel without citric acid source-in 20ml of pasteurized gel extract, 0.5gm of CaCl<sub>2</sub>.

1% of agar was added to each of the above mentioned gel types.

### 2.2.2. Preparation of Neem water

*Azadirachta indica*, also known as Neem is grown in tropical and sub-tropical regions. Neem leaves have antimicrobial and antifungal activities. The tomatoes are washed with neem water before coating with Aloe vera gel. Neem water was prepared by boiling water until it reached its boiling point. To this dried neem leaves powder was added. The mixture was boiled for 10-15 minutes and then filtered.



Image 2: Conical flask (left) contains neem solution and beaker (right) contain mixture of *Aloe Vera* solution with citric acid

## 2.3. Gel coating on tomatoes

4 sets of tomatoes with almost equal weight and size were taken into consideration. Each set consisted of 4 tomatoes which as mentioned earlier were washed with neem water prior to treatment with gel. One tomato in each set was kept as comparative control and the remaining three were coated with each gel type mentioned before. After this, these four sets of tomatoes were kept in ambient conditions for four weeks.

**2.3.1. Weight loss:** samples were weighed initially before coating them with *Aloe Vera* gel and at intervals of 1 week the data for the average weight measurements (in grams) is tabulated below. Comparative data is also illustrated graphically. The calculations are made considering the difference between initial and final weight as the total weight loss. The data is recorded using digital balance.

**2.3.2. Firmness:** The firmness was calculated keeping the girth of tomatoes as the measurement scheme for the same. A measuring tape was used to measure the same.

**2.3.3. pH:** The initial and final pH for the four sets of tomatoes was recorded using pH strips. The tomatoes were ground and pH was recorded by dipping pH strips and comparing the color change with

the standard pH chart during the beginning and end of the experiment. The initial and final pH of tomatoes was found to be 4.0 as compared to control tomatoes were found to be found pH 5.0.

**2.3.4. Width:** The width of the tomatoes was measured initially before coating them with *Aloe Vera* gel and at intervals of one week using a measuring tape. The data for the average width measurements (in centimeter) is tabulated below. The results are also illustrated graphically

Table 1: Comparative studies of tomatoes' weight with different gel coating

Time\ Samples	Control (gm)	Aloe Vera with Citric acid (gm)	Aloe Vera with Lemon juice (gm)	Pure Aloe Vera gel (gm)
0 <sup>th</sup> week	72.875	73.012	72.567	72.321
1 <sup>st</sup> week	70.428	71.005	71.581	71.990
2 <sup>nd</sup> week	66.081	69.999	69.090	70.002
3 <sup>rd</sup> week	62.58	67.950	68.000	69.343
4 <sup>th</sup> week	59.059	65.698	67.044	68.457

Figure 1: Graphical representation of weight of tomatoes

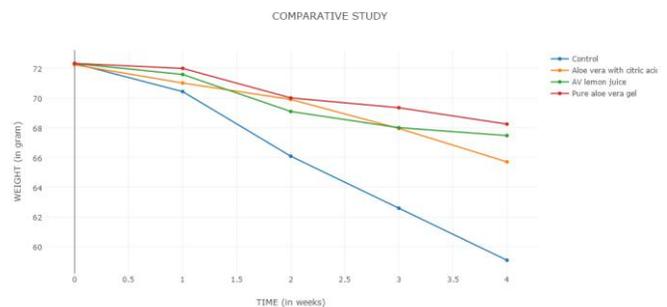
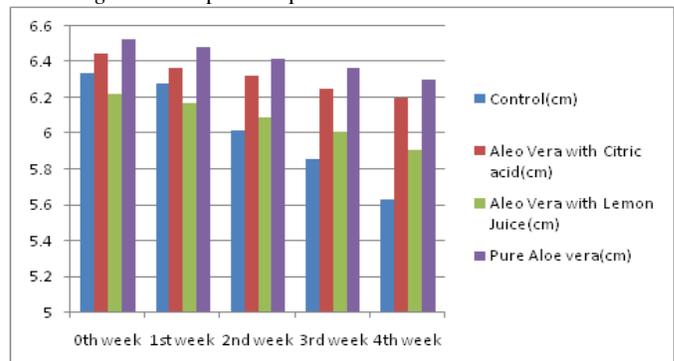


Table 2: Comparative studies of tomatoes width with different gel coating

Time\ Samples	Control (cm)	Aloe Vera with Citric acid (cm)	Aloe Vera with Lemon juice (cm)	Pure Aloe Vera gel (cm)
0 <sup>th</sup> week	6.34	6.45	6.22	6.53
1 <sup>st</sup> week	6.28	6.37	6.17	6.48
2 <sup>nd</sup> week	6.02	6.32	6.09	6.42
3 <sup>rd</sup> week	5.86	6.25	6.01	6.37
4 <sup>th</sup> week	5.63	6.2	5.91	6.3

Figure 2: Graphical representation of width of tomatoes



### 3. RESULT

#### *Physical parameters*

The weight of tomatoes kept in control decreased abruptly. However the weight loss of tomatoes coated with pure Aloe Vera gel was least. These tomatoes also retained their shapes while the others constricted with control being the most affected. The tomatoes coated with Aloe Vera gel were firm for a longer period of time compared to the control which lost its firmness rapidly. The tomatoes coated with pure aloe vera gel were the most firm. The final pH was estimated to be approximately equal to the initial pH of the tomatoes coated with these gels showing the pH remains constant when treated with Aloe Vera gel while the control was found to be higher. The tomatoes coated with aloe vera gel remained fresh and consumable for 30 days while the uncoated tomatoes were spoiled within 15 days. Hence using aloe vera and other easily available materials to make a gel we were able to increase the shelf life of tomatoes by 15 days.

### 4. DISCUSSION

Washing the tomatoes with neem water before coating with aloe vera gel was advantageous as neem inhibited the growth of microorganisms on the surface of tomato and hence the control tomatoes remained fresh for 15 days. Adding calcium chloride to aloe vera gel was also beneficial as it helps in delaying ripening of fruits. By adding a layer of aloe vera gel the tomatoes remained fresh for another 15 days. They retained their width and firmness due to gas exchange while the width and firmness of the control decreased steadily. Pure aloe vera was more effective in increasing the shelf life of tomatoes compared to mixing aloe vera with citric acid or lemon juice indicating that citric acid does not play a major role in increasing the shelf life of tomatoes.

### 5. CONCLUSION

*Aloe Vera* gel applied as an edible coating on tomatoes has a positive effect in retarding the ripening process and microbial action on it. This method is effective as a physical barrier and thus reduces the weight loss, maintaining the firmness and enhancing the shelf life of tomatoes by preventing microbial actions. In addition, *Aloe Vera* gel delays softening. The best result was found to be of tomatoes coated with pure *Aloe Vera* gel, as compared to other tomatoes with citric acid and lemon juice. Thus aloe vera gel can be used as an edible coating to reduce post harvest loss of tomatoes and increase its shelf life. It is an effective method that can be adopted in our daily life.

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