Research Journal of Food Science and Quality Control (RJFSQC) E-ISSN 2756-5483
P-ISSN 2695-2459 Vol 10. No. 6 2024 www.iiardjournals.org Online Version

Effect Of Aloe Vera Gel on Shelf Life of Tomato Fruits Grown in Gboko Local Government Area of Benue State, Nigeria

[1]Adia M. N., [1]Iko, W.,[1] Swande, P. I. and [2]Tume, C.T
Department of Science Laboratory Technology,
Akperan Orshi Polytechnic, Yandev, Benue State
2. Department of Forestry Technology, Akperan Orshi Polytechnic, Yandev, Benue State
*Corresponding authors email and phone no.: mnenaadia@gmail.com
DOI: 10.56201/rjfsqc.v10.no6.2024.pg12.19

Abstract
Tomato is one of the most extensively cultivated vegetable in Gboko local Government Area of Benue State. However, the main challenge faced by growers of the crop is the post-harvest losses. This study investigated the effect of Aloe vera gel on the shelf life of tomatoes grown in Gboko. A total of 160 tomatoes fruits were collected from four locations (40 per location) across the local government. The samples were washed and weighed using electric weighing balance. The four replicates (comprising of 40 fruits each) were treated with Aloe vera gel with different volumes as follows: A,one millilitre (lml), B(3ml), C(5ml) and D control (0ml) respectively. The Aloe vera gel was produced by blending Aloe vera leaves. The samples were package in Petri Dishes and stored under room temperature for 21 days in the lab. During this period, the weights of the fruits were measured as well as the number spoiled under each treatment. The number of deteriorated fruits was highest in treatment D and C as 31 and 21 respectively while A and B recorded the lowest number of spoilage 12 and 15. The percentage deterioration for treatments A, B, C and D was 30%, 37.5% 52.5% and 77.5 while weight loss was recorded to be 6.84g, 7.55g 12.04g and 45.9g respectively in 21 days. Therefore, application of Aloe vera gel (lml) was the most effective in increasing the shelf life of tomatoes.
Keywords: *Aloe vera, Tomato, Shelf life, Gboko, Preservation, Fruits*

INTRODUCTION

Post-harvest losses is one of the major challenge faced by farmers in Africa and indeed other part of the world. Tomatoes as perishable crops is difficult to be handled after harvest hence farmers are compered to market it immediately after harvest to avoid spoilage. This research investigated the effectiveness of Aloe vera gel in extending the shelf life of tomato in Gboko local Area of Benue State Nigeria.

Many storage techniques have been developed for preservation and storage of food crops. One method of extending post-harvest shelf life is the use of edible coating. Edible coatings are thin layers of edible materials applied to the product's surface in addition to or as a replacement for natural protective waxy coatings and provide a barrier to moisture, oxygen and solute movement for the food (Ahmed, *et al*., 2009). Edible coatings are used to create modified atmosphere and to reduce weight loss during transport and storage. Aloe vera gel is one edible coatings commonly used for the preservation of fresh fruits around the world.

Aloe vera is a succulent, perennial evergreen plant species belonging to the genius *Aloe vera* and family liliaceae. The plant which is reported to have originated from the Arabian Peninsula is grown widely in tropical climates around the world and is cultivated for agricultural and medicinal uses. The plant which use for indoor decoration is also used for the production of many consumable products including beverages, skin lotion, cosmetics/ointments for treatment of minor burns and sunburns.

Aloe vera is a stemless or short stemmed plant which grows up to 60-100 cm (24-59 in) tall. The leaves are thick and freshly, green to grey-green, with some varieties showing white flecks on their upper and lower stem surfaces. The margin of the leaf is secreted and has small white teeth. The flowers are produced in summer on a spike up to 90 cm (35 in) tall, each flower being pendulous with a yellow tubular corolla 2-3 cm (0.8-1.2 in) long like other *Aloe vera* species, Aloe vera forms arbuscular mycorrhiza (Arowora *et al*., 2013), a symbiosis that allows the plant better access to mineral nutrients in soil. *Aloe vera* leaves contain phytochemicals under study for possible bioactivity, such as acetylated mannans, polymannans, anthraquinone c-glycosides, anthrones, other anthraquinones such as emodin and various lectins. *Aloe vera* is considered to be native only to the South-West Arabian Peninsula. However, it has been widely cultivated around the world, and has become naturalised in North Africa as well as Sudan and neighbouring countries, along with the Canary Islands, Cape Verde, and Madeira Islands. It is also naturalised in wild areas across Southern Spain, especially in the region of Murcia, being the only place in Europe where it has been found naturalised Serrano (2005). In this research, the use of *Aloe vera* gel as edible coatings for preservation of tomatoes grown in Gboko was carried out to determine *the efficacy of the plant in extending the shelf life of the crop.*

MATERIALS AND METHOD

Forty (40) ripe tomatoes each were collected from four locations namely Tse-Kucha,Yandev, Mkar, and Agbile, making a total of 160 fruits collected for the study. The tomatoes were collected directly from farmers in clean covered containers and immediately taken to the Akperan Orshi Polytechnic Yandev Microbiology Laboratory. In the lab, the samples were thoroughly wash and weighed using electric weighing balance. Individual weights of each tomatoes fruit (40) collected in each location was measured and recorded as well.

Preparation of *Aloe vera* Coating gel

Aloe vera gel was prepared by blending Aloe vera leaves after separating the matrix from the outer cortex of the leaves. The colourless hydroparenchyma was then homogenised in a blender. The resulting mixture was sieved to remove the fibres. The liquid constituted fresh *Aloe vera* gel.

Application of Treatments

Four treatments, A (lml), B(3ml), C(5ml) of Aloe vera gel and D control (0ml) were applied to the four replicates comprising of 40 fruits each respectively. The samples were packaged in Petri Dishes and stored under room temperature in the lab for 21 days. During this period, the weights of the fruits under each treatment was measured and the number spoiled counted and recorded after every three days.

The temperature and relative humidity of the laboratory where the tomatoes were stored was also measured periodically.

The percentage of the deteriorated tomatoes was calculated using the formula adopted by Mehdi (2015).

Tomato Deteriorated (TD)%. $TD\% = \frac{\text{No of decayed tomato}}{\text{No of initial (total) fruits}} \times 100$

RESULTS AND DISCUSSION

Results

A total number of one hundred and sixty tomatoes were subjected to the four treatments A (1ml), B (3 ml) C (5 ml) and D was control (zero ml of the gel.) respectively. Result from the study is presented in the table below

Table 1: Initial mean weight (g) of tomato fruit in each sampled location

Treatment	R1	R2	R3	R4
A (l ml)	60.5	61.6	60.02	53.16
B (3 ml)	66.87	65.07	61.98	52.07
C 5 ml	59.0	55.51	58.17	56.28
D control	62.3			

Key: R1, R2, R3, R4 = sample location

Table 2: Total number of tomato deteriorated during the study (21 days)

Days	Treatment			
	A	B	C	D Control
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	1
5	-	-	-	-
6	-	-	-	4
7	-	-	-	2

8	-	-	-	1
9	-	-	-	1
10	1	2	3	1
11	3	1	1	1
12	-	-	2	1
13	-	2	-	1
14	-	4	2	2
15	2	-	-	1
16	1	2	3	2
17	3	1	2	3
18	1	1	4	1
19	1	-	3	3
20	-	2	1	4
21	-	-	-	2
Total	12	15	21	31

Table 3: Percentage deterioration of tomato fruits in each treatment

Treatment	Percentage
A	30%
B	37.5
C	52.5
D control	77.5

Table 4: Mean weight loss of tomato in each treatment

Treatment	Initial weight (g)	Final weight (g)	Weight loss (g)
A	58.7	51.86	6.84

B	61.5	53.95	7.55
C	57.24	45.2	12.04
D	62.3	16.4	45.9

Discussion

A total of 160 tomato fruits were sampled and subjected to three treatments A (1 ml), B (3 ml) C (5 ml) and a control D. Forty (40) fruits were subjected to each treatment, prior to application of the gel, the initial weight was recorded which ranged from 66.87-52.07 (g) while the final average weight of the tomato fruit ranges from 53.95-16.4 (g) The level of deterioration was determined by counting the number of the fruits deteriorated in each treatment i.e A, B, C, and D and the percentage deterioration was calculated. The result of the study showed high level deterioration of tomato fruits in treatment D which was the control. Recall that fruit in the control were not treated with *Aloe vera* gel. A total of 31 tomato fruits out 40 decayed after twenty-one days in storage. Similarly, a total of 21 fruits deteriorated in treatment C. The first decayed in treatment D was observed on the 4th day after storage. In all the lowest number of deterioration was recorded in treatment A (l ml) and B (3 ml) with total decay of 12 and 15 tomato fruits respectively. The percentage deterioration was calculated for each treatment and recorded A, B C and D as 30%, 37.5%, 52.5% and 77.5% respectively. Decay is one of the most important post-harvest factors that reduces the quality and shelf life of crops. Kazerinin (2011) reported that the use of edible coating on strawberry improved physical properties, fruit firmness and reduced decay. (Martinex-Romeo *et al*., 2005), also noted that direct application of Aloe vera gel reduces the activities of microorganism especially fungi and bacteria. The high level of deterioration observed in treatment C may be as a result of high quantity of Aloe gel which caused accumulation of moisture.

The result of treatment on weight loss in table 9 reveals that uncoated tomato fruits in treatment D exhibited a significant increase in weight loss of about 45,9(g), in fact the highest weight loss was obtained in uncoated fruits (tomato) while the coated tomato with treatment A recorded the lowest loss in weight of 6.84 (g), treatment B 7.55 (g) weight loss and C with the weight loss of 12.04 (g). This effect is based on the ability of Aloe gel to prevent moisture loss and controlled respiratory gases exchange. Valverde *et al*. (2005) reported that weight loss in fruits is as a result of moisture out of the surface of the fruits but when coated it can be prevented.

Conclusion

From the obtained results it can be concluded that application of Aloe vera gel has effect on improving the shelf life of tomato. Application of Aloe vera of lml increase post-harvest quality of tomato grown in Gboko 21 day after harvest. Although tomatoes are best stored under 0 ^{o}C for long term storage. From this research we recommend that Farmers or consumers of tomato can use Aloe Vera gel to preserve their tomatoes for short term storage and Tomatoes should be properly washed with clean water and kept in clean utensils to avoid colonization of microorganisms that may likely to cause decay.

Reference

Adetunji, C. O., Fawole, O. B., Arowa. K. A., Nwaubini, S. I., Ajayi. E. S., Oloko, J. K., Majolagbe, O. M., Ogundele, B. A., Aina, J. A. and Adetunji, J. B. (2012). Effects of edible coatings from coatings from Aloe vera Gel on quality and post-harvest physiology of *Ananas Comosus* fruit Junning ambient storage. *Global Journal of Science frontier Reseach*, **12** (5): 39-43.

Ahmed, M. J., Singh, K. and Khan, A. S. (2009). Post-harvest Aloe vera gel-coating moduslates fruits repening and quality of Arctic "Snow" nactamie kept in ambient and storage. *International Journal of food science and Technology*, **44**: 1024-1033

Anthmaselv, K. A., Sunilthan, P. and Kevathy, B. (2013). Development of Aloe vera based edible coating for tomato. *International Agrophy sinology*. **27**: 369-375.

Arowora, K. A., William, J. O., Adetunji, C.O., Fawole, O. B., Afolayan, S. S., Olaleye O. O., Adetunji, J. and Ogundele, B. A. (2013). Effects of Aloe vera coating on quality characteristics of oranges stored under cold storage. *Greener Journal of Agricultural Science*. **2**: 39-47

Asghari, M. L., Ahadi, S. and Riaie, S. (2013). Effects of Salicylic acid and edible coatings based Aloe vera gel treatment on storage life and post-harvest quality of grape. *International journal of Agriculture and crop sciences*. **5**(23) 2890-2898

Castillo, S. D., Navano, P. J., Zapata, F., Elvillen, D., Valero, M., Serrano, M. and Martinez D. R. (2010). Antifungal efficacy of Aloe vera in vito and its use as a post-harvest treatment to maintain post-harvest. *Biology and Technology*. **57**: 183

Chaullan, S. H, Gupta, K.C. and Agrawal, M. (2014). Application of biodegradable Aloe vera gel to control pos-harvest decay and longer the shelf life of grapes. *International Journal of Current Microbiology Applied Science*, **3** (3): 632-642

Cheng-pei, C., Be-jen, W. and Yih-ming, W. (2010). Physiochemical and antimcrobical properties of edible Aloe/galatime composite films. *International Journal of Food Science and Technology*, **45**(50): 1050-1055

Dang, K.T., Singh, V. and Swimming, E. E. (2008). Edible coatings influence fruit ripening quality and aroma biosynthesis in mango fruit. *Journal of Agriculture and Food Chemistry*, **56**: 1361

Ergab, M and Satici, F. (2012). Use of Aloe vera gel as bio-preservative for Grammy Smith and "Red Chief apples. *The Journal of Animal and Plant Sciences*. **22** (20): 363 -368.

Eshun, K. and He, Q. (2004). Aloe vera; A valuable ingredient for food, pharmaceutical and cosmetic industries. A review. *Critical Reviews of Food Science and Nutrition*, **44**: 91-96

Guillen, F., Diaz-mula, H. M., Zapata, P. J., Valero, D., Serrona, M., Castillo, S. and Martinez-Romaero, D. (2013). Aloe or borescens and Aloe vera gesl as coatings in decaying post-harvest ripening in peach and plan fruit. *Post-Harvest Biology and Technology*. **83**: 54-57

Kazerinin, S. E. (2001). Effect of Chitosan and Starch Edible coating and hot water treatment on postharvest quality of strawberry. M.sc Thesis in Horticultural Sciences. shiraz University 79 **p**.

Maria, V., Clara, P. Julian, M. D. and Ehen, G. M. (2008). Recent aduamees in edible coatings for fresh and minimally processed fruits. *Critical Reviews in Food Science and Nutrition*,**48** (6): 496-511

Marpudi, S. L., Ramachandran, P. and Srividya, N. (2013). Aloe vera gel coastings for post-harvest quality maintenance of fresh fig fruits. *Research Journal of Pharmaceutical Biological and Chemical Sciences* **4**: 878-887

Martinex-Romero, D., Alburgieerque, N., valverde, J. M., Guillen, F., Castillo, S., Valero, D. and Serrano, M. (2006). Post-harvest sweed cherry quality and safety maintenance by Aloe vera gel a new edible coating. *Post-Harvest Biology and Technology*, **39**: 93-100

Martinez-Romeo, D., catsillo, S. Valverda, J. M., Guillen, F., Valero, D. and Serrano, M. (2005). The use of natural aromatic essential oil helps to maintain post harvest quality of crimison table grapes-Acta. *Horticulture*, **682**: 1723-1729

Mehdi, H. F. (2015). Impact of Aloe vera gel as postharvest Treatment on quality and shelf life of table grape cv Askari. *Journal of Agriculture Communications*, **1**(1) 30-36

Morillon V. F., Debeaufort, G., Blond, M., Capelle, A. and Volley, A. (2002). Factors affecting the moisture permeability of lipid-based edible films; A review. *Critical* R*eviews of food Science and Nutrition*, **42**: 67-89

Padmaja, N. and John Don Bosco, S. (2014). Preservation of Julube fruits by edible Aloe vera gel coating to maintain quality and safety. *Indian Journal of Science Research and Technology*. **2**(3): 79-88

Paladines, D. Velero, D., Valverde, J. M., Diazmula, H., Serrano, M. and Martinez-Roero, D. (2014). The addition of Roselip oil improves the beneficial efectc of Aloe vera gel on decaying ripening and maintaining post-harvest of several stone fruit. *Post-harvest Biology and Technology*, **92**: 23-29.

Rojas-Argudo, C., Perez-Gago, M. B. and Del Rio, M. (2005). Post-harvest quality of coating cherries C.V Burlat as affected by coatings composition and solids content. *Food Science and Technology International* , **11**(6): 417-424.

Serrano, M. Velverde, J. M., Guillen, F., Castillo, S. and Martinez-Romero, D. (2006). Use of Aloe vera gel coating preserves grapes. *Journal of Agriculture and Food Chemistry*. **54**: 3882-3886

Surjushe, A., Vasani, R. and Saple, D. G. (2008). Aloe vera; A short review. *Indian Journal of Dermatology* . **53**: 163-66

Valverde, J. M., Martinez-Romero, D. G., Guillen, F., Castillo, S. and Serrano, M. (2005). A nove edible coating based on Aloe vera gel to maintain table grapes quality and safety. *Journal Agriculture and Food Chemistry*. **53**: 7807-7813