

INFLUENCE OF DIFFERENT CONCENTRATIONS OF *Aloe vera* LEAF GEL ON THE SHELF LIFE OF BANANA PEPPER (*Capsicum annuum*) IN DIFFERENT STORAGE TEMPERATURE

J. Renuga¹, L. Pradheeban² and M. Anusiya^{*1}

¹Department of Biosystems Technology, Faculty of Technology, University of Jaffna, Kilinochchi, Sri Lanka

²Department of Agronomy, Faculty of Agriculture, University of Jaffna, Kilinochchi, Sri Lanka

Abstract

The application of edible coating is a technique that used to increase the shelf life of vegetables. This experiment was conducted from February to May 2022 at Department of Agronomy, Faculty of Agriculture, University of Jaffna, Kilinochchi to study the influence of different concentration of *Aloe vera* gel on increasing the shelf life of *Capsicum annuum*. Two factor factorial laboratory experiment was carried out in Complete Randomized Design (CRD) with six replicates. First factor was different storage conditions use up to 16 days (C1- room temperature 32 °C, C2–refrigerator temperature 10 °C) and second factor was different concentration of *Aloe vera* coating (T1- 100% of *Aloe vera* gel, T2- 80% of *Aloe vera* coating, T3- 60% of *Aloe vera* coating, T4 - Control). Physical and chemical parameters such as moisture content, firmness rate, weight loss, pH and titratable acidity were measured for capsicum. All the data was analyzed in ANOVA using SAS software version 9.4. The means were compared by using Duncan's multiple range test to identify the best treatment combination. The result revealed that the highest moisture content (90%), firmness rate (75%), low level of weight loss (15%), and pH (6.28 pH) were found in T1 at refrigerator temperature in 16th day. These processes being more intense during the storage periods. According to this study, it can be concluded that different ratios of *Aloe vera* gel and different storage conditions have impact on banana pepper shelf life. Among the different ratio of *Aloe vera* solution, 100% of *Aloe vera* solution can be recommended as best coating at the refrigerator temperature (10 °C), due to good quality of vegetables.

Keywords: *Aloe vera* gel, edible coating, storage condition, shelf life, physicochemical parameters

Introduction

Banana pepper (*Capsicum annuum* L) belongs to the family Solanaceae, it is the most economically important plant in Sri Lanka (Ruhunuge *et al.*, 2021). It could be a highly perishable in nature having low shelf life period and is additionally prone to fungal infections (Barkai-Golan, 1981). *Aloe vera* gel is one of the natural and environmentally friendly preservative materials. It is used to minimize the rate of respiration, water loss and maintaining the quality attributes of vegetables and fruits (Misir *et al.*, 2014). Therefore, research is carried out to study the effect of different concentrations of *Aloe vera* gel coating to increase the shelf life of banana pepper and reduce the moisture and other losses.

Materials and Methods

Experimental design

Experiment was conducted in two factor factorial method in complete randomized design (CRD) with six replicates. The treatment combinations with water are 100 % (T1), 80 % (T2), 60 % (T3) of coating solution and control method (T4). And used two storage conditions are 10 °C (C1), (30±2) °C (C2).

*Corresponding author- anugobalakrishnan91@gmail.com

Selection of vegetables

Banana sweet pepper was selected with uniform size and thoroughly washed in water to lose the dirt particles.

Preparation and application of *Aloe vera* gel edible coating

Aloe vera leaf was collected and washed with tap water to remove the mucus. It was homogenized in a blender and filtered through Whatman filter paper. It was pasteurized at 70°C for 45 min. Then 4.5g of citric acid was added to regulate PH at 4. *Aloe vera* gel solution was prepared by diluted with distilled water. Dipped the banana pepper in *Aloe vera* coating. It was kept at two different temperature 10°C and (30±2) °C. Shelf life of samples were compared with the control samples.

Analysis of coated banana pepper

Weight loss, firmness, moisture content, pH, Titratable acidity, Total Soluble Solid was analyzed in 4 days intervals. pH, Titratable acidity, Total Soluble Solid of banana pepper was analyzed using standard procedures. Weight loss were calculated by following equation:

$$\text{Weight loss\%} = \frac{\text{Initial weight} - \text{Weight in storage}}{\text{Initial weight}} \times 100$$

Moisture content were determined by gravimetrically method. it was calculated by following equation.

$$\text{Moisture content\%} = \frac{\text{Initial weight} - \text{oven dried weight}}{\text{Initial weight}} \times 100$$

Statistical analysis

Using ANOVA SAS 9.4 software and Duncan's multiple range test was used for comparing difference among mean value.

Results and Discussion

Weight loss

The effect of coating and different temperature effect on weight loss % of capsicum. The weight loss % of T1 is lower than T4 (Figure 1) Stored at 10 °C was significantly lower weight loss than that stored at 30±2 °C (Figure 2). This was supported by Misir *et al.* (2014) who estimated that Aloe gel based edible coating act as barrier, thereby restricting water transfer and protecting fruit skin from mechanical injuries.

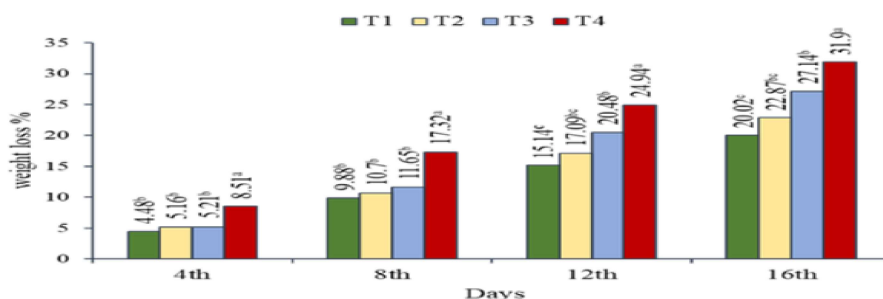


Figure 1: Weight loss percentage in different ratio of *Aloe vera* gel coating.

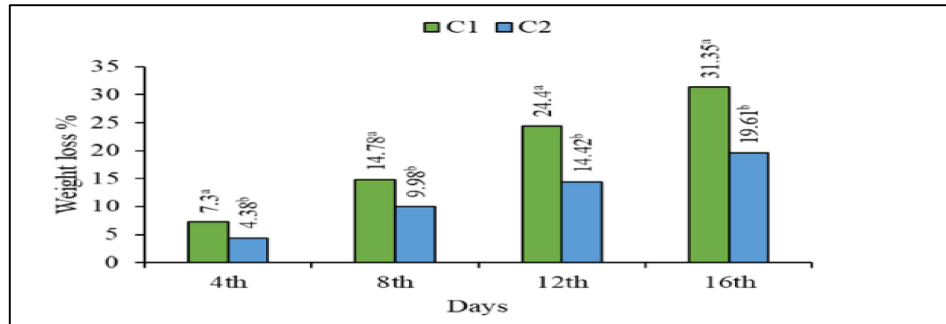


Figure 2: Weight loss percentage in different storage condition.

Moisture content

The moisture content in capsicum was significantly differed with different ratio of *Aloe vera* gel coating. The highest moisture content was recorded in T1. Morillon *et al.* (2002) stated that of *Aloe vera* gel has proved to be highly effective as a moisture barrier which allowed the formation of a barrier to the diffusion of water between the fruit and environment.

Firmness

The rate of firmness gradually reduces with time. Highest firmness percentage value was recorded in T1 than other treatment (Figure 3). The firmness of coated capsicum at 10°C was significantly higher than that stored at room temperature (Figure 4). *Aloe vera* coating delays softening of fruits and maintains its texture. This result is in conformity with Hameed *et al.* (2013) who indicated that fruit stored at 10°C were firmer than fruit store at high temperature. It may be due to lower metabolic activities at 10°C which retained fruit firmness.

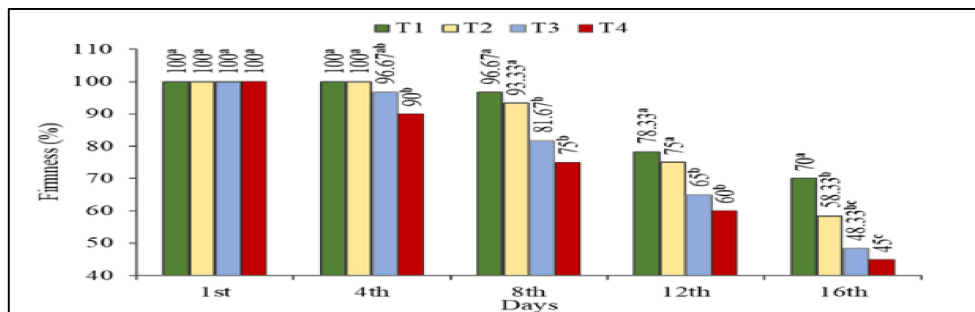


Figure 4: Firmness (%) in different ratio of *Aloe vera* gel coating

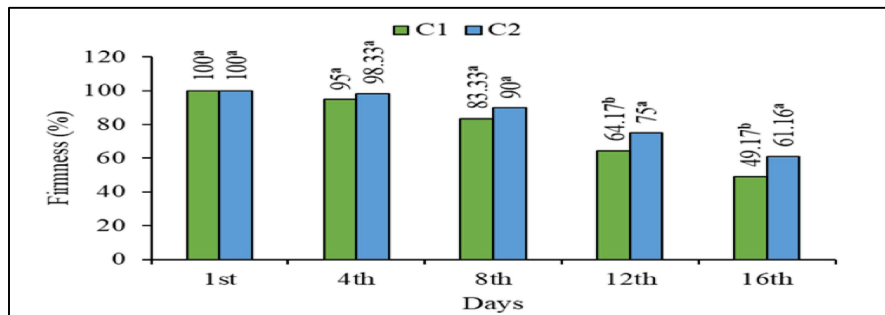


Figure 5: Firmness (%) in different storage condition

pH

Aloe vera coating delayed the changes in pH of capsicum. pH of T1 stored at 10 °C was significantly less increased than that of coated capsicum stored at (30±2) °C (Table 2). This result was supported by Firdous *et al.*, (2020). (Firdous et al, 2015) who said that biochemical reactions leading towards ripening and decay are slowed by *Aloe vera* gel-based coating.

Titrateable acidity

The acidity (%) reduces in high level at T4, but titrateable content was not changed in T1 (Table 1). There was no significant different in acidity (%) among different storage condition. This was supported by Sharmin *et al.*, (2015) who estimated that retention of TA by coated papaya was due to the protective effect of aloe gel coating as barrier to O₂ from surrounding atmosphere.

Total soluble solid

Total soluble solid content from the initial value increased up to 8th day of storage followed by decrement at end of storage (Table 1). The highest total soluble solid content was recorded in T1 stored at 10 °C. This result was further supported by previous finding of Kalauni *et al.* (2020) where they found that higher total soluble solid and sugar contents in coated fruits can be ascribed to the lower rate of metabolic changes due to reduced respiration.

Table 1: Total soluble solid, pH, Titrateable acidity (%) in different ratio of *Aloe vera* gel coating

	TSS				pH				Titrateable acidity			
	4 th day	8 th day	12 th day	16 th day	4 th day	8 th day	12 th day	16 th day	4 th day	8 th day	12 th day	16 th day
T1	4.05 ^a	4.38 ^a	3.3 ^a	3.3 ^a	6.2 ^a	6.27 ^{ab}	6.27 ^b	6.28 ^b	0.01 ^a	0.01 ^b	0.01 ^b	0.01 ^a
T2	4.07 ^a	4.2 ^b	3.33 ^a	3.33 ^a	6.14 ^a	6.28 ^{ab}	6.31 ^{ab}	6.33 ^b	0.02 ^a	0.01 ^{ab}	0.01 ^{ab}	0.01 ^{ab}
T3	4.06 ^a	4.63 ^a	3.46 ^a	3.11 ^b	6.15 ^a	6.22 ^b	6.24 ^b	6.31 ^b	0.02 ^a	0.01 ^{ab}	0.01 ^{ab}	0.01 ^{ab}
T4	3.96 ^a	4.21 ^b	3.28 ^a	3.02 ^b	6.28 ^a	6.38 ^a	6.42 ^a	6.55 ^a	0.02 ^a	0.02 ^a	0.01 ^a	0 ^b

Table 2: Total soluble solid, pH, Titrateable acidity % in different storage condition

	TSS				pH				Titrateable acidity			
	4 th day	8 th day	12 th day	16 th day	4 th day	8 th day	12 th day	16 th day	4 th day	8 th day	12 th day	16 th day
C1	3.94 ^a	4.79 ^a	3.38 ^a	3.28 ^b	6.22 ^a	6.31 ^a	6.34 ^a	6.39 ^a	0.02 ^a	0.01 ^a	0.01 ^a	0.01 ^a
C2	3.83 ^a	4.32 ^a	3.32 ^a	4.1 ^a	6.17 ^a	6.26 ^a	6.28 ^a	6.34 ^a	0.02 ^a	0.01 ^a	0.01 ^a	0.01 ^a

Conclusion

Shelf life of capsicum in different concentration of *Aloe vera* gel have great influenced on its physicochemical properties. Coated capsicum showed lower weight loss and color changes, reduce softening and ripening. The result of this study indicate that capsicum coated with 100 % of *Aloe vera* gel showed a significant increase of storage life during storage at 10 °C.

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