International Journal of Advance Tropical Food (IJATF)
Vol. 2, No. 1, Mei 2020, pp. 18-24
E-ISSN: 2715-5889, DOI: http://dx.doi.org/10.26877/ijatf.v2i1.6127.

Changes In Vitamin C and Total Microbes Of Papaya Fruit (Carica papaya L.) Which Is Processed Minimally Using Edible Coating Of Agar-agar Based On The Storage Time

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Abstract

Minimal processing and edible coatings began to be known to provide food security and improve the quality of food products at the time of storage. This study was to determine the effect of minimal processing using agar-agar based on storage time to changes in vitamin C and total microbes papaya (Carica papaya L.).This research is an experimental laboratory study with the research design used is a two-factor Randomized Completely Design (CRD). The number of units used in the study was 28 samples followed by samples without agar coating. Data on vitamin C were measured by the iodimetry method, total microbes by the Total Plate Count (TPC) method. The statistical test used was the Two Way Anova. There are differences in the results of tests of vitamin C levels, total microbes and weight loss between the treatment and control groups. There is a minimal processing effect using agar-agar on vitamin C levels ($\rho = 0.006$) and total microbes ($\rho = 0{,}000$). Minimal processing using agar-agar coatings based on long storage effect on the levels of vitamin C and total microbes papaya (Carica papaya L.).

Keywords: papaya, minimal processing, edible coating

How to Cite: Apriani, L., Aminah, S., & Isworo, J. T. (2020). Changes In Vitamin C and Total Microbes Of Papaya Fruit (carica pepaya l.) Which Is Processed Minimally Using Edible Coating Of Agar-agar Based On The Storage Time. *International Journal of Advance Tropical Food, 2(1),*18-24. http://dx.doi.org/10.26877/ijatf.v2i1.6127.

INTRODUCTION

Papaya is one of Indonesia's horticultural commodities that is developed and has various functions and benefits (Suyanti et al, 2012). Papaya fruit is a good source of vitamin C and has other high nutritional content such as calcium, magnesium, phosphorus, iron, niacin, thiamine, riboflavin and beta carotene (Nwofia and Ojimelukwe 2012). Papaya is classified as a non-seasonal plant, so the fruit is available at any time, the price is also relatively cheap and affordable (Febjislami et al., 2018). Based on data from the Central Statistics Agency (BPS), agriculture in 2019 papaya fruit production in 2018 increased 1.4% from the previous year 2017.

Increased papaya production is influenced by public awareness to consume fruits as a source of nutrients in the form of vitamins and minerals. Along with increasing public understanding there has also been a shift in the propensity for papaya fruit consumption in the community, thus causing upstream-downstream providers to be demanded to provide papaya fruits with nutritional values and tastes that are in accordance with consumer desires (Febjislami et al., 2018).

Papaya fruit is ready to be harvested 163 days or after the rind is red 25-30%. However, after maturity the storability of the fruit is only 3-4 days, so that economically it can cause the selling value to be low (Suyanti and Setyadjit, 2012). Therefore, the presence of papaya fruit in fresh form and or in the form of peeled fruit with minimally processing is very helpful in overcoming problems in the papaya fruit (Erica, 2012).

Minimally processing or also known as fresh-cut is a processing of fruit or vegetables that involves washing, stripping and slicing before being packaged and using low temperatures for storage so that it is easy to consume without eliminating the freshness and nutritional value they contain (Parera, 2007). Based on research by Lestari et al. (2016) the use of edible coatings can inhibit the decrease in vitamin C levels and slow the growth of microbes. However, there has been no research into the use of hydrocolloid coatings from agar on fruits that have been modified by means of Fresh cut minimally processed fruits.

Agar-agar derived from seaweed is a group of rhodophyceae producing natural hydrocolloids from plants that have a high fiber content and is safe to be mixed in food processing and can be potential as an edible coating because it is able to prevent respiration (Andriani and Nurwantoro, 2018). good resistance to O2 and CO2 gases and can increase physical strength (Garnida, 2006). Therefore this study is expected to be able to find out changes in vitamin C levels and total microbes of papaya fruit weight (carica papaya L.) which are processed using a minimum of agar based on the storage time.

RESEARCH METHOD

Materials and Equipment

Papaya fruit to be used is class A type of papaya (Carica papaya L.) with limitation criteria; There are no irregularities in the shape of the fruit, little damage to the skin of the fruit (such as bruises due to impact, sunburn and / or contact with the sap), a small amount of pest and disease scars, total damage does not exceed 10% of the surface area of the skin and does not affect the flesh fruit with a physiological maturity level of 75% yellow (ripe). Obtained from the fruit market, the fruit used is the middle part, plain agar agar.

Research Design

The research design used was a completely randomized design (CRD) of two factors, namely coating and without coating. The influential variable is storage time, the affected variable is the level of vitamin C and total microbes.

Analysis of Vitamin C (Wijanarko, 2002)

The method used in determining vitamin C levels is iodimetry using the formula:

$$\text{mg \%Vit C} = \frac{100\ gram}{gr\ sampel} \text{x Fpx Volum titran } I_2 \text{ x } \frac{N.\ \text{Iodium}}{0{,}01} \text{x 0,88 mg vit C}$$

Analysis of Total Microbes (Fardiaz, 1987)

The method used to calculate the total microbes is by means of a calculation using a colony counter and the TPC (Total Plate Count) method is calculated using the formula. The number of microbes is calculated by colony counter.

$$\text{Total microbies per mL} = \text{Total coloni x} \frac{1}{faktor\ pengencer} \text{x } 10^1$$

Data Analysis

Data from measurements of vitamin C levels and total microbes were tested in normalcy first, the data obtained were normal and then tested using Analysis of Variants (Anova) two way anova, if there was a real effect where p-value <0.05 then continued using the test the difference between Least Significant Difference (LSD) and Ducan treatments with the help of SPSS 17.

RESULTS AND DISCUSSION

Vitamin C

Testing of vitamin C levels aims to determine whether there is an influence of vitamin C levels in papaya fruit that is processed using a minimum of gelatin coating with a long storage time. Testing of vitamin C levels in papaya is followed by treatment without agar-agar coating. The test results are shown in Figure 1.

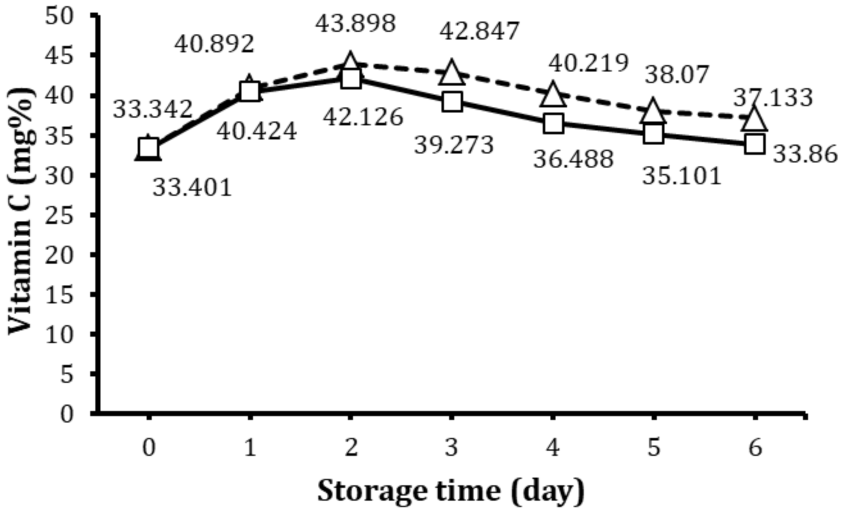

Figure 1. Vitamin C of Papaya Edible Coating During Storage. (□) without coating, (Δ) coating.

Figure 1 shows the level of vitamin C changes that tend to decrease during storage. The highest increase in both treatments occurred on storage day 2. Day 1 to day 2 the percentage difference of vitamin C levels of papaya fruit that is 6.84% has increased this shows that papaya fruit coated with agar increased levels of vitamin C during storage. According to Andarwulan (2006) at low temperature storage, the enzyme ascorbate oxidase in fruit is not released by cells so it is unable to further oxidize vitamin C into a compound that does not have vitamin C activity anymore.

Day 2 to day 3 the percentage difference in vitamin C levels of papaya fruit that is 2.39% has decreased compared to the previous day and has continued to decline. This is due to the nature of vitamin C which is easily oxidized so that vitamin C will decrease along with the duration of storage (Andarwulan, 1992). According to Santosa (2005) Generally the organic acid content decreases during cooking. This is because organic acids are respirated or converted to sugar. Organic acids can be considered a source of energy reserves in the fruit, and are then expected to decrease during metabolic activity during cooking.

Figure 1 explains that the papaya fruit without coating treatment shows results that tend to be the same as the agar coating treatment but the decrease tends to be higher. Seen in the 0th heri storage until the 1st day the percentage difference in vitamin C levels is 17.37% lower than the coating. The increase in vitamin C which is quite high is due to the coating process or edible coating can inhibit the oxidation process that is too high. According to Lestari 2016 edible coating functions as a barrier to oxygen entering the papaya fruit so that it inhibits the oxidation process.

The results of the Anova analysis (Analysis of Variance) of two factors at a significance level of 5% showed that the storage duration of treatment had a significant effect on the vitamin C levels of papaya fruit which was minimally processed using agar coatings. This is indicated by the value of ρ is 0.006 ($\rho < 0.05$). Followed by a post hoc test using LSD, it was found that there was a significant difference in the duration of storing 0 days with 1 day, 0 days with 2 days, 0 days with 3 days, 0 days with 4 days, 0 days with 5 days, 0 days with 6 days.

Total Microbes

The total microbial testing aims to determine whether there is an influence of storage time on the total microbial papaya which is processed using a minimum of agar agar. The results of total microbial tests on papaya fruit are processed using a minimum of gelatin coating based on storage time. Testing of total microbes in papaya fruit is followed by treatment without gelatinous coating. shown in Figure 2.

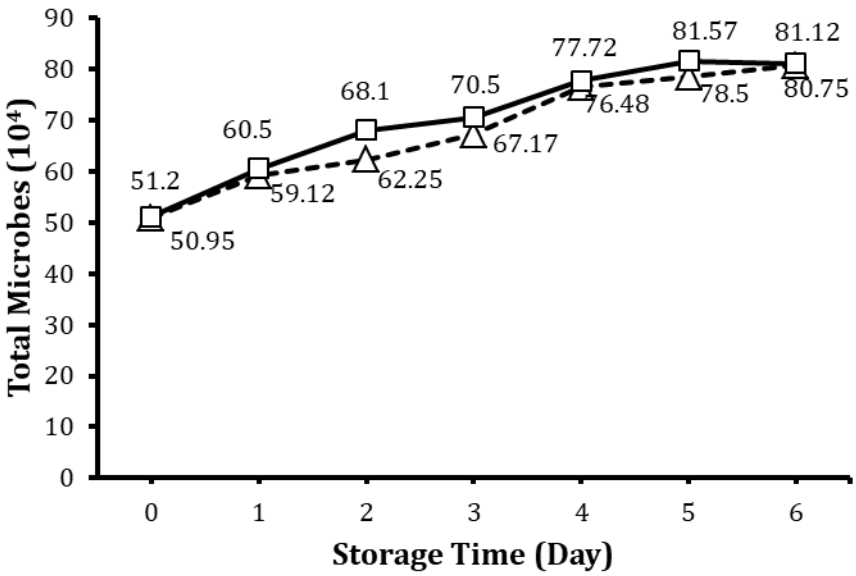

Figure 2. Total Microbes of Papaya Edible Coating During Storage. (□) without coating, (Δ) coating.

Figure 2 shows the total microbial changes that tend to increase during storage. The highest increase in the two treatments occurred on storage day 2. The percentage difference in total microbial changes in storage on day 1 and day 2 was as much as 5.02% and the subsequent days increased higher than the initial storage. This is due to bacteria that can live in cold storage will develop and stay alive. According to Handayani et al. (2010) handling at cold temperatures is only able to extend the shelf life of up to several days in fruits that can inhibit the activity of microbes and enzymes so that cold storage can not kill all microorganisms, but only inhibits its development. Reinforced Nuraeni et al. (2000) bacterial microorganisms present in the fruit classified as psychropilic bacteria that can live at low temperatures, namely 0°C - 30°C.

Papaya fruit without gelatin tends to increases in total bacteria. At the beginning of storage (day 0 and day 1) the percentage of the difference reached 2.63% of papaya fruit using coating. This is due to papaya fruit that uses edible coating agar to be able to suppress the oxidation process in papaya fruit so that it slows the change of vitamin C into other enzymes that can be used as nutrients for the growth of microorganisms, so the total increase in microbes is smaller than without coatings. In line with Doddy et al. (2017) research on cut melons there is an increase in total microbes in cold temperatures, humidity and high sugar content on the surface of fresh cut melons is very suitable for microorgnism to grow.

The results of the Anova analysis (Analysis of Variance) of two factors at a significance level of 5% showed that the storage duration of treatment had a significant effect on the total microbial papaya which was minimally processed using agar coatings. This is indicated by the value of ρ is 0,000 ($\rho < 0.05$). So that it is continued with post hoc test using LSD, it is found that there are significant differences namely 0 days with 1 day, 0 days with 2 days, 0 days with 3 days, 0 days with 4 days, 0 days with 5 days, 0 days with 6 day

CONCLUSION

Treatment minimally processing with edible coating can affect the levels of vitamin C and the total microbes of papaya fruit (Carica papaya L.) during storage. The highest levels of vitamin C on day 2 storage. The highest total of microbes in the 6th day storage. The treatment of minimally processing and edible agar is one of the food innovations in maintaining shelf life and adding nutrients for consumption. Thus increasing the quality of nutritional values and tastes in accordance with consumer desires.

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