The Analysis of Glucose and Vitamin C on Papaya (*Carica papaya* L.) with Different Time Storage

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**Abstract.** Papaya (*Carica papaya* L.) contains vitamins, carbohydrates, minerals, fiber, and enzymes that are useful for digestion. Storage after harvest is usually done for trading needs. The length of storage will affect glucose and vitamin C levels contained in it. The purpose of this study was to determine differences in glucose and vitamin C levels with different storage times. The method in this study is descriptive quantitative. Samples of *C. papaya* L. were obtained from farm farmers in Wayharong village, Waylima sub-district, Pesawaran district. This study consisted of 2 treatments, 3 days and 6 days of storage, each of which was 3 repetitions. Glucose levels were measured using the Luff Schoorl titration method. While the determination of vitamin C levels uses the iodine titration method. The results of the study data were analyzed by one-way ANOVA, followed by the LSD test at 5% level. The results showed differences in storage time with glucose levels increased compared to controls, with the highest increase of 7.23% in the storage period of 6 days. The storage duration also caused an increase in vitamin C levels. The highest storage time of 3 days was 16.88 mL / 100 gr.

1. **Introduction**

Papaya (*Carica papaya* L.) is one of the fruits plant species that spread in the tropics [5]. Papaya fruit is a popular fruit and is generally favored by most of the world's population. This is because the flesh is soft in red or yellow, tastes sweet, and refreshes and contains lots of water [5]. Papaya is a plant source of vitamins, minerals, fiber, and contains enzymes that are useful for digestion [1]. Papaya has many health benefits such as anti-inflammatory, anti-hypertensive, can decrease triglyceride and total cholesterol in the blood [2].

The ripe papaya fruit contains carotenones of 1000 ug / 100 g, Niacin 0.338 mg / 100 g, calcium 51 mg / 100 g, fat 0.2 g / 100 g and contains fiber as much as 1 g / 100 g which is very beneficial for the body [2]. In addition, papaya fruit also contains vitamin C. Vitamin C is rich in papaya fruit, which is about 78 mg. Vitamins are a small group of organic components that are needed in food but are essential for metabolic reactions and are necessary for normal body growth and health maintenance [3].

Generally harvested papaya fruit has a tinge of yellow color. Papaya fruit harvested at this maturity level will cook within four or five days and will rot on the seventh day. At the maturity level can be
avoided from damage when transporting. The harvested papaya will be stored at room temperature to reduce or drain the sap out of the fruit for a day. Papaya fruit before the sale is placed in a bamboo basket covered with newspapers at room temperature for 1-2 days so that the fruit has been ripe ready for sale. Papaya fruit is not worth selling until it is not worth consumption about 7 days after harvest. Seeing that papaya through three days of storage and a period of sale at room temperature for about seven days postharvest, the researchers conducted a study to determine the levels of glucose and vitamin C in papaya fruit after storage.

2. Materials and Methods
The material used is papaya fruit varieties jingo from papaya garden in Wayharong Village, Waylima District, Pesawaran Regency, Lampung. The fruit is cleaned and labeled according to the length of storage then placed in a cardboard box and stored in room temperature. This study consisted of 3 types of treatment, namely storage time 0, 3, and 6 days postharvest. Each treatment was repeated three times, each using 3 papaya fruits. Each fruit sample was analyzed by glucose level and vitamin C content. The fruit that was analyzed was the flesh. The analysis was averaged from all three replications. Then compared the differences in the duration of storage. Determination of glucose levels, in general, using Luff Schoorl titration method. The luff Schoorl method is a method or method of determination monosaccharide by chemical means. In determining this method, which is determined instead of the kuprooxide which settles but by determining the inner copper oxide the solution before reacting with reducing sugars (blank titration) and after reacting with reduced sugar samples (sample titration). Determination of titration using Natiosulfate. The difference in blank titration by titrating the sample is equivalent to the copper oxide formed and also equivalent to the amount of reducing sugar present in the material / solution. The reaction that occurs during the determination of carbohydrates in this way is initially the copper dioxide in the reagent will free the iodine from the K-iodide salt. The amount of iodine released equivalent to the amount of copper oxide. The amount of iodine can be known by titration using Na-thiosulfate. To find out that the titration is already enough, the starch indicator is needed. If the solution changes color from blue turn white, indicating that the titration is complete [4].

While the determination of vitamin C levels using iodine titration method. Consider 10 g of papaya then mashed with a blender. Then put in 50 ml flask, added distilled water 50 ml. Filter with a funnel use filter paper for separating the filtrate. Then take 5 ml of filtrate using a pipette volume, input in 125 ml erlenmeyer, add 2 drops of starch solution and 20 ml aquadest. The sample is titrated with solution iodine 0.1 N using starch indicator until a color change occurs become solid blue. Then count vitamin C levels [4].

3. Result and Discussion
The study of the effect of storage time of papaya fruit (Carica papaya L.) on glucose and vitamin C levels was carried out with six C. papaya L. experiments were stored in a place with room temperature ranging from 29-32°C and three which were not stored were used as the control. Glucose and vitamin C levels in C. papaya L. were observed after being treated with storage time of 0 days (control), 3 days and 6 days. After testing the C. papaya L. which was not treated (control) and treated, the results were obtained in the form of glucose levels and vitamin C levels as shown in the table 1 below:
Table 1. Observation data levels of vitamin C and glucose

| Parameter  | Time of Storage (Day) |       |       |
|------------|-----------------------|-------|-------|
|            | 0                     | 3     | 6     |
| Vitamin C (mg) | 8,68a± 0,30     | 16,88b± 0,79 | 16,58b± 0,76 |
| Glucose (%)   | 6,12a± 0,93        | 6,40a± 1,19    | 7,23a± 1,45 |

From the results obtained, it is known that vitamin C levels in the storage time of 3 days and 6 days have increased compared to the storage time of 0 days (control). The highest increase in vitamin C levels was obtained after *C. papaya* L. was stored for 3 days, which is equal to 16.88 mg. From the average results, it can be seen if the glucose level in the treatment of storage time of 3 days and 6 days has increased compared to the storage time of 0 days (control). The highest increase in glucose levels occurred after *C. papaya* L. was stored for 6 days, which was 7.23%. But based on statistical testing it does not show a significant difference. Changes in glucose and vitamin C levels as presented in the figure 1 below:

Figure 1. Changes in levels of vitamin C and glucose

Increased levels of vitamin C are thought to occur due to increased glucose levels. In the ripening process when storage of glucose levels increases but respiration may decrease, so that a portion of glucose is converted into other forms, namely the form of vitamin C. Carbohydrates (glucose) contained in *C. papaya* L. can be used as a precursor for the formation of vitamin C. Biosynthesis Vitamin C can be started when environmental stress occurs in plant tissue. In this case, there is a possibility of environmental pressure at room temperature against the tissue of *C. papaya* L. so that glucose is converted into vitamin C as a form of adaptation to environmental stresses. This is consistent with the theory that to adapt to extreme environmental stresses, plants develop antioxidants including vitamin C and high acidity.

Vitamin C is produced by plants in large quantities. The function of vitamin C for plants is as an antioxidant agent that can neutralize oxygen singlets that are very reactive, play a role in cell growth, function like hormones, and play a role in photosynthesis. The formation of glucose into ascorbic acid is thought to follow the following path. An efficient precursor to the formation of ascorbic acid is D-
mannose and L-galactose. The formation process begins with D-mannose-1-P which is assisted by a phosphorylated GTP to release 1 fospat into GDP-D-Mannose. GDP-D-Mannose is an isomer of GDP-L-Galactose. GDP-L-Galactose releases GMP into L-Galactose-1-P. Then phosphorylation releases 1 phosphate to L-galactose. NAD in L-Galactose is reduced so that it gets H+ to become NADH to form L-Galactono-1,4-lactone which is subsequently oxidized and releases 2H into L-Ascorbic Acid [7].

Changes in acidity during storage can vary according to the level of maturity and high storage temperatures. In general, decreasing ascorbic acid levels are faster at higher storage temperatures. The acid content in the fruit is known to increase until harvest time, but after harvest, when storage the acidity level decreases. The decrease in total acid during storage is caused by the use of organic acids in the process of respiration that takes place.

Vitamin C can form L-ascorbate and L-dehydroascorbic acid, both have activeness as vitamin C. L-dehydroascorbic acid is chemically labile and can undergo further changes to L-diketogulonat acid (DKG) which does not have vitamin C activity anymore. This inactive form often occurs in the heating process.

While changes in glucose levels occur due to the process of changing carbohydrates into simpler compounds due to the respiration process that occurs in C. papaya L. In general, raw fruit is known for its green characteristics, hard texture, sour taste or no taste at all like unsalted flour, the aroma is little or no aroma. During the fruit ripening process changes will occur in various aspects including changes in structure, texture, color, taste and biochemical processes that occur in it.

Papaya (C. papaya L.) is a climacteric fruit based on its respiration activity. Climacteric fruits undergo sudden changes in respiration rate before entering the ripening process. In general, fruits belonging to the climacteric group will ripen automatically after being harvested, when harvested in full old age, the ripening process will take place more quickly in the presence of ethylene gas in sufficient concentration. Because C. papaya L. is a climacteric fruit, it can mature by itself after being harvested (in this study the fruit is harvested in an old-fashioned state). The papaya after harvesting is still undergoing the ripening process as a form of change towards destruction to further experience the decay process. So that the respiratory process still occurs in it. Changes that occur in the ripening process include changes in carbohydrates that occur during fruit ripening. In young fruit, carbohydrates are still many in the form of starch so the fruit taste is not sweet. During the fruit ripening process, through an enzymatic reaction, the starch will be broken down into simple sugars such as glucose, fructose, and sucrose so that the fruit becomes sweet [6].

During the fruit ripening process, there is usually an increase in the amount and sweetness as a result of the degradation of polysaccharides. In line with this theory, the increase in glucose that occurs is due to the degradation of polysaccharides (starch) which will be broken down into simple sugars such as glucose in the ripening process in C. papaya L. that still occurs after being harvested. Respiration affects the fruit ripening process. In the process of respiration, there is a change of carbohydrates into simpler compounds which cause the flesh to be soft-textured and sweet because of the sugar formed. The occurrence of an increase in glucose levels is caused by the breakdown process of polysaccharides into sugar (sucrose, glucose, fructose) that occurs in the fruit ripening process in the post-harvest period.

Temperature also affects respiration speed. Respiration tends to decrease at low temperatures so that photosynthetic results stored if not respired will be converted into other forms such as developing antioxidants in the form of vitamin C and acidity, for adaptation to environmental stresses. This is what causes an increase in glucose levels that are not too large because some of the glucose that is not respected will be converted into other forms such as vitamin C. In the storage treatment of 3 and 6 days, respiration may no longer occur or has decreased so that some glucose is converted into vitamin C.

In terms of taste, in C. papaya L. the control treatment was slightly sweet and the fruit texture was still solid and hard. At 3 days of storage, the fruit has a refreshing sweet taste and a texture of solid and slightly soft fruit flesh. At 6 days of storage, some of the rinds have rotted, the soft flesh of the structure is not
dense and tastes sweet but not refreshing. This is due to the overhaul of polysaccharides (starch) into sugar which is one of the results of the ripening process that occurs in the fruit. Changing starch to sugar causes sweetness and decreases the hardness of fruits that have matured. Sweetness can be caused by glucose, fructose, and sucrose in the fruit. There is an increase in glucose, fructose, and sucrose little by little during maturation. Fructose synthesis is one and a half times more than glucose. In this study, glucose levels experienced an increase, although not too large, so it was thought that sweetness was increasing not only because of the presence of glucose but also fructose and sucrose in *C. papaya* L. Fructose is the sweetest type of sugar, and after that sucrose and glucose. This is uncertain. Therefore it is necessary to further test the levels of fructose and sucrose in *C. papaya* L.

4. Conclusion
From the research that has been done on the effect of storage time of papaya fruit (*C.papaya* L.) on glucose and vitamin C levels obtained glucose levels at 3 days and 6 days storage time respectively 6.40% and 7.23% increased compared to controls that have glucose levels of 6.12%. Vitamin C levels in storage for 3 days and 6 days were 16.88 mg and 16.58 mg respectively compared to controls that had vitamin C levels of 8.68 mg. This states that the storage time of *C. papaya* L. has an influence on glucose levels, and vitamin C levels contained in *C. papaya* L.

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