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Variation of Processed Fresh Pineapple on Vitamin C Content Using UV-VIS Spectrophotometry

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Abstract

Important sources of vitamin C in food mainly come from fruits and vegetables. One type of fruit that contains vitamin C and is much in demand by the public is pineapple. To extend the shelf life of pineapple fruit can usually be done by processing the fruit into other preparations. But on the other hand the content of vitamin C in fruit and food will be damaged due to the oxidation process by the outside air, especially when heated. This study aims to determine the levels of vitamin C in fresh pineapple and processed varieties of pineapple. This research method is descriptive by analyzing the content of vitamin C in fresh pineapple and its processed variations using the UV-Vis spectrophotometry method. Based on the results of the study, the levels of vitamin C in fresh pineapple, pineapple syrup and candied pineapple were (95.75 ; 49.09 ; 44.09) mg/100g, respectively. Based on the statistical test results, a significant value of $p>0.05$ was obtained, which meant that the data was normal and continued with the paired parametric T test. The result of the test is $p<0.05$. There are differences in the value of vitamin C levels in fresh pineapple and processed variations.

Keywords: Candied pineapple, pineapple syrup, vitamin C, UV-VIS spectrophotometry

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1. Introduction

Fruits contain various vitamins and minerals needed by the body. One of these vitamins is vitamin C. Vitamin C has a role as an antioxidant for the body and is effective in dealing with free radicals that damage cells or body tissues. Vitamin C has the property of being easily soluble in water so that when food ingredients undergo the process of slicing, washing and boiling to be used as a variety of other preparations, these foodstuffs will experience a decrease in their vitamin C levels. (Kurniawati, E., & Riandini, 2019). The content of vitamin C in fruit will be damaged through the oxidation process by the outside air, especially if the food is heated. Therefore, to avoid damage or reduced levels of vitamin C in these foods, it is necessary to make efforts to store them at low temperatures and cook them so as not to cause discoloration of the food. (Putri, M. P., & Setiawati, 2017).

In addition to containing various kinds of vitamins and minerals, in the fruit contains a fairly high water content. The high water content can accelerate the occurrence of damage, especially due to biological influences (bacteria and fungi) which cause rot in the fruit so that it is necessary to process the fruit into a variety of preparations with the aim of extending the shelf life of the fruit. (Karinda, M., Fatimawali, F., & Citraningtyas, 2013). Fruit can be processed into various kinds of processed drinks such as fruit

syrup, fruit juice and also other foods such as being preserved in the form of canning and candied fruit. (Arel, A., Martinus, A. B., & Ningrum, 2017). Candied fruit is a variety of processed fruit that is preserved with the aim of providing a sweet taste and preventing the growth of microorganisms. Salt water and whiting water are often added to the process of making candied fruit with the aim of maintaining the shape and eliminating itching or bitterness in the fruit. (Buhari, 2010).

Pineapple is a fruit that is in great demand by the public. Pineapple has an elliptical shape and has a scaly fruit skin. The abundant harvest of pineapples every year has made entrepreneurs carry out variations on pineapple preparations, among others by preserving pineapples in cans, making sweets and pineapple syrup. The process of making these variations of processed pineapple usually consists of peeling, cutting, washing, salting, boiling, adding sugar or whiting in the process of making candied pineapple. (Fauzana, 2022). At the cutting, washing and boiling stages of pineapple can result in a decrease in the levels of vitamin C contained in the fruit. Based on research (Putri, M. P., & Setiawati, 2017) states that the level of vitamin C in fresh pineapple is higher in value when compared to canned pineapple. This can be caused because vitamin C has water-soluble properties and is easily oxidized by outside air. Besides that, in the process of processing pineapple into various kinds of preparations, a cooking process occurs which causes a reduction or damage to the vitamin C contained in the fruit. (Elfariyanti, E., Zarwinda, I., Mardiana, M., & Rahmah, 2022).

Based on this, a study was conducted with the aim of knowing the levels of vitamin C in fresh pineapple and a variety of processed pineapple which includes candied pineapple and pineapple syrup.

2.

Research Methods

2.1 Tools and Materials

The materials used in this study were fresh pineapple, candied pineapple, and pineapple syrup while the reagents used were CO2-free distilled water and ascorbic acid p.a.

The tools used in this study were UV-VIS spectrophotometry, a set of glassware, analytical balance, mortar, stamper, and filter paper.

2.2 Research Procedures

The research procedure included sample preparation, determination of the maximum wavelength, preparation of a standard curve and measurement of vitamin C levels in samples of fresh pineapple, sweets and pineapple syrup. Fresh pineapple and candied pineapple are cut and then mashed and filtered. The filtrate obtained was weighed as much as 5 grams and dissolved with 100 mL of CO_2-free distilled water then the filtrate was diluted by pipetting 10 mL of solution and dissolved with 100 mL of CO_2-free distilled water. For the pineapple syrup sample, 5 mL of syrup solution was pipetted and then dissolved in 100 mL of CO_2-free distilled water. Determination of the maximum wavelength of vitamin C is done by measuring the absorption at a wavelength of 200-300 nm. Calibration curves were made by preparing series solutions of vitamin C levels with concentrations (0, 2, 4, 6, 8, 10, 12) ppm and measured at the maximum wavelength. Vitamin C levels in fresh pineapple, candied pineapple and syrup were measured using a UV-Vis spectrophotometer. Aquades was used as a blank solution and ascorbic acid as a standard solution. The data that has been obtained was analyzed using the T test.

3. Results and Discussion

The maximum wavelength of a compound can have different results if determined under different conditions and tools, so it is necessary

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to measure the maximum wave content as a reference for determining vitamin C levels in samples. The maximum wavelength measurement was carried out using a serial standard solution with a concentration of 6 ppm.

Table 1. Ascorbic Acid Absorbance Measurement Data at a concentration of 6 ppm

Wavelength (nm)	Absorbance (A)
200	0,078
210	0,083
220	0,096
230	0,139
240	0,165
250	0,264
260	0,327
270	**0,498**
280	0,421
290	0,234
300	0,107

Based on the data in table 1, the maximum wavelength measurement results are obtained at 270 nm with an absorbance value of 0.498 so that the data will be used to create a standard curve and measure vitamin C levels in the sample. The standard curve was prepared by measuring the absorbance of the ascorbic acid series standard solutions at concentrations (0, 2, 4, 6, 8, 10, 12) ppm.

Table 2. Absorbance Data of Ascorbic Acid Series Standard Solutions

Concentration (ppm)	Absorbance (A)
0	0
2	0,147
4	0,276
6	0,403
8	0,532
10	0,679
12	0,799

Based on the data in table 2, a standard curve for the relationship between ascorbic acid concentration and absorbance is made. The results of making a standard curve will show the linear regression equation which will be used as a formula to calculate the concentration of vitamin C in each sample, namely fresh pineapple, pineapple syrup and candied pineapple. The standard curve of the ascorbic acid solution can be seen in Figure 1.

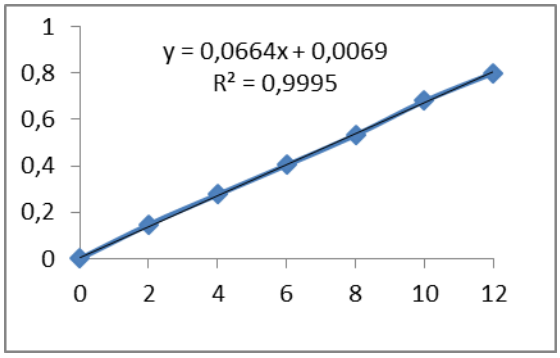

Figure 1. Ascorbic Acid Standard Curve

Based on Figure 1, the linear regression equation is obtained, namely y = 0.066x + 0.006 with a value of R2 = 0.999. From the results of measuring the absorbance of the samples, namely fresh pineapple, pineapple syrup and candied pineapple, to determine the value of the concentration of vitamin C in each sample, it can be done by plotting the absorbance value of the samples in the linear regression equation so that the value of vitamin C levels in each sample can be seen in Table 3.

Table 3. Results of Measuring Vitamin C Levels in Samples

Sample	replication	A	[sample] ppm	Content (mg/100 g)	Average Content (mg/100g)

	2	0,318	4,727	94,54	
Sirup nanas	1	0,165	2,409	48,18	49,09
	2	0,171	2,500	50	
Manisan nanas	1	0,150	2,182	43,64	44,09
	2	0,153	2,227	44,54	

Based on the data in Table 3, it can be seen that the levels of vitamin C in fresh pineapple samples were 95.75 mg/100g, pineapple syrup 49.09 mg/100g and candied pineapple 44.09 mg/100g.

Vitamin C is a water-soluble vitamin. Vitamin C has a role as an antioxidant that can counteract free radicals from the environment. Symptoms of mild vitamin C deficiency in the body are characterized by fatigue, anorexia, muscle aches, easier stress and infection while symptoms of severe vitamin C deficiency are the emergence of scurvy which is characterized by bleeding of the gums, weakness, joint pain and anemia (Lathifah, Q. A. Y., Turista, D. D. R., Hermawati, A. H., & Jannah, 2022). Vitamin C is mostly obtained from vegetables and fruits, one of the fruits that contain high levels of vitamin C is pineapple.

Fresh pineapple fruit can be processed into various kinds of food, one of which is pineapple syrup and candied pineapple. The research data shown in Table 3 shows that the levels of vitamin C in fresh pineapples are higher in value when compared to the levels of vitamin C in pineapple syrup and candied pineapple. The content of vitamin C in fresh pineapple was 95.75 mg/100g while the content of vitamin C in syrup and candied pineapple were (49.09 and 44.09) mg/100g respectively. Differences in vitamin C levels can be caused by the nature of vitamin C which is easily oxidized by heat, light, pH or from the surrounding air so it is necessary to store at low temperatures and not cook until it causes a color change in foods containing vitamin C. In the pineapple processing Making syrups and sweets involves peeling, washing, sorting, heating, sterilizing and storing (Destiana, 2022).

Based on research conducted by (Putri, M. P., & Setiawati, 2017) who analyzed the levels of vitamin C in fresh pineapple and canned pineapple, it was found that the levels of vitamin C in canned pineapple were lower than fresh pineapple. This is because vitamin C has water-soluble properties and is easily oxidized by air, in addition to that due to heating during the processing process and depending on the storage time of the canned pineapple. In addition, based on research conducted by (Nasution, A. Y., Pratiwi, D., Frimananda, Y., & Ardiansyah, 2021) who analyzed the levels of vitamin C in samples of fresh pineapple and pineapple chips, the results showed that the average level of vitamin C in fresh pineapple samples was 10.8393 ppm (0.4331%) and the average level of vitamin C in pineapple chips samples was 7.0692 ppm (0.2827%). This decrease in levels can be caused by the effect of temperature when frying the chips and the length of time the chips are stored because vitamin C is very susceptible to both of these factors.

Differences in vitamin C levels in fresh pineapple, pineapple syrup and candied pineapple can be seen from the results of statistical tests. Based on the normality test with Shapiro-Wilk, it shows a sign value > 0.05, which means that the data is normally distributed. Then a paired t-test was performed and a sign value <0.05 was obtained, which meant that there were differences in vitamin C levels in fresh pineapple, pineapple syrup and candied pineapple.

4. Conclusions and Suggestions

Based on the research that has been done, it can be seen that the levels of vitamin C in fresh pineapple, pineapple syrup and candied pineapple are (95.75 ; 49.09 ; 44.09) mg/100g

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respectively. Statistical test results showed that there were differences in levels of vitamin C in fresh and processed pineapple.
It is hoped that in future research, antioxidant activity can be carried out in other variations of processed fruit.

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