

The Analysis of Vitamin C in Peeled and Unpeeled Malang Apples Using Iodimetric Titration Method

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ABSTRACT. Based on data The National Social Economic Survey, the average consumption of apples in the Indonesian population had an increase of 0.10% a year. Malang Apples contain of Vitamin C which is useful in the formation of intracellular collagen. Lack of vitamin C can cause cancer. This research aims to determine the levels of vitamin C using Iodimetri and Qualitative Test. In the organoleptic test of shape, color, and diameter of the sample showed the apples are round, reddish-green color, with a diameter of 7 cm and included in the grade A. The results of the qualitative test in peeled and unpeeled Malang apples was that had positive for vitamin C with a brick-red color change after the addition of benedict solvents and \pm 2 minutes heating. In peeled and unpeeled Malang apples obtained concentration levels of vitamin C for 6 days, that was 20.54 mg/100g and 27.88 mg/100g.

Keywords: Vitamin C, Peeled, Malang Apples, Iodimetric Titration Method.

1. INTRODUCTION

One of the fruits that contain vitamin C is apples. Apples are one of the most consumed fruits in Indonesian society. Based on data from the National Socio-Economic Survey (SUSENAS), the average apple consumption per capita by Indonesians reaches 0.10 kg every year. It has increased by an average of 0.10% each year from 1987 to 1996. In Indonesia, Malang city is a cultivation place which is famous for the highest production of apples. (Batu and Poncokusumo). Apples are a superior crop of the Malang region. Various superior varieties of Malang apples, namely Rome Beauty, Manalagi, and Anna, have their own characteristics and uniqueness. According to the three superior varieties, Rome Beauty and Manalagi apples are the most in-demand and are sold in supermarkets. However, the popularity of these apples was shifted along with the number of imported apples that have entered Indonesia, such as Fuji, Washington, and Golden Delicious. Better taste and larger size make local apples unable to compete in the market [1].

According to Susanto and Setyohadi (2011), Vitamin C in apples is influenced by storage conditions, growth, and how the apples are processed. The vitamin C content of Rome Beauty apples was higher, namely 7.04 mg / 100 ml compared to the Anna variety (5.28 mg / 100ml) and Manalagi variety (6.60 mg / 100 ml). Soelarso (1996) and Ashust (1995) in Estiasih and Khurniyati (2015), also stated that the vitamin C content (mg / 100 g) of Rome beauty apples was higher than Manalagi and Anna

varieties. People generally consume apples in various ways, some people choose to eat apples without skin or in processed products and some people prefer apples with fresh skin or fruit. In people who choose to eat apples without skin, it may be commonplace because of the chewy taste that some people don't like. Basically, apple peel waste can not only be used as animal feed and plant fertilization, but apple skin waste can also be used as a natural antioxidant that is needed by the body, especially in the skin to fight free radicals from outside [2].

Vitamin C or ascorbic acid is a very important nutrient for humans and certain other animal species. Ascorbic or ascorbic acid can naturally be produced in the body when one of the two is introduced into cells because they can form interactions according to body pH. Vitamin C is a cofactor that is involved in eight enzymatic reactions, including some collagen synthesis reactions which when dysfunctional cause severe scurvy symptoms. Besides, ascorbic acid is also widely used as a food additive to prevent oxidation [3].

There are several methods developed to determine vitamin C levels, one of which is the Iodimetric titration method. Iodimetric titration is the most widely used method, because this method is quite cheap, simple, and does not require sophisticated laboratory equipment. Iodimetric titration uses iodine which is used as a titrant which oxidizes vitamin C and uses starch as an indicator. The direct iodometric titration method refers to titration with a standard iodine solution [4].

Based on the description above, the researchers indicates that the different way of consuming apples causes the body not optimal to accept the antioxidant content of vitamin C in apples. So, the researchers are interested in examining the levels of vitamin C in Malang apples using quantitative tests.

2. LITERATURE REVIEW

The role of vitamin C is in the formation of intracellular collagen. Collagen is a protein compound that is widely found in cartilage, inner skin of bones, dentin, and endothelium vascular. Ascorbic acid plays an important role in the hydroxylation of two amino acids proline and lysine to become hydroxy proline and hydroxyline. Both of these compounds have important collagen components which are useful for the wound healing process and the body's resistance to infection and stress[4].

The sources of vitamin C mostly come from vegetables and fruits, especially fresh fruit, therefore vitamin C is often called Fresh Food Vitamins. Fruits that are high in vitamin C are oranges, pineapples, guavas, bananas, apples, pears, and peaches. Vegetables that contain vitamin C are spinach, chilies, broccoli, and cabbage even after cooking [4].

3. THE MODEL

3.1 Materials and equipments

The research instruments are the tools used for the manufacture of apple filtrate including filter paper, knife, blender, beaker glass, measuring flask, and funnel. The tools used for analysis include burette stand, mortar and pestle, measuring flask, beaker glass, funnel, dropper pipette, volume pipette, measuring cup, scale, spirit, tripod, evaporating cup, stirring rod, erlenmayer, test tube, a 200 ml chocolate bottle, and a 60 ml chocolate bottle. The materials used were Malang apples purchased at supermarkets around Pamulang city and some water. While the materials used for the analysis were Malang apples, Iodine (I₂), starch (amylum tapioca), potassium iodide (KI), sodium thiosulfate, sodium dichromate, Hydrochloric Acid (HCl) P, Benedict's solution, and Aquadest

3.2 Organoleptic Test

The organoleptic test was an Apple observations based on shape, color, grade, and diameter.

3.3 Qualitative Test

The qualitative test was a testing of 2 ml of apple filtrate with benedict solution and heating at 40 ° C for 2 minutes.

3.4 Quantitative Test

The procedure for Unpeeled Apple Samples:

First, wash apples to be free from dirt.

- Cut the fruit into small pieces.
- Then, mash with the addition of a little water.
- Then, weigh 20g input in a volumetric flask.
- Dilute with 100 ml of Aquadest.
- Filter the sample with filter paper.
- Then, put the sample as much as 25 ml using pipette into a 250 ml erlenmayer.
- Add 2 ml of amylum 1%,.
- Finally, titrate with 0.1 N Iodine until the blue color changes [5].

The procedure for Peeled Apple Samples:

- First, wash apples to be free from dirt,
- Then, cut the fruit into small pieces and peel the skin of the fruit,
- Mash with a little water,
- Next, weigh as much as 20g,
- Put in a volumetric flask,
- Dilute with 100 ml of Aquadest,
- Filter the sample with filter paper,
- Finally, take the sample as much as 25 ml using pipette and pour into a 250 ml erlenmayer,
- Add 2 ml of amylum 1%,
- Finally, titrate with 0.1 N Iodine until the blue color changes [6].

Formula : Association of Official Analytical Chemists International Official Methods of Analysis (AOAC, 1995) [7]

$$\text{Vitamin C} = \frac{VI_2 \times \frac{V_t}{V_f} \times A}{W_s} \times 100$$

Information :

VI₂ = Iodine volume (mL)

V_t = Total volume of filtrate (mL)

V_f = The volume of the filtrate used

A = Equivalence I₂ 0.1 N with pure Vitamin C (8,806 mg)

W_s = Sample Weight (gram)

4. NUMERICAL EXPERIMENTS

4.1 Organoleptic Test

The observation results showed that the apple fruit was round, reddish green colorured, and was grade A with a diameter of 7cm

TABLE 1. Qualitative Test

Sample Code	Repetition	Benedict's Solution
A1	1	+
	2	+
	3	+
A2	1	+
	2	+
	3	+

Information:
A1 (Unpeeled Malang Apple)
A2 (Peeled Malang Apple)

Based on Table 1, samples A1 and A2 were found to be positive for vitamin C after being added with

benedict's solution and heated in 40°C temperature for 2 minutes

4.2 Quantitative Test

TABLE 2. Quantitative Test of Unpeeled Apples' Sample (A1)

Day	Trial	Weight of Sample (g)	Volume I ₂ 0.1 N (ml)	Levels of Vitamin C content (mg/100g)	Percentage Levels (% b/b)
0	1st	20,00 g	0,3 ml	52,836 mg/100 g	0,052 % b/b
	2nd	20,00 g	0,3 ml		
2nd	1st	20,00 g	0,4 ml	52,836 mg/100 g	0,052 % b/b
	2nd	20,00 g	0,2 ml		
4th	1st	20,00 g	0,2 ml	44,03 mg/100 g	0,044 % b/b
	2nd	20,00 g	0,3 ml		
6th	1st	20,00 g	0,1 ml	17,612 mg/100 g	0,017 % b/b
	2nd	20,00 g	0,1 ml		

TABLE 2. Quantitative Test of Peeled Apples' Sample (A2)

Day	Trial	Weight of Sample (g)	Volume I ₂ 0.1 N (ml)	Levels of Vitamin C content (mg/100g)	Percentage Levels (% b/b)
0	1st	20,00 g	0,3 ml	44,03 mg/100 g	0,044 % b/b
	2nd	20,00 g	0,2 ml		
2nd	1st	20,00 g	0,1 ml	35,224 mg/100g	0,035 % b/b
	2nd	20,00 g	0,3 ml		
4th	1st	20,00 g	0,1 ml	26,418 mg/100g	0,026 % b/b
	2nd	20,00 g	0,2 ml		
6th	1st	20,00 g	0,1 ml	17,612 mg/100 g	0,017 % b/b
	2nd	20,00 g	0,1 ml		

Based on Table 2, there was a decrease in vitamin C levels every day. The six-day average vitamin C level was 27.88 mg / 100g. Based on Table 3, there was a decrease in vitamin levels every day with a result of a six-day average vitamin C level was 20.54 mg / 100g.

4.3 Qualitative Test

The purpose of conducting a qualitative test was to determine changes in color, shape, and smell

during storage. Based on the data in the qualitative test of Malang apple juice with skin and without skin, there was vitamin C with a brick red color change with the addition of benedict solution and heating for 2 minutes. Benedict's solution was used as a color reagent in the sample. This was following previous research according to Wahyuni (2016), if vitamin C was added with Benedict's reagent, and then heated, it would inhibit oxidation so that it could maintain the state of a substance and if the results were yellowish-

green, red until there was a brick red deposit, this indicated a positive sample of vitamin C. This was also the same, according to Winarno (2007), vitamin C had the properties of reducing oxygen, nitrate, cytochrome A, cytochrome C, crotonyl-CoA and mer-Hb so that when vitamin C reduced oxygen contained in benedict's reagent, a positive result was formed [4,5].

4.4 Quantitative Test

The quantitative test aimed to analyze vitamin C levels in Malang apples using the iodometric method. Based on table 2, the unpeeled sample of Malang apples was made with a sample weight of 20 grams. It was used to analyze the levels of vitamin C. The concentration of vitamin C on day 0 was 52.83 mg / 100g, day 2 was 52, 83 mg / 100g, day 4 was as much as 44.03 mg / 100g, and day 6 was as much as 17.612 mg / 100g. Based on table 3, the weight of the sample of peeled Malang apples was 20 grams. The researchers used it to analyze the levels of vitamin C. The concentration of vitamin C on day 0 was 44.03 mg / 100g, day 2 was 35.224 mg / 100g, day 4 was as much as 26,418 mg / 100g, and day 6 was as much as 17,612 mg / 100g. The level of vitamin C in peeled and unpeeled apples decreases every day because vitamin C is oxidized during storage, growth, and how the apples are processed (Susanto and Setyohadi, 2011). The level of vitamin C in six-day unpeeled Malang apples was 27.88 mg / 100g or 0.0275% w / w, and in six-day peeled Malang apples were 20.54 mg / 100g or 0, 0203% w / w. In both results, it could be seen that the peeled and unpeeled Malang apples have a reduction of 7.34 mg / 100g. This result is far from the statement of the United States Department of Agriculture (2017), which states that peeled apples will produce vitamin C ≤ 2 mg / 100g from unpeeled apples [8].

5. CONCLUSION

From this research, the result shows that unpeeled Malang apples had a higher vitamin C content than

the vitamin C content in peeled Malang apples. Further direction of this research includes organoleptical test for Vitamin C in Malang's Apple in mice to measure the effectivity of vitamin C in Malang,s Apple.

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