

TEST VITAMIN C LEVELS IN RED PEPPERS (*Capsicum annuum L.*) USE THE IODIMETRIC TITRATION METHOD

Dwi Novianti Darso^{1*}, Yuyun Wirasmita^{2*}, Sitti Alfyanita Ilham^{3*}

¹ Baubau Polytechnic, Baubau, Indonesia

² Baubau Polytechnic, Baubau, Indonesia

³ Baubau Polytechnic, Baubau, Indonesia

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CORRESPONDING AUTHOR

Name : Yuyun Wirasmita

Address: Baubau Polytechnic, Jln. Lakarambau, Lipu,
Betoambari District, Baubau City, Southeast
Sulawesi, Indonesia.

Email : wirasmita.y@gmail.com

A B S T R A C T

Background Red pepper (*Capsicum annuum L.*) is a fruit with very abundant vitamin C levels and contributes greatly to increasing immunity as well as a natural antioxidant. **The purpose of** the research is to determine the amount of ascorbic acid in **red peppers** (*Capsicum annuum L.*) which is sold in one of the stores in Baubau City with the iodimetry titration method. The method was chosen because of its practicality, simplicity, and does not require complex tools. **The results** of the study showed that red pepper (*Capsicum annuum L.*) there is vitamin C of 1012.18 mg per 100 grams. **Conclusion** that red bell pepper (*Capsicum annuum L.*) having vitamin C of 1012.18 mg per 100 grams far exceeds the recommended daily nutritional allowance (AKG), namely men need 90 mg, while women 75 mg.

INTRODUCTION

As part of nutrients, vitamins have an essential function in the body because they participate in various metabolic reactions and health maintenance. In various types of vitamins, vitamin C is known to have a wide range of functions, ranging from strengthening the immune system, helping the formation of collagen, to having antioxidant activity that protects cells against the detrimental effects of free radicals. Physiologically, humans depend on external sources to obtain vitamins, the fulfillment of their daily consumption is fulfilled through the consumption of vegetables, fruits or supplements (Satyanarayana & Chakrapani, 2013). Deficiency of this vitamin can cause symptoms such as bleeding gums, canker sores, and in an advanced degree cause scurvy (Sembiring & Siregar, 2019).

Vitamin C is known to function in caring for cartilage, bones and teeth, as well as maintaining a healthy cardiovascular system. With these benefits, vitamin C is considered to help prevent heart attacks and strokes. In addition, adequate consumption of vitamin C is also believed to be able to reduce the possibility of cataracts and bile diseases (Ilham *et al.*, 2025).

Red pepper (*Capsicum annuum L.*) including one of the foods with relatively abundant levels of vitamin C. Vitamin C content of red pepper (*Capsicum annuum L.*) sample even higher than other fruits that have sources of vitamin C that are widely known to the public, such as oranges and papaya (Herawati, 2012; Sanuddin *et al.*, 2021). Unfortunately, in some areas, including Baubau City, the consumption of red peppers (*Capsicum annuum L.*) still relatively low in the community. The causative factor is not only related to taste, but also due to limited access and lack of information about its nutritional content. This condition is an important reason to study the vitamin C content in red peppers marketed in the region.

Determination of vitamin C levels can be done by various analysis techniques. Some commonly used methods include UV-Vis spectrophotometry, acid-base titration and iodimetric titration. Of these methods, iodimetry titration is often chosen because it is simpler, the cost of analysis is low, and the results obtained are quite accurate; This method works based on the redox reaction between iodine as an oxidizer and vitamin C as a reducer, so it is very suitable for analyzing the vitamin C content in daily food (Rahmawati & Hana, 2016; Asmal *et al.*, 2023).

Several previous studies have applied iodimetric titration in vitamin C tests on food. Testing the ascorbic acid level in citrus fruits has yielded a result of 51.88 mg/100 g, with the conclusion that the iodimetry method is able to provide accurate data with a simple procedure and low cost. Meanwhile, a study was conducted on tomatoes with a vitamin C level of 25.4 mg/100 g, and compared the iodimetry method with other methods. The results showed that although the value of the level varied, the iodimetry method remained relevant and reliable for routine analysis. This difference in results shows that the content of vitamin C is greatly influenced by the type of sample and environmental conditions, so it is important to conduct further research on red peppers marketed in Baubau City. Rahmawati & Hana (2016): Asmal *et al.*, (2023).

The purpose of this study was to analyze the vitamin C content of red pepper (*Capsicum annuum L.*) samples which is sold in Baubau City using the iodimetric titration method. The results of the study showed that red pepper (*Capsicum annuum L.*) have very abundant levels of vitamin C, which is 1012.18 mg/100 g, which far exceeds the daily Nutritional Adequacy Rate (CRA) for both men and women. The novelty of this study is to focus on the analysis of red peppers from the local market with a simple method that is applicable. The purpose of this study is to present scientific data on the vitamin C content of red pepper (*Capsicum annuum L.*) So that it can be the basis for increasing its use as a source of natural nutrition in people's diets.

METHODOLOGY

Data Type

This study was conducted in the form of a laboratory test with an experimental design, using iodimetry titration as an analysis method to determine how much vitamin C is contained in a sample of red pepper (*Capsicum annuum L.*).

Time and Place

The implementation took place at the Pharmacy Laboratory of the Baubau Polytechnic on May 31, 2025.

Tools and Materials

The tools used are burettes, measuring gourds, spray bottles, stirring rods, blenders, glass funnels, erlenmeyer, whatman paper, chemical cups, horn spoons, drip pipettes, digital balances, staves and clamps, watch glasses, measuring cups. Meanwhile, the ingredients consist of amylum, aquadest, sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$), iodine (I_2) 0.1 N, potassium iodide (KI) and red pepper (*Capsicum annuum L.*) (Jumi *et al.*, 2023).

Working Procedure

Sample Processing

The peppers that have been separated from the seeds are washed until they are free of dirt, Next, the pepper sample is cut into small pieces and then weighed with a weight of 100 grams. After that, the sample is mashed using a blender until it is in the form of juice/slurry. From the results of the slurry, 10 grams of samples were taken and then placed in a 100 mL beaker container. After the aqueduct is added, the solution is filtered using a filter cloth to separate the pulp with the filtrate. The collected filtrate is then put into a 100 mL measuring flask and diluted with aqueducts until it reaches the limit mark. This filtrate solution is then used as a test sample (Rahman *et al.*, 2015).

Qualitative Tests

This test is carried out to ensure the presence of vitamin C. A total of 5 grams of homogenized slurry with 100 mL, 1 mL sample is pipetted and poured into a test tube. After being dripped with iodine 0.1 N, there is a reaction of changing the color from light brown to clear indicating the presence of vitamin C which acts as an antioxidant (Nisa *et al.*, 2020).

Quantitative Test

Amylum Indicator 1%

1 g of amylum is mixed with 100 mL of boiled aquadest, then heated until completely dissolved. (Rahman *et al.*, 2015)

Raw Solution Iodine 0.1 N

1.27 mL of liquid iodine was mixed with 2.3 grams of KI then dissolved in a 100 mL aquadest. (Cresna *et al.*, 2014).

Standard Solution $\text{Na}_2\text{S}_2\text{O}_3$ 0.1 N

Weighing $\text{Na}_2\text{S}_2\text{O}_3$ 6.5 grams, then dissolved with 250 mL of aquadest in a beaker.

Standardization of I₂ Solution With Na₂S₂O₃ Standard Solution

Measured 25 mL of iodine raw and poured into 100 mL of erlenmeyer, a 1% amylum indicator was inserted and titrated using a solution of sodium thiosulfate (Na₂S₂O₃) of 0.1 N until the blue color disappeared. This process is repeated three times (triplo)

Determination of Vitamin C Levels

10 mL of red pepper filtrate was poured into 100 mL of erlenmeyer with 20 mL of aquadest as well as 2 mL of amylum indicator. The sample was then titrated using the standard I₂ 0.01 N until it changed to a stable dark blue color. The test was carried out 5 times (Cresna *et al.*, 2014).

Data Analysis

The data obtained is in the form of the volume of titran used, then the vitamin C level is calculated with the formula:

$$\text{Vitamin C level (mg/100gram)} = \frac{(V_{I_2} \times 0,88 \times Fp) \times 100}{W_s \text{ (gr)}}$$

Ket:

V I₂ = Volume of iodine (mL)

0.88 = 0.88 ascorbic acid

W_s = Sample weight

Fp = Dilution factor

The calculation of vitamin C levels was carried out five times, then the average value was calculated. The results obtained were compared with the Nutritional Adequacy Figures of vitamin C according to the Indonesian Minister of Health Regulation No. 28 of 2019, namely 90 mg per day for men and 75 mg per day for women.

RESULTS & DISCUSSION

The study was carried out with the aim of identifying how much vitamin C is contained in red pepper samples (*Capsicum annum L.*) which is sold in one of the stores in Baubau City using the iodimetric titration method. The analysis was carried out through two stages, namely a qualitative test to confirm the presence of vitamin C, and a quantitative test to calculate its level. The following table presents the results of the qualitative test:

Table 1. Qualitative Test Results of Red Pepper (*Capsicum annum L.*)

Sample	Sample Color	Reagents	Sample color+iodine	Result Observation	Ket
Red Pepper	Orange	Light brown iodine	Light Brown	Iodine color (light brown becomes colorless/clear)	+

Source: Primary Data (2025)

Ket: (+) positive contains vitamin C

The results of the qualitative test showed that the sample of red pepper (*Capsicum annum L.*) which was initially orange in color, after the addition of a light brown iodine solution, changed to clear. This change indicates the presence of a compound that is able to reduce iodine, namely vitamin C. Thus, the qualitative test gave positive results on the presence of vitamin C in the sample.

Before being used as a titrant, iodine solutions need to be standardized to determine their actual concentration. For iodine standardization data, it is presented as follows:

Table 2. Iodine Standardization Results (I₂)

Volume Na ₂ S ₂ O ₃ (mL)					
Volume I ₂ (mL)	I	II	III	Average	Normality I ₂ (N)
25	10,50	10,50	10,54	10,513	0,0420

Source: Primary Data (2025)

At the stage of standardization of iodine solution, the average volume of sodium thiosulfate used reached 10.513 mL with an iodine concentration of 0.0420 N. This standardization process is important so that quantitative titration can be carried out with controlled titrant concentrations and the results of the calculation of vitamin C levels become valid.

Furthermore, in determining vitamin C levels, it was measured using iodimetry titration, a filtrate sample of 10 mL. The titration process uses 0.1 N iodine with an amylum indicator of 1%. The

endpoint is reached when the solution shows a stable dark blue color. This procedure was repeated to obtain more valid and uniform results, the experiment was carried out five times. The results obtained are shown in the following Table:

Table 3. Results of Iodimetric Titration of Red Bell Pepper (*Capsicum annuum L.*) (100 grams sample)

Replication	Volume I ₂ (mL)	Vitamin C Level (mg/100 gr)
1	11.53	1014,64
2	11.53	1014,64
3	11.50	1012,00
4	11.46	1008,48
5	11.49	1011,12
Average	-	1012,18

Source: Primary Data (2025)

As a result of the determination of the level with five repetitions, the volume of iodine used ranged from 11.46 mL to 11.53 mL. The calculation results showed vitamin C levels of 1008.48 mg/100 g to 1014.64 mg/100 g, with an average of 1012.18 mg/100 g. Although the analyzed sample was only 10 grams, the results of the calculation were converted into units per 100 grams. This conversion aims to adjust to the standard format of nutrition reporting and facilitate comparison with literature data and Nutritional Adequacy Figures (AKG) which are generally expressed per 100 grams. Thus, the vitamin C levels obtained from 10 grams of samples were extrapolated to the content in 100 grams of samples.

The ascorbic acid levels obtained were then compared to the value of the daily Nutritional Adequacy Rate according to the Indonesian Ministry of Health, which is 90 mg per day for men and 75 mg per day for women. The level of fulfillment of daily needs from the consumption of 100 grams of red peppers (*Capsicum annuum L.*) can be seen in the following table.

Table 4. Vitamin C Levels in 100 gr Red Bell Pepper (*Capsicum annuum L.*) and AKG Percentage

Red Bell Pepper (<i>Capsicum annuum L.</i>)	Vitamin C Levels (mg)	% Male AKG (90 mg)	% Female AKG (75 mg)
100 grams	1012,18	1124,64%	1349,57%

Source: Primary Data (2025)

The vitamin C content in the sample had an average of 1012.18 mg per 100 grams, indicating that the consumption of 100 grams of red pepper (*Capsicum annuum L.*) is able to meet more than 1000% of daily vitamin C needs. When compared to the Nutritional Adequacy Rate from the Ministry of Health of the Republic of Indonesia, this figure is equivalent to around 1124.64% of men's daily needs and 1349.57% of women's daily needs. This indicates that red peppers can be a natural source of vitamin C with very high potency.

This study proves that the vitamin C content in red peppers (*Capsicum annuum L.*) in very large amounts, which is about 1012.18 mg per 100 grams. This fruit has more vitamin C content than other fruits which are a source of vitamin C widely known in the community. For example, kiwi is reported to Mulyani (2018) have a content of 353 mg/100 g, while red guava is reported to Padang & Maliku (2017) have a content of only about 42.9 mg/100 g. Fresh ripe papaya contains 97.21 mg/100 g (Fadel *et al.*, 2021), red dragon fruit 12.65 mg/100 g (Aryani & Mu'awanah, 2019) and fresh pineapple 3.43 mg/100 g (Salwa *et al.*, 2023). Meanwhile, sweet oranges are reported to Ariani & Muhsin (2023) contain only 31.65 mg/100 g and limes are around 90 mg/100 g. The difference in numbers shows that red peppers are a natural source of vitamin C with very high levels and have great potential to support the fulfillment of daily nutritional needs.

The iodimetry method applied in this study proved to be simple but capable of providing effective results. The consistency of the titration value at five repetitions indicates a good level of precision. In addition, this titration technique does not require expensive instruments so it can be widely used, both for learning and research purposes. Therefore, this method is worthy of being recommended as a routine analysis technique in determining vitamin C levels in various fruit and vegetable foods.

CONCLUSION

Based on the results of a study on the identification of vitamin C content in red peppers (*Capsicum annuum L.*) Using iodimetric titration, it was found that red peppers sold at one of the stores in Baubau City got very high levels of vitamin C, which was 1012.18 mg per 100 grams of samples. These results illustrate that red peppers are rich in vitamin C and can meet or exceed even the recommended daily needs. The limitations in this study are mainly found at the time of titration which is highly dependent on the observation of indicator color changes so that it can cause subjectivity. In addition, the easily oxidized nature of vitamin C is also an obstacle because the preparation and titration process must be done quickly so that the results remain accurate.

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