

DETERMINATION OF VITAMIN C LEVELS IN PURPLE MIANA LEAVES (*Coleus scutellarioides* (L.) Benth) IN THE LIABUKU AREA USING THE IODIMETRIC METHOD

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A B S T R A C T

Background: Purple miana leaves (*Coleus scutellarioides* (L.) Benth) are traditional medicinal plants that have long been used by the community because they have various benefits, one of which is as a source of natural antioxidants. This plant contains various bioactive compounds, such as flavonoids and tannins that function as antioxidants. Antioxidants themselves are compounds that can delay or prevent the oxidation process by free radicals that have the potential to inhibit body cells and trigger various diseases. **Objectives:** The study aims to identify the vitamin C levels of purple miana leaves cultivated in the Liabuku region. **Method:** The determination of vitamin C levels was implemented using an iodimetric titration design. The form of the study used was a laboratory experiment. Miana leaf samples were processed into filtrate, then qualitative and quantitative tests were carried out. To ensure the presence of vitamin C, the sample was first tested qualitatively, which was indicated by the disappearance of the iodine color to clear. While the quantitative test was carried out using the iodimetric titration method using 0.01 N iodine solution as a titrant and starch as a benchmark that determines the end point of the titration when the solution turns blue. **Results:** The analysis showed that the purple miana leaf sample contained 730.4 mg of vitamin C per 10 grams of sample. **Conclusion:** The study shows that purple miana leaves have great potential as a natural source of vitamin C that is beneficial for the health of the wider community.

INTRODUCTION

Biodiversity offers numerous benefits to society, particularly in the health sector. Therefore, public understanding of proper management methods is essential to maximize these benefits without causing environmental damage (Herdaningsih & Kartikasari, 2022) Indonesia boasts a vast territory and abundant and diverse flora, where various types of plants thrive. This plant diversity has been proven to have numerous benefits, including as medicinal ingredients. Various types of plants have been shown to have various medicinal properties, according to research. In Indonesia, the term TOGA (Family Medicinal Plants) is commonly used, and these plants are generally cultivated or grow naturally around homes.(Ubaedilah & Supriyatna, 2023) The use of traditional medicine is quite common in treating a variety of ailments. Because they are based on natural ingredients, traditional medicinal plants generally have relatively mild side effects, and in some cases, even no side effects at all, compared to chemical-based medications. This is one factor that makes people more inclined to use traditional medicine (Kumontoy & Mulianti, 2023).

Miana leaves have been used for generations by people, especially in West Java, as a traditional medicine to treat various ailments such as muscle pain, postpartum pain, stomach aches, coughs, and skin problems. Furthermore, these leaves are also used as a traditional remedy for animal bites, bronchitis, asthma, and digestive disorders. Meanwhile, in the Philippines, miana leaves are widely known as a herbal remedy for dengue fever, malaria, and hemorrhoids, and have significant potential as an antioxidant and anti-tuberculosis agent (Natasya *et al.*, 2023) Miana leaves are a plant widely used in Indonesia. They have long been used in traditional medicine to help relieve various health conditions such as coughs, asthma, hepatitis, flu, and fever (Akbar *et al.*, 2023). In addition, miana leaves also have various other benefits, such as acting as a poison neutralizer, antiseptic to inhibit the growth of microorganisms, accelerate the maturation of boils, overcome worm infections (vermicide), treat

hemorrhoids, regulate menstruation (emenagogue), help break down blood clots, overcome digestive disorders (dyspepsia), and play a role in treating pneumonia, insect bites and venomous snake stings (Wattiheluw *et al.*, 2022).

This plant contains various active chemical substances that function as medicine. Today, more and more people are choosing natural ingredients to maintain their health and reduce their dependence on synthetic chemicals. One plant with potential health benefits is the miana leaf. This leaf contains flavonoids that act as antibacterials, as well as tannins that are known to inhibit bacterial growth (Anita *et al.*, 2019). Not only that, the extract also contains saponins which function as antimicrobial agents, alkaloids which provide pharmacological activity, and anthocyanins which act as natural antioxidants (Salimi, 2021).

According to (Podungge *et al.*, 2017), reported that flavonoids in miana leaves play an important role as antioxidants. This antioxidant activity was tested using the DPPH method, showing a result of 98.53 mg AEAC/g. Furthermore, according to (Khotimah *et al.*, 2018) Miana plants are a source of natural antioxidants that effectively ward off free radicals. This finding is supported by the results of miana leaf extraction using a maceration method with 96% ethanol, which showed the presence of flavonoids, steroids, tannins, saponins, and anthocyanins. Although various studies have revealed the antioxidant potential of miana leaves, studies on the vitamin C content of this plant are still very limited. Research on this matter is important because vitamin C is known as an antioxidant that can boost the immune system and prevent cell damage from oxidation (Mustiqawati *et al.*, 2021) In this study, purple miana leaf samples were obtained from plants grown by the researchers themselves on private land in the Liabuku area. The plant seeds were obtained from Rongi Village, then planted and cared for until harvest to ensure good sample quality before analysis.

Based on explanation in the background, the researcher conducted a study entitled "Determination of Vitamin C Levels in Purple Miana Leaves in the Liabuku Area Using the Iodimetry Method".

METHODOLOGY

The research used was a Laboratory experiment with the aim of measuring the vitamin C content in purple miana leaves using an iodimetric titration design. This activity was actualized from April to May 2025 at the Baubau Polytechnic Pharmacy Laboratory. The population in this study was all purple miana leaves found in the Liabuku area. While the sample was 100 grams of fresh purple miana leaves taken. All equipment ranging from blenders, stirrers to burettes and glass funnels, Erlenmeyer flasks and filter paper, measuring cylinders and beakers, measuring cylinders and pipettes, analytical scales, funnel spoons, and stands with clamps were used in this study. Purple miana leaves, distilled water, starch indicators, 0.1 N iodine solution, potassium iodide (KI), 0.1 N sodium thiosulfate (Na₂S₂O₃), and other elements were used.

Next, the samples were analyzed qualitatively to identify the presence of vitamin C by changing the color to clear, and quantitatively using the iodimetric titration method to determine the vitamin C levels.

Research Procedures

Sample Processing

Purple miana leaves were thoroughly washed under running water, then weighed 100 grams and blended until they formed a slurry or juice. From this, 10 grams of the slurry was taken and placed in a 100 mL beaker. Afterward, distilled water was added and filtered to obtain the filtrate. The filtrate was transferred to a 100 mL volumetric flask and topped up with distilled water to the mark. This filtrate was used as the study sample (Karmila & Nuryanti, 2021).

Qualitative Test

Clean, dry test tubes were prepared and labeled for each sample. A total of 5 grams of sample was taken and placed in a 100 mL volumetric flask using distilled water. From this solution, 1 mL was transferred to the prepared test tube. A 0.1 N iodine solution was slowly added until the color changed, indicating the presence of vitamin C (Nisa *et al.*, 2020).

Determination of Sample Content

Making 1% Starch Indicator

Weigh a total of 1 gram of starch and dissolve it in 100 mL of hot water in a beaker. Heat the solution until it becomes clear, and the resulting solution is used as an indicator (Karmila & Nuryanti, 2021).

Preparation of 0.1 N iodine standard solution

Take 1.27 grams of iodine and 2.3 grams of potassium iodide (KI) and weigh them, then dissolve them gradually using distilled water until completely dissolved. This solution is then transferred to a 100 mL volumetric flask and then make up to the mark with distilled water (Karmila & Nuryanti, 2021).

Preparation of 0.1 N Na₂S₂O₃ standard solution

Take 6.5 grams of sodium thiosulfate (Na₂S₂O₃) and weigh it, then put it in a beaker and dissolve it using 250 mL of distilled water (Asmal, 2018).

Standardization of I₂ Solution with Na₂S₂O₃ Standard Solution

The burette was filled with a 0.1 N sodium thiosulfate (Na₂S₂O₃) solution that had undergone a standardization process. Next, 25 mL of iodine solution was pipetted into a 250 mL Erlenmeyer flask, followed by 2 drops of 1% starch solution as an indicator. The titration was actualized with Na₂S₂O₃ until the blue color of the solution disappeared exactly. This standardization process was repeated three times (triplicate) (Asmal, 2018).

Determination of Vitamin C Levels Using the Iodimetric Method

Take 10 mL of purple miana leaf filtrate and place it in a 250 mL Erlenmeyer flask. Next, add 2 mL of 1% starch solution and 20 mL of distilled water. Titration is carried out with 0.01 N iodine solution until the color changes to dark blue (Karmila & Nuryanti, 2021).

Vitamin C Content Formula

Can be measured using a formula (Ngginak et al., 2019):

$$\text{Vitamin C content mg/gram} = \frac{(\text{Vol I}_2 \times 0,88 \times \text{Fp}) \times 100}{\text{W Sampel (g)}}$$

Information : Vl_2 = Iodine volume (mL)
 0.88 = 0.88 mg Vitamin C equivalent to 1 mL of solution I₂0.01 N
 Fp = Dilution factor
 Ws = Sample weight (g)

RESULTS AND DISCUSSION

Determination of vitamin C levels in purple miana leaves utilized an iodimetric titration model. Iodimetric titration is a method that uses an iodine solution as a standard solution under slightly acidic or neutral conditions. The sample analyzed was 100 grams of purple miana leaves before being ground. Then, 10 mL of the ground sample was taken into a 100 mL Erlenmeyer flask, added 2 mL of 1% starch and 20 mL of distilled water, and titrated using a 0.01 N iodine solution until the solution turned dark blue.

Before testing the vitamin C levels in purple miana leaves (*Coleus scutellaroides* (L.) Benth), the samples were first subjected to a qualitative test to confirm the presence of vitamin C. The qualitative test was conducted by reacting the purple miana leaf samples with iodine (I₂). The results of the qualitative test are shown in Table 4.1.

Table 4.1 Qualitative test findings on purple miana leaves (*Coleus scutellaroides* (L.) Benth.)

Sample	Sample color	Reagent	Sample color + Iodine	Observation result	Not e
Purple Miana Leaves	Purple	Iodine	Dark brown iodine color	Iodine color (dark brown fades to clear)	+

Note: (+) positive for containing vitamin C

The next step is standardizing the concentration of the iodine solution (I₂) using sodium thiosulfate, which is carried out three times (triplicate). This process aims to determine the concentration of the iodine solution as a secondary solution, which must first go through a concentration determination process. The results of the standardization of the iodine concentration (I₂) are shown in Table 4.2.

Table 4.2 Standardization of I₂ concentration

Volume I ₂ (mL)	Volume of Na ₂ S ₂ O ₃				I ₂ (N) level
	I	II	III	Average	

25	0.5	0.8	1.2	0.8333	0.0032
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The titration process was then carried out three times (triplicate) to measure the vitamin C levels in purple miana leaf samples (*Coelus scutellaroides* (L.) Benth) using an iodimetric titration design. The data findings for determining vitamin C levels can be displayed in Table 4.3.

Table 4.3 Findings of determining vitamin C levels in purple miana leaves.

Sample		Volume I ₂ (mL)				Sample weight (g)	Vitamin C content (mg/10 g)
		I	II	III	Average		
Purple Miana Leaves		11.3	7.3	6.3	8.3	10 g	730.4

This study used the iodimetry method as an analytical technique to measure the vitamin C content of purple miana leaves. This titration is a type of redox titration using a standard solution (I₂) in neutral and slightly acidic conditions.

The sample used for the vitamin C test was purple miana leaves (*Coleus scutellarioides* (L.) Benth.). The vitamin C test consisted of two stages: qualitative and quantitative. The qualitative test aimed to confirm the presence of vitamin C in the sample, while the quantitative test was used to determine the amount of vitamin C contained in the purple miana leaves.

In the study process, purple miana leaves were used as research samples, the samples were picked in the morning in the Liabuku area. Before conducting qualitative and quantitative research, the purple miana leaves were first washed thoroughly and cut into small pieces to separate the bacteria present in the purple miana leaves. Next, the leaves were weighed as much as 100 grams, then ground using a blender to form juice or slurry. From the results of the grind, 10 grams of sample were taken and put into a 100 mL beaker and added with distilled water, then separated between the dregs and the filtrate by filtering using filter paper. This filtering was carried out three times to get the maximum results from the purple miana leaves.

For the first test, a qualitative test was carried out, each sample was taken as much as 5 grams which had been ground and then dissolved in 100 mL of distilled water, then a clean and dry test tube was obtained and labeled for each sample, then 1 mL was taken and put into the prepared test tube and 0.01 N iodine was dropped and recorded how many drops were needed until the color changed to clear with a positive result which means that the purple miana leaves contain vitamin C. According to (Nisa et al., 2020) Qualitative tests show a color change to clear after the addition of iodine solution. This phenomenon occurs due to the reaction between vitamin C (ascorbic acid) and iodine, where vitamin C acts as a reducing agent that can convert iodine (I₂) into iodide ions (I⁻), while vitamin C itself is oxidized to dehydroascorbic acid. This reaction is called a redox reaction, which is a reaction that involves the transfer of electrons between two substances. The color of the iodine solution, which was originally brownish, will fade and turn clear because the iodine that gives the color has reacted and changed form. Therefore, the color change to clear is used as a sign that vitamin C is present in the sample.

The first quantitative test conducted was the standardization test of the I₂ solution with Na₂S₂O₃ solution. 2 drops of starch solution were added to 25 mL of the I₂ solution and titrated using Na₂S₂O₃ until the solution became clear and the final result (0.0032 N) was obtained (Asmal, 2018) In the standardization test, after adding a 1% starch solution, the solution turned blue. This blue color appeared because the iodine in the solution reacted with the starch. After that, the solution was titrated using a sodium thiosulfate solution (Na₂S₂O₃). When sodium thiosulfate was added, the blue color began to fade slowly. The end of the titration was marked by the complete disappearance of the blue color, so that the solution became clear.

In determining the vitamin C content in purple miana leaves along with the iodimetric titration design, 10 mL of sample filtrate was taken, 2 drops of 1% starch solution and 20 mL of distilled water were added, then titrated using 0.01 N iodine solution until a dark blue color was formed. This procedure was repeated three times, and the vitamin C content was obtained at 730.4 mg per 10 grams of sample. According to (Karmila & Nuryanti, 2021), the appearance of a dark blue color indicates that the end point of the titration has been reached, where all the vitamin C in the sample has reacted.

In the titration results for determining the vitamin C content of purple miana leaves, the volume of I₂ solution obtained was 11.3 in the first replication, which was higher than the second replication of

7.3 and the third 6.3. This difference was most likely caused by inaccuracy in determining the titration endpoint in the first replication. If the I₂ solution drops beyond the endpoint, over-titration will occur, namely the excess volume of I₂ that does not react with vitamin C, so that the results obtained are greater than the expected value. The over-titration condition in the first replication could have occurred because the observation of the titration endpoint was not optimal, so that the I₂ solution dropped exceeded the limit. In the second and third replications, the titration process was more controlled so that the results were more consistent.

Based on study findings, the vitamin C content of purple miana leaves is 730.4 mg per 10 grams. Compared to other plants, this is quite high. For example, moringa (*Moringa oleifera*) leaves, known for their high vitamin C content, contain around 220 mg per 100 grams, or about 22 mg per 10 grams. Meanwhile, commonly consumed citrus fruits contain around 50–70 mg per 100 grams. Thus, purple miana leaves have the potential to be an excellent source of vitamin C.

CONCLUSION

The study findings describe the average vitamin C content in purple miana leaves of 730.4 mg in every 10 grams of sample, which has great potential as a natural source of vitamin C. However, this study still has limitations in the accuracy of determining the titration endpoint so that in the first replication there is a possibility of over-titration which causes the results to be higher than they should be.

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