

Analysis of Tannins and Saponins in Sticks Made from Chayote Flour (*Sechium edule*)

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Sticks are snacks consumed by the people. Sticks are a type of food that is made by frying. Sticks made from chayote flour (*Sechium edule*) are food products that contain tannins and saponins. This study aims to determine the levels of tannins and saponins on sticks made from chayote flour. Sample extraction was carried out by maceration method with 96% ethanol as solvent. The tannin compounds in the sample extracts were analyzed using the UV-Vis Spectrophotometry method, while the saponin compounds in the sample extracts were analyzed using the Gravimetric method. The results showed that the tannin content of the chayote stick was 0.442 ± 0.012 g/100 g and the saponin content of the chayote stick was 2.090 ± 0.018 g/100 g. So the results of this study indicate that chayote sticks contain tannin and saponin compounds that can be used as snacks that are beneficial to the body.

Keywords: Stick; chayote; tannins; saponins

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Indonesia is one of the countries that has a diversity of biological natural resources consisting of vegetable natural resources and animal natural resources. Animal natural resources and vegetable natural resources can be utilized in various aspects of life. Some of them are used as a source of medicine and food source. Animal foodstuffs are foodstuffs of animal origin including meat, eggs, and fish. Vegetable foodstuffs are foodstuffs derived from plants in the form of leaves, stems, flowers, or some or even all parts of the plant. One of the plants that has benefits as a food and medicinal plant is Chayote [1].

Chayote (*Sechium edule Sw*) is known by the people as one type of plant that is widely consumed by the community because Chayote is easy to get and the price is relatively cheap. Chayote can be processed into a variety of dishes and in general processed into vegetables. In addition to the fruit, the tops of the leaves can also be used as vegetables. Chayote extract has a useful diuretic effect to smooth urination. In addition, Chayote can also prevent heart disease, stroke and can improve the immune system [2]. Chayote contain alkaloids, saponins, cardenoline/bufadienol and flavonoids [3].

One way to make chayote fruit as an alternative non-pharmacological medicinal ingredient is to be processed into the basic ingredients for making healthy food called chayote-based processed products that can be used as antihypertensive and diabetes drugs based on the results of research [4]. One way that can be done is to use Chayote fruit into flour and then further processed into food products, namely made into

processed sticks. Stick is a type of snack that is quite in demand by the public [5].

Sticks are one of the snacks that are flat or long-shaped with a frying solution, have a savory taste and have a crispy texture. Sticks are snacks with ingredients such as wheat flour, tapioca flour or sago flour, fat, eggs and water. In its development, sticks are often found with various substitutions such as Moringa leaves, shorgum flour sticks, gayam flour sticks, and flour sticks derived from tubers.

Tannins are one of the active compounds of secondary metabolites that are known to have several properties, namely astrigens, antidiarrheals, and anti-oxidants. Tannins can be used as antibacterials because tannins have a phenol group, so tannins have properties such as alcohol, which is antiseptic which can be used as an antimicrobial component [6]. In addition, tannins are anti-viral because tannins can inhibit the activity of enzymes necessary for viruses to develop [7].

Saponins are one of the secondary metabolite compounds. The main property of saponin compounds is "sapo" in Latin which means soap. Saponins have the benefit of being able to treat diabetes, liver disease, hepatitis, and high blood pressure. Saponins also have the effect of reducing the risk of atherosclerosis due to their ability to bind cholesterol. In addition, saponins work as antibacterials by resulting in the leakage of proteins and enzymes in cells [8].

One of the sources of tannins and saponins is found in Chayote. Research on the content of tannins and saponins in processed Chayote processed products is not yet known in detail. Therefore, the author is interested in conducting research on the analysis of tannins and saponins on sticks made from Chayote flour (*Sechium edule*).

METHOD

This research is a type of experimental research laboratory research with repetition (duplo) which is used to analyze tannin and saponin levels in sticks based on Chayote flour. For the analysis of tannin levels using the UV-Vis spectrophotometry method and the analysis of saponin levels using the gravimetric method. This research was conducted in the chemistry FKIP laboratory and laboratory of FMIPA Tadulako University, Central Sulawesi. The sample used in this study was a Chayote that was patterned into Chayote sticks.

Data Collection Techniques

Data Collection Techniques in this research with the following details:

Manufacture of Extracts

A sample of Chayote sticks is put in a maceration container, then 96% ethanol is added. The maceration container is closed and kept for 24 hours. It is further filtered, separated between the residue and its filtrate. The obtained filtrate is then concentrated with a rotary evaporator and evaporated until a viscous extract is obtained. The extract obtained is weighed using an analytical balance sheet.

Analysis of Tannin Levels

The research process of tannin content in chayote sticks begins with the manufacture of a standard solution of tannic acid to determine the calibration curve. The procedure for making a standard solution of tannic acid, starting with weighing the tannic acid standard of 0.010 grams, then put in a 10 mL measuring flask. Add ethanol to the border mark. A standard set of solutions of 5, 10, 15, 20, and 25 ppm is made. Then pipettes of each standard tannic acid solution of 1 mL into the test tube and then labeled, then added 1 mL Folin Ciocalteu reagent and then homogenized. Then let stand for 8 minutes. Then add 3 ml of 20% Na₂CO₃ reagent then let stand for 2 hours. Measure its uptake at the maximum wavelength obtained using a UV-Vis spectrophotometer.

The process of analyzing the tannin content begins with weighing a sample of 0.010 grams of extract. Add ethanol 10 ml and then homogenized. Then take 1 ml of solution, transferred into a test tube and added 10 ml of aquades. Then add a reagent folin ciocalteu as much as 1 ml then let stand for 8 minutes. Then add 3 ml of 20% Na₂CO₃ reagent then let stand for 2 hours. Measurement of absorption at a maximum wavelength obtained 751.5 nm using a UV-Vis spectrophotometer.

Analysis of Saponin Levels

Analysis of saponin content gravimetrically. The research process on the content of saponin levels in Chayote sticks begins with weighing a sample of 0.5 grams of extract. Then it is crushed with 25 ml of petroleum ether at 60°C-80°C for 30 minutes and then cooled. After cooling the petroleum ether solution is discharged and the residue left behind is dissolved in 25 ml of ethyl acetate, then the ethyl acetate solution is separated. The residue left behind is dissolved with n-butanol 25 ml 3 times. the whole n-butanol solution is mixed and evaporated with a rotavapor. The remaining evaporation is dissolved with 10 ml of methanol then this solution is dripped into 10 ml of ether while stirring. The precipitate formed in the mixture is poured on filter paper of known weight. The precipitate on filter paper is dried in the oven then cooled in a desiccator for 30 minutes then weighed until the weight is fixed. The difference in the weight of the filter paper before and after filtering is set as the weight of the saponin.

Data Analysis Techniques

The data analysis technique in this study is divided into two techniques, namely tannin levels analysis and namely saponin levels. Using the formula:

$$\text{Tannin levels (mg/100g)} = \frac{\text{tannic acid equivalence} \times V \times 100}{1000 \times \text{concentrated extract weight}}$$

$$\text{Saponin levels} = \frac{X_2 - X_1}{A} \times 100\% = \dots$$

Description:

X₁ = Filter paper weight (g)

X₂ = Filter paper weight + saponin deposit (g)

A = Weight of chayote stick extract (g)

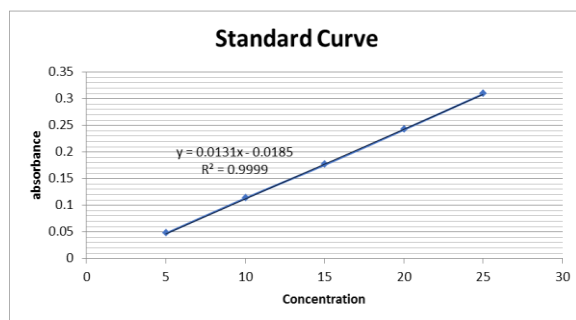


Figure 1. Tannin Acid Standard Solution Absorbance Graph.

Table 1. Results of Analysis of Tannin Levels in Sticks Based on Chayote Flour and Chayote Flour.

No	Sample	Tannin Levels (Mean±SD) (g/100g)
1.	Chayote Sticks	0.442 ± 0.012
2.	Chayote Flour*	4.308 ± 0.022

Primary data source : *Sakung *et al.*, (2022).

RESULTS AND DISCUSSION

The results obtained from this study are about the analysis of tannins and saponins in sticks based on Chayote flour, with details of the results of the study.

Tannin Levels Analysis

The results obtained from the study analyzed tannin levels on sticks based on Chayote flour using the UV-Vis spectrophotometry method. Data on tannin levels from sticks based on Chayote flour, namely at the stage of determining tannin levels, use the standard as a comparison solution, namely tannic acid. The use of tannic acid as a comparison solution because tannic acid is included in the hydrolyzed tannin group so that it can be used as a comparison in measuring total tannin levels [9].

Determination of tannin levels using the ciocalteu folin method. The principle of the Folin Ciocalteu method is the oxidation of hydroxyl phenolic groups phenolic compounds react with Folin Ciocalteu reagents only in an alkaline atmosphere in order for proton dissociation to occur so that phenolic compounds can become phenolic ions. To create an alkaline condition used Na_2CO_3 [10]. This tannin content analysis study used a UV-Vis spectrophotometer at a wavelength of 751.5 nm which was carried out with two repetitions which aimed to increase accuracy in conducting the analysis. The standard curve obtained in this study has the equation line $y = 0.0131x - 0.0185$ with a regression value of 0.9999.

The results obtained from the tannin content test on the chayote stick (*Sechium edule*) can be seen in Table 1.

Based on the results of the study, the tannin content in Chayote sticks at a wavelength of 751.5 nm was 0.442 ± 0.012 . Based on the results of the study, the tannin content in sticks based on Chayote flour with two repetitions was 0.454 g/100 g and 0.431 g/100 g with an average of 0.442 g/100 g. The results of determining the tannin content on sticks based on Chayote flour when compared to primary data, namely Chayote flour obtained different results, in determining the total tannin content in Chayote flour, which was 4,307 g/100 g so that it can be said that Chayote flour processed as stick products experienced a decrease in tannin levels [11].

In principle, the process of processing sticks based on Chayote flour goes through several stages of heating which results in reduced tannin levels in the sample, this is appropriate if the results of the study are compared with Chayote flour. The process of processing the stick goes through a heating stage which results in reduced tannin levels in the sample. The higher the heating temperature, the lower the tannin content in the stick product, and vice versa. The use of high temperatures in the frying process results in lower levels of tannins in food products. The higher the temperature, the more it can cause tannin levels to break down [12].

According to the results of research from Firdani A. E et al (2022) that the tannin content in Mangrove fruit crackers *R. Mucronata* and Tapioca flour in the range of 6.75-22.71 mg/100 g or equivalent to 0.00675-0.02271 g/100 g was lower when compared to sticks based on Chayote flour with tannin content of 0.442 g/100 g.

Tannins can be found in leaves, stems, fruits, wood and roots. Tannins belong to the group of poly-

phenol compounds that have medicinal properties, therapeutic properties and have the potential to be antioxidants and therefore exhibit various pharmacological properties [13]. Tannins consist of a benzene ring (C_6) that binds to the hydroxyl group. Tannins have benefits for the body including anti-toxic, anticancer, antiallergic and anti-inflammatory, anthelmintic, antimicrobial, antiviral, wound healing, dysentery healing etc. [14].

Research on the analysis of tannin levels in Chayote sticks using UV-Vis spectrofotometers showed the presence of tannins that had tannin levels of 0.442 g/100 g. From the research data obtained sticks based on chayote flour can be recommended as a snack with tannin levels that are useful for body health.

Analysis of Saponin Levels

The results obtained from the study analyzed saponin levels in sticks based on Chayote flour using the gravimetric method. Data on saponin levels from sticks based in Chayote flour produce saponin deposits. In this study, the determination of saponin levels was carried out as many as 2 repetitions which aimed to produce more accurate analysis data. The results obtained from the test of saponin levels in chayote sticks (*Sechium edule*) can be seen in table 2.

In this study, the determination of saponin levels was carried out as many as 2 repetitions which aimed to produce more accurate analysis data, and the results of the study of saponin levels on sticks made from Chayote were 2.072 % and 2.107 % with an average of 2.090 %.

The total content of saponins in sticks based in Chayote flour is 2.090 %. The results of determining the saponin content in sticks based on chayote flour when compared with the primary data used as a comparison, namely Chayote flour, different data were obtained. In the determination of saponin levels in chayote, which was 2.813 % [11]. The saponin content in sticks based on Chayote flour can be said to have decreased.

Processing chayote flour into sticks products

can reduce or eliminate secondary metabolites such as saponins. The processing of Chayote flour through a heating process (frying pan) so as to produce stick products. The use of high temperatures at the time of processing causes the level of saponins to decrease. Mufflihah (2015) stated that saponins are prone to high temperatures, these bioactive compounds can be damaged when heated to high temperatures. This is in accordance with the comparison of the saponin content of Chayote flour which is used as a comparison with the data from the analysis.

Saponins are glycosides of triterpenes and sterols whose general components are gluconic acid. Saponins are generally polar, non-volatile, bioorganic natural compounds that are widespread, especially found in plants, marine life (starfish, sea cucumbers, sponges), and bacteria. Saponins provide a positive effect on the body when consumed. In the prevention or treatment of diseases, saponins have benefits as antibacterial, antifungal, antiviral, control of basic glucose levels, and are able to inhibit the growth of tumor cells [15].

Research on the analysis of saponin levels in Chayote sticks using gravimetric methods showed the presence of saponin content which had saponin levels of 2.090 % or equivalent to 2.090 g/100 g. From the research data obtained sticks based on chayote flour can be recommended as snacks with saponin levels that are useful for body health.

CONCLUSION

Based on research conducted on the analysis of tannin and saponin levels on sticks based in chayote flour (*Sechium edule*) it can be concluded that sticks based on Chayote (*Sechium edule*) contain tannin compounds with a value of 0.442 ± 0.012 g/100g and saponin compounds with a value of 2.090 ± 0.018 g/100g.

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Table 2. Results of Analysis of Saponin Levels in Sticks Based on Chayote Flour and Chayote Flour.

No	Sample	Saponin Levels (Mean \pm SD) (g/100g)
1.	Chayote Sticks	2.090 \pm 0.018
2.	Chayote Flour*	2.813 \pm 0.148

Primary data source : *Sakung *et al*, (2022).

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