International Journal on Advanced Science Engineering Information Technology

Vol.13 (2023) No. 4
ISSN: 2088-5334

Phytochemical Screening of *Tacca* Plant (*Tacca leontopetaloides* L.) Ethanol Extract Using Spectrophotometry UV-VIS Method

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***Abstract*—Phytochemical screening is a general approach to medicinal plants and is a local knowledge that exists in the community. Tacca (*Tacca lentopetaloides* L.) is a traditional plant with criteria as raw material for traditional medicine, but most people do not know the benefits of these plants. Phytochemical screening tests have been carried out on the ethanol extract of the taka plant by soaking for 3 days. This Study aims to determine the phytochemical compounds found in plant organs such as leaves, stems and tubers using spectrophotometric UV-vis methods and quantitative methods. The testing mechanism uses the Tacca plant's leaves, stems and tubers. Screening phytochemicals of ethanol extract included tests for flavonoids, alkaloids, tannins, phenols, and saponins. From the results of the Study, it can be seen that the location of the Tacca plant grows very significantly affects phytochemical compounds. From the three research locations, Gorango village has higher yields, namely the tubers that have a number of alkaloid compounds around 2,496.35 mg/kg and saponins (4,203.32 mg/kg), followed by flavonoids (7.20), tannins. (12.74) and phenol (4.08), followed by the villages of Bebsili and Gurua. This indicates that the Tacca plant contains phytochemical compounds, including alkaloids, flavonoids, saponins, phenols and tannins which have properties such as pain relievers, anticancer, antibacterial, anti-viral, so that the Tacca plant can be used as recommendation material as a mixture of medicinal ingredients in world of medicine.**

***Keywords*—Screening phytochemical; tacca plants; spectrophotometric UV-vis; ethanol extract.**

Manuscript received 21 Aug. 2022; revised 14 Nov. 2022; accepted 9 Jan. 2023. Date of publication 31 Aug. 2023.

I. INTRODUCTION

Since ancient times, the Indonesian people have known medicinal plants known as potions (*rorano*). One area that still uses traditional ingredients is North Maluku; most people still rely on traditional ingredients as medicinal ingredients. Medicinal plants have health benefits and have been known for a long time by the people of Indonesia. Medicinal plants play an important role in life [1]. This herb is a drug that can treat various diseases such as itching, diabetes, liver, kidney, heart, and cancer [2].

Tacca (*Tacca lentopetaloides* L.) is a traditional plant with criteria as a medicinal raw material, but most people do not know the benefits of these plants. The use of traditional medicine is hereditary, and Most of the people of North Maluku still rely on traditional ingredients as medicinal ingredients. Medicinal plants have health benefits and have been known for a long time by the people of Indonesia. Medicinal plants play an important role in life [1]. Tacca is one of the traditional plants with criteria as a medicinal raw material, but most people do not know the benefits of these plants. Traditional medicine is passed down from generation to generation and treats various diseases [3].

The use of traditional medicine in terms of side effects is relatively less than chemical drugs or modern medicines, so traditional medicines are considered safe for consumption while still paying attention to the dose of use [4]. The modern medical world has widely appreciated today's traditional plants because they have medicinal properties that have been studied and studied scientifically [4]. This shows that medicinal plants contain compounds that benefit health [5]. Tacca can be used as a laxative, diabetes, and anti-malarial, relieving tooth pain, reducing swelling, and stopping bleeding [6].

Tacca has a myriad of benefits, such as anticancer, anti-malaria anti-virus. In line with the research reported that S. *polyanthum* leaves have antibacterial activity against *staphylococcus aureus*, *E. coli*, *listeria monocytogenes*,

shigella dysenteriae, *Serratia marcescens*, and *salmonella enteritidis* [7], [8]. The Tacca tuber has a bitter taste and a strong smell. Syafi et al. [9], who researched the *Ruta angustifolia L. Persers* plant, said plants with a bitter taste can be used as anticancer drugs.

Alternative medicine using herbal plants has become very popular in Indonesia in recent decades. The high cost of going to doctors and hospitals as well as concerns about the side effects of chemical drugs consumed, are the reasons people choose herbal medicines. So, through this research, the researcher aims to study the phytochemical compounds contained in the taka plant. From the above problems, this Study aims to identify phytochemical compounds in plants in Tacca leaves, stems, and tubers using UV-vis spectrophotometry and quantitative methods.

II. Material and Method

A. Materials

The tools used were spectrophotometric UV-vis, measuring flask, cuvette, magnetic stirrer, separating funnel, rotary evaporator (*BUCHI Rotarspor R 200*), Vortex, analytical scales (*Precisa XB 220A*), oven (*Memmert*), and test tubes. The material used is the extract of the *Tacca* plant. H_2SO_4, HCl_2N, Chloroform ($CHCl_3$), ether, BCG, anisaldehyde, sulfuric acid, sodium nitrite, aluminum chloride, sodium hydroxide, distilled water, anisaldehyde, phosphate buffer, Diethyl ether, NaOH.

1) Manufacture of Simplasia: The materials used as the basic ingredients for the *simplasia* powder are the leaves, stems, and tubers of fresh taka plants obtained from the areas of Gurua, Gorango, and Bebsili villages, then cleaned of stuck dirt, washed with running water until clean, then drained to free leaves from the rest of the washing water. Plant material that has been cleaned is cut into small pieces and let air dry. Furthermore, the taka plants' leaves, stems and tubers are dried again using the oven. After drying, then mashed and stored in a clean container and tightly closed.

2) Extraction: Samples of *simplicasia* powder that had been mashed using a blender were weighed as much as 50 g for each sample, put in a jar, and soaked using 95% ethanol. The sample was allowed to stand for 3 x 24 hours (48 hours) while shaking it using an orbital plug. After 72 hours the extract is filtered using filter paper, allowed to stand for a while until it settles then pour it to a standard pan over a water bath with a temperature of 70 ^oC, assisted by a fan to evaporate quickly after being tilted; after not flowing and put into the extract storage bottle.

B. Phytochemical Screening

Phytochemical screening of the ethanol extract of leaves stems and Tacca tubers, among others:

1) Alkaloid compounds: Prepare a sample ± 100 mg, then put 5 ml of HCl 2N, then shake it in a measuring flask, then the solution washed with chloroform as much as 10 ml is filtered 3 times, then the chloroform phase is disposed of adding 0.1 N NaOH to neutralize the sample, use a 5 ml solution of phosphate buffer and BCG, add 5 ml of chloroform to continue the extraction process while stirring for ± 15 minutes at a speed of 500 rpm. The use of chloroform in the extraction process is carried out two times. Proceed with the process of evaporation of chloroform with nitrogen gas. Absorption at a wavelength of 470 nm.

$$TotalAlkaloid = \frac{(ppm)xVol.akhirxfp}{beratsampel(g)}/10000 \quad (1)$$

2) Flavonoid compounds: Weigh the sample as much as 0.10 g, use a 10 ml test tube as a container, put 5% sodium nitrite by 0.3 ml for 5 minutes, then add 10% aluminum chloride by 0.6 ml. After 5 minutes, put 2 ml of sodium hydroxide, use a measuring pumpkin add 10 ml of aquadest, then carry out the dilution process as needed. The readings use a spectrophotometer with ƛ 510 nm.

$$TotalFlavonoid = \frac{(ppm)xVol.akhirxfp}{beratsampel(g)}/10000 \quad (2)$$

3) Phenol compounds: Weigh the sample as much as 0.05 g, use *folin-ciocalteu* reagent for 0.5 ml, and add aquades by 7.5 ml, carried out the storage process at room temperature for 10 minutes, by adding 1.5 ml of 20% sodium carbonate, then add 10 ml of aquades, then dilute as needed. Perform readings using a spectrophotometer with ƛ 760 nm.

$$TotalFenol = \frac{(ppm)xVol.akhirxfp}{beratsampel(g)}/10000 \quad (3)$$

d. Tannin compounds

The sample weighed as much as ± 100 mg and carried out the excitation process using diethyl ether as much as 10 ml for 20 hours. Then the results of the extraction were filtered and evaporated. The remains of diethyl ether were carried out. Next, the sample is dissolved in aquades as much as 10 ml, then a solution of 1 ml is taken, put *folin ciocalteu* reagents by 0.1 ml, then in the vortex for 5 minutes. Add sodium carbonate by 2 ml let stand for 5 minutes, then add 10 ml of aquades and dilute it 10 times. Carry out the incubation process at room temperature for 30 minutes readings with a spectrophotometer at an absorbance of λ 760 nm [10].

$$TotalTannin = \frac{(ppm)xVol.akhirxfp}{beratsampel(g)}/10000 \quad (4)$$

4) Saponin compounds: Prepare a sample of ± 100 mg into Erlenmeyer, then add 25% H_2SO_4 as much as 2 ml, use an autoclave for 120 minutes at a temperature of 110 ^0C, continue with the extraction process using ether. Then the filtrate is drained, add aquades 1 ml, extracted for 5 minutes, then use anisaldehyde as much as 50 µl while shaking and let stand 10 minutes. 50% sulfuric acid by 2 ml, then heated for 10 minutes at a temperature of 60 ^0C, then add 10 ml of aquades. Perform readings with a spectrophotometer at an absorbance of λ 435 nm.

$$TotalSaponin = \frac{(ppm)xVol.akhirxfp}{beratsampel(g)}/10000 \quad (5)$$

C. Spectrophotometric UV-vis analysis

Taka plant extracts that showed phytochemicals were analyzed using Spectrophotometry Uv-vis.

III. Result and Discussion

A. Phytochemical Analysis

Phytochemical compound testing is a method used to test the quality of medicinal plants that have considerable natural resource potential. This phytochemical test can determine the

types of secondary metabolites in medicinal plants, such as flavonoid compounds, tannins, alkaloids, phenols, and saponins. The results of testing phytochemical compounds in Tacca plants from the extraction process using ethanol on the stems, tubers, and leaves are shown in the following Table 1.

TABLE I
QUANTITATIVE ANALYSIS OF PHYTOCHEMICAL COMPOUNDS IN TAKA PLANTS

Phytochemical	Test material		
	leaf	Stems	Bulbs
Alkaloids	+	+	+
Flavonoids	+	+	+
Tannins	+	+	+
Phenol	+	+	+
Saponins	+	+	+

Description: + = Contains chemical compounds

Table 1 indicates the three research locations show that phytochemical compounds can be used as traditional medicines. Judging from the habitat for growth, it allows taka plants to have a perfect secondary metabolism. The results showed that the highest phytochemical analysis of taka plants was in Gorango village, which was then followed by Bebsili and Gurua villages which were not significantly different. This shows that the taka plant that thrives at this location is a good place for the growth of taka plants.

The *Tacca* plant can grow on the coast with sand media because the taka tubers are more developed in soil that does not bind water. Taka tubers grow under the shade of trees because the tubers need media to strengthen the roots, so they do not fall easily. Tacca tubers can adapt to hot temperatures and low humidity because the *Tacca* plant can live in hot temperatures above 36ºC and tolerance to high salt.

In accordance with research conducted by [11],[12] about mangroves that thrive in coastal waters, contain phytochemicals, including tannins, saponins, alkaloids, and flavonoids. In the leaves of the *Tacca* plant, there are phytochemical compounds, although not as many as in the tubers, but they have the same compounds. The three research locations show that the leaves have a good metabolism.

Phytochemical compound analysis using ethanol extract on spectrophotometry UV-vis showed that the taka tubers had the highest content, followed by leaves and stems (Table 2). Table 2. The quantitative test results show that alkaloid and saponin compounds have a higher content in each test material, namely leaves, tubers, and stems, followed by phenolic compounds, flavonoids, and tannins.

Table 2 shows that Tacca leaf extract contains phytochemical compounds. In line with Bigoniya's [13] research regarding *Syzygium cumini* leaf extract extracted with ethanol, it contains alkaloids, flavonoids, triterpenoids, and saponins. The same thing was done by Wijayanti et al. [14] regarding *juwet* leaf extract, which contains alkaloids, phenolics, and terpenoids.

TABLE II
ANALYSIS OF PHYTOCHEMICAL COMPOUNDS ON THE LEAVES OF TACCA PLANTS (*TACCA LEOTOPETALOIDES L.*) USING THE SPECTROPHOTOMETRY UV-VIS METHOD

Material	Phytochemical	Location		
		Bebsili	Gorango	Gurua
leaf	Alkaloids	976.39	988.62	996.62
	Flavonoids	1.30	1.53	1.40
	Tannins	4.52	6.79	7.83
	Tannin	2.26	4.48	2.84
	Saponin	2.359	3.267	3.472
Bulbs	Alkaloid	2.394	2.496	2.390
	Flavonoid	9.07	7.20	8.50
	Phenol	11.48	12.74	10.73
	Tannin	4.90	4.08	5.14
	Saponin	3.835	4.203	4.016
Stems	Alkaloid	2.130	2.186	2.298
	Flavonoid	4.33	4.56	4.89
	Phenol	8.19	9.45	9.80
	Tannin	3.93	3.01	3.11
	Saponin	2.318	2.327	2.388

The results of Table 2. Show that the *Tacca* stem contains phytochemicals, among other flavonoids, alkaloids, saponins, phenols, and tannins. In line with the research of Bigoniya [13] regarding ethanol extract, the Pakoba stem bark contains flavonoids, tannins, and alkaloids. The stems of the *Tacca* plant have the same phytochemical compounds as in the tubers and leaves, but the numbers are different. However, it is no different from what was done in the previous study, namely at the location of Gurua, Bebsili, and Gorango in the *Tacca* plant. According to research conducted by Wijayanti et al. [14], mangrove skin is rich in phytochemicals such as flavonoids, alkaloids, saponins, and tannins.

B. The Standard of Alkaloids Compounds, Flavonoids, Phenols, Tannins, and Saponins

From the standard result that has been determined by the LPPM UGM section, to determine the levels of flavonoids, alkaloids, phenols, tannin, and saponins in each sample can be seen in (Fig. 1, 2, 3, 4, and 5). Concentration series is used because the method used in determining the standard curve equation is first made several concentration series to get a linear equation to calculate the percent of the content. The linear regression equation shows that the higher the addition of ethanol extract to the *Tacca* extract, the higher the secondary metabolite compounds will be read.

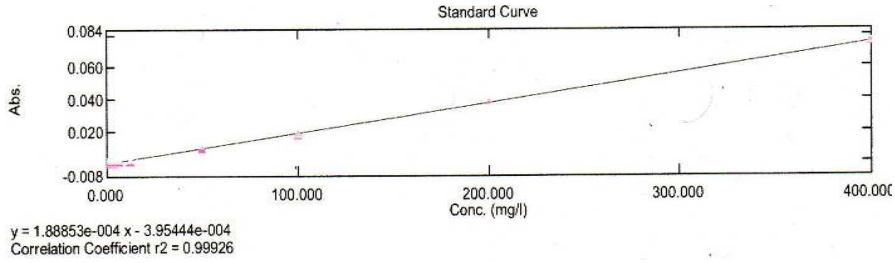

Fig. 1 The standard of the alkaloid (quinine) maximum curve λ 470 nm

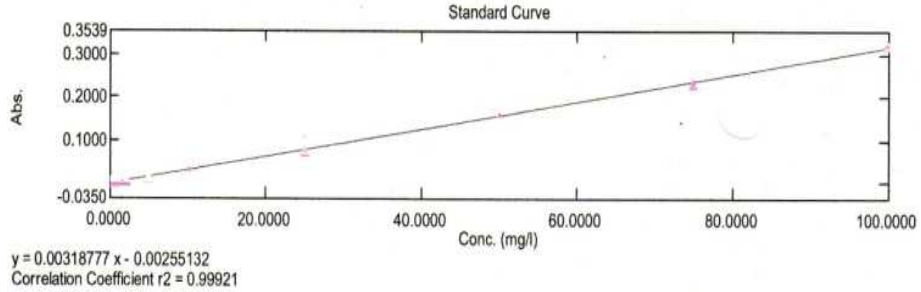

Fig. 2 The standard of flavonoid (quercetin) maximum curve λ 510 nm

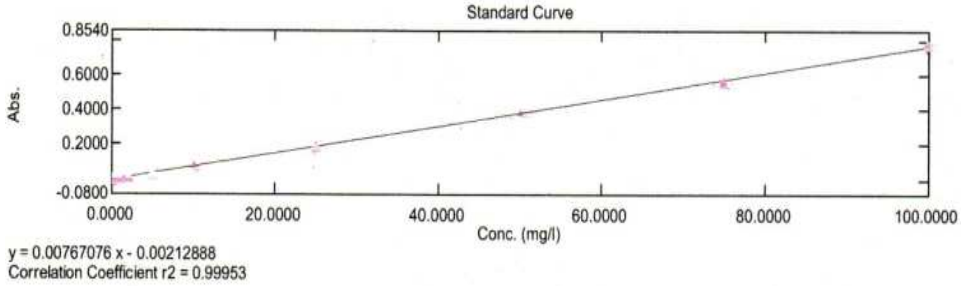

Fig. 3 The standard of phenols (folin-ciocalten) maximum curve λ 760 nm

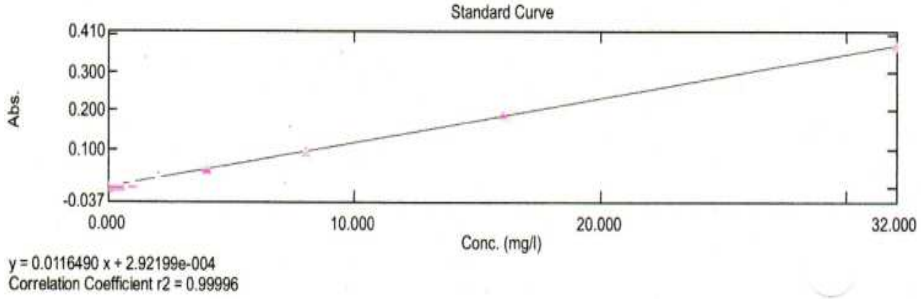

Fig. 4 The standard of tannins (tannins acid) maximum curve λ 760 nm

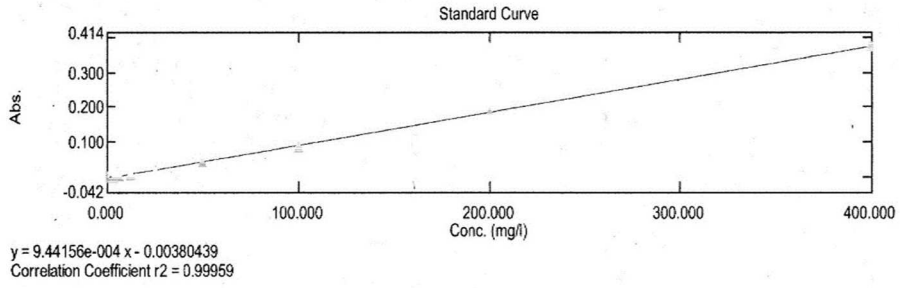

Fig. 5 The standard of saponin maximum curve λ 435 nm

C. Analysis of Alkaloid Compound

The analysis showed that the three samples positively contained alkaloid compounds. Tacca tubers showed the highest number, namely tubers in Gorango village which had alkaloids of around 2,496.35 mg/kg (tubers), followed by Gurua village with around 2,390.46 mg/kg (tubers), then Bebsili village showed the number of alkaloids around 2,394.38 mg/kg (tubers). This indicates that the tuber is a place where carbohydrates are collected which are used for growth.

The results showed that the leaves contained phytochemical compounds such as alkaloids. In line with Wijayanti et al [14] research regarding *Syzygium cumini* leaf extract extracted with ethanol, it contains alkaloids. The same thing was done by [15] regarding *juwet* leaf extract which contains alkaloids.

Apart from tuber leaves which have alkaloid compounds, the stems also have alkaloid compounds. In line with the research of [16] regarding the ethanol extract that the Pakoba stem bark contains alkaloids. In the field of pharmacology, the role of alkaloids is needed to improve the nervous system, lower blood pressure, as an antimicrobial, antioxidant activity and fight infections [17].

D. Analysis of Flavonoid Compound

The analysis showed that the ethanol extract of *Tacca* tuber had the highest flavonoid content in Bebsili village, namely

9.07%, followed by Gurua village 8.50% and Gorango village around 7.20%. on the leaves also have flavonoid compounds. In line with Syafi et al [9] research regarding *Syzygium cumini* leaf extract extracted with ethanol, it contains flavonoids. Not only in the leaves and tubers, but the stems also have flavonoid compounds. [16] about the ethanol extract that the Pakoba stem bark contains flavonoids.

The *Tacca* plant that lives on the beach has a high phytochemical content. In line with the research, seaweed has bioactive content from ethanol extract, namely flavonoids saponin, alkaloid, triterpenoid and phenol. Total active flavonoid id from ethanol extract of *Gracilaria sp*. [18],[19].

A higher number of flavonoids can act as a competitive inhibitor, because they contain anti-inflammatory, antibacterial, antioxidant and anti-diarrhea activities [20]. Flavonoids have allergy, antioxidant, vascular and anti-tumor cytotoxic properties. Flavonoids have allergy, antioxidant, vascular, and anti-tumor cytotoxic properties [21].

Table 2. Shows that the ethanol extracts of leaves, tubers and taka stems at the three research locations contain flavonoids. The results of the analysis with a UV-vis spectrophotometer had the highest number of flavonoids in Bebsili Village, namely around 9.07% (tuber), and the lowest number of flavonoids was found in the leaves, namely 1.30% (Bebsil). leaves of *Karamunting* extracted using ethanol obtain bioactive compounds that are useful as anticancer compounds, namely flavonoid compounds [22].

E. Analysis of Phenolic Compound

The analysis showed that the phenol content in the ethanol extract of taka tubers showed phenol content of 12.74% (Gorango), followed by Bebsili (11.48%) and Gurua (10.73%). The same results were found in the leaves and stems. The same thing was done by Wiajayanti et al [14] regarding juwet leaf extract which has phenolic content.

The ethanol extract of taka rods had moderate amounts of phenols compared to alkaloids and saponins. The amount of phenol in the taka stem is 8.19% (Bebsili), 9.45% (Gorango) and 9.80% (Gurua, the same thing is done with moderate phenol levels, namely 51.5 mg GAE/g, can increase antioxidants, Inhibiting microbes or these antioxidants have various pharmacological effects such as antibacterial, anticancer, antiviral, and anti-inflammatory [23].

From the results of the tests that have been carried out, it shows that the three positive samples contain tannin compounds. The highest content of tannin compounds in the tubers was around 5.14 (Gurua), followed by Bebsili (4.90%) and Gorango (4.08%) and in the leaves the highest number of tannins (4.48%). Apart from *Tacca* tubers, leaves and stems also produce tannin compounds. [16] regarding the ethanol extract that the Pakoba stem bark contains tannins. The bark of *Rhizophora apiculate* produces tannins which are used as a source of natural antioxidants [24].

The presence of phytochemical components in mangrove plants lies in the leaves, roots, stems and fruits. Rhizophora apiculata is useful as an anti-diarrhea, nausea, vomiting, antiviral and hypoglycemic drug. The bark of Rhizophora apiculata produces tannins which are used as a source of natural antioxidants [25]. Those basil leaves contain tannin compounds, which function as antipyretic, anti-fungal, analgesic, antiseptic and antibacterial [26].

F. Analysis of Tannin Compounds

From the results of the tests that have been carried out, it shows that the three positive samples contain tannin compounds. The highest content of tannin compounds in the tubers was around 5.14% (Gurua), followed by Bebsili (4.90%) and Gorango (4.08%) and in the leaves the highest number of tannins (4.48%). Apart from *Tacca* tubers, leaves and stems also produce tannin compounds. [16] regarding the ethanol extract that the Pakoba stem bark contains tannins. The bark of *Rhizophora apiculate* produces tannins which are used as a source of natural antioxidants, which can ward off free radicals [17].

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Table 2. Shows that the ethanol extracts of leaves, tubers and *Tacca* stems at the three research locations contain tannin compounds. The results of the analysis using the spectrophotometer UV-Vis that had the highest number of tannins were tubers in Gurua village around 5.14%, followed by tubers from Bebsili village about 4.90% and leaves from Gorango village 4.48%, the lowest was on leaves, namely 2.26% from Bebsili village. The same thing was done by [27] regarding *biduri* leaf extract at a concentration of 300 ppm of 7.12 µg/ml and the lowest at a concentration of 100 ppm, namely 1.16 µg/ml, this shows that there are other compounds in the tannin compound.

Extracted from mangrove leaves using ethanol extract has the potential to control bacterial growth, because mangrove leaves contain bioactive compounds in the form of alkaloids, tannins, saponins, steroids, and flavonoids [28].

G. Analysis of Saponin Compound

From the test results, it was found that all the samples used produced high saponin compounds, namely tubers, stems and leaves. The highest saponin compounds were around 4,203.32 mg/kg (Gorango), followed by Gurua (4.0167.71 mg/kg) and Bebsili (3,835.86 mg/kg). Apart from the taka tubers, the leaves and stems also produce saponins. Saponins have biological activity that is used as cosmetics and antioxidants [29]. In saponin compounds, there are glycosides that function as polar groups and nonpolar groups [30].

Charantin which is a saponin steroid compound is very effective in lowering blood glucose [29],[30]. There is also *Momorcharin* which is a glycoprotein reported to have anti-fertility properties and can even cause miscarriage. Other activities are allergy, anticancer, anti-HIV (Antivirus), immunomodulators [31].

The results of the ethanol extract research on the taka plant using *spectrophotometric UV-vis* showed, that the saponin in the taka tuber had a higher amount of around 4.203.32 mg/kg (Gorango), followed by Bebsili (3.835.86mg/kg) and Gurua (4.016.71 mg/kg), while the number of taka leaves had the lowest saponin content, namely 2.318.54 mg/kg (Bebsili). [29] that *senggani* flowers with ethanol extract contain saponins, namely 11.46%.

H. The Standard of Alkaloids, Flavonoids, Phenols, Tannins and Saponins Compounds

The choice of method can influence research, so the extraction method is easy to do and can protect compounds that are not resistant to heat. Ethanol as a solvent for extraction is very good, because ethanol is a semi-polar solvent with a polarity index [32]. Ethanol as a semi-polar solvent can be used to extract alkaloid, flavonoid, phenol, tannins and saponin compounds. Ethanol is used as a safe solvent for medicines [30].

This analysis aims to determine the levels of total alkaloids, flavonoids, phenol, tannins and saponins in the extract obtained from the standard curve equation. The absorbance data produces a standard curve line equation y = 1.88853e-004 x - 3.95444e-004 with a value of r2 = 0.99926 (Fig. 1). The total flavonoid content of 5.11 mg QE/g extract was obtained from the quercetin standard curve equation, namely y = 0.00318777 x - 0.00255132 with r2 = 0.999921 (Fig. 2).

The use of gallic acid with a concentration of 10 mg, with the addition of *folin-ciocalteu* reagents as much as 0.5 ml and aquades as much as 7.5 ml by producing absorbance data that produces a standard curve equation y = 0.00767076 x - 0.00212888 with a value of R = 0.99953 (Fig. 3). From this equation, the total phenol content was 7.64 mg GAE/g extract. The concentration of 10 ml *folin ciocalteu* reagent added 0.1 ml and 10 ml aquabides to the absorbance data resulted in a standard curve line equation y = 0.0116490 x + 2.92199 with a value of r2 = 0.99996 with a value of R = 0.99953 (Fig. 4).

The concentration of H_2SO_4 25% 2 ml, then in autoclave for 120 minutes, extracted with ether, The addition of aquades as much as 1 ml, then the extraction results in the vortex for 5 minutes, then add anisaldehyde as much as 50 µl and the addition of 50% sulfuric acid as much as 2 ml. The absorbance data produces a standard curve line equation y = 9.44156e-004 x -0.00380439 with a value of r2 = 0.99959 (Fig. 5).

Fig. 3 shows that the yield produced from the extract of the taka plant, both tubers, stems and leaves with 96% ethanol solvent, namely 4.17%, shows that the active component was successfully extracted. The use of extraction to separate bioactive compounds such as secondary metabolites from a plant by using certain solvents. There are several factors that can affect the yield, including plant varieties, plant age, plant maintenance process, and environmental factors.

IV. Conclusions

From the results of research on *Tacca* plant extraction and the screening of phytochemical compounds of *Tacca* plant (*Tacca leontopetaloides* L.) ethanolic extract using the UV-vis Spectrophotometry Method on medicinal plants. There are phytochemical content in all *Tacca* plant organs such as leaves, stems and tubers. There are 5 types of compounds, namely flavonoids, phenols, alkaloids, saponins and tannins used by several ethnic groups in North Maluku (Gorango, Bebsili and Gurua). Tacca plant can be used as an anti-biotic in the medical field, anticancer, anti-viral, antibacterial and pain reliever in the medical field. Parts used of the *Tacca* plant are tubers, leaves and stems. Local knowledge in use medicinal plants owned by ethnic groups in Indonesia is a source of medicinal ingredients that can studied further in the context of searching and alternative medicine development.

Acknowledgment

This research is supported by LPDP funding from the Ministry of Finance (BUDI-DN) scheme with contract agreement No: PRJ-49530/LPDP.3/2016.

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