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CURRENT RESEARCH**

**IDENTIFICATION OF COMPOUNDS CONTAINED IN  
METHANOL EXTENSION OF DRIED SUCH AS BANANA  
LEAVES OF HALMAHERA (*MOSES PARADISIACA L.*)**

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## ABSTRACT

The need for raw materials of medicine in Indonesia is mostly imported word while the potential u.s. herbs raw materials of herbal medicines have low side effects for consumers and acres very easy to find around us. With the development of science and technology it allows treatment, herbal medicine began ogled and conducted research content of natural other ingredients such as such as banana yellow kepok banana dried Halmahera (*Moses paradisiaca L.*). The purpose of this study was to identify the compounds contained in dried such as banana leaves of Halmahera (*Moses paradisiaca L.*). This study is an experimental research methodology, in this is done by the samples acres expected, dried, powdered, immersed with methanol, filtered, and the resultant filtrate is evaporated until a thickened extract is obtained. The results of the study using heading Gc-Ms tool, methanol extract from such as banana leaves yellow kepok banana dry contains compounds such as Hexadecanoic acid 2.02%; Vitaimin E 18.36%; Beta.-sitosterol 5.03 percent and other compounds with the number of presentations smaller than Vitamin E. The conclusion of the research is methanol condensed extract containing the most Vitamin E with a presentation of 18.36%, in such as banana yellow kepok banana leaf also contained beta compound -sitosterol is can lower cholesterol.

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## INTRODUCTION

Around us many plants and plants that potential as a herbal medicine that is easy to found. Even the parents in the family we often use plants and plants as medicine.

Besides the growth of the pharmaceutical industry in Indonesia around 10-14% year on year, meanwhile Indonesia itself still raw material shortages of drug so that the raw material must be imported from outside. Thus the Indonesia still dependency on raw materials that potentially create Yogyakarta country into a consumptive. Almost 96 percent of raw material is still imported from abroad. The strategies that need to be done so that Indonesia mandiri in raw material needs one only by strengthening research.1

According to the data of the porch of the POM of the Republic of Indonesia in Nasiret *et al.*, (2016) the number of registered herbal medicines until 2015 greatly increased. One of the causes of the increased use of herbal medicines is the low potential risks posed.2

With more and more development of science da technology, it is possible in the world of treatment also experienced many changes and progress. Traditional Medicines that previously was considered as a way of treatment that is now ancient starting to gain attention and conducted research on the content of natural ingredients.3

Based on the research done by Saha dkk 2013 in Titri Siratantri Mastuti, and Ratna Handayani (2014) known that banana leaf (*Musa sapientum 7.6 var. Sylveteris*) potentially used in the medical field because there are known microbial activity and antioxidants. Did so also research results Titri Siratantri Mastuti and Ratna Handayani (2014), in the area of Panongan, Tangerang obtained the conclusion that banana leaf rock and bananas Ambon have chemical compounds aroma producer and may also have biological activity as a compound fitokimia. Research extracting compound flavors and none of the banana leaf rock and ambon result distalasi water extracted with solvent ethyl acetate known the existence of the five main compounds that the same compound 2 of 4-Methoxy-vinylphenol, Phytol, 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) Esther, Vanilin and E 15th-Heptadecenal. In addition to the five compounds, on extracting the banana leaf ambon also there is a compound Phenol, 2,4-bis(1,1-dimethylethyl) and Alloaromadendren.4

Dimana Senyawa 1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) Esther with percent large enough area is located on a second extract banana leaf. On extracting ethanol from plant *Polygonum chinense* L. found a compound in the same amount of enough. The compounds including *plasticizer* is known to have the nature of microbial, antioxidant and antiperadangan.4

Phenol compounds, 2,4-bis(1,1-dimethylethyl) is the compound the fenolik. compounds have

antibacterial activity. The results of research that on the fraction of ethyl acetate leaves *Gynura segetum* diketahui gods existence Phenol compounds, 2,4-bis(1,1-dimethylethyl) and E 15th heptadecenal suspected contribute to microbial activity.4

The research done by Nasir *et al.*, 2016do research on the leaves Gedi (*Abelmoschus manihot L dermatology*) where on the leaf found a compound Hexadecanoic which is a natural antioxidant. From the research above then perhaps antioxidant compounds (*Hexadecanoic acid*) is found in the leaves Gedi (*Abelmoschus manihot L dermatology*) there are also on the Banana Leaf (*Moses paradisiaca* L) or appears antioxidant compounds and other malodor compounds compounds.2

Anti oxidative therapy, particularly using natural antioxidants and the synthesis, is a therapeutic approach that makes sense for the prevention and treatment of heart disease because of the role of oxidative stress in contributing to the initiation and development of liver damage. Even though the concept of the anti oxidative therapy has increased for several decades and intensive efforts have been done, there is a long way to apply application antioxidant in liver disease. In clinical tests today, the mechanism where the drugs or compounds that treat heart disease some can be associated with the capability of anti oxidative, but plain antioxidants are primarily used as a diet supplement to prevent the progress of the disease or improve the results of the patient may also be effective. The role of the complex of oxidative stress in the process of physiological and pathological culture, lack of study of the basic mechanisms in human and other difficulties in research translational is the challenges in the future. In the current study, antioxidant intervention explored widely in the prevention model from the model of treatment, without elaborating the investigations of the mechanisms are unclear. To study the natural plants, dose used, especially the content of antioxidant, always dim, has not yet been a shift in the dose for man. For research in which the dose effects have been examined, only a small part of the plants antioxidant that shows how dose effects to reduce damage to the heart, shows the role of the complex of oxidative stress in the pathogenesis. In the animal research, antioxidant is given in the animal through oral or intraperitoneal injection. The giving of the route is also influence the absorption and bio-availability of antioxidants. In addition, because the heart is organ central for metabolism, oxidative stress on liver diseases interact with many other diseases such as renal disease and diabetes, some models in the animal research must be improved. The limitations in the

current research can cause an antioxidant which shows the desired effect to the prevention or maintenance on the model of the animals, but on the man they do not appear to be effective for the treatment of established disease, which is a barrier for the development of anti oxidative therapy. Remember oxidative stress acting positive in certain circumstances and the difference between animals and human beings, effective dose and the dose secure, long treatment, absorption and bio availability of antioxidants requires thorough investigation. Next to the front of the large-scale samples and the duration of the anti oxidative treatment for heart disease should be done.<sup>5</sup>

The Magic of banana leaf as an anti-inflammation effect also has been examined and proven by the research carried out by the test to extract ethanol Banana Leaf Ambon (*Moses paradisiaca* L) against the White Rats (*Rattus norvegicus* L) and get the conclusion that extracting ethanol banana leaf has anti-inflammatory activity that effective on the dose of 750 mg/kg.<sup>6</sup>

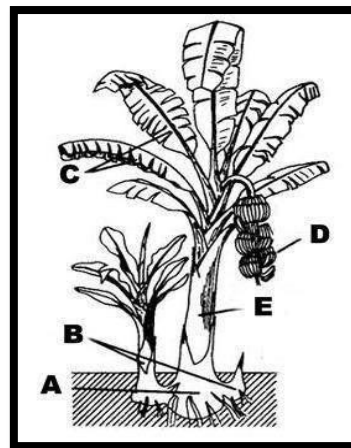
By successive, humans have made use of bananas as traditional medicines drugs while) prior medical actions. According to scientists from Johns Hopkins University in the United States that the potassium (calcium) in bananas help facilitate the transfer of salt (sodium) in the body, so it will quickly lower blood pressure.<sup>7</sup>

Banana Leaf is still young can be used as a traditional medicine to heal inflammation mucous eyes and burn injuries.<sup>7</sup>

Based on the data usability banana leaf tersebutmaka author interested to perform the identification of chemical compounds contained in the yellow kepok banana leaf extract dry Halamahera.

### An overview of the Library

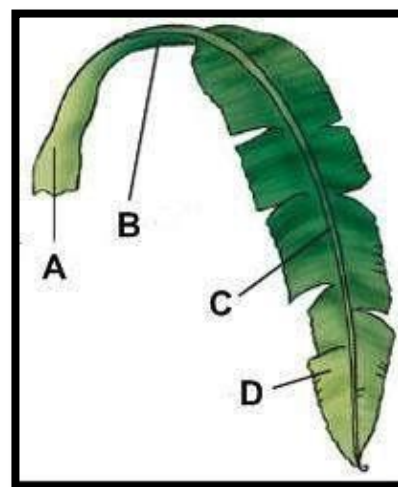
Banana plants are plants herbs that have annual system of roots and batang under ground. Types of bananas that there are differences in the morphology that give variations and banana cultivar level and therefore it from the character can distinguish the type of bananas from some cultivars, although the plants have not grown up and bear fruit. Banana plants are herbs that only fruit once (monokarpik), then died. High between 2 - 9 m, have bars under the land (a hump made out/a) short.<sup>7</sup>



**Figure 1.** Parts of the banana plants (*Moses paradisiaca* L) can be seen in the Figure 1 below.

Description of the Figure 1.1 : (A) banana stem under the land, (B) nanny goats bananas, (C) banana leaf, (D) Some comb of bananas in one cluster, (E) Batang pseudo . Source: *Food and Agriculture Organization of the United Nations Corporate Document Repository*, 2008.<sup>7</sup>

The banana tree rooted rimpang that drawing on fennel barcode. Banana Leaf is composed hooks by blunt, loop, culminated smooth, truncated and easy tersobek. Locate the leaf with real a parallel veins. Stomata on both the surface of the leaves. The leaves are most easily formed in the middle of the plant and leaves the oldest hard pressed out forming the crown of leaves. banana leaf is convenient spread. small pieces of the leaf shaped lanset lengthen, and leaves easy once torn by a breeze hardware because it does not have the bones of the edge that strengthen the sheets of tabernacles.<sup>7</sup>



**Figure 2.** Parts of the leaves can be seen in the Figure 2 below

Description of the Figure 2 : (A) leaf, (B) leaf stems, (C) The leaf, (D) small pieces of leaves.<sup>7</sup>

## The benefits and content of banana plants

To generation, humans have made use of bananas as traditional medicines (drugs while) prior medical actions. The Benefits of bananas for the health of potential enough because the bananas contain nutritious food complete. According to the scientists from Johns Hopkins University in the United States that the potassium (calcium) in banana leaves very help facilitate the transfer of salt (sodium) in the body, so it will quickly lower blood pressure.<sup>7</sup>

Rural Communities take advantage of banana leaf as a Cladding Material food. The old leaf after for chopping, usually used for, livestock such as goats, buffalo or cow for many method for the elements that are required by the animals. The banana leaf that is still young can be used as a traditional medicine to heal inflammation mucous eyes and burns.<sup>7</sup>

The banana skin contains enough fiber penitents, vitamin C, vitamin B, calcium, proteins and carbohydrates that indirectly can be used as an alternative food consumption or drugs. The banana skin can help cure some types of skin diseases such as psoriasis and eksem disease on man. In addition, banana skin also helps prevent new lines in the formation of the sagging and help the skin more smooth and fresh Sarulo. The banana skin can also be used in the making of pektin, nata, flour, vinegar through the process of fermentation alcohol and acid vinegar, even can be used for the health of the eyes, and as medicine pads that reduce sharpness of pain and pain aritis.<sup>7</sup>

Banana also regulates to remove sputum, healing patients with anemia, lower blood pressure, give the power to think, rich fiber and help to diminish the influence of nicotine, prevent stroke, controlling body temperature especially for pregnant, neutralize stomach acids, helps the nervous system, and the seeds of bananas can be used to heal lender membrane inflammation of the bowel, mouth sores. The fruit of *Musa paradisiaca* and *Moses sapientum* by tradisionl can be used to treat diarrhea, dysentery, intestinal lesions, on ulcerative ulseratif, diabetes, mouth sores, uremia, nefritis, uric acid and hypertension and heart disease.<sup>7</sup>

The research done by Budi HS et al, 2016 concluded that lymph banana stem ambon (*Moses paradisiaca* 7.6 var. *Sapientum*) role in accelerating the process of wound healing of tooth extraction on white mice by increasing the expression "platelet derived growth of BB with proliferation and fibroblast. The optimum dose lymph banana stem as wound healing after tooth extraction on white wistar rats is 30 mg with a decrease in water extract.<sup>8</sup>

Not only as medicine, banana plants it can also be used as material for the care of the beauty of the body. Banana capabilities for the maintenance of the beauty of this body because of the nutritional elements such as potassium, vitamin C, vitamin B and vitamin E.<sup>7</sup>

There are oxidative stress on the affected children diabetes mellitus type 1 to 76 percent of patients who are diagnosed. On the children of diabetic patients with 400 mg Vitamin E every day and for three months are able to repair oxidative stress.<sup>9</sup>

## Extracting

Extracting is bicarbonate dry, thick, or liquid made with penyari simplisia according to the way that matches, outside of the influence of direct sunlight. Dry extract must be easily digerus become debris.<sup>10</sup>

Extraction is the process of separating materials from mixed with Zanjabil with used solvent in accordance. The process of extraction dihentikn when achieved a balance between the concentration of a compound in the solvent with a concentration in plant cells. After the extraction process, solvent separated from samples with filtering. Unpack the beginning difficult separated through a single separation techniques to isolate single compounds. Therefore, unpack the early need to be separated into fractions that have incorrect polarity and the size of the same molecule.<sup>11</sup>

The methods that can be used are:

### a) Macerasion

Macerasion is a simple method used the most. This way according to the small scale and the scale industriAgoes, 2007 in Mukhriani (2014). This method is done with mamasukkan plant powder and solvent according to the inert container which closed containers at room temperature. The process of extraction stopped when achieved a balance between the concentration of a compound in the solvent with a concentration in plant cells. Setelahproses extraction, solvent separated from samples with filtering. The main loss from the method is macerasion time consuming, solvent used enough and probably several compounds lost. In addition, several compounds may be difficult diekstraksi at room temperature. But on the other hand, macerasion method can avoid the destruction of these compounds are termolabil.<sup>11</sup>

### b) Ultrasound-Assisted Chemical Solvent Extraction

Is a method of macerasion modified using *ultrasound assistance* (a signal with high frequency, 20 kHz). The container that contains the pollen samples were placed in the *ultrasonic container* and *ultrasound*. This is done to provide

mechanical pressure on the cells to produce the cavity samples. The damage of the cell can cause increased kelarutan compound in the solvent and increase the extraction of.11

#### c) Perkolasi

On perkolasi method, pollen samples moistened slowly in a perkolator (cylinder container equipped with taps at the bottom). Solvent added on the top of the sample powder and left drips slowly on the bottom. The advantages of this method is the samples always touched by the solvent new. While the disadvantages is if the samples in the perkolator not homogeneous then solvent will be difficult to reach all areas. In addition, this method also requires many solvents and time consuming.11

#### d) Soxhlet

This method is done by placing the powder sampeldalam sarongs cellulose (can be used paper filter) in klonsong placed at the top of the knops and under the Conditioner condenser. Solvent fit into the knops and penangas temperature regulated under reflux temperature. The benefits of this method is the process of extraction of wastage, samples terekstraksi by pure solvent condensation results so it does not need many solvent and not time consuming. The disadvantages is the compound that is termolabil can be degraded areas because the extract obtained continuously located on the boiling point.11

#### e) Reflux and Steam Destilasi

On reflux method, samples included with the solvent into the gourd that is connected with the Conditioner condenser . Solvent heated up until it reaches boiling point. Terkondensasi steam and back into the Gourd

Steam Destilasi have the same process and is usually used to extract essential oil (a mixture of various compounds evaporated). During the global warming, steam terkondensasi and destilat (separate as 2 part that not mingling with one another) ditampunag in the container that is connected with the Conditioner condenser. The loss of these two methods is the compound that is termolabil can be degraded forest.11

### Standard Research

The sample in this research is the Banana Leaf Halmahera (*Moses paradisiaca* L). The leaves taken is daunsegar is old and open the perfect and is located on the branches or bars that receive direct sunlight perfect.13

Bananas taken foliage was around 15 months. samples taken in Counties North Halmahera, Tongas Tobelo, Wosia Village.

### The appliance and Research Material

#### The appliance

1. The Oven
2. Stirrer bars
3. Chemical beaker
4. The Measuring cup
5. Bunsen
6. Erlenmeyer
7. Rotavator
8. Feet three
9. Aluminum foil
10. The paper filter
11. Blender Jar
12. The sieve mesh 65
13. The appliance GC-MS

#### Ingredients

1. The leaves yellow kepok banana (*Moses paradisiaca* L)
2. Methanol
3. Spritus

#### Work Procedures

##### A. The making of extracting the Banana Leaf (*Moses paradisiaca* L)

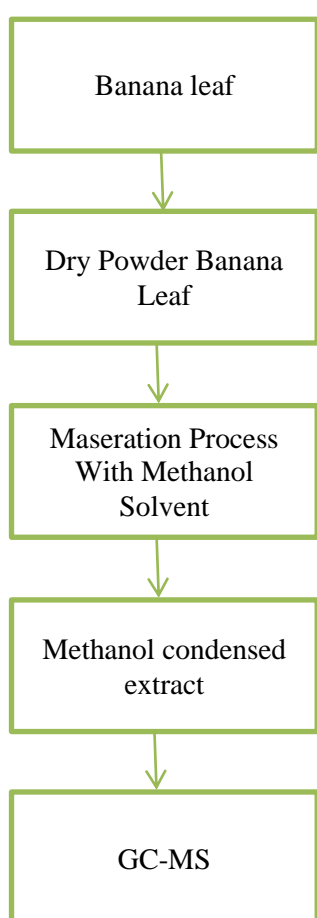
The steps the making of extracting the banana leaf:

1. Banana Leaf is old collected dandicuci with water flow
2. After being washed banana leaf to be shorn small.
3. Weight leaves 990gr bananas and dried without direct sunlight hinnga easy diremah and broken.
4. Simplisia banana leaf that has dried weighed and obtained the weight 300gr then made into powder with the appliance pollination until smooth.
5. Simplisia powder banana leaf that has smooth sieving and weighed and put in the container and given label.
6. Simplisia powder banana leaf is inserted into the compartment maceration and am anointed penyari liquid methanol until passing through simplisia powder.
7. The lid and leave for 5 days are protected from the light of the sun with done stirring each day.
8. 5 days versus the sieve and oily residues pressed.
9. Residual simplisia banana leaf plus liquid penyari again daily bread and stirring.
10. The container closed and left for 2 days and protected from the light of the sun
11. After two days, separate with soaks.

12. The banana leaf simplisia Filtrate evaporated on the water or with rotavator penangas until obtained extracting thick.
13. Unpacking with thick banana leaf obtained weighed and given label.

### How identifikasi compounds using GC-MS

Unpack the thick methanol difraksinasi in chemical beaker and done using the identification GC that function to test the purity of certain ingredients, or separate the various components of the mixture that can help in identifying the complex compounds. Then followed by using the appliance MS that functioned as a compound converter samples become the ions positive signals and negative ions produced from the source of the plant.<sup>12</sup>



**Figure 3.** Workflow Compound Identification Banana Leaf (*Moses paradisiaca* L).

## RESULTS

Collection samples fresh yellow kepok banana leaf (*Moses paradisiaca* L) dilakukandi North Halmahera District, Sub-district Tobelo Midst, Wosia Village from July until August. samples had been collected and then washed with water flow and small

small to be shorn and dried. Simplisia dried corns with the blender and soaked with methanol for 5 days with done stirring each day. After 5 days of being immersed and then filtered and residual soaked back with methanol for 2 days and after two days done re-filtering. Filtrat or liquid methanol filtration results with greenish black color evaporated until obtained extracting thick.

Thick extract obtained black colored yellowish green with a heavy 10 grams. Thick extract obtained the test is done active substance in Gc-Ms, extracting samples given the pressure of helium or nitrogen so that the sample is in the form of steam before were injected into the column (Gc). From the Gc column to detector systems (MS) to separated splits into fragments. Fragments produced indicates the existence of these compounds that will appear in the appliance Gc-Ms.

**Table 1.** GC-MS Thick Extract yellow kepok banana leaf Dry Halmahera (*Moses paradisiaca* L).

Samples	Compound	The womb (%)
Yellow kepok banana leaf Dry Halmahera	Hexadecanoic acid	1.31
	ethyl Esther	2.02
	Hexadecanoic acid	4.81
	(2E)-3,7,11,15-tetremethyl-2-hexadecem-1-ol	2.13
		1.20
	The 3-Pyridine	1.92
	carboxamide, oxime,	12,10
	N-(2-trifluoromethylphenyl)	18,36
		5.99
	9 Of Tricosene	5.00
		2.65
	Squalene	3.28
		3.62
	. Gamma-Tocopherol	5.03
	Vitamin E	3.02
	3,21	
Geranylgeraniol	2.93	
21H-Bilin-1(2H)-one,		
3,17,18,23-tetrahydro-		
3,3,7,8,12,13,17,17,19-	6.08	
nonamethyl	3.84	
	1.76	
Stigmasterol		

Samples	Compound	The womb (%)
	The sitosterol beta.	
	The cyclotetradecatrien 2,5,9-1-ol,2,6,10- trimethyl-13-(1- methylethenyl)-,[1S- (IR*,2E,5E,9E,13S*)]	
	The-7,22 Ergosta dien- 3- ol,(3.beta.,5.alpha.,22E)	
	2 of 3-methyl-(3 of 2- butenyl methyl)-2-(4 of 3-methyl- pentenyl)oxetane	

## DISCUSSION

Yellow kepok banana leaf Halmahera (*Moses paradisiaca* L) is the parts of the plant from the family *Musaceae* or tribe of the bananas pisang. In the traditional banana leaves are used as a wrapper food and giver of flavors and none in food processing.<sup>4</sup> Extracting methanol yellow kepok banana leaf Dry Halmahera contain a compound Vitamin E with the highest number of 18,36%. Vitamin E is one of the eight molecules that has kromanol ring (kroman ring with one hydroxyl group alcohol) 12-side chain carbon alifatis which contains two methyl groups in the middle and more than two methyl groups at the end of the. Vitamin E is a vitamin that have antioxidant activity that can neutralise free radicals. The intake of Vitamin E which penitents in food can prevent Parkinson Disease.<sup>15</sup>

Based on the research done by Ripka Parang on 2016, Vitamin E is also found in extracting the Golobe (*Hornstedtia alliacea*), with presentation 1,17%.<sup>16</sup> if seen from the results of the Vitamin E is contained in the yellow kepok banana leaf extract dry far greater than the Vitamin E found in extracting the Golobe.

One of the compounds are also found in the yellow kepok banana leaf extract dry Halmahera is Beta-sitosterol yang is one of several Phytosterol Ester (sterol in plants) which has the same chemical structure with the structure of cholesterol. Sitosterol is white powder such as candles and special memilikibau. Is hidrofobik Sitosterol and dissolved in alcohol. Both himself and at

the same time with the same Phytosterol Ester, Beta-sitosterol can reduce the amount of cholesterol in the blood and sometimes used in treating hypercholesterolemia. Beta-sitosterol inhibits increase the absorption of cholesterol in the intestines. After absorbed in the intestines, sterol will be carried away by the lipoprotein and incorporated into the cell membrane. Phytosterol Ester and phytostanol same inhibit the taking of bilier cholesterol and cholesterol food, so that the level of LDL cholesterol and total cholesterol in the serum decreases. Because the structure of Beta-sitosterol is very similar to the structure of the cholesterol, then Beta-sitosterol take cholesterol food and bilier position in micelle that is produced in the intestines caused by smooth muscle. This is the cause of increase the absorption of cholesterol in the body. Beta-sitosterol is also found in the *prophet*, cernilton Palmetto berry (extracting polen), and *Pygeum africanum* (African plums) which has been clinically evaluated for use in the treatment of mild prostatic hyperplasia.<sup>15</sup>

## Conclusion

With through a series of steps to get the yellow kepok banana leaf extract Halmahera and then tested with the appliance Gc-Ms it can be concluded that the leaves yellow kepok banana Halmahera contains Vitamin E with the highest presentation of 18,36%. Where Vitamin E functions as an antioxidant that can neutralize free radicals, so that the risk of *stress oksidative* and degenerative disorder decreased. Besides, in yellow kepok banana leaf also there is a beta-sitosterol compounds that fast decrease kelestero. The two compounds are potentially used as herbal medicines because of raw material get easily.

## Suggestions

From the conclusion above, researchers suggested as follows:

- 1) For the Government to the fore more support and more help again in terms of adequate facilities and infrastructure in the examine the ingredients of natural medicine so that the students can improve their work.
- 2) For education institution in order to provide advice and encouragement to the students to develop and forward research about yellow kepok banana leaf dry Halmahera.
- 3) For the next researcher, in order to develop this research so that can be bicarbonate and useful herbal the wider community.

## REFERENCES

1. KEMENKES. PERMENKES RI Nomor 87 Tahun 2013 Tentang Peta Jalan Pengembangan Bahan Baku Obat.Kesehatan. Jakarta: KEMENKES RI, 2013.
2. Muh N, Mapanawang AL, Rusu N, Maengkom AO, Latuconsina KR, Tualeka A, et al. Identification of Hexadecanoic Acid in Gedi Extract (*Abelmoschus L medik*). International Journal of ChemTech Research, 2016;Vol 1(01):23-27, Doi: 10.22301/IJHMCR2528-3189.79.
3. Mapanawang AL. Riset di Bidang Kesehatan. Tobelo: Yayasan Medika Mandiri, 2016.
4. Mastuti TS, Handayani R. Senyawa Kimia Penyusun Ekstrak *Ethyl Asetat* dari Daun Pisang Batu dan Ambon Hasil Distalasi Air. Semarang: Universitas Pelita Harapan, 2014.
5. Li S, Tan H-Y, Wang N, Zhang Z-J, Lao L, Wong C-W, et al. The Role of Oxidative Stress and Antioxidants in Liver Diseases. International Journal of Molecular Sciences, 2015;Vol 16:26987-26124, Doi: 10.3390/ijms161125942.
6. Sukmawati, Yuliet, Hardani R. Anti-Inflamatory Activity Test of Ethanolic Extract of Banana Leaf (*Musa paradisiaca L.*) on Carragenan-Induced Paw Edema in White Rats (*Rattus norvegicus L.*). Galenika Journal of Pharmacy, 2015;Vol 1(2):6.
7. Yuliasih PD. Biosistematika Berbagai Varietas Pisang (*Musa paradisiaca L.*) Berdasarkan Karakter Morfologi Melalui Metode Fenetik. Surabaya: Universitas Airlangga, 2016.
8. HS B, IL K, SA S. Ambonese banana stem sap (*Musa paradisiaca var. sapientum*) effect on PDGF-BB expressions and fibroblast proliferation in socket wound healing. International Journal of ChemTech Research, 2016;Vol 9(12):558-564, Doi: 2455-9555.
9. Martinez AY, Rodriguez AD, Tellez ME, Amarales IM. Antioxidant Effects of Vitamin E in Diabetes Melitus Type 1. International Journal of Clinical Pharmacology & Toxicology, 2013;Vol2(3):63-65, Doi: <http://dx.doi.org/10.19070/2167-910x-1300013>.
10. POM B. Acuan Sediaan Herbal. Jakarta: Badan POM RI, 2010.
11. Mukhriani. Ekstraksi, Pemisahan Senyawa, dan Identifikasi Senyawa Aktif. Jurnal Kesehatan, 2014;Vol VII(2):4.
12. Bahti HH, Kromatografi Gas Teori dan Aplikasinya. Bandung: Alfabeta, 2013.
13. Anggreni SF. Laporan Penyiapan Sampel Sambiloto (*Andrographis Paniculata*). Makassar: Universitas Hasanuddin, 2014.
14. Budiadji AF, Mapanawang AL, Sedeng D, Muh N, Tualeka A, Fambrene BT, et al. Identification of Hexadecanoic Acid Compound which in Golobe Extract (*Hornstedtia zingiberaceae*). International Journal Of Health Medicine and Current Research, 2016;Vol 1(01):47-51, Doi: 10.22301/IJHMCR2528-3189.79.
15. Syamsudin, Nutrasetikal. Yogyakarta: Graha Ilmu; 2013.
16. Parang R. Identifikasi senyawa Trans Caryophyllene yang terkandung dalam ekstrak Golobe (*Hornstedtia alliacea*). Tobelo: Yayasan Medika Mandiri, 2016.

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