

IDENTIFICATION OF CHEMICAL COMPOUNDS ON HALMAHERA RED FRUIT (*Trichosanthes quinquangulata* A. Gray) USING CHROMATOGRAPHY-MASS SPECTROSCOPY (GC-MS) GAS METHOD

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ABSTRACT

Background: Plants play an important role in the environment by supporting all types of biological life forms. Plants also play a promising role in the treatment of disease. One such plant species is *Trichosanthes*. Research Objectives: identification of chemical compounds in the red fruit of Halmahera (*Trichosanthes quinquangulata* A. Gray) using the GC-MS (Gas Chromatography-Massa Spectrometry) method.

Type of Research: This type of research is experimental research with a laboratory scale. Based on the results of the GC-MS analysis that has been carried out, it can be concluded as follows: The ethanol extract of Halmahera red fruit contains chemical compounds of fatty acids, steroids and flavonoids The ethanol extract of Halmahera red fruit contains 7 compounds of the fatty acid group, namely Tetradecanoic acid, ethyl ester (1.36%); Ethyl 9-hexadecenoate (5.68%); Hexadecanoic acid, ethyl ester (25.52%); Hexadecanoic acid, ethyl ester (1.24%); Hexadecanoic acid, ethyl ester (1.17%); Ethyl linolenate (38.23%); Octadecanoic acid, ethyl ester (15.23%); the steroid group is Chondrillastero (2.16%) and the flavanoid group is Ergost-7-en-3-ol, (3, beta) (1.24%).

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INTRODUCTION

Indonesia is a country with abundant natural resources, almost all types of plants can grow in this country.¹ Indonesia's wealth of biological resources ranks third in the world after Brazil and Zaire so that it is grouped in the mega country of biodiversity.² Most of it has been used by our ancestors to treat various diseases.

Health is the welfare of every living being where the current level of health is facing enormous challenges. One of the reasons is the increasing cost of medical treatment, which can worsen the quality of life and public health. In line with the increasing public need for medicine, people in general prefer to achieve a health degree by using traditional medicine or herbal medicine.⁴

Plants play an important role in the environment by supporting all types of biological life forms. Plants also play a promising role in the treatment of disease. One such plant species is *Trichosanthes*. *Trichosanthes* is one of the largest genera belonging to the Cucurbitaceae family with about 100 species spread over East Asia, Malaysia and Tropical Australia to Fiji and Subtropical Eurasia.⁵

One of the *Trichosanthes* species is *Trichosanthes quinquangulata* A. Gray is a climbing plant that grows in Taiwan, China, the Philippines, Indonesia, Malaysia, Burma, New Guinea, and Vietnam. The tendrils are forked. The leaves are simple and spiral in shape.⁶ The fruit is round, 8 cm long, hairy, red, and contains several small brownish seeds.⁷

This plant is used to treat various types of diseases. It has been reported that *Trichosanthes* and its species are useful as antidiabetic, antifungal, antibacterial, skin disorders, hepatoprotective, cholesterol-lowering, antioxidants, and wound healing.⁸

In the Philippines, the seeds are fried and the cooking oil is used externally to soothe itching. The seeds are reduced to a powder and mixed with wine to make a drink used to relieve stomach aches.⁹

In mainland China, *Trichosanthes* species including *Trichosanthes quinquangulata* A. Gray or Wu Jiao Gua Lou have attracted a great deal of interest for their ability to break down a ribosomal inhibitory protein called trichosanthin, which has shown encouraging signs as an anti-human immunodeficiency virus (HIV) drug. *Trichosanthes* species are complicated in addition to trichosanthin, trichomycline, which induces apoptosis. Cytotoxic multifloran triterpenoids including carounidols are known to occur in *Trichosanthes* species.⁹

One of the genera of *Trichosanthes* plants that has not been widely studied scientifically is the species *Trichosanthes quinquangulata* A. Gray from the Cucurbitaceae family. Based on the above background, the researchers are interested in conducting research on the identification of chemical compounds in the red fruit of Halmahera (*Trichosanthes quinquangulata* A. Gray).

RESEARCH METHOD

Types of research

This type of research is experimental research with a laboratory scale.

Population and Sample

1) Population

Population is the whole object of research. The population in this study was the red fruit of Halmahera (*Trichosanthes quinquangulata* A. Gray) which was taken from Simau Village, Galela District, Kab. North Halmahera.

2) Samples

The sample used in this study was 200 grams of the simplicia powder of Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray).



Figure 1. *Trichosanthes quinquangulata* A. Gray: a. Habitat; b. Leaf base with various glands; c. Bracts with round glands; d. Male flower petals; e. Calyx and corollas of male flowers; f. Fruit⁷

Work Procedures

1) Material Collection

The plant used was the dried fruit of Halmahera (*Trichosanthes quinquangulata* A. Gray). Halmahera red fruit obtained from Simau village, Kec. Galela, in wet sorting, then washing it with running water and then drying it by aerating it at room temperature.

2) Preparation of Halmahera Red Fruit Methanol Extract
Simplicia Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray) is sorted back from the remaining dirt. The sorted simplicia is then mashed by means of coarsely ground until a small powder is obtained and then sieved is intended for simplicia size uniformity so as to facilitate the extraction process. After that, the red fruit extract of Halmahera was made by maceration. A total of 200 grams of powder was macerated with 600 ml of 70% ethanol solvent. Maceration is carried out for 5 days at room temperature and protected from direct sunlight while stirring occasionally. After 5 days, the macerate is filtered and the residue is squeezed out. Then the residue is remacerated with 600 ml of ethanol solvent for 3 days, then filtered. Maserat I and II were collected and aerated

to produce a thick ethanol extract of Halmahera's red

$$\text{Rendement (\%)} = \frac{\text{Extract weight obtained (grams)}}{\text{the extracted simplicia weight}} \times 100\%$$

fruit.

3) Identification of Chemical Compounds

The thick ethanol extract of Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray) was purified by fractionation using column chromatography. The fraction obtained is accommodated in a test tube. Physically, each fraction gives the same solution color. Each fraction obtained was then re-tested by TLC. The TLC analysis of the fraction which showed the presence of spot spots was then analyzed by Gas Chromatography Mass Spectrometry (GCMS).

The fraction of the methanol extract of Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray) was analyzed using GC-MS. A total of 2 µl fraction from the ethanol extract of Halmahera red fruit was injected into the GCMS column with helium as the carrier gas. The eluted component will be detected on the mass detector. The spectrum of known compound components is stored in the NIST library and determines in the name of the compound, molecular weight and is included in the class of compounds such as terpenoids, alkaloids, flavonoids, phenols, sterols, fatty acids and others which are useful compound components for GC-MS analysis. 19

RESULTS

A. Sample preparation

Sample preparation was carried out in Simau Village, Kec. Galela, Kab. North Halmahera. The red fruit samples of Halmahera (*Trichosanthes quinquangulata* A. Gray) were wet sorted then washed under running water, then chopped and dried for 5 days using direct sun. The dried simplicia are then sorted again from the remaining or damaged dirt. The dry sorted simplicia is then mashed until a small powder is obtained and then sieved using an 80 mesh size sieve in order to uniform the simplicia size so that it makes the extraction process easier..

B. Organoleptic Examination

Organoleptic examination of Halmahera red fruit simplicia (*Trichosanthes quinquangulata* A. Gray) can be seen as in the table 1:

No.	Halmahera Red Fruit Simplicia	Information
1.	Shape	Oval
2.	Color	Fruit skin: Red
3.	Smell	Rancid
4.	Taste	Salty, slightly spicy

Source: Primary Data, 2020

C. Extraction and Extract Yield

The extraction method for Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray) uses maceration. A total of 200 grams of Halmahera red fruit simplicia powder was macerated with 600 mL of 70% ethanol in a ratio (1: 3). The extraction process lasts for 5 days at room temperature and is protected from direct sunlight while stirring occasionally. After 5 days, the macerate I was filtered and the residue was squeezed out. Then the residue was remacerated with 600 ml of 70% ethanol for 3 days, after which, macerate II was filtered. Maserate I and II were combined then evaporated the solvent at room temperature to produce a thick ethanol extract of Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray). The results of visual observation of the ethanol extract of Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray) in the form of light yellow macerate are then evaporated by aerating until 26 grams of thick brown ethanol extract are obtained with 13% extract yield as presented in the table 2:

Sample	Simplicia Sample (gram)	Extract (gram)	Rendem ent (%)
Halmahera Red Fruit	200	26	13

Source: Primary Data, 2020

The size of the extract rendamen shows the effectiveness of the extraction process, the effectiveness of the extraction process can be influenced by the type of solvent, the simplicia particle size, the extraction time and the extraction method used.

D. Identification of Halmahera Red Fruit Chemical Compounds

The following is the identification result of the chemical compound identification of the 70% ethanol extract of Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray) as in the table 3 :

Table 3. Results of Identification of Halmahera Red Fruit Chemical Compounds

Type / Sample Code	RT	Q	Name of Compound	Content (%)
Halmahera Red Fruit	25.8 24	95	Tetradecanoic acid, ethyl ester	1,36
	27.7 83	99	Ethyl 9-hexadecenoate	5,68
	27.9 76	99	Hexadecanoic acid, ethyl ester	25,52
	28.2 10	97	Hexadecanoic acid, ethyl ester	1,24
	28.5 34	93	Hexadecanoic acid, ethyl ester	1,17
	29.1 00	93	Ethyl linolenate	38,23
	29.2 03	97	Octadecanoic acid, ethyl ester	15,23
	36.6 43	83	Chondrillast erol	2,16
	37.5 05	89	Ergost-7-en-3-ol, (3, beta)	1,24
	25.8 24	95	Tetradecanoic acid, ethyl ester	1,36

Source: Primary Data, 2020

DISCUSSION

Based on the results of laboratory examination of the ethanol extract sample of Halmahera red fruit (*Trichosanthes quinquangulata* A. Gray) which is presented in table 4 using Gas Chromatography Mass Spectroscopy (GC-MS) shows that Halmahera's red fruit flesh contains 7 identified chemical compounds, namely Tetradecanoic acid, ethyl ester (1.36%); Ethyl 9-hexadecenoate (5.68%); Hexadecanoic acid, ethyl ester (25.52%); Hexadecanoic acid, ethyl ester (1.24%); Hexadecanoic acid, ethyl ester (1.17%); Ethyl linolenate (38.23%); Octadecanoic acid, ethyl ester (15.23%); Chondrillastero (2.16%); Ergost-7-en-3-ol, (3, beta) (1.24%).

From the chromatogram, there are three most dominant peaks seen from the percent area, namely 38.23% with ethyl linolenate at the absorption peak with a retention time of 29,100 minutes; 25.52% with a compound Hexadecanoic acid, ethyl ester at the peak of absorption with a retention time of 27,783 minutes; 15.23% is a compound of Octadecanoic acid, ethyl ester at the peak of absorption with a retention time of 29,203 minutes. The dominant compounds in the 70% ethanol extract of Halmahera red fruit have biological activity, namely as antibacterial, antifungal, antioxidant, anti-inflammatory and can reduce levels of bad cholesterol (Low Density Lipoprotein).

Analysis using the GC-MS method is the key in the analysis of unknown plant chemical components. Analysis by GC-MS has been widely used in identifying hundreds of components of compounds present in plant cells that cannot be done by ordinary phytochemical screening. This is because phytochemical screening is limited to the identification of compound groups. 9

CONCLUSION

Based on the results of the GC-MS analysis that has been carried out, it can be concluded as follows:

1. The ethanol extract of Halmahera red fruit contains chemical compounds of fatty acids, steroids and flavonoids
2. The ethanol extract of Halmahera red fruit contains 7 compounds of the fatty acid group, namely Tetradecanoic acid, ethyl ester (1.36%); Ethyl 9-hexadecenoate (5.68%); Hexadecanoic acid, ethyl ester (25.52%); Hexadecanoic acid, ethyl ester (1.24%); Hexadecanoic acid, ethyl ester (1.17%); Ethyl linolenate (38.23%); Octadecanoic acid, ethyl ester (15.23%); the steroid group is Chondrillastero (2.16%) and the flavanoid group is Ergost-7-en-3-ol, (3, beta) (1.24%).

SUGGESTIONS

The suggestion in this study is that further research is needed to determine the pharmacological effects and toxicity tests on experimental animals.

REFERENCES

1. Gagiwu L, Pareta D, Bandari J, Budiadji A. Identification Methoxyeugenol Compounds In Fruit Extract Methanol Golobe Marbles (*Etilingera alba* (Blume) A.D. Poulsen). Jurnal IJHMCR. 2018 December ; 3 (4) : 1071 – 5.
2. Sambou C, Pontho F, Ofa M. Identification Of Octadecadienoic Acid That Compounds Within Extract Methanol Stem Golobe Marbles (*Etilingera alba* (Blume) A.D Poulsen). Jurnal IJHMCR. 2018 September ; 3 (1) : 1015 – 19.
3. Gagiwu L, Pareta D, Bandari J, Budiadji A. Identification Methoxyeugenol Compounds In Fruit Extract Methanol Golobe Marbles (*Etilingera alba* (Blume) A.D. Poulsen). Jurnal IJHMCR. 2018 December ; 3 (4) : 1071 – 5.
4. Ismail, Nyanyi S, Mapanawang A. L. The Identification Of Chemical Compounds Contained

- In The Methanol Extract Grain Halmahera (*Setaria italica* Beauv.) Jurnal IJHMCR. 2018 June ; 3 (2) 939-42.
5. Brigittae Duyfjes and Kanchana Pruesapan. 2004. Genus *Trichosanthes* L. (*Cucurbitaceae*) di Thailand. Bangkok Herbarium, Department of Agriculture. 50 Phahonyothin Road, Chatuchak, Bangkok, 10900, Thailand.
 6. Darmapatni A., Basori A., dan Suaniti N. 2016. Pengembangan metode GC-MS untuk Penetapan Kadar *Acetaminophen* Pada Spesimen Rambut Manusia. Jurnal Biosains Pascasarjana Vol. 18. Universitas Airlangga, Indonesia.
 7. Gill NS, Arora Rashmi, Kaur Manjinder, Bala Kiran. 2016. Jurnal Internasional Farmasi dan Bio – *Trichosanthes* : Tinjauan Komprehensif. Departemen Kimia Farmasi, Institut Farmasi Rayat, Railmajra, SBS Nagar, Pb. 144533.
 8. Boes E., Analisis, Identifikasi Precursor dan Hasil Degradasi Senyawa Senjata Kimia Menggunakan Teknik *Gas Chromatography Mass Spectrometry-Electron Ionisasi* (GCMS-EI). Pusat Penelitian Kimia. JKT, Vol.16 No. 1, Juni 2014:1-9. ISSN 0853-2788.
 9. Doughari James Hamuel., *Phytochemicals : Extraction Methods, Basic Structures and Mode of Action as Potential Chemotherapeutic Agents*. Department of Microbiology School of Pure and Applied Sciences, Federal University of Technology Yola, Nigeria. 2012.
 10. Khotimah K., Skrining Fitokimia dan Identifikasi Metabolit Sekunder Senyawa Karpain Pada Ekstrak Metanol Daun *Carica pubescens* Lenne & K. Koch Dengan LC/MS (*Liquid Chromatograph-tandem Mass Spectrometry*). Universitas Islam Negeri Maulana Malik Ibrahim. Skripsi. 2016.
 11. Laban Rasingam. 2012. *Trichosanthes quinquangulata* (*Cucurbitaceae*) – A new record for India from Andaman Islands.
 12. Mapanawang, Arend. 2020. Hasil Pemeriksaan Laboratorium. Pemerintah Provinsi Daerah Khusus Ibukota Jakarta.
 13. Pradina E.L., Aplikasi Metode GC-MS Untuk Penetapan Kadar Residu Profenofos Pada Buah Strowberi (*Fragaria* Sp.) Setelah Pencucian. Naskah Publikas Fakultas Farmasi Universitas Muhammadiyah Surakarta. 2012.
 14. Rugayah., 2001. Species Diversity of *Trichosanthes* In Gunung Halimun National Park. Bidang Botani, Pusat Penelitian Biologi-LIPI, Bogor.
 15. Sukma D, IM Artika, ET Tondok. 2008. Protein Antimikrob dari Tanaman *Trichosanthes*. Jurnal Ilmu Pertanian Indonesia, Desember 2008. Vol. 13 No.2. ISSN 0853-4217
 16. Wiart Christophe Pharm. D. 2006. *Medicinal Plant of Asia and the Pacific*. Copyright 2006 Taylor & Francis Group, LLC. London.