Original Article

Standardization And Characterization Of Essential Oil Of Patchouli Stem (Pogostemon Cablin Benth.) By Chromatography-Mass Spectrometry (GC-MS) Method

Aktsar Roskiana Ahmad*[1,2*], Rafika Haerunnisa Saleh[2], Virsa Handayani[1,2]

[1]Faculty of pharmacy, Universitas Muslim Indonesia, Urip Sumoharjo Km. 5, 90231, Indonesia
[2]Department of Pharmacognosy phytokimia, Urip Sumoharjo Km. 5, 90231,Indonesia

*corresponding: aktsar.roskiana@umi.ac.id
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Abstract

Patchouli (Pogostemon cablin Benth.) is one kind of the plants producing essential oil that can be used in the treatment, because the content on the patchouli oil is seskuiterpen, cytotoxic chalcones, and antimutagenik. This study aimed to establish the standardization of crude drugs and characterization of essential oil of patchouli stem by GC-MS. The research carried out includes the determination of specific and non-specific parameters, as well as the characterization of essential oil by GC-MS. The standardization result include the non-specific parameters including identity test, that is, patchouli stem botanicals, botanical organoleptic test forming dry powder, khaki, distinctive smell, bitter taste, water soluble extract content 0f 5,9891%, levels of ethanol soluble extract 0f 8,0578% and positive compounds identification containing alkaloids, flavonoids, terpenoids, essential oils as well as specific parameters, that is, drying shrinkage of 0,8281%, moisture content of 1,7968%, total ash content of 5,7730%, and acid insoluble ash content of 0,3459%. The result of GC-MS characterization of essential oils derived from patchouli stem by stahl distillation shows five main components, namely benzaldehyde, 2,4-dimethyl, phenol,2,4-Bis91,1-Dimethylethyl1,6-Methanonaphthalen-1(2H)-OL, Octahydro-4,8A,9,9-Tetramethyl, octadecanoic acid, ethyl ester and hexadecanoic acid, ethyl ester.

KEYWORDS: Patchouli stem, patchouli oil, simplicia standardization parameters

INTRODUCTION

Our country is one of the largest essential oil-producing countries in the world, and this oil is also a commodity that generates foreign exchange. Therefore, in recent years, essential oils have received considerable attention from the Indonesian government (Syauqiah et al. 2008).

Essential oils are also known as etheric oils or flying oils (essential oils, volatile oils) produced by plants. Obtained from the roots, stems, leaves and flowers of plants. Essential oils have volatile properties at room temperature without decomposition, have apungent taste, smell good according to the smell of the plant, generally soluble in organic solvents and insoluble in water (Setya, Budiarti & Mahfud 2012).

Indonesia has only produced twelve types of essential oils, namely: clove oil, ylang oil, patchouli oil, vetiver oil, nutmeg oil, eucalyptus oil, citronella oil, ginger oil, pepper oil, sandalwood oil, cubeb oil, and masoyi oil. Of these twelve types of essential oils, six are the most prominent in Indonesia, one of which is patchouli oil (Syauqiah et al. 2008).

Patchouli (Pogostemon cablin Benth.) belongs Lamiaceae which in the world of trade is known as patchouli. Patchouli entered Indonesia more than a century ago, first cultivated in Aceh, then developed in several other provinces such as North Sumatra, West Sumatra, West Java, Central Java and East Java (Nuryani 2006) .

Patchouli oil is obtained from the distillation of the leaves, stems and branches of the patchouli plant (Pogostemon cablin Benth.). Patchouli oil is used in the perfume, cosmetic, antiseptic, and insecticide industries. With the development of traditional medicine, patchouli oil is also widely used as an aromatherapy ingredient (Syauqiah et al. 2008).

Seeing the great potential of patchouli (Pogostemon cablin Benth.) as an essential oil-producing plant that can be used as medicine, it is necessary to standardize simplicia so that it can determine the quality and safety of simplicia raw materials used to support health. By standardizing simplicia, the objectives of standardization can be achieved, namely maintaining consistency and uniformity of efficacy, to ensure safety and stability aspects of simplicia, as well as increasing economic value (Saefudin 2011).

METHODOLOGY

1. Sampling and Processing

Sample used was patchouli stem (Pogostemon cablin Benth.). Patchouli plants at the ready-to-harvest age, the stems are taken, sorted between good and bad stems, then cleaned of adhering dirt using running water and then dried by aerating, then weighed until it is obtained as fresh weight, then patchouli stems are dried. Then sorted dry, then powdered using a blender.

2. Simplicia Standardization

a. Specific Parameter

a) Parameters Simplicia Identity

Parameters Simplicia identity parameters were carried out with the aim of providing an objective identity of plant names. The nomenclature description includes the simplicia name, the Latin name of the plant, the part of the plant used and the Indonesian name of the plant (Depkes RI, 2000).

b) Organoleptic test

Organoleptic test is a simple initial recognition as objective as possible. The organoleptic test was carried out by observing the shape, color, smell, and taste. (Depkes RI, 2000).

c) Test of Water Soluble Compounds

5.141 grams of simplicia were macerated for 24 hours with 100 ml of water-chloroform using a corked flask while shaking for the first 6 hours and then left for 18 hours, then filtered. Evaporate 20 ml of the filtrate to dryness in a shallow, flat-bottomed dish that has been tared. The residue was heated at 105 C to a constant weight. Calculate the concentration in percent of water-soluble compounds to the initial weight of simplicia (Depkes RI, 2011).

d) Ethanol Soluble Compound Test

An amount of 5.0510 grams of simplicia was macerated for 24 hours with 100 ml of ethanol (95%) using a stoppered flask while being shaken repeatedly for the first 6 hours and then left for 18 hours. Filtered quickly by avoiding ethanol evaporation, then 20 ml of the filtrate was evaporated to dryness in a calibrated vaporizer cup, the residue was heated at 105ºC to a constant weight. The concentration in percent of ethanol-soluble compounds to the initial weight of simplicia was calculated (Depkes RI, 2011).

e) Identification of Groups of Compounds

1. Examination of Alkaloid

Simplicia powder was weighed as much as 0.5072 g, then added 1 ml of 2 N hydrochloric acid and 9 ml of distilled water, heated over a water bath for 2 minutes, cooled and filtered.filtrate was used for the following experiments:

a. 3 drops of filtrate was added to 2 drops of Mayer's reagent solution, a white or yellowish white clot was formed.
b. 3 drops of filtrate is added with 2 drops of Bauchardat reagent solution, a brown to black color will be formed.
c. 3 drops of filtrate is added with 2 drops of Dragendorff's reagent solution, a red or orange precipitate will be formed.

Alkaloids are positive if there is a precipitate or turbidity in at least two of the three experiments above (Ditjen POM, 1989).

2. Saponin Examination

A total of 0.5047 g of simplicia powder was put into a test tube, then 10 ml of hot water was added and cooled, then shaken vigorously for 10 seconds. Saponins are indicated by the formation of a stable foam for not less than 10 minutes as high as 1-10 cm, with the addition of 1 drop of 2 N hydrochloric acid, the foam does not disappear (Ditjen POM, 1989).

3. Flavonoid Examination

Samples of simplicia powder as much as 200.23 mg, then extracted with 5 ml of ethanol and heated for five minutes in a test tube. Then add a few drops of concentrated HCl, then add 0.2 grams of Mg powder. Positive results are indicated by the appearance of a dark red color for 3 minutes (Marlinda, Sangi & Wuntu 2012).

4. Tannin Examination

A total of 0.5020 grams of simplicia powder was extracted with 10 ml of distilled water and then filtered, the filtrate was diluted with distilled water until it was colorless. 2 ml of the solution was taken and 1-2 drops of$_3$ 1%If a blackish green or blue-black color occurs, it indicates the presence of tannins (Harbone, 1987).

5. Terpenoid Examination

A total of 1.0233 g of simplicia powder was soaked with 20 ml of ether for 2 hours. Filtered, then the filtrate was evaporated in an evaporating dish, and the remaining 20 drops of anhydrous acetic acid and 1 drop of concentrated sulfuric acid (Liebermann-Burchard reagent) were added. If blue, blue green, red, pink or purple colors are formed, it indicates the presence of terpenoids (Harbone, 1987).

6. Essential Oil Check

Simplicia Essential Oil 2.248 grams in a test tube was added 10 ml of petroleum ether and a funnel was installed (which was given a layer of cotton that had been moistened with water) at the mouth of the tube, heated for 10 minutes on a water bath and cooled and then filtered with filter paper. The obtained filtrate was evaporated with a vaporizer cup to obtain a residue. The residue was dissolved with 5 ml of alcohol solvent and then filtered through filter paper. The filtrate is evaporated in a vaporizer cup, if the residue smells aromatic/pleasant then it indicates the presence of volatile oil group compounds (Farnsworth, 1966).

b. Non-Specific

a) Parameters Drying shrinkage parameter

Simplicia powder is weighed carefully as much as 2,0005 g and put into a porcelain dish which has been previously heated at a temperature of 105°C for 30 minutes which has been thawed. Before being weighed, the simplicia powder was flattened in a cup, by shaking the cup, until it was a layer of about 5 mm to 10 mm thick. Then put in a drying chamber, dry at a temperature of 105°C to a constant weight. Before each drying, allow the cup to cool in the desiccator to room temperature.

b) Water content

Enter approximately 10.0641 grams of simplicia and weighed carefully in a porcelain cup that has been tared. Dry at 105ºC for 5 hours, then put in a desiccator to room temperature and weighed. Then calculate the percentage of water content contained in the sample (Depkes RI, 2000).

c) The ash content of

As much 5,0008 grams of simplicia powder that has been weighed carefully, put into a silicate crucible that has been incandescent and tara, flattened. Incandescent slowly until the charcoal runs out, cool, weigh. If this method does not remove the charcoal, add hot water, filter through ash-free filter paper. Light the remaining paper and filter paper in the same crucible. Put the filtrate into the crucible, evaporate, incandescent until the weight remains, weigh. Calculate the ash content of the air-dried material.

d) Acid insoluble ash content The ash

obtained in the determination of the ash content, boil with 25 ml of dilute sulfuric acid for 5 minutes, collect the insoluble part in acid, filter through a glass crucible or ash-free filter paper, wash with hot water, incandescent to constant weight, weigh. Calculate the acid insoluble ash content of the air-dried material.

3. Essential Oil Distillation

A total of 100 grams of fresh patchouli stalks (Pogostemon cablin Benth.) were put in a distillation flask and 500 ml of distilled water was added. Stahl distilled for approximately 6 hours. Furthermore, the obtained distillate is stored in a vial and used as a sample for further processing (Zetra et al. 2011).

4. Characterization of Chemical Components of Essential Oils

Characterization of chemical components of essential oils obtained from patchouli stems (Pogostemon cablin Benth.) was carried out at the Chemical Engineering Laboratory of the State Polytechnic of Ujung Pandang using a set of Gas Chromatograph – Mass Spectrometer (GC-MS) model GCMS-QP2010 Ultra Shimadzu Autosampler AOC-20i with Helium carrier gas. Injector temperature 250°C with Splitless mode, pressure 76.9 kPa and flow rate 14 mL/min and ratio 1:10. Ion source and interface temperatures are 200°C and 280°C, solvent cut time is 3 minutes, 400-700 m/z. Column type SH-Rxi-5Sil MS column length is 30 m with an inner diameter of 0.25 mm. The initial temperature of the column is 110°C with a holding time of 2 minutes and the temperature is increased to 200°C at a rate of 10°C/min and the final temperature is 280°C with a holding time of 9 minutes at a rate of 5°C/min so that the total analysis time is 36 minutes.

RESULTS AND FINDINGS

Quality traditional medicinal products is determined by the quality of the raw materials (simplicia) used. The simplicia quality requirements consist of several general standard parameters (Azizah & Salamah 2013). Patchouli (Pogostemon cablin Benth.) is one of the essential oil-producing plants that can be used in traditional medicine, because the content of patchouli oil is sesquiterpenes, cytotoxic chalcones, and antimutagenic (Miyazawa et al. 2000). The results of research by Zhao et al (2005) showed that the compounds contained in patchouli oil have several pharmacological activities such as antiemetic properties, trypanocidal activity, anti-bacterial, anti-fungal and Ca^{2+}.

Determination of simplicia parameters carried out includes the determination of specific and non-specific parameters. This standardization parameter test aims to find out information from patchouli stems used in determining the quality of simplicia. In addition, being a supporter to achieve safe, efficacious, and quality simplicia that can be used as traditional medicine (Liana, Fitriningsih & Mulqie 2015).

In this study, the stem part of the patchouli plant (Pogostemon cablin Benth.) was used which was obtained from North Luwu Regency, Masamba District, South Sulawesi Province. Patchouli plants that were intact and still fresh were immediately determined at the Pharmacognosy-Phytochemical Laboratory of the Faculty of Pharmacy, UMI. The results of the determination showed the type of plant Pogostemon cablin Benth. from the Lamiaceae family.

The patchouli stem is then made into simplicia. The process of preparing patchouli stem simplicia starts from sorting to select and take the good part of the stem, then washing it to remove impurities attached to the patchouli stem. Then the process of resizing is carried out to increase the contact surface area which facilitates the drying process (Gunawan & Mulyani 2004). After that, drying is carried out in order to obtain simplicia that are not easily damaged, and can be

stored for a long time, and prevent the quality of simplicia from decreasing by reducing the water content and enzymatic reactions contained in patchouli stems (Liana, Fitriningsih & Mulqie 2015).
Specific parameter testing includes simplicia identity test, simplicia organoleptic test and parameter test for dissolved compounds in certain solvents (Febriani, Mulyanti & Rismawati 2015).
The simplicia identity parameter is carried out with the aim of providing an identity that is as objective as possible from the plant names used (Depkes RI, 2000). In terms of identity, the simplicia stem patchouli (Pogostemon cablin Benth.) obtained is presented in table 1..

Table 1. Parameters of simplicia identity

Parameter	Result
Name Simplicia	Pogostemon cablin Caulis
Nama Latin	(Pogostemon cablin Benth.)
Plant parts	Stem

On organoleptic examination simplicia includes shape, colour, smell and taste. This organoleptic determination is one of the specific parameters determined using the five senses and aims for a simple and subjective initial recognition (Helmi et al. 2006). Organoleptically, the patchouli stem simplicia obtained is presented in table 2.

Table 2. Organoleptic parameters of simplicia

Parameter	Result
Form	Dry Powder
Color	Yellowish Brown
Odor	Aromatic
Taste	Bitter

The next specific parameter is the determination of the levels of dissolved compounds in water and ethanol. The water soluble extract content aims to determine the number of compounds in the simplicia that will dissolve in water, which indicates the number of polar compounds present in the simplicia. While the ethanol soluble extract content aims to determine the number of compounds in simplicia that are soluble in ethanol, thereby describing the number of semipolar compounds present in simplicia (Sulaksono, Fitrianingsih & Yuniarni 2015). The results of determining the levels of dissolved compounds in water and ethanol are presented in table 3.

Table 3. Parameters of dissolved compounds in certain solvents

No	Parameter	Result (%)	Library
1	Content of water soluble	5,9891	> 5 %
2	compounds Content of ethanol soluble compounds	8,0578	> 7 %

For the minimum requirement for purity of simplicia, a test to determine the concentration of the extracted substance in water and ethanol must be carried out (Soetarno and Soediro 1997). From the test results for determining the levels of dissolved compounds in water and ethanol, the water soluble extract content in patchouli stems was 5.9891% and the ethanol soluble extract content was 8.0578%. So these results indicate that there are more semipolar compounds in patchouli stem simplicia than polar compounds. Based on the results of comparison with the literature that is eligible. Determination of the levels of water-soluble extracts and ethanol is not an impact related to pharmacological effects, but as an estimate of compounds that are polar (water soluble) and active compounds that are semi-polar-nonpolar (soluble in ethanol) (Saifudin & Aziz 2011).

Examination of the chemical content of simplicia aims to ensure the content of chemical compounds contained in simplicia (Febriani, Mulyanti & Rismawati 2015). These compounds are secondary metabolites, therefore the identification of compounds is mainly aimed at groups of compounds such as alkaloids, flavonoids, saponins, terpenoids and essential oils (Lumanraja 2009). The results of the examination of the chemical content of patchouli stems are presented in table 4.

Table 4. Identification of compound groups

Name of Sample	Identification of compound group	Specific reagent	Description
Simplicia stem patchouli (Pogostemon cablin Caulis)	Alkaloid	Mayer	(-)
		Bauchardat	(+)
		Dragendroff	(+)
	Saponins	HCl 2 N	(-)
	Flavonoids	Magnesium powder	(+)
	Tannins	$FeCl_3$ 1%	(-)
	Terpenoid	Lieberman-Baurchat	(+)
	Essential oil	Petroleum eter	(+)

Keterangan : (+) = Positive
(-) = Negative

The formation of precipitates in the alkaloid test with Bouchardat and Dragendroff specific reagents indicated that the patchouli stem was positive for alkaloids. Positive results of alkaloids in Bauchardat reagent were indicated by the formation of a brown to black color precipitate. It is estimated that the precipitate is potassium-alkaloid. The reaction that occurs is that K^+ will form coordinate covalent bonds with nitrogen in the alkaloids to form a precipitated potassium-alkaloid complex. While the reaction that occurs in Dragendroff's reagent, nitrogen is used to form coordinate covalent bonds with K^+ which is a metal ion (Setyowati et al, 2014).
In the flavanoid test, it shows a red color which means positive for the presence of flavonoids. Magnesium and hydrochloric acid react to form bubbles which are H2 gas, while concentrated Mg and HCl metals in this test reduce the benzopyron core contained in the flavonoid structure so that a red color change is formed (Setyowati et al., 2014).

Positive results in the terpenoid test with the Lieberman-Bauarchat reagent were indicated by a change in color to pink from the reaction between terpenes and acids (CH_3COOH and $H_2SO_{4)}$) (Marliana, Suryanti & Suyono 2005).
And in the essential oil test, the use of petroleum ether because essential oils are easily soluble in petroleum ether, and where one of the properties of essential oils is volatile and has a distinctive odor, which indicates that it contains essential oils positively (Voight 1995).
The next step of simplicia standardization is testing of non-specific parameters focusing on chemical and physical aspects that will affect consumer safety and stability, including drying shrinkage, moisture content, ash content and acid insoluble ash content (Zaenab et al. 2016). The results of testing non-specific parameters on patchouli stem simplicia are presented in table 5.

Table 5. Non-specific parameters of patchouli stem simplicia

No.	Examination of Specific Parameters of		Results
1.	Drying shrinkage	0.8281%	-
2.	Moisture content	1.7968%	10%
3.	Total ash content	5.7730%	8%
4.	Acid-insoluble ash content	0.3459%	1%

Drying shrinkage is one of the non-specific parameters whose aim is to provide a maximum limit (range) of the amount of compound lost in the drying process. The drying shrinkage parameter is basically a measurement of the residual substance after drying at a temperature of 105°C for 30 minutes to a constant weight expressed as a percent value (Depkes RI, 2000). In determining drying shrinkage parameters on patchouli stem simplicia (Pogostemon cablin Benth.) the drying shrinkage value was 0.8281%, this indicates that the amount of compound lost (evaporated) during the drying process was only 0.8281%.
Water content testing aims to determine the amount of water contained in simplicia. According to the literature, the water content in simplicia should not exceed 10% (Soetarno & Soediro 1997). The results of the water content test for patchouli stem simplicia of 1.7968% showed that the simplicia had met the standard requirements for water content. Excess amount of water in simplicia will accelerate microbial growth and decay, so that controlling the water content can suppress the occurrence of spoilage and material damage both in storage and processing (Liana, Fitrianingsih & Mulqie 2015).
Ash content testing is a material that is heated at a certain temperature where organic compounds and their derivatives are destroyed and evaporated. So that there are only mineral and inorganic elements, which provide an overview of the internal and external mineral content that comes from the initial process until the simplicia is formed. From the test results, the total ash content of patchouli stem simplicia was 5.7730%. And the results obtained describe the internal and external mineral content of patchouli stem simplicia (Ministry of Health, 1986).
While the acid insoluble ash content is one of the criteria in determining the level of cleanliness in the processing of a product. Acid insoluble ash is reflected by the presence of acid insoluble mineral or metal contamination in a product.

From the test results, the acid insoluble ash content in patchouli stem simplicia was 0.3459%. The results of this acid insoluble ash content describe the external mineral content that comes from outside or impurities (Guntarti et al. 2015).
To obtain patchouli essential oil, a distillation process was carried out using the Stahl distillation method. Where a sample of fresh patchouli stems that have been cut into small pieces, aims to facilitate the evaporation of water as well as expand the material area to remove oil (Supriono & Susanti 2014), then weighed as much as 100 grams, then put into a distillation flask and added 500 ml of distilled water. . Then it is connected to the distillation apparatus and the temperature is adjusted. This distillation process was carried out for 6 hours and obtained 5 ml of distillate (Zetra et al. 2011).
Furthermore, to determine the chemical components contained in patchouli oil, GC-MS analysis was used (Zaimah 2014).
Gas chromatogphy mass spectrometry (GC-MS) is a method of analyzing chemical compounds specifically in the form of vaporized oil. This method can be used to analyze compounds qualitatively and quantitatively. Qualitative analysis can be done by comparing the results of the chromatogram with standard reference compounds. While the quantitative analysis that can be seen is based on the peak area of the chromatogram (Agusta, 2000).
Patchouli stem essential oil (Pogostemon cablin Benth.) was then characterized using the GCMS model GCMS-QP2010 Ultra Shimadzu Autosampler AOC-20i with Helium carrier gas. The sample is injected into the injection chamber with an injection needle through a special valve. The sample will be carried through the column. The samples will be separated in a column from one another and then forwarded to the detector in the form of electrical signals. Furthermore, it will be recorded in the form of recorded pulses. The peaks of the spectrum will be passed on to a mass spectrometer to determine the molecular weight of the fragmentation (Sukmajaya et al. 2008).
The chromatogram results from gas chromatography analysis showed that there were 25 components (25 peaks) of essential oils detected, as shown in Figure 1.

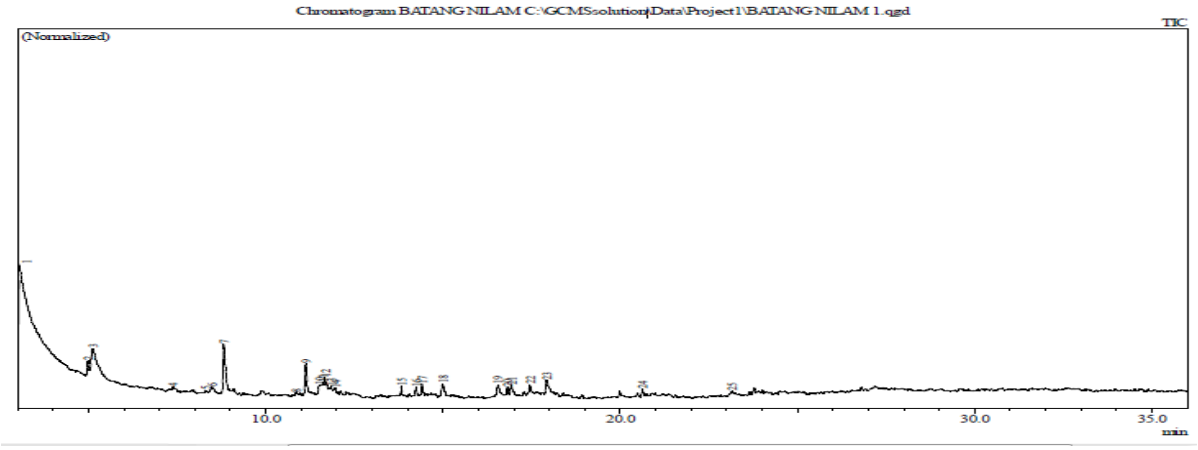

Figure 1. GC Chromatogram of patchouli stem essential oil

Mass spectrometer fragmentation data are shown in table 6. In this study only five compounds were discussed, due to their relatively higher intensity and good separation compared to other compounds.

Table 6. Components of patchouli essential oil characterized by GC-MS

No.	Name of component	Retention time (minutes)	Molecular formula Molecular	weight	% area
1	Benzaldehyde, 2,4-dimethyl	5,103	$C_9H_{10}O$	134	12,98

2	Phenol, 2,4-Bis(1,1,-Dimethylethyl)	8,809	$C_{14}H_{22}O$	206	8,36
3	1,6-Methanonaphtalen-1(2H)-Ol, Octahydro-4,8A,9,9-Tetramethyl	11,126	$C_{15}H_{26}O$	222	4,72
4	Octadecanoic acid, Ethyl ester	17,922	$C_{20}H_{40}O_2$	312	3,06
5	Hexadecanoic acid, Ethyl ester	14,988	$C_{18}H_{36}O_2$	284	2,25

Fragmentation of mass spectrometry results of patchouli essential oil components were as follows::

1. The compound at peak 3 with a retention time of 5.103 minutes had similar fragments to the compound Benzaldehyde, 2,4-dimethyl ($C_9H_{10}O$) with a m/z of 133 and a percent area of 12.98%. The mass spectra of the compound at peak 3 can be seen in Figure 2.

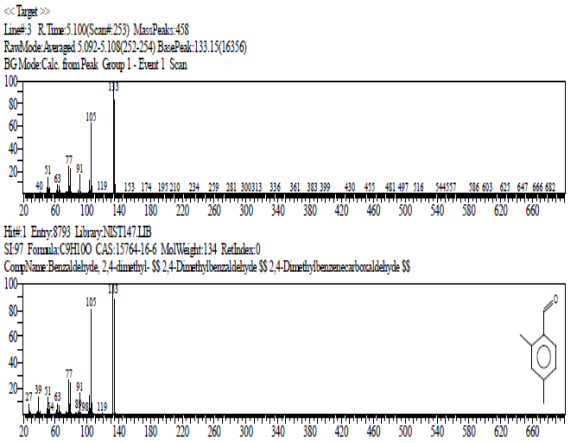

Figure 2. Mass spectrum from the 3rd peak with a retention time (Rt) of 5,103 minutes.

2. The compound at peak 7 with a retention time of 8.809 minutes had similar fragments to the Phenol compound, 2,4-Bis(1,1-dimethylethyl) ($C_{14}H_{22}O$) with m/z 206 and a percent area of 8.36. %. The mass spectra of the compound at peak 7 can be seen in Figure 3.

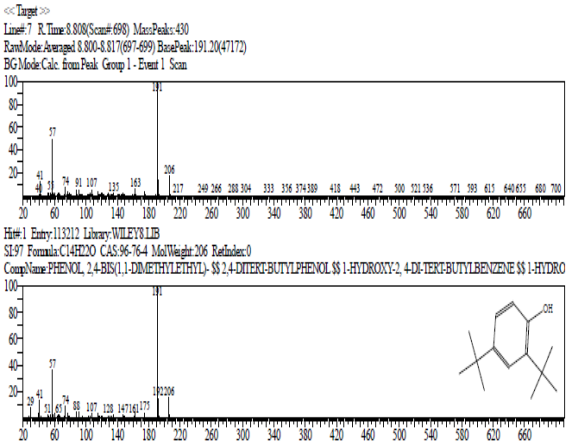

Figure 3. Mass spectrum from the 7th peak with a retention time (Rt) of 8.809 minutes

3. The compound at peak 9 with a retention time of 11.126 minutes had similar fragments to the compound 1,6-Methanonaphthalen-1 (2H) - OL, Octahydro - 4, 8A, 9,9 Tetramethyl ($C_{15}H_{26}O$) with m /z 222 and percent area 4.72%. The mass spectra of the compound at peak 9 can be seen in Figure 4.

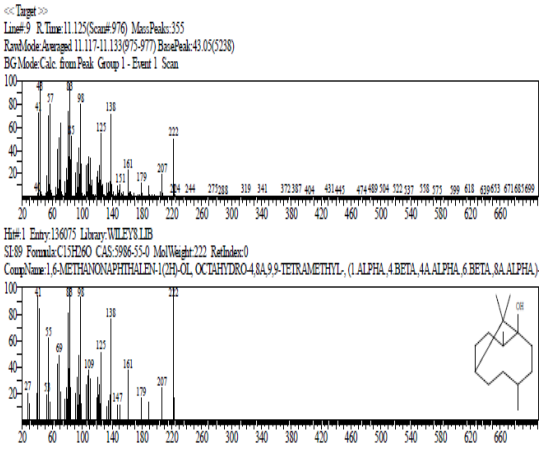

Figure 4. Mass spectrum from the 9th peak with a retention time (Rt) of 11.126 minutes.

4. The compound at peak 23 with a retention time of 17.922 minutes had similar fragments to the compound Octadecanoic acid, Ethyl ester ($C_{20}H_{40}O_2$) with m/z 321 and a percent area of 3.06. The mass spectra of the compound at peak 23 can be seen in Figure 5.

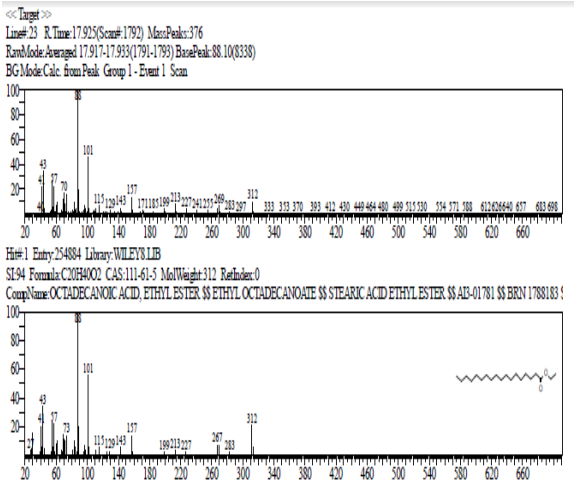

Figure 5. Mass spectrum from the 23rd peak with a retention time (Rt) of 17,922 minutes.

5. The compound at peak 18 with a retention time of 14,988 minutes had similar fragments to the compound Hexadecanoic acid, ethyl ester ($C_{18}H_{36}O_2$) with m/z 284 and a percent area of 2.25. The mass spectra of the compound at peak 18 can be seen in Figure 6.

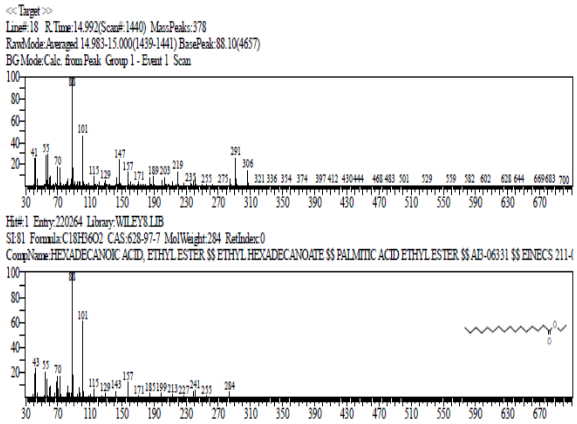

Figure 6. Mass spectrum from the 18th peak with a retention time (Rt) of 14,988 minutes.

According to research by Aisyah et al(2008), the chemical components of patchouli oil consist of oxygenated sesquiterpenes (oxygenated sesquiterpenes) and hydrocarbon sesquiterpenes (hydrocarbon sesquiterpenes). While the components identified in the experimental results are benzaldehyde 12.98%, phenol, 2,4-Bis (1,1,-Dimethylethyl) 8.36%, 1,6-Methanonaphthalen-1(2H)-Ol, Octahydro-4,8A,9 ,9-Tetramethyl 4.72%, octadecanoic acid, ethyl ester 3.06% and hexadecanoic acid, ethyl ester 2.25%. The differences in the chemical components of patchouli oil, both qualitatively and quantitatively, can be caused by differences in environmental factors in different areas of origin which greatly affect the chemical composition of the oil (Nickavar et al. 2004).

CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that:

1. In the simplicia quality test covering specific and non-specific parameters, the standardization of patchouli stem simplicia (Pogostemon cablin Benth.) from North Luwu Regency, Masamba District, South Sulawesi Province met the quality standard.
2. The results of the GC-MS characterization of essential oils obtained from patchouli stems (Pogostemon cablin Benth.), showed 5 main components with a percent area, namely benzaldehyde, 2,4-dimethyl 12.98%, phenol, 2,4-Bis(1 ,1,-Dimethylethyl) 8.36%, 1,6-Methanonaphthalen-1(2H)-OL, Octahydro-4,8A,9,9-Tetramethyl 4.72%, octadecanoic acid, ethyl ester 3.06% and hexadecanoic acid, ethyl ester 2.25%.

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