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IDENTIFICATION AND ANALYSIS OF COMPOUNDS IN PATCHOULI (*POGOSTEMON CABLIN BENTH*) ESSENTIAL OIL

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ABSTRACT

Essential oils, or volatile oils, are secondary metabolites generated by higher plants from a variety of plant components, including patchouli. Nerelodol, patchoulenone, and patchoulol are the chemicals found in patchouli oil, which is usually collected from the tropical herb patchouli plant. Patchouli essential oil is frequently used in fragrances, medications, and cosmetics. An instance of patchouli oil"s application in medicine and cosmetics is in a hair tonic solution. In order to stop hair loss, it is simple to apply, absorbs fast, and leaves the scalp feeling non-sticky. These essential oils can be obtained by extraction, distillation, or pressing. Analytical method used was Gas Chromatography-Mass Spectrometry (GC-MS). Aside from that, this research analyzed a number of hair tonic samples utilizing SNI. The results of the analysis of patchouli essential oil of sample A (self-distilled essential oil) in accordance with SNI meet the good requirements of the organoleptic test, namely: reddish yellow in color with a typical patchouli aroma, solubility in alcohol is 1:9, specific gravity test is 0.964, number test acid is 5.2, ester number test is 18, patchouli content test is 12.87%. Meanwhile, the alcohol solubility value of sample B"s patchouli essential oil (a traditional essential oil) is still 1:11, which is beyond the recommended maximum of 1:10, and so does not comply with SNI. The remainder for sample B complies with SNI the organoleptic test yields a yellow color and a patchouli scent, but one that is somewhat faded. Gas Chromatography-Mass Spectrometry is used to compare the research and commercial results of patchouli essential oil analysis. Sample A (self-distilled sample) yielded 34 chemical compound components found in essential oils, while Sample B (Commercial Essential Oil Sample) yielded none. 61 different kinds of chemical compound components that are present in patchouli essential oil were identified.The result is that the essential oils utilized in the research, as well as the preparation of a hair tonic with a mixture of patchouli essential oils, in accordance with the SNI criteria.

KEYWORDS: essential oils, patchouli oil, hair tonic, gc-ms.

INTRODUCTION

Essential oils (also known as volatile oils). Essential oil is a secondary metabolite generated by higher plants and may be collected from a variety of plant parts, including roots, stems, twigs, leaves, flowers, and fruit. It is a combination of volatile molecules that can be recovered by distillation, pressing, or extraction. Essential oils are generated from a wide range of plant species, including the patchouli plant.

Patchouli is a tropical herbaceous plant that produces an essential oil known in worldwide commerce as patchouli oil or patchouli alcohol. The patchouli plant (Pogostemon cablin Benth) offers several health advantages and is commonly utilized in traditional Chinese medicine. Patchouli oil is classified as an essential oil, with the major component being patchoulol. Patchouli oil, or patchouli oil, includes chemicals that can aid with hair loss. These chemicals include nerelodol, patchoulenone, and patchoulol. Aside from that, patchouli oil can cause muscular spasms, preventing hair loss and sagging skin. Patchouli oil helps prevent hair loss by improving scalp circulation and improving hair roots. This helps to speed up hair growth.

Patchouli oil can help prevent hair loss by being manufactured into a hair tonic solution that is simple to use, absorbs fast, and does not feel sticky on the scalp. Hair tonic is a cosmetic product that nourishes hair, prevents balding, and promotes hair growth. The primary elements in hair tonic remedies are solvents and helpful compounds. The solvents utilized include water, alcohol, and glycerin, and the beneficial compounds are phytosterol components and fatty acids found in plants that help to eradicate or prevent dandruff, increase scalp blood circulation, repair and restore sebum gland production, cleanse the scalp, and encourage hair growth. Thus, it is believed that this research might be

used to explore the potential of patchouli oil as an additional.

Research Purposes

According to the above-described issue formulation and backdrop of the research, the following are the goals of this study; to analyze the stability and organoleptic properties of patchouli essential oil when used as a hair tonic extract, to conduct an analysis of patchouli essential oil using SNI, to determine the outcomes of a comparative examination of patchouli essential oil based on research and commercial findings using Gas Chromatography-Mass Spectrometry.

Research Methods

Plant Material

The dried nilam plants utilized in this study were collected from Padangan village in Pupuan district, Tabanan district.

Chemicals

The substances that were used in this research are; n-heksana, NaCI, Aquadest, Alkohol, Metil Paraben, PEG (*Polieilena Glikol*), Propilen Glikol.

Research Tools

The research used the following equipment and instruments: a set of steam distillation instruments, a separator, an erlenmeyer, an analytical balance, a measuring glass, an essential oil bottle, a blender, filter paper, and a set of GS-MS tools, mixer bars, Ph meters, viscomers, picnometers, drop pipets, volume pipettes, and beaker glasses.

Sample Preparation

Patchouli plants are cut into small pieces, air dried, and mashed by blending or pounding (to open as many cells or oil glands as possible because essential oils in plants usually reside in the oil glands in the leaves; by cutting them small, it is hoped that the steam will penetrate plant tissue and force the oil to the surface, allowing it to escape easily).

The research uses steam distillation to extract essential oils from dried and crushed patchouli plants. The plants are placed in a steamer filled with water, and the condenser is heated. The distillate, a combination of oil and water, is separated with a separating funnel. The extracted essential oils were compared to commercial oils using GS-MS.

Hair Tonic Formulation

Pre-research has been done, and that information served as the basis for the formula utilised to make this Hair Tonic.

Table 1: Formulation of Hair Tonic.

No	Bahan	Formulasi		
		F1 (5)	F2 (7.5)	F3 (12.5)
1	Patchouli essential oil extract	5	7,5	12,5
2	Propilen Glikol	15ml	15ml	15ml
3	Polietilen Glikol 400	1ml	1ml	1ml
4	Aquades	Add 105ml	Add 105ml	Add 105ml
4	Metil Paraben	0.3ml	0.3ml	0.3ml
6	Etanol 96%	Add 60ml	Add 60ml	Add 60ml
7	Menthol	0.2g	0.2g	0.2g

The method used to produce hair tonic preparations, patchouli essential oil extract, is split into two (2) phases: the alcohol phase and the water phase, which are then combined gradually until the combination is homogenous, at which point the water phase is added to the alcohol phase.

RESULTS AND DISCUSSION

The results of the identification and analysis of compounds in patchouli essential oil (Pogestemon Cablin Benth) as well as stability analysis of patchouli essential oil in the Hair Tonic formulation of patchouli essential oil extract include several research parameters like color test, odor test, solubility in alcohol, acid number, ester number, specific gravity, patchouli alcohol, and alpha copaene levels originating from Pupuan village, Tabanan district, and evaluation.

Table 2: Requirements of the Indonesian National Standard.

No	Characteristics	Condition		
		SNI	Sample A	Sample B
1	Specific Gravity 25/25°C	0,943 – 0,983	0.964	0.962
2	Solubility in Alcohol 90%	Clear or light Opalic solution in a volume ratio of 1 to 10 parts	01:09	01:11
3	Maximum Acid Number	8.0	5.2	9.5
4	Maximum Ester Number	20.0	18	12
5	Alcoholic patchouli levels	31.0%	12.87%	6.37%

Result of the research on the extraction of essential oils from Patchouli plants using steam distillation. The distillation process of 30,000 grams of patchouli leaves with an 8-hour distillation time yields 30 grams of patchouli oil, yielding 0.01%. The organoleptic testing of patchouli essential oil and comparison with commercial oil revealed that the color of sample A was reddish brown, while sample B had a light yellow color. Sample A also had a thick or strong aroma, similar to sample B but slightly faded due to storage. Solubility testing in

alcohol showed that sample A met the requirements of the Indonesian National Standard (2006), with a volume ratio of 1:9 for sample A and 1:11 for sample B. The acid number test showed that sample A met the requirements of SNI standards, while sample B had a high acid number due to the presence of chemical components in direct contact with the surrounding air.. The acid number test obtained the acid number of sample A, namely 5, 2 samples B, namely 9.5. Sample A already meets the requirements of SNI standards compared to Sample B which is not suitable because it has a high acid number result which may be caused by the large number of free acid compounds formed due to the presence of chemical components that are in direct contact with the surrounding air. The results from sample A are in accordance with the requirements for the acid number of patchouli oil, namely Max. 8. The ester number test obtained from sample A 18 sample B 12. The results obtained from Samples A, B were appropriate and met the Indonesian National Standards (2006). The high ester number shows that the oil is not easily oxidized so that the distinctive aroma of patchouli oil is more perfect and the aroma lasts longer. However, an ester number that is too high, more than the quality requirement, namely 20.0, indicates the presence of impurities or other substances such as free fat or the presence of additional ingredients mixed into the patchouli oil. So it can be concluded that the ester number value of the three patchouli oil samples has good quality. not good, the ester number is also influenced by the distillation time, the longer the distillation time, the higher the ester number. The specific gravity of the samples obtained from sample A was 0.964 g/mL, sample B was 0.962 g/mL. Based on testing, the specific gravity of patchouli oil complies with the quality requirements for patchouli oil, namely (SNI 06-2385-2006). The specific gravity of patchouli oil is not influenced by the volume of patchouli oil itself but rather the chemical components contained in patchouli oil itself such as patchouli alcohol and other chemical compounds. So it can be said that each chemical component contained in patchouli oil has a different specific gravity, namely the higher the concentration of patchouli oil components, the higher the specific gravity.

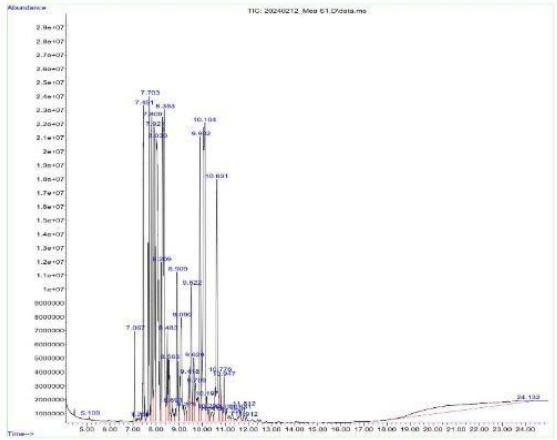

Fig. 1: Kromatogram of Patchouli Essential Oil Sample A.

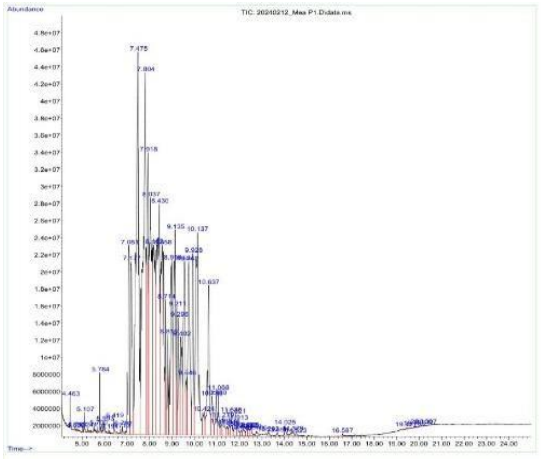

Fig. 2: Kromatogram of Patchouli Essential Oil Sample A.

Table 3: Samples A and B Were Compared to SNI Standards.

Chemical Compounds	Rate %	Sample	
		A	B
Patchouli alkohol	30	12.8	6.3
α-bulnesen	17	-	-
α-gualen	14	5.7	4.2
Seychellene	9	6.1	0.9
α-patchoulene	5	-	-
β-caryophyllene	4	3.1	10.7
β-patchoulene	2	-	-
α -cadinene	2	-	-
Pogostol	2	-	-

The results of the analysis using GC-MS of sample A (a self-distilled sample) showed 34 chemical compound components contained in essential oils, based on the table above. It can be seen that in the patchouli oil sample (A), the patchouli alcohol content was 12,868%, where the level of patchouli This is the largest contributing component to the patchouli essential oil sample, sample B (Commercial Essential Oil Sample). Based on the table above, we obtained 61 types of chemical compound components contained in patchouli essential oil. The patchouli alcohol content in sample B was only 6,368%, which was less than the content of the Copaene component compound, which was 11,311%. Patchouli alcohol is The largest compound in patchouli essential oil as a determinant of oil quality, the patchouli alcohol content in patchouli essential oil, according to SNI 06-2385-2006, is a maximum of 30%. The results obtained by samples from A and B have met the Indonesian National Standards. However, sample A has a higher patchouli alcohol content compared to the patchouli alcohol content produced from sample B.

Evaluation Results of Hair Tonic Patchouli Essential Oil Extract

Table 4: Organoleptic Results Formulas A, B, and C.

no	Organoleptic	Preparation		
		Formula A	Formula B	Formula C
1	Color	yellowish milky white	yellowish milky white	yellowish milky white
2	Smell	patchouli smell	patchouli smell	patchouli smell
3	Preparation Form	liquid form	liquid form	liquid form
4	Homogeneity	homogeneous	homogeneous	homogeneous

Based on a table of organoleptic observation results from storage at high, room, and low temperatures. Where there are no large changes, but there are little alterations, such as when the preparation with Variation C at week 6 is placed at a cold temperature, a small portion of the extract rises to the surface (floats), but this portion can be redistributed all at once. Shuffling. Organoleptic examination of the three hair tonic formulas from week 0 to week 6 revealed that the preparations produced were not transparent. The use of patchouli essential oil extract causes the final hair tonic to be yellowish milky white in color, rather than clear.

Table 5: pH Result Formulas A,B, and C.

Formula	Storage Temperature	pH	
		Week -0	Week -6
Formula 1	4°C ± 2°C	5.5	5.6
	27°C ± 2°C	5.9	6.1
	40°C ± 2°C	5.6	5.9
Formula 2	4°C ± 2°C	6.0	6.4
	27°C ± 2°C	6.4	6.8
	40°C ± 2°C	6.1	6.5
Formula 3	4°C ± 2°C	6.2	6.8
	27°C ± 2°C	6.6	6.5
	40°C ± 2°C	6.4	6.0

This pH test is performed to determine the acidity level of the preparation and to ensure that the preparation does not impair the effectiveness or stability of the hair tonic preparation. Because an alkaline pH can induce scaliness in the skin, while an acidic pH might cause irritation. The three formulas based on pH readings for six weeks changed, but not significantly. This indicates that the hair tonic preparation's pH is relatively stable.

Table 6: Viscosity Result Formulas A,B, and C.

No	Formulation Hair tonic	Week -0	Week -6
1	variation concentration A	1.730	1.301
2	variation concentration B	1.776	1.724
3	variation concentration C	2.578	1.739

Viscosity testing was done using an Oswald viscometer on preparations in the first and sixth weeks at room temperature to assess the difference between the preparation when it was freshly produced and after 6 weeks. This test was conducted by calculating the flow time of the preparation for passing two marks. The viscosity test results of the patchouli essential oil extract hair tonic formulation in this study were: formula 1,2,3,week 0, and week 6, respectively 1,730cPs, 1,776 cPs, 2,578 cPs, 1,301 cPs, 1,724 cPs, and 1,739 cPs. Hair tonics with high viscosity can produce crusting, which causes dandruff, therefore if you look at the viscosity table, formulations 1, 2, and 3 are stable.

Table 7: Specific result formulas A,B, and C.

No	Formulation Hair tonic	specific gravity	
		Week-0	Week-6
1	variation A	0.969	0.972
2	variation B	0.955	0.966
3	variation C	0.963	0.974

The results of specific gravity for hair tonic preparation Variations A, B, and C week 0 and week 6 were: 0.972g/ml, 0.969g/ml; 0.966g/ml, 0.955g/ml; 0.974g/ml, 0.963g/ml. The findings of this evaluation demonstrate that the specific gravity results of these three formulas have tiny differences and are not the same, and these values remain below the standard, namely. However, in Variations A and C in the sixth week, the specific gravity of the preparations is practically identical to the standard, which could be due to temperature changes between measurement and storage. It may be concluded that the hair tonic preparations of variations A, B, and C are stable and meet the standards.

CONCLUSION

The results of the analysis of patchouli essential oil for sample A (self-distilled essential oil) and sample B (conventional essential oil) in accordance with SNI meet the requirements of both the organoleptic test and the GC-MS test, though there is one test in sample B that does not meet the requirements. Evaluate compare patchouli essential oil analysis data from research and commercial sources using Gas Chromatography-Mass Spectrometry. Sample A (self-distilled) yielded 34 chemical compound components found in essential oils, as did Sample B (commercial essential oil sample). We

found 61 different chemical compound components in patchouli essential oil.

Patchouli essential oil in variations A, B, and C can be used in hair tonic formulations since it is stable and meets organoleptic test characteristics such as homogeneity, pH, viscosity, and specific gravity.

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