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	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 11 **Volume:** 127

Published: 29.11.2023 http://T-Science.org

Issue Article

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CHEMICAL STRUCTURE OF TREE OILCROP INDUSTRY *Litseaindica Pers.*

***Abstract**: Litsea (Litseaindica Pers.) oil that was distilled from the leaves and barks of the plant using either the water and steam method or the direct steam method had essentially identical physical and chemical qualities, but the composition of the oil was fundamentally different. According to the results of the gas chromatography examination, the primary component of this oil was cineole, which accounted for 48.5% of the total (using the water and steam method) and 40.7% using the direct steam method. Both of these numbers are derived from samples of bark. On the other hand, cineole may be extracted from leaves at a rate of 57.5% through the water and steaming procedure and 4.57 percent using the direct steam technique.*

***Key words**: Litseaindica, distillation method, essential oil, cineole.*

***Language**: English*

***Citation**:* Hamzah, F., & Hamzah, N. (2023). Chemical structure of tree oilcrop industry Litseaindica Pers.. *ISJ Theoretical & Applied Science, 11 (127),* 334-338.

***Soi**:* http://s-o-i.org/1.1/TAS-11-127-41 ***Doi**:* crossref https://dx.doi.org/10.15863/TAS.2023.11.127.41

***Scopus ASCC**: 1600.*

Introduction

The plant that produces Litsea oil in Indonesia is Litseaindica. In West Java this oil is called trawas oil and in Central Java it is called krangean but in Riau it is called kilemo oil. This type of oil contains relatively the same chemical components but different levels (Rusli et al., 2022). So far, Litseaindica oil has been used for the pharmaceutical industry, fragrances, food and beverage additives, soap ingredients, and ingredients for mixing fat-soluble vitamins, including vitamins A and K (Lehninger, 2022).

Litsea is a plant belonging to the Lauraceae family and grows widely on the island of Java on mountain slopes (Anggraeni et al., 2022). This plant can produce relatively a lot of essential oil because all parts of the tree such as roots, bark, leaves, flowers and fruit contain essential oil, but in this study only the leaves and bark were taken because they have more potential than other parts (Mayuni, 2022) .

Apart from being influenced by climate, soil type, material handling, distillation and storage methods, the quality of essential oils is also influenced by the type and variety of plants. Oil quality is determined in the form of physicochemical and organoleptic properties. The physical constants are specific gravity, refractive index, optical rotation and solubility in ethanol. The observed specification chemical constants depend on the type of oil. Generally, essential oil specifications include acid number, ester number, saponification number and the main components of the oil. The main component that is nutritious in the body of this plant, both the leaves and the bark, is cineol. This component is the main medicinal constituent of Litsea oil. So far, it is usually used as a stain and color remover, besides cineol there is also relatively large portions of citronellal, especially in the stem bark. Litsea oil is known to be antiseptic and inhibits the action of staphylococcus sp. (Leider, 2022 and Schreiber, 2022) which explains the cholikinetic action due to the presence of camphene compounds in the leaves.

Research on the main components of Litsea essential oil has been carried out by several experts including Dieterle and Emperor (2013) and Guenther (2013) who analyzed the oil components using thin layer chromatography and gas chromatography.

Winkler (2020), Malingre (2020), and Purseglove et al. (2013) have also identified chemical components in Litsea oil. Each of these studies shows different results in terms of the type and amount of the main components contained in the oil.

In relation to this problem, this research aims to describe the physicochemical properties of Litsea oil, identify the main components, and apply their benefits in order to explore the possibility of substituting imported ingredients and developing types of essential oils that can be exported by Indonesia.

Plant determinations were carried out at the Biology Department Laboratory, Andalas University, Padang and at the Bogoriensis Laboratory at LIPI Bogor. The laboratory results of this plant include division: Spermatophyta, subdivision: Angiospermae, class: Dicotyledone, order: Ebenales, family: Lauraceae, genus: Litsea, species: Litseaindica. Isolation of Litsea oil samples was carried out at the Research Institute for Spices and Medicinal Plants, Cimanggu, Bogor.

Gas chromatography (Hitachi 263-70) with the following conditions: flame ionization detector, graph paper speed 0.5 cm/min; capillary column 25 m X 0.25 mm(L x diameter) carbowax 20 M; nitrogen carrier gas with air pressures of 40, 30, and 300 ml/min, respectively; injector temperature 220oC program column temperature 60-180oC. The tool is programmed with a temperature increase speed of 3oC/minute: volume up to 0.2 micron liter; identification of chemical components; components of Litsea oil by adding 20% standard components to the oil sample.

METHODOLOGY STUDY

Steam and water distillation (steamed)

The principle of distillation using this method is to use low steam pressure. This method causes the distilled material to not be in direct contact with water. The ingredients are placed on a plate. The plate is made from a stainless steel plate with holes (like a sieve), and is located several cm above the water surface in the kettle. After the water boils, water vapor comes out through the disc holes and continues to flow between the ingredients. Together with this water vapor, the Litsea oil contained in the ingredients will also be distilled. The water vapor that arises is channeled through the pipe and then enters the cooling device(concensor). In a cooling device, water vapor condenses into water and oil. The mixture of oil and water is collected in an oil separator vessel. Due to the difference in specific gravity, the water will be separated from the oil and then collected in a special vessel.

Direct steam distillation

Distillation with a steam system basically involves flowing high pressure steam. The water steam boiler is separated from the distillation boiler, namely the boiler containing the material. The water vapor produced in the steam boiler flows through a pipe into the distilling boiler. The distilled material is placed on a perforated disc in the boiler. There can be more than one plate and can be used in stages. To facilitate the movement of water vapor to a higher level, empty space is provided between the material located on the disk below it and the disk above it. Between the plate located at the bottom and the base of the boiler there is an empty space as a reservoir for steam from the boiler. The clear steam produced at a pressure of approximately 1 atm is channeled into the distilling kettle. Together with the water vapor, the Litsea oil will also be distilled, which is channeled through the condenser. After undergoing a condensation process, oil and water can separate due to differences in specific gravity.

RESULTS AND DISCUSSION

PHYSICAL PROPERTIES

The physical properties observed in this research include specific gravity, refractive index, and optical rotation.The physical properties of Litsea oil can be seen in Table 1.

Table 1. Physical Properties of Litsea Bark and Leaf Oil

Physical Properties	STEAM				STEAM			
	Leaf		Bark		Leaf		Bark	
	X	elementary school	X	elementary school	X	elementary school	X	elementary school
Specific Gravity	0.8786	0.0029	0.8786	0.0012	0.8785	0.0002	0.8785	0.00014
Refractive Index	1,458	0.0003	1.4582	0.0002	1.4579	0.0002	1.4583	0.0003
Optical Rotation (o)	(-)6.70	0.008	(-) 6.70	0.0141	(-)6.75	0.0216	(-)6.72	0.0216

Information: X = Average of three replications
SD = Standard Deviation

Specific Gravity

Based on the research results, the specific gravity of Litsea oil treated with two steam and steam distillation methods from the bark and leaves is almost the same, namely an average of 0.878 (Table 1), thus it can be said that Litsea from the stem bark and leaves distilled in this study hasthe same level of purity. Furthermore, Gunther (2022) explained that the specific gravity value of essential oils for plants from the Lauraceae family is generally 0.696-1.0888. This is said to be included in the specific gravity group of relatively good quality essential oils.

According to national and international quality standards (EOA No. 24). The specific gravity of essential oils from the Litsea genus, including the Lauraceae family, ranges from 0.696-0.993. The results of this research mean that the specific gravity of Litsea is 0.878, which means it meets these quality requirements. The size of the steam pressure used in the distillation process can affect the specific gravity of the Litsea produced in addition to environmental factors also influencing it.

Refractive Index

The index determines the purity of the oilessential. Deviations in the refractive index of the oil obtained from distillation are an indication that the oil is getting dirtier or of lower quality. The let index results from research on Litsea oil from stem bark and leaves using two distillation methods (steam and steam) are almost the same, namely an average of 1.458 (Table 1).

The lethal index for Litsea oil from stem bark and leaves is almost the same because the purity level is almost the same. This is in accordance with the opinion of previous researchers, Jhun (2022), who explained that the purity level of essential oils is almost the same, meaning that all their physical properties are relatively almost the same, especially in parts of trees of the same species.

The refractive index in the quality standard provisions of the Indonesian Ministry of Trade is 1.454-1.473 from the Essential Oil Association of USA (EOA No. 24) is 1.456-1.478. This means that the refractive index of Litsea oil from leaves and stem bark as a result of the research meets the quality requirements.

Optical Rotation

The research results showed that the Litsea optical rotation was (-) 6.7o (Table 1). Both from the bark and leaves. The quality standard provisions from the Indonesian Ministry of Trade are (0o)-(-6o) and from the Essential Oil Association of USA (EOA No. 24) are (0o)-(-6.9o) thus meaning that the optical rotation of Litsea oil is a research result slightly different from the national quality standard provisions, however, this is compared with the optical rotation of Litsea from ordinary distillation which is generally carried out on the flower parts, the result will be the same, namely positive, meaning that the Litsea oil from the flower does have the ability to rotate light polymerization to the right (dextro-rotation) (Endah, 2014).

In general, the greater the steam pressure used in the distillation process, the smaller the optical rotation of the Litsea oil produced. This means that with high steam pressure, the oil components which have the ability to rotate light polymerization to the right will change or decompose a lot so that as a result the rotation of Litsea oil resulting from distillation using high steam will be smaller than the optical rotation of oil resulting from distillation. by using low steam pressure (Gunther, 2022). The results of research on Litsea oil from stem bark and leaves show that the size of the steam pressure used in the distillation process will affect the quality of the oil produced. So deviations from quality standards that occur during optical rotation mean that the oil can be said to be relatively low quality (Yulia, 2022).

CHEMICAL COMPONENTS

The differences in the chemical components of the essential oils of the two parts of the tree can be seen in Table 2.

Table 2. Chemical Properties of Litsea Bark and Leaf Oil

Component (%)	Steam		Steam	
	Leaf	Bark	Leaf	Bark
Citral	1.43	3.20	1.43	5.20
Cineole	57.50	48.50	45.70	40.70
Citrionelal	0.90	25.50	0.76	21.40
Linalol	-	5.58	-	2.36
Geraniol	10.60	6.70	15.60	4.20

α – Pinene	1.50	1.04	5,10	1.90
β – Pinene	3.61	1.12	3.67	1.54
Camphene	4.90	-	4.96	-

Description: - Not detected

The results of gas chromatography analysis can be seen that the highest component is cineol, both from stem bark and leaves. This may be caused by species, where the plant grows and other factors such as soil type, age, variety and treatment during the distillation process (distillation method and time).

Napis (2022) explains that the essential oil compounds of Litsea plants that grow in the highlands generally tend to contain more cineol compounds than other compounds. In the world of trade, things that are similar to Litsea oil are krangean oil, trawas oil and May Chang oil. These three types of oil predominantly contain 40-70% cineol compounds known as cineol oil (Rusli, 2022). Sineol is soluble in alcohol, ether, benzyl benzoate, diethyl phalate, and slightly soluble in mineral oil and insoluble in glycerin.

The results of this research, apart from cineol, Litsea oil still contains other compounds, namely citronellal ($C_{10}H_{18}O$), citral ($C_{10}H_{16}O$), linaloon ($C_{10}H_{18}$) in the bark, camphene ($C_{10}H_{16}$) in the leaves, graneol, α and β Pinene. All of these compounds are relatively low except for citronellal and graniol in the leaves which is quite high, namely more than 10%. This is in accordance with the opinion of Lumberg (2022) who explainsif the essential oil content is less than 10%, it can be said to be relatively low and does not have a pleasant smell because the main things that cause it to smell are citronellal and graniol.

Quality standard provisions from the DepartmentIndonesian Trade and the Essential Oil Association of USA (EOA No. 24) is a citronellal and graniol content of at least 3.5% of Litsea oil which is equated to May Chang oil, meaning that the oil from the results of this research almost all of its components meet the requirements for cineol oil.

In all the descriptions of the physicochemical properties, it can be said that the research oil from the Litsea plant meets the requirements of national and international quality standards.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Data from research on Litsea oil from leaves and stem bark shows that the oil has almost the same physical and chemical properties, only the percentage levels are different. The main components of Litsea oil besides cineol in other aromatic series found include citronellal stem bark (21.4-25.5%), graniol (4.2-10.6%), citral (1.43-5.2) quite has the potential to be isolated and used as an ingredient in perfume, cosmetics and medicines.

Suggestion

Data on the yield of Litsea oil is relatively high, its chemical properties are quite potential, so the Litsea plant needs to be developed as an essential oil commodity with good prospects.

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