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Composition on Essential Oil Extraction from Lemongrass Fragrant by Microwave Air Hydro Distillation Method to Perfume Dermatitis Production

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Abstract. Essential oils from fragrant lemongrass are generally obtained by conventional extraction methods that require large energy, a significant amount of solvents, and a fairly long processing time. This study used a method developed from microwave hydro distillation, which is a microwave water- hydro distillation to optimize the extraction of essential oils. The purpose of this study was to produce citronella essential oil with the best quality and a large amount compared to the extraction method, where the obtained fragrant citronella oil can be used as raw material for making perfume. Where extraction is carried out at 600 W power; the ratio of the raw material to be extracted and the solvent is 0.5 g mL⁻¹ and the extraction time is 150 minutes. In extraction with microwave water-hydro distillation, the air flow rates used are 1, 2, 3, 4, and 5 L/min. The results showed that the extraction of citronella oil with microwave water-hydro distillation was easier and produced higher yields compared to extraction by microwave hydro distillation method. Testing the physical properties of fragrant citronella oil shows that essential oils obtained by microwave hydro distillation and microwave water- hydro distillation have the same quality (refractive index and specific gravity). Furthermore, testing the chemical properties of fragrant citronella oil showed that essential oils obtained by hydro distillation-air microwaves had better flavor compared to oils obtained by microwave hydro distillation.

1. Introduction

Essential oils are oils from species of aromatic plants obtained from plant parts such as roots, bark, stems, fruit, seeds or flowers through the process of hydro distillation or steam distillation. Essential oils produced are needed by various industries, such as the perfume, cosmetics, pharmaceutical / medicine industry and the food and beverage industry. In trade, essential oils are viewed as having a role to produce primary and secondary products, both for domestic and export needs [1].

Every year, consumption of essential oils increases by around 8-10%. Due to the increasing need for essential oils for the perfume, cosmetics and health care industries [2]. This is also driven by consumers to switch from the use of materials containing synthetic compounds to use natural ingredients; this is what causes the demand for essential oils. In addition, essential oil products cannot be replaced by synthetic ingredients.

One of the many essential oils in Indonesia is fragrant citronella oil. where fragrant citronella oil can be used as a natural insect repellent and very attractive to the pharmaceutical industry and fragrances [3]. Fragrant citronella oil has uses as analgesic, anticonvulsant, anxiolytic, anti-fungal, anti-bacterial, anti-parasitic and



nematicidal activity [5]. In traditional practice, citronella oil has been used as antipyretic, aromatic, vermifuge, diuretic and mental illness [6].

Indonesia places the 9th supplier position in the world as of 2011, with a value of USD 0.16 billion [7]. The biggest essential oil user industry is the flavor & fragrance industry whose global trade value is estimated at USD 18 billion per annual and Indonesia's import value is estimated at USD 400-500 million p. Aa Industry other users include Spa /Aromatherapy, pharmaceuticals, insecticides and one of the industry perfume.

Perfume is a product that is in great demand by both local and foreign people, because the use of perfume itself and the aroma produced from perfume are of particular value to consumers. Perfume is obtained from the addition of essential oils, alcohol and extracts from plants that have a distinctive aroma and interest by the public. One of the most important plants in Indonesia, especially in Aceh, is the fragrant lemongrass found in the Bener Meriah area, where the area is a strategic area for cultivating fragrant lemongrass.

At present, fragrant lemongrass is exported abroad for processing into essential oil and then used as a variety of cosmetic and perfume products [8], which is then imported back into the country to increase foreign exchange. Where the needs of the public for body deodorizers and as a treatment for dermatitis also increase. Therefore, it is needed another alternative to minimize the production of fragrant lemongrass export-import by processing the fragrant lemongrass into a product that can boast Indonesia abroad, and to improve the economic needs of the local community and can boast domestic products that come from local materials but have international quality which will then be marketed on the world market.

Therefore, in this study to produce fragrant lemongrass essential oil in greater amounts than the usual extraction method using microwave assisted air hydro distillation method, where the essential oil obtained can be used as raw material for the manufacture of perfumes that can treat disease Dermatitis.

2. Methods

2.1 Materials

The materials used in this study were fragrant lemongrass is obtained from Takengon, North Aceh. All dried plants are moistened in the semi-dark room for 10-15 days and then cut into small pieces. Plant samples are then stored in a zip plastic bag at room temperature. Aquadest and anhydrous sodium sulfate. In making perfume, the ingredients used are ethanol, locking oil (sandalwood oil or other flavorful essential oils) A subsubsection. The paragraph text follows on from the subsubsection heading but should not be in italic.

2.2 Microwave Hydro Distillation

Microwave ovens that have been modified for microwave hydro distillation operations. 30 grams of citronella powder which has been crushed which is placed in a 1 liter flask containing deionized water (500 mL). The pumpkin is arranged in a microwave oven cavity and condenser at the top of the oven to collect the essential oil extracted. Using a compressor, electric motor and maximum pressure of 3 bars. Air flow is added to the distiller which contains fragrant lemongrass powder and deionized water. Microwave ovens are operated at a power level of 600 W for a period of 2 hours. Then the oil is separated using a separating funnel. To remove water, the essential oil extracted is then dried over anhydrous sodium sulfate.

2.3 Gas Chromatography-Mass Spectrometry (GC-MS)

The qualitative and quantitative analysis of the fragrant citronella oil extracted was carried out using Shimadzu GC-MS equipment with a wavelength of 60 m and an internal diameter of 0.25 mm. The initial oven temperature was 500°C to 2600°C. Injectors and transfer line temperatures are 250°C and 200°C, respectively. The holding time is 2 minutes and the solvent delay time is 8 minutes. Helium is used as a carrier gas at 1 ml/min - 1.2 µl of volume of oil sample (2% solution of citronella oil in hexane) is injected. Split ratio of 50: 1 and scanning range of 50-600 Da are used. Constituent identification retention time and search is carried out based on spectral spectrum (NIST).

2.4 Fourier Transform Infrared (FTIR)

The IR spectrum of fragrant citronella oil (obtained from the leaf portion on the highest oil yield) was obtained from the "IR Affinity 1" FTIR spectrometer (Shimadzu Corporation, Japan), measured in the range between 4000- 400 cm^{-1} with a resolution of 2 cm^{-1} and 30 scans per spectrum. Potassium bromide (KBr) is used for reference. KBr pellets were prepared and about 20 μl of lemongrass oil was spread on the pellets and then immediately taken for analysis. Basic correction and frequency variations are applied using the Shimadzu IR solution. Software 1.5 is included with the equipment.

3. Results and Discussion

3.1 The Effect of Water Content from Fragrance Citronella Oil

Based on the dry weight of the fragrant lemongrass plant which was 2.11% at 3 hours distillation time. These results indicate that oil is very influential by the moisture content of the plant samples. During drying of plant samples, volatile compounds may seep into the surface and evaporate together with water resulting in a decrease in oil content.

In the drying process, temperature is the most important parameter for preserving whole essential oil in plant material. The drying method significantly affects the oil content and composition. From the explanation above, it is clear that the drying process affects the active ingredients of essential oils. Therefore, in this study, shady plant materials are dried in a semi-dark room. In addition, given the traditional practice of refining lemongrass plants and the unavailability of fresh ingredients regularly, parts of dried fragrant lemongrass plants are used in optimization studies by hydro-distillation processes.

The following is research data from the results of fragrant citronella oil using the water-hydro distillation method, can be seen in table 1 below.

Table 1. Yield of Citronella Oil obtained by Microwave Air-Hydro Distillation.

Extraction Method	Air Flow Rate (L/min)	Citronella Oil Yield (%)
Microwave Air-Hydrodistillation	1	1.2074 \pm 0.1123
	2	1.2387 \pm 0.1057
	3	1.3145 \pm 0.0968
	4	1.3891 \pm 0.0973
	5	1.3878 \pm 0.0985

Experiments were carried out to evaluate the effect of different parameters such as the fragrant citronella plant, solvent ratio and distillation time on the oil yield. The oil yield increased with an increase in extraction time, and almost all oil was extracted within 2 hours of the extraction period. Increasing extraction time up to 3 hours increases oil yield by only 1-5% of the total oil extracted and outside of 3 hours deteriorates oil quality (Ahmed, 2005).

3.2 GC-MS Analysis

The extracted oil from various parts (leaves and stems) obtained at the highest yield was analyzed using GC / MS. Percentages of areas higher than the peak indicate a higher percentage of compounds that are suitable in oil. The chromatogram plot obtained from the leaf section revealed high concentrations of three major commercially important compounds, namely citronellal (55.23%), geraniol (26.29%) and citronellol (13.41%) accounting for 94.94% of total constituents. Meanwhile, all aerial parts have 89.15% of these three compounds and the stem part only covers 69.84%.

The following is research data from citronella oil fragrance using GC / MS analysis can be seen in Figure 1 below.

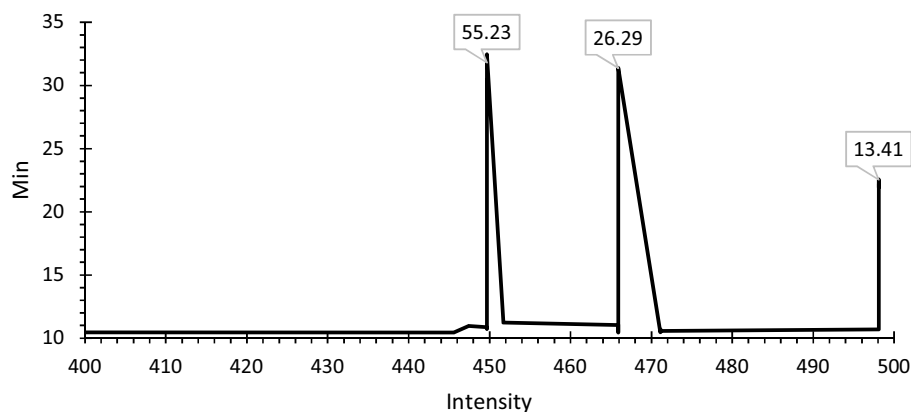


Figure 1. GC/MS Chromatogram of Air-Hydro Distillation Citronella Oil.

3.3. FTIR Analysis

Qualitative analysis of different organic compounds can be ascertained from the characteristics of the infrared spectrum at certain frequencies that are influenced by certain functional groups. The percentage of transmittance corresponding to the wave number concluded in the total infrared spectrum is weakened as shown in figure 2.

There is an intense broad peak in the range 3600–3200 cm^{-1} specifically at 3365.78 cm^{-1} according to the hydroxyl (OH) group. Another intense and branching peak in the range 2935–2915 cm^{-1} is the C-H methyl group and stretches of methylene, mostly aliphatic alkyl groups. The medium peak at 2719.63 cm^{-1} is the C-H aldehyde group of carbonyl compounds. Cluster C = O ketones at wavelength 1750–1705 cm^{-1} . The alkene group is detected at a wavelength of 852.53 cm^{-1} . Whereas in small vibrations on the wave of 750–660 cm^{-1} there is an aromatic group namely vinyl C-H.

The following is research data from citronella oil fragrance using GC / MS analysis can be seen in figure 2 below.

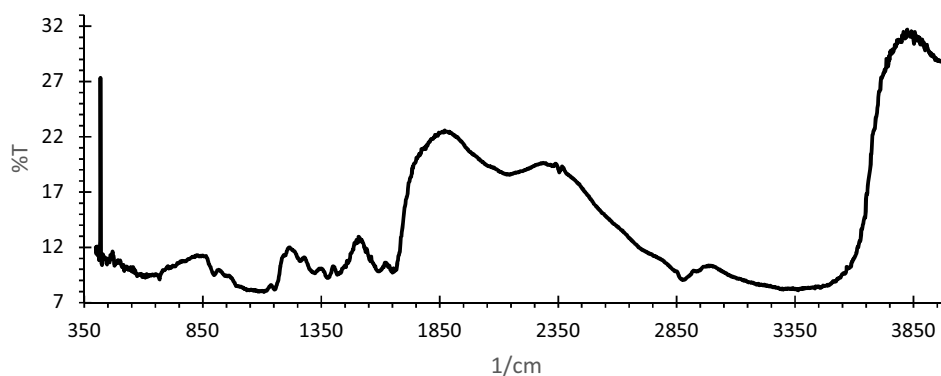


Figure 2. FTIR Spectra of Air-Hydro Distillation Citronella Oil.

4. Conclusions

Scented Lemongrass Oil is one of the many essential oils in Indonesia that can be used as natural insect repellents and are very attractive to the pharmaceutical and fragrance industries. Therefore, this study successfully to produce fragrant citronella essential oil by extraction method but is assisted by solar

energy for heat needs, where the essential oil obtained can be used as raw material for making perfumes that can treat dermatitis. This is a preliminary study and is expected to be continued for further research.

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