The Influence of Raw Materials Area, Methods and Distillation Time of Aceh Patchouli Oil

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Abstract. Patchouli oil is the result of distillation from patchouli plants. It used as a mixture and fragrance binder in the perfume, pharmaceutical and cosmetic industries. But the constraints in the patchouli oil refining industry are still produced the low yields. The factors that influence the yield of patchouli oil include the use of seeds, how to handle raw materials (knitting, withering and drying), refining process, the time of distillation, and the use of distillers. The purpose of this research is to get high yield of patchouli oil to increase the selling value. Which is variable sources of raw materials, and the length of distillation time obtained the highest yield of patchouli oil about 2.09% with distillation time of 5 hours.

1. Introduction
Patchouli (PogostemoncabinBenth) is one of Indonesia's essential foreign exchange contributors. About 90% of the world's patchouli oil is supplied from Indonesia [1]. Patchouli development in Indonesia, especially patchouli production in Nanggroe Aceh Darussalam (NAD) contributes 70% to Indonesia's patchouli oil supply or 1696.8 tons / year from the area of 2,876 Ha [2]. Common constraints in patchouli agribusiness include low oil content, low oil quality and oil uniformity, and then the supply of non-continuous products and fluctuating prices [3].

Patchouli oil is used as a fragrance and fragrance binder in the perfume industry, pharmaceutical and cosmetic industries. Patchouli oil is obtained from the distillation of leaves and stalks. In the perfume industry, patchouli oil is the main raw material whose function cannot be replaced by other oils. The main components obtained from the distillation of patchouli leaves are patchouli alcohol (45-50%) in patchouli oil. According to [4], the factors that influence the yield of patchouli oil are the use of seeds, how to handle raw materials (knitting, withering and drying), how to refine, the length of distillation time, and the use of distillers. While the quality of patchouli oil depends on the factors as the use of original seeds, soil and climate, diverse land conditions, system of cropping patterns, the use of distillers, methods used in raw materials handling, and oil forgery.

Based on the description above it is known that there are several factors that affect the yield of patchouli oil, including external and internal factors. In addition to different raw materials and methods, the length of distillation time is one of the factors that affect in oil yield production. In the patchouli distillation process in some places, it does not use the right time to stop the distillation.
process. If the distillation process ruins very long, exceeds the optimal time, the ester content in the oil will increase and caused low quality for the result and the color will be more concentrated. If it is stopped too quickly, the distillation process is not perfect because there is still oil contained in the leaves that had not been distilled. Therefore, the amount of patchouli oil yield from several places is very different. Based on the description above, a study is needed to determine the optimum yield of oil with good quality, from the distillation by varying the area of raw material sources (patchouli), the method and time of refining.

Get the optimum result in variables combination of research between the area of raw material sources, distillation methods, and length of distillation time. Determine the optimum conditions of the range of research variables conducted.

2. Methodology
This research has been conducted in Kuala Batee-Aceh Barat Daya District. Research that has been done is limited to patchouli oil refining. The village is located at an altitude of 500 meters above sea level with latosol soil. Patchouli oil for analysis will be obtained from 3 patchouli refineries in Kuala Batee-Aceh Barat Daya District. Patchouli oil obtained will be calculated and analyzed for its quality at the Laboratory of Agricultural Analysis, Faculty of Agricultural Technology, SerambiMekkah University. The analysis was also carried out in the Laboratory of Analysis of Agricultural Products, Pilot Plan, and Organoleptics, Faculty of Agriculture, Syiahkuala University, Banda Aceh.

The materials used for the distillation process in this study were patchouli leaves, stems and twigs, and water obtained from Aceh Barat Daya. The equipment that will be used for research are knives, machetes, drying containers (mats), thermometers, a set of distillation tools for water and steam methods, condensers (20 m), heaters, scales, measuring flasks and distillate glass bottles 75 ml.

Patchouli distillation process:

1. Patchouli raw material is dried on plastic sheeting under sunlight (30-40°C) which is protected by trees (not directly contacted with sunlight), up to 14% moisture content (2-3 days).
2. Leaves, twigs, and 30% of stems that are ready to be dried were cut into 5 cm pieces using machetes and knives.
3. Material as much as 40 kg of dried patchouli leaves (per unit of experiment) is put into the refining kettle with time according to optimal treatment. Refining is carried out continuously with pressure less than 1 atm, for optimal distillation.
4. Refined oil (oil and water) is stored in a container (a closed plastic container)
5. Furthermore, the stored oil and water are separated simply by using a separating funnel.
6. Furthermore, patchouli oil was calculated for its yield and physical analysis was carried out, and patchouli oil content.

3. Results and Discussion
The yield is a comparison of the amount (quantity) of oil produced from the extraction of aromatic plants. The yield uses percent (%) unit. The higheryield value produced, the higher the value of essential oils produced. The increase in yield or ratio of the amount of oil produced could be done with two approaches, first, the cultivation process second, the oil refining process. The quality of the oil produced is usually not proportional or invert to the amount of yield produced. One effort to increase in the patchouli oil yield and quality could be done by optimization method.

3.1. Effect of Regional Source of Raw Material on Patchouli Oil Rendement
Based on the yield analysis toward the patchouli oil, the yield value ranged from 0.17% -3.63%, with average value of 1.26% (Table 11). Figure 4 shows the relationship between the influence of the area of raw material source to the yield of patchouli oil in the condition of patchouli oil refining process.
Figure 1. Graph of the relationship of raw material source areas (D1= DrienGlumbang Region, D2=Jeumpa Region, D3= Guhang Region) to the yield of patchouli oil.

From Figure 4 it shows that the highest yield is obtained from 2.01% D1, as the origin of patchouli raw materials sources from the DrienGlumbang area. Patchouli plants in this village are planted on land so that is not overgrown with other plants around it. The lowest yield was obtained from 0.52% D3, as the Guhang area. The raw material that have been distilled in this area is planted in the community house area and with any other plants around it. Sediment yield reported at D2 is 1.26%, the source of raw materials is planted in the garden and shaded by other plants. From the yield obtained it is known that the area of raw materials sources is greatly affects the yield due to the different types of soil and cropping patterns in each region. In addition to the patchouli source area, the type of patchouli will also affect the oil yield, in this study using the type of Aceh patchouli plant. Aceh Patchouli (Pogostemoncablin), not flowering, high oil content (2.5-5%). Patchouli can grow in various types of soil (andosol, latosol, regosol, padsolik, kambisol) but will grow well on loose soil and contain a lot of humus, with soft texture to sandy clay, pH 5.5-7. The slope of the land should be less than 15°. The desired climate is a moderate climate with an average rainfall of 3000 mm / year and its distribution is evenly distributed throughout the year. The desired temperature is around 24-28°C with relative humidity of 70-90%. And the land is free from disease. Patchouli plants need open space conditions. Patchouli plant with broad leaf, thin and green but the low oil content is low. Conversely, if patchouli is not given by another plants (protective plants) the growth of patchouli plants become rather dwarf, the leaves are small thick, yellowish red but have a higher essential oil content [5].

Commonly, patchouli grows well in the lowlands and produces high at an altitude of 10-400 meters above sea level. Requires fertile soil, enough humus and organic matter. Patchouli also requires sufficient sunshine with rainfall ranging from 2,500-3,500 mm / year, with a temperature of 24-28°C. Patchouli that grows in the highlands is relatively better, because of the influence of air temperature and fertility conditions and relatively cool natural conditions. By optimizing patchouli planting, it will increase in the yield and increase the sell value of patchouli oil [6].

3.2. Effect of Distillation Method on Patchouli oil yield

Figure 2 shows the relationship between the refining method to the yield in the conditions of patchouli oil refining.
From the picture, it could be seen that the highest yield of patchouli oil is obtained in M2, which is a steam distillation method with a yield value of 1.30%. Whereas the lowest yield was obtained in M3, as steam refining method with 1.21% yield. And M1 water distillation method yield value 1.24%. From the results of the analysis it could be seen that the distillation method affects the yield value. This is due to method differences. In this study steam distillation process cannot separate patchouli oil well so that the yield is lower, because steam does not optimally separate oil from leaves due to density of material so that oil yield is not optimal. This is important because the density of materials on the tool will affect the distillation process. That is, steam that separates oil cannot runs optimally or requires a long time to refine. This is also due to the simple distillation equipment still assembled by the community. Steam distillation is an effective refining method for patchouli oil refining [7].

3.3. Effect of long time distillation on patchouli oil yield

Figure 3 shows the relationship between distillation time to the yield of patchouli oil in patchouli oil refining.

The results showed that the highest yield was obtained at 5 hours distillation (W3) which it was 2.09%. While the lowest yield was obtained at 3 hours refining time (W1) which it was 0.37%. 4 hours refining time (W2) yields is 1.29%. The longer of the distillation time, the higher yields until a certain
time of refining will not increase (constant). Figure 6 shows that 5-hour refining times produced the highest yield about 2.09%. When the distillation time is above 5 hours there are no more oil cells that could be evaporated.

4. Conclusion
The longer time the distillation limit in 5 hours refining, the oil yield will increase in, this is due to the increasing amount of heat received by the material to vaporize the oil cells from the material and the more steam associated with the oil cells of the tissue material, so that the oil is distilled more and more. In addition, the longer the distillation time, the more heat is received. [8] In the distillation process the diffusion process will increase and it cause the yield will also increase.

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