

# Analysis of Volume and Panelic Tests of Quality of Sewing Oil on the Difference of Gaharu Type (*Aquilaria malaccensis* L.) on The Process of Gaharu oil distillation (as a support for high level botany courses)

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**Abstract—** Learning Outcomes Graduates of the Higher Botany courses in the Biology Education Undergraduate Study Program in the field of knowledge include students able to conduct practicum activities and trials in accordance with the concept of biological knowledge by utilizing available natural resources. Eaglewood is one of the commodities of Non-Wood Forest Products that have a very expensive selling value and have a multipurpose value. The very high potential of agarwood usually comes from the type *Aquilaria malaccensis* L. Agarwood oil is an essential oil obtained through a distillation process (distillation). Organoleptic tests are carried out with sensory assessment, a panel that acts as an instrument or instrument is needed. People who are members of the panel are called panelists. This research is a type of descriptive analysis research with the approach taken is a qualitative approach that is used to determine the data in the form of numbers. The purpose of this study are: 1) to determine whether there are differences in the volume of agarwood oil to the different types of agarwood (*A. malaccensis* L.) in the process of gaharu oil refining. 2) to determine the panelist's test on the quality of Agarwood oil (*A. malaccensis* L.). The results showed that the volume of oil produced from the type of agarwood *A. malaccensis* L. with the type of kemedengan as much as 3.5 g and type of sapwood as much as 11.1 g. Panelists' test on the quality of agarwood oil in terms of color, aroma, texture and durability of a good aroma are: the type of kemedengan with blackish brown color and thick texture, the type of sapwood with a very fragrant aroma and long lasting aroma.

**Keywords—** Volume Analysis, panelist test, agarwood oil, agarwood type, distillation process, *Aquilaria malaccensis* L.

## I. INTRODUCTION

In accordance with the Vision of Mulawarman University namely education that relies on natural resources (SDA), especially humid tropical forests (tropical rain forest) and its environment, and refers to Permendikbud number 44 of 2015 concerning National Standards of Higher Education (SNPT), Presidential Regulation number 8 in 2012 concerning the Indonesian National Qualification Framework (KKNI), and local wisdom that aims to prepare students to succeed in living

in the future and to use local contextual conditions by highlighting local wisdom.

The curriculum of the Biology Education Study Program is currently compiled based on Permenristekdikti No. 44 of 2015 and coverage of general descriptions and descriptions of level 6 qualifications of RI Presidential Regulation number 8 of 2012. The curriculum is also arranged based on local wisdom in East Kalimantan, namely the Principal Scientific Pattern (PIP) of Mulawarman University, namely "Tropical Rain Forest Study" and the environment.

Achievement of Graduates Learning (CPL) High-level Botany courses in the Biology Education Undergraduate Program in the field of knowledge including students capable of practicum activities and trials in accordance with the concept of biological knowledge by utilizing available natural resources.

East Kalimantan is the most important aloes producing area in Indonesia, especially the *Aqualaria spp* which is known to produce the best quality aloes. The potential of agarwood in Kalimantan is quite large, 27 percent of the total number of agarwood in Indonesia comes from East Kalimantan which is 2752 tons. Eaglewood is obtained from nature and cultivation [11]. Agarwood is the main seed of Non-Timber Forest Products (NTFPs) [9]. Agarwood is the most expensive aromatic ingredient in the world, because the best quality agarwood prices on the international market can produce around 2 kg of trawling for 58 million. Agarwood hunting in natural forests is increasing due to the high selling prices that threaten the sustainability of Agarwood. This led to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1994 establishing the genus *Aquilaria spp*. And *Grynops sp*. Included in Appendix II CITES means that the trade is limited because the population is shrinking by hunting in natural forests. The development of Gaharu farming and the process of inoculating the trees by applying the

technology found in the Forest Research and Development Center and Nature Conservation Center (P3HKA), one of the 4-5 year old agarwood tree trunks after being induced can produce a minimum of 2 kg of Agarwood sapwood within 1-3 years [10].

The results of the chemical analysis, Agarwood (*A. malaccensis* L.) originating from Kalimantan contains the main component of agarwood oil in the form of chromone. This chromone causes a fragrant smell from agarwood when burned [13]. Agarwood contains resin which is not exuded but is deposited in wood tissue in the tree. Chemically, the resin is a mixture of resin acid, alcohol resin, resinotanol, ester and resen [4]

The quality of agarwood is determined by the level of resin contained in it, the higher the resin content the better the quality. The quality of agarwood oil produced from this type of sapwood will be far better than the kemedangan class [7]. Kemedangan class is cheap and light, and the chemical component of high-value kemedangan. While the type of agarwood in the ash class is a mixture of the results of the quality of sapwood and kemedangan gaharu cleansing [8]

The layout of the type of agarwood in the distillation process should use three types of agarwood, namely sapwood, kemedangan and ash. If only using the low-quality type of agarwood, the productivity will be low, so the process becomes uneconomical. Therefore in the process of refining agarwood oil in one distilled kettle must use several qualities, namely sapwood, kemedangan, and ash. The quality of the agarwood type can affect the volume of oil produced in the process of gaharu oil refining [3]

The quality of agarwood oil is influenced by several factors, namely the basic ingredients of aloes wood always have a difference in oil content or resin, the origin of wood whether natural or natural from forests or agarwood wood cultivation results also affect the quality of oil produced, the character of the aroma of aloes produced from a species with other species have differences, other than that the quality of the oil is related to the refining process such as the preparation of basic materials including what and how long the process of soaking the basic material before refining, refining devices, refining techniques, refining technology, the temperature used in the process refining [6]

Eaglewood is grouped into 3 (three) types, namely aloes, Kemedangan gaharu, and Abu gaharu. Eaglewood and Kemedangan sapwood are obtained by cutting down the gaharu-producing trees that have died, as a result of the accumulation of mastic caused by infection in the tree. Agarwood sapwood is wood that comes from a tree or part of an aloes-producing tree, which contains mastic with a rather strong aroma, characterized by its black or blackish brown color. Kemedangan is wood that comes from an aloes-producing tree, contains mastic with a weak aroma, characterized by its grayish-white color to brown, coarse fibrous, and soft wood [2]

Agarwood oil is an essential oil obtained through a distillation process. This essential oil is commonly used in making perfumes and cosmetics [9]. Refining is a process of isolating essential oils from their raw materials with the help of water vapor, where oil and water do not mix. Because of the nature of such essential oils, the content of oil in condensate (a mixture of water and oil coming out of the condenser) is different for each type of essential oil [5] There are three methods of extracting essential oils commonly used as follows:

1. Boiling water (distillation) where the ingredients in the kettle are soaked with water.
2. Steamed distillation (water and steam distillation) in this system the material is placed in a filter with a certain distance above the surface of the water in the distilled kettle.
3. Direct steam distillation where the material is in the distilled kettle and steam coming from the boiler is supplied with a certain pressure at the bottom of the distilled kettle. [5]

The organoleptic test or sensory evaluation is a scientific measurement in measuring and analyzing the characteristics of a food ingredient that is received by the senses of sight, taste, smell, touch, and interpret the reaction of the sensing process carried out by humans who also can be called panelists as a measuring tool [14]

To carry out sensory assessment, a panel is needed. In assessing the quality or analysis of the sensory properties of a commodity, the panel acts as an instrument or tool. This panel consists of people or groups who are tasked with assessing the nature or quality of commodities based on subjective impressions. People who are members of the panel are called panelists [1]

Syukri says that in organoleptic assessment there are seven panels, namely: 1) individual panels, 2) limited panels, 3) trained panels, 4) rather trained panels, 5) untrained panels, 6) consumer panels, and 7) children's panel.

According to Nungky (2015), in an organoleptic assessment a panelist needs senses that are useful in assessing the sensory properties of a product, namely:

1. The visual senses associated with gloss color, viscosity, size and shape, volume density and specific gravity, length and diameter and shape of the material.
2. The sense of touch is related to structure, texture and consistency. Structure is the nature of the constituent components, texture is a sensation of pressure that can be observed with the mouth or touch with the fingers, and consistency is thick, thin and smooth. [1]

## II. METHODS

This study uses a descriptive type of research that is, by describing a number of variables relating to the problem and the unit under study between the phenomena being tested. The approach taken is a qualitative approach,

namely a research approach that answers the research problem, requires a thorough and thorough understanding of the object under study, to produce research conclusions.

The sampling technique in this study is Purposive Sampling is the determination of agarwood that is used is the type of kemedangan and gubal which are the raw materials in the process of gaharu oil refining. The placement of the type of eaglewood used is three levels of difference, namely 7 kg of sapwood and 7 kg of kemedangan for one time distillation process, then analyzed the volume of agarwood oil produced in each of the different types of agarwood and panelists tested for the determination of the quality of agarwood oil.

### III. RESULT AND DISCUSSION

#### A. Results

Analysis of the volume of agarwood oil produced in the distillation process using two levels of differences in type of agarwood, *A. malaccensis* L. with kemedangan type and *A. malaccensis* L. with sapwood type. The difference in the volume of oil obtained from each type of agarwood at the agarwood oil refining process listed in table 1.

TABLE I. RESULTS OF VOLUME ANALYSIS OF AGARWOOD OIL ON REFINING PROCESS OF *AQUILARIA MALACCENSIS* L. WITH TYPE OF KEMEDANGAN AND TYPE OF GUBAL

No.	Agarwood Type	Volume of Oil Produced (g)
1	Kemedangan	3.5
2	Gubal	11.1

Based on table 1, it is known that there is a difference in the volume of agarwood oil produced in the process of gaharu oil refining. The difference in the volume of oil produced from each type is *A. malaccensis* L. with a kemedangan type of 3.5 grams. *A. malaccensis* L. with a type of sapwood as much as 11.1 g.

Panelist tests were carried out by distributing assessment sheets that had been filled by panelists. Some of the criteria contained in the assessment sheet containing the description in the form, the assessment of the sample tested described in the assessment sheet include specifications: 1) color; 2) aroma; 3) texture; and 4) the endurance of aroma from agarwood oil.

The hedonic test of sample/sample assessment based on the level of panelists' preference for gaharu oil samples, the number of levels of preference varied depending on the criteria that had been prepared on the organoleptic test assessment sheet, then the sample assessment tested was done by calculating the number of scores given, by giving a check mark (✓) on the assessment sheet from this check mark, the calculation of the number of scores given is in accordance with the panelist's response to the sample provided.

Based on the results of organoleptic test (preference test) the color of agarwood oil carried by 15 panelists on the Kemedangan type *A. malaccensis* L. and the sapwood type *A. malaccensis* L. obtained the following results:

Based on the results of organoleptic test (preference test) the color of agarwood oil carried by 15 panelists on the Kemedangan type *A. malaccensis* L. and the gubal type *A. malaccensis* L. obtained the following results:

TABLE II. PANELIST TEST RECAPITULATION OF THE COLOR OF AGARWOOD OIL ON *AQUILARIA MALACCENSIS* L. TYPE OF KEMEDANGAN AND TYPE OF GUBAL

Agarwood Oil	Total score	Average
Kemedangan type	45	3
Gubal type	30	2

Table 2 shows that the agarwood oil species *A. malaccensis* L. type kemedangan obtained an average value of 45 with the highest value and has a brownish yellow color, whereas in agarwood oil the species of *A. malaccensis* type of sapwood has a clear yellow color with a value of 15.

The results of organoleptic test (test of preference) on the aroma of agarwood oil carried out by 15 panelists on the type of kemedangan *A. malaccensis* and sapodilla type *A. malaccensis* obtained the following results:

TABLE III. RECAPITULATION OF PANELISTS' TEST ON AROMA OF AGARWOOD OIL FROM *AQUILARIA MALACCENSIS* L. TYPE KEMEDANGAN AND TYPE GUBAL

Agarwood Oil	Total score	Average
Kemedangan type	41	2.73
Gubal type	52	3.46

Table 3 shows that the species of *A. malaccensis* type of sapwood with an average value of 3.46 and has a very fragrant aroma so that it has the highest value compared to *A. malaccensis* L. type kemedangan with an average value of 2.73.

Based on the results of organoleptic test (preference test) on the texture of agarwood oil carried out by 15 panelists in the kemedangan type *A. malaccensis* and the sapwood type *A. malaccensis* obtained the following results:

TABLE IV. RECAPITULATION OF PANELISTS' TEST ON THE TEXTURE OF AGARWOOD OIL *AQUILARIA MALACCENSIS* L. TYPE KEMEDANGAN AND TYPE GUBA

Agarwood Oil	Total score	Average
Kemedangan type	50	3.33
Gubal type	32	2.13

Table 4 shows that *A. malaccensis* type kemedangan species obtained an average value of 3.33 with a very thick texture, while *A. malaccensis* species were Gubal types with a value of 2.13 with a less viscous texture.

Based on the results of organoleptic test (test of preference) on the endurance of the aroma of agarwood oil carried out by 15 panelists of *A. malaccensis* kemedangan type and *A. malaccensis* type of Gubal obtained the following results:

TABLE V. RECAPITULATION OF PANELISTS' TEST ON THE DURABILITY OF THE AROMA OF AGARWOOD OIL OF *AQUILARIA MALLACENSIS* L. TYPE KEMEDANGAN AND L TYPE OF GUBAL

Agarwood Oil	Total score	Average
Kemedangan type	41	2.73
Gubal type	51	3.40

Table 5 shows that the agarwood species of *A. mallacensis* type sapwood obtained an average value of 3.40 with the highest value of the dam has a long lasting aroma compared to *A. mallacensis* type kemedangan with a value of 2.73.

### B. Discussions

The oil produced in the distillation process uses raw material of *A. malaccensis* L. type of kemedangan as much as 3.5 grams. The type of kemedangan wood used has mastic content with a weak aroma when burned and has a brownish white wood color. Kemedangan is wood derived from gaharu-producing trees, which contain mastic with a weak aroma, characterized by its grayish-white color to brown, coarse fibrous and has a soft woody texture [12]. While the distillation of agarwood from *A. malaccensis* L. with a type of sapwood as much as 11.1 gr is wood derived from trees or parts of aloes-producing trees, containing mastic with a rather strong aroma, characterized by its black or blackish brown color and has solid fiber.

The difference in the volume of agarwood oil produced in the distillation process is influenced by the quality of agarwood wood used in the distillation process. The quality of agarwood is determined by the level of resin contained in it, the higher the resin content the better the quality and the more oil content contained in the wood [8]. Sap or resin can be characterized by a distinctive aroma that is removed from the wood if it is burned and can also be marked with the black color interspersed with chocolate found in the agarwood wood shavings.

Determination of panelists with a trained panelist category in which these trained panelists have good sensitivity. The panelists used 15 people to assess the quality of agarwood oil in terms of color, aroma, texture and endurance of the aroma of agarwood oil. Before conducting an organoleptic test the researcher gave a briefing to the panelists how to fill out the questionnaire for organoleptic tests what should be done to assess the three gaharu oil samples that have been provided.

Agarwood oil *A. mallacensis* L. type kemedangan has a brownish yellow color while the sapwood type *A. mallacensis* has a clear yellow color. The scent produced from *A. mallacensis* L. from the sapwood type is very fragrant, while *A. mallacensis* L. type of kemedangan is less fragrant. The aroma of this sapwood type *A. malaccensis* L. is obtained from sapwood shavings, the shaved parts of sap are actually waste, but the waste from this sapwood shavings can be reused for refining to produce agarwood oil with a fragrant aroma, the aroma of agarwood oil for perfume users from oil Agarwood is usually used for aroma therapy as a body freshener, reduces stress and wins the mind.

The texture of this agarwood oil can be seen from whether the agarwood oil is thick or not, from the results of organoleptic tests conducted by 15 panelists, the results of *A. mallacensis* L. type kemedangan have a very thick texture due to the specific gravity of agarwood oil lower than water. Garub type *A. malaccensis* L. type is less viscous because it is heavier because the oil content is almost similar to the density of water so that it floats and floats in the distilled water.

Fragrance endurance is carried out by applying the agarwood oil in hand and allowed to stand for 15 minutes. After 15 minutes the hand that has been applied to agarwood oil was kissed again whether the aroma of the agarwood oil is still present or is gone. *A. mallacensis* from the sapwood type has longer fragrance endurance with 12-15 hours compared to *A. mallacensis* L type kemedangan which smells less and does not last long with 5-7 hours when smeared in the hands.

The quality of agarwood oil can be seen in terms of color, agarwood oil generally has a cloudy yellow, clear yellow, brownish yellow and blackish brown besides that the aloes wood that is used also affects the quality of agarwood oil where the darker the color of agarwood is, the higher the mastic, Furthermore, the quality of agarwood oil can be seen from the aroma or smell produced by agarwood oil. Agarwood has a distinctive aroma, is strong and durable. In addition, the quality of agarwood oil is also influenced by the distillation process, refining technique methods, the quality of agarwood oil is also affected whether the eaglewood comes from the forest or cultivated because the character of the aroma produced from a species with other species has a difference. The quality of agarwood oil produced from the sapwood class is much higher than the kemedangan class. [2]

### IV. CONCLUSION

1. The difference in the volume of agarwood oil produced in the distillation process is influenced by the quality of agarwood wood used in the distillation process.
2. Agarwood oil from *A. mallacensis* L. type kemedangan has a brownish yellow color while the gubal type has a clear yellow color. The scent produced from *A. mallacensis* L. gubal type was very fragrant, while kemedangan type was less fragrant.
3. Panelist test on the quality of agarwood oil in terms of color and good texture is found in the species of *A. mallacensis* L. type kamedengan with blackish brown color and thick texture.
4. Panelist test on the quality of gaharu oil in terms of aroma and durability of a good aroma, namely the species of the *A. mallacensis* L. type of gubal with a very fragrant aroma and long lasting fragrance of 12-15 hours.

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