

Antioxidant Activity and Preferences Test of Agarwood Leaves Tea (*Aquilaria malaccensis* Lamk) Based on Leaves Drying Methods

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4

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Abstract: Gaharu (Agarwood) leaf tea can be used as raw materials brewed drinks. This study aims to know the antioxidants activity and to test the consumer preference to agarwood leaf tea (*Aquilaria malaccensis* Lamk) based on leaves drying method. The drying method of gaharu leaves was conducted by using three methods (dried under direct sunlight, roasted and heated at 40°C in an oven). Then, extract of the leaves in water was tested for the antioxidant activity by DPPH (2,2-Diphenyl-1-picrylhydrazyl) method. The hedonic test of agarwood leaf tea was performed to determine the consumer preference. The extraction of this leaf showed antioxidants activities with IC₅₀ values accounted for 33,91 µg/ml with the oven drying at 40 °C, 25,54 µg/ml with roasted, and 32,16 µg/ml under direct sunlight drying. The preference level based of consumption based on hedonic test of leaves drying methods on 3-4 scale in moderately favorable. Although the oven drying method was preferably, the roasted drying method had very strong antioxidant activity despite of the oven drying method.

1 INTRODUCTION

The changes of community life as well as improper diet and age increase leads to the formation of free radicals in the body. The effort to prevent or reduce the risk posed by free radical activity is to consume foods or supplements that contain antioxidants. Phenolic compounds, in particular, phenolic acids, tannins and flavonoids are known to be potent antioxidants and they are abundantly found in plant termasuk pada daun

Agarwood leaves (*Aquilaria malaccensis* Lamk.) are utilized as a brewed beverage (tea). Phytochemical screening of simplisia and ethanolic extract of agarwood leaves have the secondary metabolites namely flavonoids, glycosides, tannins and steroids/triterpenoids potential as antioxidants (Surjanto, *et.al* 2015). The results of antioxidant activity test that agarwood leaves have very strong antioxidant activities, as well as the age and the

growth difference of agarwood leaves. So, as a brewed drinking, agarwood leaves could be as an alternative in replacing tea even though the leaves are collected differently without separating them based on ages or methods.

Generally, tea is consumed in to refresh the body. These days, tea is collected from the tea plants i.e. *Camelia sinensis*. Today, tea has a mass of random variables from the leaves which are delicious and has health benefits. One of them is the leaves of gaharu tea as a variety of tea.

Previous studies linked to the safety of the product have shown that no toxic symptoms after test in mice (male and female), agarwood tea in all doses showed that no effect on the behavior, weight, organ weight and macroscopic observation of male and female mice. The products of agarwood leaves tea are safe to be consumed (Batubara, *at al*, 2016).

Agarwood leaf tea is feasible to be produced and consumed. It requires to be considered more particularly regarding to the processing of tea from

agarwood leaves before being consumed by people. One phase of the processing is the operation of leaf drying. This research objective to determine antioxidant activity and preference test to consumers in agarwood leaf tea (*A. malaccensis* Lamk) based on leaves drying method.

2 METHODS

2.1 Materials

Samples agarwood leaves were gathered from the gaharu trees in the Pekan Bahorok village, Langkat, North Sumatera, Indonesia authenticated by The Biology Department of Faculty of Mathematics and Sciences, Universitas Sumatera Utara, Medan. The other chemicals applied in this study were toluene, ascorbic acid, methyl alcohol, distilled water and they all were supplied by Bratachem corporation.

2.2 Preparation of Gaharu Leaves

This study used dry leaves which have not been fermented. The drying methods used were common methods applied by the society. They are heating at 40°C, roasting and drying directly under sunlight.

2.3 Determination of Water Content

The process of measuring the water content of agarwood leaves was performed according to the azeotroph distillation method (P.O.M Ditjen, 1995).

2.4 Hedonic Test

The Hedonic test is a test of the consumer's preference for agarwood leaf tea. The test involved three methods of drying which are heated 40°C, roasted, and dried directly under sunlight. It is performed to obtain what methods are the most favorable given by the consumer.

2.5 Preparation of Extraction of Gaharu Leaves in Water

The dried leaves were extracted by infundation method using distilled water as the solvent (P.O.M Ditjen, 1972)

2.6 Antioxidant activity test

The antioxidant activities extract water were tested and compared between extraction solvents used using DPPH free radical scavenging activity. Ascorbic acid was used as positive control. The measurement of absorbance was performed by UV-Vis spectrophotometer at 516 nm wavelength.

3 RESULTS AND DISCUSSIONS

3.1 Water Content

The determination of water content is performed to provide a minimal boundary of water content that can still be permitted in the dried agarwood leaves. The determination of water content is also useful for presuming the durability or resilience of samples in storage with the result that relate to the quality of the dried agarwood leaves.

The water content of agarwood leaves based on three drying methods (direct sunlight, roasted, and oven drying) is listed in Table 1. The water content has fulfilled Indonesian National Standard (INS) of tea. This result also fulfilled the POM standard, i.e. the water content of the dried agarwood leaves does not exceed 10 % (Ditjen POM, 1995).

Table 1. Water Content of Agarwood Leaves

Drying Method	Drying Time (Days)	Water Content (%)
Direct sunlight	7	4.00
Roasted	1	4.00
In oven	5	6.00

Hidayat (2004) moisture content affects the quality of materials, the lower the moisture content, the better the quality of the material. High water content can trigger microbial growth, especially fungi that can decay chemical content of the leaves.

In Table 1 also depicts the period of time needed to dry the agarwood leaves. The drying operation is affected by temperature and drying time (Huriawati, 2016). The stable temperature was performed in dried oven method but it occupied a long time. Direct sunlight drying is influenced by daily temperature, usually fluctuate. While on the roasting process the temperature depends on the heating devices are employed.

3.2 Preference (Hedonic) Test

The hedonic test (preference test) was conducted to determine the opinion of the consumer to the color, flavor, and aroma of agarwood leaf tea. Test results are listed in Table 2.

Table 2. Results of Preference Test Against Agarwood Leaf Tea Based on Leaves Drying Method

Drying method	Aroma	Flavor	Color
In oven	3.833	3.900	3.700
Roasted	3.300	3.433	3.033
Direct sunlight	3.766	3.667	3.533

1= Dislike very much, 2= Dislike moderately, 3= Neither like nor dislike, 4 = Like moderately, 5 = Like very much

Table 2 shows that the results of consumers regarding to the samples in terms of aroma, flavor and color are averagely in a scale > 3.00 (Neither like nor dislike until like moderately). Based on Table 2, it is known that the consumers prefer agarwood leaf tea which is dried with oven due to the drying temperature was constant so that the leaves are evenly dry. While on drying in an oven with 40°C, essential oil contained in it, has not been vaporized. However, the volatile compounds evaporated when being brewed, so that the aroma is preferred.

The flavor is one of the most important parameters that influence the consumer acceptability of a drinking product. According to Saragih (2014), the flavor produced is influenced by presence of the chemical components. The taste becomes a very decisive factor in the consumers' final decision when rejecting or accepting a beverage despite the good color and aroma.

The most favored taste parameter chosen by consumers was the agarwood leaf tea dried by oven. According to Ningrum (2015), the preference for consuming tea occurs because of the habit that has been done since childhood throughout their family culture. In this study, the tested tea is a new tea from agarwood leaves not been consumed by the public commonly.

Color is a physical attribute that can be used as a measure to determine the taste, texture, nutritional value and microbiological properties. Harahap (2016) has reported that color can affect the beverage interesting and this can be a hint whether the beverages have good quality or not. Based on the hedonic test, the most favored color parameter chosen by the consumers was the tea treated in oven drying. It was chosen because the thermal is distributed evenly in the oven, and the same happens

to the color of simplicial that is more uniform in greenish.

Drying under sunlight method is very dependent on the sun's heat. The color after drying is usually brown and the simplicial steeping is more concentrated. Drying with the roasted method is very dependent on the temperature of the stove, and the stirring of the simplicia, so the dryness of the leaves is also less uniform.

The aroma produced by agarwood tea leaves is caused by the volatile oil contained in the leaves. The aroma of tea is composed by volatile oil (essential oil) which is originated from the treatment in the plantations and it is partially developed during the process of making tea (Winarno (1993), Saragih, (2014). Based on the preference test, the most favored aroma parameter selected by the panelists was the leaves dried by the oven which is the same to the color treated by the same method. Because the leaves are relatively dried in the same condition, the aroma was also evenly distributed when being brewed.

Based on the results obtained from preference test, it can be stated that the consumers accept the existence of agarwood leaf tea as an alternative for tea. It is because the results of the research shows that the color, taste and aroma were moderately favorable. The flavor becomes a crucial factor in the consumer's final decision to reject or accept a foodstuff, although the other rating parameter is better, if the taste of food is not favored then the product will be rejected.

The type, grade, and taste of tea steeping water attributes the quality of the products, so that customers prioritize in consuming tea. From this research, it is projected that the agarwood leaves tea become an alternative in replacing the tea, and to be offered in market. Therefore, the color, taste and aroma parameters are essentially important. The level of consumer preferences based on the results of three drying methods, were measured in 3-4 scale within moderately favourable, and the most favoured drying method was heated technique inside an oven. In practise, the most important factors that can be conducted quickly in determining the quality of the tea is based on colours, aromas, and flavours.

3.3. Antioxidant Activity of Agarwood Leaves Water Extract

The IC₅₀ value is a number indicating the concentration of test sample which gives DPPH absorbance by 50% or, able to reduce DPPH oxidation process by 50% (Andayani, at. Al, 2008)..

The capability of the test sample in trapping DPPH as free radicals in methanol solution with IC_{50} values (the concentration of the test sample which is capable of trapping free radicals by 50%) was utilized as a parameter to determine the antioxidant action of the test sample (Prakash, 2001). IC_{50} values of agarwood leaf extracted water based on three drying methods are listed in Table 3. The antioxidant activity of the extracted of agarwood leaves in all drying methods shows the same values that are $< 50 \mu\text{g/ml}$. According to Mardawati (2008), if IC_{50} values $< 50 \mu\text{g/ml}$ are classified as a very strong category indicating there are no differences among three drying methods.

Table 3. The IC_{50} Value of Agarwood Leaf Water Extract ($\mu\text{g/ml}$)

Drying method	IC_{50} value ($\mu\text{g/ml}$)
Direct sunlight	32.158
Roasted	25.544
In oven	33.913

Strong or weak antioxidants are determined by several factors, in which is the chemical composition contained within the leaves. Geochemically speaking, the chemical composition is also influenced by the habitats of the plants (Firdiyani, 2015). The main compounds that cause strong antioxidants are phenolic group compounds, such as flavonoids. An Ethanolic extract of the agarwood leaves have classes of secondary metabolites namely flavonoids, tannins, and steroids/triterpenoids potential as antioxidants.

The agarwood leaf tea has a very strong antioxidant content compared to others. The highest results antioxidant activity from ten steeping quality types of Indonesian black tea is categorized as Type Dust I, with IC_{50} values of $97.00 \mu\text{g/ml}$. While for the lowest antioxidant activity with IC_{50} value accounted for $178.56 \mu\text{g/ml}$ is categorized as Type BTL quality (Sudaryat, et. al, 2015). These antioxidants content is an important thing that must be considered in processing the agarwood leaves tea. Based on the three drying methods used on this research, the antioxidants content is maintained very well.

Antioxidants can trap free radicals in the body resulted from the process metabolism, air pollution, contamination of food, sunlight. Werdashari (2014) explains that various plants commonly consumed in Indonesia contain antioxidants. The research result of agarwood leaves tea has high antioxidant content so that if it is consumed, then it can be as the source of antioxidant for human body.

4 CONCLUSIONS

In conclusion, the use of agarwood leaves in replacing tea leaves is considered acceptable. Based on the research, the society accepts this leaves because of the colour, flavor, and aroma are considered the same. The most favourable tea leaves is the one which has been dried in oven with temperature of 40°C because the steeping water is acceptable regarding the similarity to colour, flavor, and aroma. While, the analysis of the IC_{50} shows that oven-dried method has the highest value among three techniques, so the ability of trapping free radicals is the best.

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