Potential of essential oil of galam (Melaleuca cajuputi) leaf waste in Palangka Raya City

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Abstract. One of the causes of environmental and climate problems is human-generated waste such as Galam (Melaleuca cajuputi) leaf waste. Galam leaf waste with Essential oil ingredients can be a solution to the problem. The research objective was to utilize Galam Leaf waste in the form of essential ingredients and to determine the impact of climate change from the continuous utilization of Galam Plants. The formula used was 10 liters of water, 4, 5, and 6 kg of Galam leaf biomass. Distillation activities carried out for 3 hours/formula. Repetition of each formula is done 5 times with the distillation technique. The essential oil results obtained from the formula of 4 kg of Galam leaf biomass are 4 ml, 6.2 ml, 12 ml, 7.5 ml, and 14 ml. Formula 2 is 11.5 ml, 16 ml, 14.5 ml, 13.5 ml and 15.5 ml. Formula 3 is 24.5 ml, 28 ml, 27 ml, 20.5 ml and 16 ml. Galam leaf waste processing activities can be a solution to reduce the impact of environmental and climate pollution.

1. Introduction
Changes in environmental conditions and climate, local and global, one of which is influenced by humans. These changes have a big impact on living things. Living things that can adapt to unfavorable environmental and climatic conditions will produce new characters such as types of food, morphological forms and others. Environmental components (biotic and abiotic) are components that always interact because they influence each other in meeting the needs of living things such as human needs (anthropocentrism) [1]. Humans in meeting the necessities of life, such as the need for clothing, food, and shelter, have an impact on the environment, such as the use of Galam plants to meet housing needs. Another problem with this activity is the emergence of heaps of biomass such as Galam leaves which require time, money, and energy to reduce.

The environment has a limit on the ability to accommodate resources, if there are many resources, it will be a problem for the environment to accommodate these resources, but if the number of resources is small, then the environment is still in a balanced/good condition. Galam is one of the typical plants that grow in Palangkaraya City with a characteristic peat swamp environment so that the Galam plant is used optimally by the community. For example in the construction of houses, roads and bridges. Galam is an environmental product that is easily available in Palangka Raya City, besides being easy to find, it is also easy to reach (economical).
The ease of obtaining Galam plants and its advantages such as the part of the board when submerged in water, the better the quality of the board, while the leaves have a secondary product in the form of essential ingredients that can be utilized. The Essential oil content of Galam plants can be a great opportunity in various fields, including in the fields of cosmetics, therapy, health and education. problems in the processing and utilization of Galam leaves due to lack of knowledge and quality of human resources [2].

Another problem with the overuse of Galam is the change in local environmental conditions associated with the microclimate. One of the steps that can be taken is to utilize Galam leaf waste to minimize the environmental impact of the resulting leaf waste by taking the essential ingredients contained in the Galam Leaf waste. Another activity is to observe changes in environmental conditions from the harvesting of Galam plants.

2. Material and method

2.1. Material
Activities related to the essential potential of Galam Leaf (Melaleuca cajuputi) waste in Palangka Raya City use Galam plant biomass that has not been utilized by the community so that its existence is a problem for the environment. The biomass used is in the form of Galam leaves and water as a medium for biomass steam. The number of Galam leaves used was 75 kg with a predetermined treatment.

2.2. Method
The method used in the activity to determine the essential oil potential of Galam (Melaleuca cajuputi) leaf waste in Palangka Raya City was using simple distillation techniques [3]. The distillation activity of Galam leaf waste was carried out for 3 hours for each treatment and replication. Treatments and repetitions on the activity of observing the essential potential of Galam leaf waste as follows (Table 1):

| Treatment | Replication | Water (L) | Waste (kg) | Time (h) |
|-----------|-------------|-----------|------------|----------|
| 1         | 5           | 10        | 4          | 3        |
| 2         | 5           | 10        | 5          | 3        |
| 3         | 5           | 10        | 6          | 3        |

After the essential content of Galam, leaf waste is produced, then statistical analysis is carried out related to variation and correlation analysis using the SPSS 16.0 program. Samples of Galam waste leaves are taken in the morning, after that the Galam leaf waste is aerated at room temperature/not directly exposed to sunlight. In addition, observing environmental conditions related to micro-climate change with observational techniques and literature studies.

3. Result and discussion

3.1. Result
The results of the research carried out obtained essential oils with a total of 230.7 ml. These essential oils can be used in several products such as aromatherapy products, soaps, and others. Essential oils obtained from the utilization of Galam (Melaleuca cajuputi) leaf waste in Palangka Raya City are as follows (Table 2).

The exploitation of Galam trees in large quantities can affect the micro-climatic conditions of the environment in which these resource extraction activities are taken. Environmental micro-climate problems that occur include such as an increase in temperature, decrease in humidity and drought, and other problems for the environment.
### Table 2. Essential oil of Galam.

| Treatment | Essential oil with Repeat (ml) |
|-----------|-------------------------------|
|           | 1 | 2   | 3   | 4 | 5   |
| 1         | 4 | 6.2 | 12  | 7.5 | 14 |
| 2         | 11.5 | 16 | 14.5 | 13.5 | 15.5 |
| 3         | 24.5 | 28 | 27  | 20.5 | 16 |
| Total     | 43.7 | 120 | 71  | 80.5 | 230.7 |

3.2. Discussion

Galam (*Melaleuca cajuputi*) is one of the typical flora that grows in the peat swamp environment of Palangka Raya City, Central Kalimantan. The abundant Galam population is an opportunity for the community to make ends meet, especially related to boards [4].

Galam with all its functions still leaves the part of the plant that has not been used by the community, namely Galam leaves. The essential content of Galam leaves with a time of taking ± 2 hours yields 0.67% [3]. Whereas in laboratory-scale research conducted with distillation heating time of ± 3 hours, leaf biomass as much as 75 kg, 5 replications with a predetermined formula resulted in as much as 230.7 gr or 23.07% of essential oil ingredients. Essentials as secondary products are organic products from plants and are essential oil [5].

The first treatment of research with a formula of 10 liters of water, 4 kg of Galam leaf waste with a distillation process of ± 3 hours produces can be seen at Table 3. The percentage of essential oil obtained was 4.37%, with an average value of 8.74 ml. The second treatment with a formula of 10 liters of water, 5 kg of Galam leaf waste with a distillation time of ± 3 hours produces can be seen at Table 4. The percentage of essential oil obtained was 7.10%, with an average value of 14.2 ml. The third treatment with a formula of 10 liters of air, 6 kg of Galam leaf waste with a distillation time of ± 3 hours produces essential oil ingredients shown in Table 5. The percentage of essential oil obtained was 11.6%, with an average value of 23.2 ml.

#### Table 3. The essential oil of treatment 1.

| Treatment 1 | Repeat |
|-------------|--------|
|             | 1 | 2 | 3 | 4 | 5 | 4 ml | 6.2 ml | 12 ml | 7.5 ml | 14 ml |
| Total       |   |   |   |   |   | 43.7 ml |

#### Table 4. Essential oil of treatment 2.

| Treatment 2 | Repeat |
|-------------|--------|
|             | 1 | 2 | 3 | 4 | 5 | 11.5 ml | 16 ml | 14.5 ml | 13.5 ml | 15.5 ml |
| Total       |   |   |   |   |   | 71 ml |

#### Table 5. The essential oil of treatment 3.

| Treatment 3 | Repeat |
|-------------|--------|
|             | 1 | 2 | 3 | 4 | 5 | 24.5 ml | 28 ml | 27 ml | 20.5 ml | 16 ml |
| Total       |   |   |   |   |   | 116 ml |

The average value obtained concerning the essential biomass of Galam leaves is 15.38 ml, with the median value was 14.5 ml, and the mode value was 16 ml. Every milliliter of essential oil obtained...
indicates that Galam leaf waste has potential. Another problem that arises from the exploitation of Galam plants is that it affects micro-climatic conditions such as an increase in temperature and humidity, even drought, and forest and land fires. This problem is a frightening thing for humans in general [6]. Seeing this condition, it is necessary to take conservative steps to prevent and minimize environmental impacts arising from activities to meet the needs of life, for example in development activities [7].

The felling of natural trees and the felling of other trees in the forest has an impact on micro-climatic conditions such as the need for water for humans, comfort, and oxygen [8]. Forest destruction, especially peatlands by taking the potential of Galam trees to become a necessity for shelter, is a threat in itself to the surrounding climate (Micro-climate) and larger or global climatic conditions [2]. Seeing this condition, is necessary to have policies in taking forest potential, for the sake of resource and environmental sustainability.

4. Conclusion
Processing and utilization of Galam leaf biomass by distillation technique have volatile potential. The total volatility obtained was 230.7 ml from 75 kg of biomass with an average distillation activity for ± 3 hours. The Galam tree has an important role in maintaining the peat swamp ecosystem and influencing micro-climatic conditions

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