Development prospect of Glochidion sericeum as herbal medicine from Sumatra forest

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Abstract. Disease in degenerative metabolic group requires a long-term treatment. Treatment is done with synthetic drugs which in the long run can cause side effects. Hence, people start looking for alternative treatments using ingredients from nature. Medicines from natural ingredients are also considered to have almost no harmful side effects. One type of plants that has been used by community for generations and is believed to be effective in treating ulcer disease is Glochidion sericeum. However, exploitation of the tree bark, caused the trees to languish and eventually die. So far, there has been no scientific research on the content of active ingredients and biological activity of G. sericeum, as well as the cultivation effort. This research aims to determine content of active ingredients and the efficacy of the tree leaves as herbal medicinal ingredients. The methods used in this study are: 1) Sample preparation, samples are taken from Sukaraja village, Ulu Krui sub-district, Pesisir Barat district, Lampung Province; 2) Quantitative phytochemical screening and 3) Tests of biological activities namely antidiabetic and antihyperlipidemia (anticolesterol) were carried out at the Biochemistry Laboratory, Faculty of Medicine, Lambung Mangkurat University, Banjar Baru, South Kalimantan. The test results showed that the water extract of G. sericeum leaves contained a flavonoid, steroids, tannins, alkaloids and saponins. Based on results of biological activity test, the leaves of G. sericeum have efficacy as an antidiabetic and an anticholesterol.

1. Introduction

Diabetes Mellitus (DM) is the main cause of human’s death [1]. The WHO stated that in 2015 there were 415 million adults were diagnosed diabetes mellitus and in 2040 it is predicted that there will be 642 million people with diabetes mellitus. In 2015, Indonesia was the 7th highest DM prevalence in the world after China, India, United States, Brazil, Russia, and Mexico [2]. People with DM require lifelong medical treatment in reducing symptom, avoiding disease progressivity, and prevent it from any complicated case [3]. Hyperlipidemia is a metabolism disorder. Its symptoms are hyper triglyceride and/ or hyper cholesterol in the blood circulation system [4]. Cholesterol is a metabolite that contains sterol fat in the cell membrane and it is circulated inside the blood plasma [5]. Human’s normal cholesterol number is 200 mg/ dl. Life style, consuming high fat meal, junk food and instant food, obesity, less workout/ exercise will increase cholesterol in the blood and cause atherosclerosis. Atherosclerosis in brain can cause stroke, while in heart will cause coroner heart disease.

Both diseases require long term medication treatment, synthetic medicine that can cause side effect for the body, and high financial support. Therefore, people try to find alternative medication treatment using natural materials because it is more save [6] and cheaper. Natural medicine has been proven can help people in curing their self along the history [1]. One species of plant that has been used by people
for generations and is believed to be efficacious in treating diseases is salai (*Glochidion sericeum*) bark. The community utilizes *G. sericeum* stem bark to treat various kinds of stomach aches. Due to *G. sericeum* bark’s exploitation by the community, the tree begin to languish and eventually die. At present, the presence of *G. sericeum* in nature is hard to find, however local people has not yet thought of cultivating. The active ingredients of the stem bark of *G. sericeum* include flavonoids, saponins, tannins and steroids [7]. The efficacy of the medicinal plants can come from its active ingredients, those are from its bark, roots or leaves. Therefore from one type of this medicinal plant can have different uses. Many parts of *G. sericeum* other than its bark which are not yet known for its active ingredients, thus will open the opportunities to conduct a research on other parts of the wood to determine the content of its active ingredients and its efficacy. Based on this, this study aim to determine the content of active ingredients and the uses of *G. sericeum* leaves as herbal medicinal ingredients.

2. Materials and methods

2.1. Materials

Salai leaves that were taken from Sukaraja Village, Ulu Krui Sub-District, Pesisir Barat District of Lampung Province were used as the research materials. The leaves were cleaned and dried by using wind blow in the dark room at room temperature. Then the dried leaves were processed into powder by using the blender. Sample extraction was made by boiling 100 grams of dried leaves for 30 minutes in 1000 ml of water. Then this mixture was placed in room until reaching the room temperature and then be filtered by using Whatman paper no 5. This extract was used as the preceded experiment.

2.2. Methods

2.2.1. Phytochemical Screening

The Aluminum chloride (AlCl₃) method with quercetin standard was used to analyze the flavonoid content. Each experiment had three iterations and the total of flavonoid content was in percentage in each leave’s extract [8]. The analysis of steroid content used Van-Burden and Robinson Method. Each experiment had three iterations and the total of tanin content was in percentage in each leave’s extract [9]. The analysis of alkaloid content used Harbons Method. Each experiment had three iterations and the total of alkaloid content was in percentage in each leave’s extract [9]. The analysis of Saponin [8].

2.2.2. Biology Activity Experiment

2.2.2.1. Non-diabetes.

*Preparation of determination.* It was started by making hemoglobin, 7,4 pH Buffer Phosphate, 0,01 M of 7,4 pH Buffer Phosphate, 2% Glucose in 0.01 M of 7.4 pH buffer phosphate, and making 0.9 % NaCl.

*Step of Experiment.* The first step was making experiment solution =1 mL + 5 µL of gentamycin + 1 ml of 2% glucose (in 0,01 M of 7.4 pH Buffer phosphate) + 25 µL of herbal sample (30 µg/mL), control solution = 1 mL + 5 µL of gentamycin + 1 mL of 2% glucose (in 0.01 M of 7.4 pH Buffer phosphate) + 25 µL of 7.4 pH PBS and standard solution = 1 mL + 5 µL of gentamycin + 1 mL of 2% glucose (in 0.01 M of 7.4 pH Buffer phosphate) + 25 µL non-diabetes medicine. The solution of experiment, control, and standard are incubated for 24 hours in room temperature in the dark room. Take 10 µL of each solution (experiment, control, and standard) and dilute it with 2 mL of 0.9% NaCl, then measure the absorbency by using spectrophotometer in λ=443 nm.

*Calculation.* In calculating percentage of non-diabetes activity, the measurement result between experiment solution and control solution, multiply by 100%, were compared.
2.2.2. Non-hyperlipidemia

**Preparation of determination.** It was conducted by making 200 ppm of standard solution in 96% ethanol and 100 ppm of experiment solution in 96% ethanol.

**Step of Experiment.** The 5 mL of 7 pH Buffer phosphate was added into 5 mL of standard solution of 200 ppm of cholesterol in 96% ethanol. Take 5 mL of it, then add 2 mL of anhydrous acetic acid and 0.1 mL of H2SO4. Place it in the dark room for 15 minutes. The color will change into green. Then measure the absorbency by using spectrophotometer on \( \lambda = 430 \text{ nm} \) (A0). The 500 mL of 100 ppm experiment materials in 96% ethanol is added to 5 mL of 200 ppm cholesterol standard solution in 96% ethanol. Take 5 mL of it, then add 2 mL of anhydrous acetic acid and 0.1 mL of H2SO4. Place it in the dark room for 15 minutes. Then the color will change into green. Then measure the absorbency by using spectrophotometer on \( \lambda = 430 \text{ nm} \) (A0).

**Calculation.** The calculation was conducted by comparing the measurement result of control solution that was reduced by the experiment solution, and then the result was multiplied by 100%.

3. **Result and Discussion**

3.1. Phytochemical Screening

The phytochemical screening, quantitatively, showed that in *G. sericeum* leaves, there were active compound of flavonoid (55.732%), steroid (0.922%), tannin (12.772%), alkaloid (0.824%), and saponin (0.867%) (Table 1). Many people in Lampung Province used *G. sericeum* as a traditional medicine. They know this information from the traditional medical practices in Pesisir Barat District, that it can be used as a medicine to treat various kinds of stomach aches [6].

**Table 1. Phytochemical Result for *G. sericeum***

| No | Phytochemical Screening | Alkaloid | Saponin | Tannin | Flavonoid | Triterpenoid | Steroid |
|----|-------------------------|----------|---------|--------|-----------|--------------|---------|
| 1  | Qualitatively           | -        | +++     | +++    | -         | +++          |         |
| 2  | Quantitatively          | 0.824%   | 0.867%  | 12.772%| 55.732%   | -            | 0.992%  |

Plants contain much active compound. One of them are molecules that contain lead (Pb). It has non-hyperlipidemia and antioxidants that can be an alternative effort for herbal medical treatment [10] and medical innovation development [11]. Almost all medical plants are potential to be antioxidants [12]. Most of phenolic compound, including flavonoid are antioxidants. The antioxidants is believed can protect the human body from any damages that caused by reactive oxygen. Therefore, it will be able to inhibit any degenerative diseases, such as diabetes mellitus [13]. Meanwhile saponin and flavonoid from plants shows non-hyperlipidemia activity by reducing the level of TC, TG, LDL, and VLDL and also reducing the cardiovascular diseases by improving the level of HDL [14]. Phytosterol and alkaloid are also considered having hyperlipidemia effect [6].

3.2. Experiment on Biological Activity

Result of experiment on biological activity and hyperlipidemia (Figure 1) shows that *G. sericeum* leaves is potential to be non-diabetes medicine (16.304%) and non-hyperlipidemia (38.08%). This is based on the contained active compounds such as alkaloid, saponin, tannin, flavonoid, and steroid. More than 400 plant species have been proven having hypoglycemia because these species contain non-diabetes compound, such as polysaccharide, protein, flavonoid, alkaloid, steroid, and terpenoid [15]. Tannin shows antioxidant activity and non-diabetes effect [16]. Although the percentage of non-diabetes activity of *G. sericeum* is lower than the metformin (oral non-diabetes material), but its effect can be improved by using more qualified plants. The plant’s active compound are influenced by several factors, i.e. genetic, nutritious, enzyme, plant’s age, and the interaction between biotic and...
abiotic circumstances [17]. Therefore, natural material for herbal medicine requires a standard in its source and its activity in making the simplisia.

The antioxidant is so much helpful in preventing dangerous effects and free radical. Many researches show that there are many plant species containing antioxidant [18], for example, vitamin A, C, E, and phenolic compound, such as flavonoid, tannin, and lignin [19]. G. sericeum leaves are very potential as non-hyperlipidemia (38.08%). It is better than the synthetic materials (simvastatin=33.104%) as the comparison. There are many natural compounds that can be used to reduce the cholesterol. Many people consume it in order to reduce their cholesterol. This can reduce a risk for them in suffering degenerative diseases [20]. Some natural medicines for reducing the cholesterol are blimming wuluh (small star fruit), cucumber, salak (Zalaca edulis), boiled red betel leaves, garlic extract, soya sprouts, boiled katuk leaves, undur-undur, pacing, etc. Those contain flavonoid, allisin, sulfonyleurea, linoleic, vitamin C, vitamin E, pectin, diosgenin and fiber that can reduce the cholesterol. Its mechanism in reducing cholesterol is influenced by the content of those compounds in each plant species. Each part of species, such as fruit, leaves, bark, and root has different content of those active compounds. Therefore a raw material standard should be arranged in obtaining good and qualified its active compound.

**Figure 1.** Experiment for Biological Activity of Non – Diabetes and Non – Hyperlipidemia

4. Conclusion

In conclusion, the leaves of G. sericeum contain flavonoids (55.732%), steroids (0.922%), tannins (12.772%), alkaloids (0.824%) and saponins (0.867%). The results of biological activity tests showed the potential of G. sericeum leaves as anti-diabetic and anti-hyperlipidemia, the potential as anti-diabetic leaves of G. sericeum was supported by the content of active compounds in them, namely alkaloids, saponins, tannins, flavonoids and steroids. The content of active compounds in each part of the plant is different, in the fruit, leaves, bark and even the roots. So it is necessary to make standard raw materials to get an abundant and high quality active compound.

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