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The effectiveness of Sentalo Leaf Tea (Chromolaena odorataa Linn) in Reducing Blood Glucose Levels in Male White Rats

Nurlaila Agustikawati[1*], Desy Fadilah Adina Putri[2], Iga Maliga[1]

[1]Undergraduate Public Health Study Program, STIKES Griya Husada Sumbawa, Sumbawa Besar, Indonesia
[2]Midwifery S1 Study Program, STIKES Griya Husada Sumbawa, Sumbawa Besar, Indonesia

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Abstract: Traditional medicine cannot be removed from the lives of Indonesian people. In addition to very minimal side effects, traditional medicine using natural ingredients is widely used by the Sumbawa people because it is easy to obtain, easy to process, economical and has been carried out for generations. One of the natural ingredients that are widely used is sentalo leaf. This leaf is widely used as a medicine for torn wounds to stop the bleeding that occurs. Sentalo leaves are simply ground and then placed on the torn wound. Apart from being an antibacterial, sentalo leaves also have the potential as antidiabetic. The application of the sentalo leaf is expected to be more efficient, easy to apply by the community in health services for people with diabetes mellitus. The design of this study was True Experimental with treatment using RAL (Completely Randomized Design) and data analysis using the one-way ANOVA test. The results of the analysis of the antidiabetic effectiveness of sentalo leaf tea were shown by looking at the significant value of the one-way Anova test of 0.000 < 0.05 which could be concluded that there was a difference in the antidiabetic activity of sentalo leaf tea. The difference in blood glucose reduction in the treatment with Glibenclamide as a control group with Sentalo leaf tea 250 mg/kgBW was the same and not significant. So, it can be concluded that the optimum dose of sentalo leaf tea to obtain effective antioxidant activity is 250 mg/kgBB

Keywords: Sentalo leaf (Chromolaena odorata L. Leaf); Antidiabetic, Effectiveness; White rat

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Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results. Indonesia is rich in biological natural resources which are used as traditional medicine by the community from generation to generation, both for maintaining health, preventing or treating a disease. One of the plants that are widely used by the people of Sumbawa as traditional medicine is sentalo leaves. Sentalo leaves are a wild plant that is considered a pest and is only used as animal feed by the people of Sumbawa. Sentalo leaves are commonly used by the Sumbawa people in treating torn wounds to stop bleeding. In addition, this sentalo leaf has benefits in the treatment of diabetes mellitus.

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia and disruption of carbohydrate, fat and protein metabolism caused by damage to insulin secretion, insulin action or both (Jayanti, 2015). Patients with diabetes mellitus will experience an increase in blood glucose levels that exceed the normal limit of 200 mg /dl and have fasting blood glucose levels > 125 mg/dl2. Constantly

*Email: Agustikawatighs@gmail.com

increasing blood glucose levels can damage blood vessels, nerves, and internal structures. Thus, a complex substance will be formed in the blood vessels so that the blood vessels thicken and leak.

The use of insulin which is relatively difficult and expensive and the side effects in the use of supporting therapy from oral antidiabetic drugs make people disorganized in undergoing diabetes treatment using insulin. Therefore, researchers are interested in testing the antidiabetic activity of sentalo leaf tea. The application of sentalo leaf tea in treating diabetes mellitus is to be more efficient, easy to be applied by the community in everyday life and can be included in formal health services.

Many studies have been carried out to see the antidiabetic activity of sentalo leaves, the difference between this study and other research is that the results of this study can be directly applied by the community, where testing the antidiabetic activity directly in the form of tea (the solvent is water) which is very easy to apply in everyday life. While other studies are still using ethanol extract in testing its antidiabetic activity. Where to be applied in everyday life by the community is very difficult.

By carrying out the extract process it takes longer time to obtain the desired extract compared to directly making preparations in the form of tea, there are several compounds that will be wasted from the extraction results when using ethanol solvent which will reduce effectiveness in drawing conclusions about the effects that can be caused if the community lower class want to apply it as traditional medicine. This is because in traditional medicine people prefer water as a solvent for the ingredients. Using water as a solvent is enough with the sentalo leaf brewing process, it will be very easy to apply by the community and does not require a long time, and the results of this study can be applied directly. So far, research on antidiabetic testing has been carried out using solvents that are not yet known to the public.

Method

Analysis of antidiabetic effectiveness was carried out by giving different treatments to 5 groups of white rats that were previously made in a diabetic state by inducing alloxan monohydrate 150 mg/kgBW intraperitoneally for 4 days which was marked by an increase in the blood glucose level of rats to ± 200 mg/dL. In the case of diabetes, each group was treated as follows.

Table 1. Groups Given Treatment

Name of Groups	:	Treatment
Group 1	:	negative control, given CMC-Na 0.5%
Group 2	:	positive control, given Glibenclamide dose 0.45 mg/kgBW
Group 3	:	Sentalo leaf tea dose 125 mg/kgBB
Group 4	:	Sentalo leaf tea 250 mg/kg body weight
Group 5	:	Sentalo leaf tea dose 500 mg/kBB

Blood glucose levels of rats were measured again on the 5th and 10th day of treatment to be compared with blood glucose levels after alloxan was induced on the 4th day.

Result and Discussion

Measurement of rat blood glucose was carried out 3 times, namely 4 days after induction of alloxan monohydrate, 5 days after treatment and 10 days after treatment. Blood was taken intravenously through the tip of the rat's tail assisted by massage of the tail so that the blood came out. Blood glucose levels were measured using a glucometer using a blood sugar stick. The results of measuring blood glucose levels in white rats can be seen in Table 2.

Table 2. Average Measurement of Blood Glucose Levels in White Rats

Treatment group	Blood Glucose Level (mg/dL)		
	alloxan induction	5 days treatment	10 days treatment
I	420.67	424.23	416.00
II	409.67	204.00	109.67
III	425.00	252.00	179.33
IV	419.00	156.67	120.00
V	408.67	304.00	219.33

From Table 2 above, it can be seen that the blood glucose levels of white rats increased after being induced with alloxan monohydrate as much as 150 mg/KgBW. Measurement of rat blood glucose levels was carried out 3 times, namely after induction of alloxan monohydrate, on the 5th and 10th days of treatment. The treatment will be given when on the 4th day after alloxan induction is given, the results of the rat blood glucose measurement have reached or exceeded 200 mg/dL, the rat is considered to be diabetic. Blood glucose levels that vary in each white rat can be caused by the different resistance of individual mice to alloxan, causing the initial conditions of diabetes to be not uniform (Suarsana et al., 2010).

Based on Table 2 shows that group I (negative control) on the 5th day of treatment still experienced an

increase after alloxan induction. This can be caused by the administration of 0.5% CMC-Na does not have a significant effect on reducing blood glucose and there is still a reaction given by alloxan monohydrate in increasing blood glucose levels.

Administration of alloxan monohydrate resulted in an increase in plasma blood glucose levels 3 to 4 times compared to the normal control group (Arika et al., 2016) so that it could damage essential substances in the cells of the pancreatic islets of Langerhans, resulting in a decrease in endogenous insulin secretion through the formation of oxygen species reactive substances that can damage tissues, causing a decrease in the utilization of glucose by body tissues (Adedappo et al., 2016). This is because alloxan is a diabetogenic agent that is toxic, especially to pancreatic beta cells which, when given to test animals such as mice, will cause the test animals to become diabetic (Prameswari and Widjanarko, 2014).

The results of measuring blood glucose levels using one-way ANOVA using SPSS IBM 20 showed that there were differences in the decrease in blood glucose levels in white rats treated with glibenclamide and sentalo leaf tea with doses of 125 mg/kg BW, 250 mg/kg BW and 500 mg./kg BW indicated by the value of sig 0.00 < 0.05. To see the difference in the decrease in blood glucose levels which was more significant for each treatment, the Tukeys test was carried out to obtain a sig value administration of sentalo leaf tea at a dose of 250 mg/kg (0.927) > 0.05. It can be concluded that the administration of sentalo leaf tea at a dose of 250 mg/kgBW (group IV) with positive control (group II) was the same and the difference in the decrease in blood glucose levels in white rats was not significant.

Meanwhile, for groups III and V (giving Sentalo leaf tea at a dose of 125 mg/kgBW and 500 mg/kgBW) there was a very significant difference with the positive control. This can be seen from the value of sig. the results of the Tukeys test groups III and V (giving Sentalo leaf tea at a dose of 125 mg/kgBW and 500 mg/kgBW) were 0.002 and 0.000 < 0.05, respectively.

Based on the results of the study in Table 2, it shows that Sentalo leaf tea at a dose of 250 mg/kgBW has optimum antidiabetic activity. The decrease in blood glucose levels in the sentalo leaf tea treatment with a dose of 250 mg/kgBW was closer to the positive control of glibenclamide as a comparison.

The ability to reduce blood glucose levels of rats by sentalo leaf tea is due to the presence of antioxidants. This is in line with the research conducted by Ominije et al., (2019) which stated that the methanol root extract of Chromolaena odorata caused considerable inhibition of the formation of glucose hemoglobin complex with an IC50 value of 679.1 g/ml. This is in line with research conducted by Bamisaye (2014) who reported that Chromolaena odorata has several medicinal properties due to the presence of high amounts of flavonoids and tannins.

In line with research conducted by Agustikawati, et al., (2017) which states that the phytochemical content of Chromolaena odorata leaves is tannins, steroids and triterpenoids, flavonoids and saponins. Flavonoids, tannins and saponins have been reported to inhibit -amylase activity and maintain cell integrity (Omonije et al., 2019).

Saponins that are abundant in the seeds of Entada phaseoloides are reported to reduce blood glucose, serum insulin levels and oxidative stress associated with hyperglycemia in type 2 diabetes (Zheng et al., 2012). According to Kunyanga (2011), tannins and saponins have hypoglycemic activity in elderly diabetic patients by inhibiting -amylase and -glucosidase enzymes and translocation of glucose transporters.

The mechanism of flavonoids as antidiabetic is thought to be by regenerating damaged pancreatic beta cells (Dheer & Bhatnagar, 2010) and stimulating pancreatic beta cells to produce insulin (Kawatu et al., 2013). The flavonoid subclass consists of flavones, flavonols, flavanones, isoflavones and anthocyanidins based on differences in the generic structure of the C ring, the functional group on the ring and the position where the B ring is attached to the C ring (Vinayagam and Xu, 2015).

Quersein, one of the flavonol groups having the highest IC50 value, has a dihydroxyl group at positions C-3' and C-4' which is effectively conjugated with the active site residue of -glucosidase. Quersein stimulates GLUT4 translocation and expression in skeletal muscle so that it can improve oxidative stress and inflammation and restore cell proliferation in diabetic rats (Eid et al., 2015).

The decrease in glucose levels at a dose of 250 mg/kgBW which was more significant than at a dose of 500 mg/kgBW was probably due to the antagonistic effect of secondary metabolites contained in sentalo leaves. This is in line with research conducted by Selvanathan and Sundaresan (2020) which stated that better improvement was detected in group IV (200 mg/KgBW) than in group V (400 mg/kgBW) for histopathological examination because the percentage of successful diabetes induction was higher with lower mortality and higher tolerance by experimental animal models.

The same thing was also stated by Sukandar et al, (2011) that the test substance in the form of ethanol extract of binahong leaves, may contain antagonistic active compounds which in higher doses decrease the antidiabetic effect because the antagonist effect increases.

These antagonist compounds can be in the form of steroid compounds, namely fatty organic compounds that are not hydrolyzed. In general, steroids function as hormones and can also be found in plants. In patients with pancreatic Langerhans cells damage, administration of oral hypoglycemic drugs of the corticosteroid class at high doses can inhibit insulin degradation by the liver (Azizah and Hudayah, 2016).

Conclusion

Based on the results of the research that has been done, it can be concluded as follows. The antidiabetic effectiveness of sentalo leaf tea was shown at a dose of 250 mg/KgBW. The decrease in antidiabetic activity at a dose of 500 mg/kgBW was due to the presence of antagonist compounds.

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