

Declaration of Blood Sugar Levels with Black Raw and *Binahong* Leaves in Mencit (*Mus musculus*)

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Abstract: Diabetes mellitus is a disease marked by an increase in blood sugar levels. At present many sufferers of Diabetes Mellitus whose blood sugar levels are not controlled so that it can cause complications. The purpose of this study was to reduce blood sugar levels with black onion extract and *binahong* leaf extract on mice (*mus musculus*). This study uses a *Quasy Experimental design* with One Group pre-posttest. Samples were taken A total of 32 mice consisted of 16 in the intervention group and the comparison intervention group. The independent variables in this study were black onion extract and *binahong* leaf extract, while the dependent variable was the blood sugar level of mice. Data were collected by observation sheets and analyzed using *Kolmogorov-Smirnov* and *Independent sample T-tests*. The results of this study showed that the difference between pre and post-reduction of black onion extract was 66.4 mg/dl and the difference between pre and post administration of *binahong* leaf extract was 66.2 mg/dl. While the analysis shows the value of $p = value$ 0.985. The results of this study indicate that extracts of black garlic and *binahong* leaves are equally effective in reducing blood sugar levels and that there are no significant differences in reducing blood sugar levels in mice. Thus both the black onion extract and the *binahong* leaf are equally effective in reducing blood sugar levels.

Keywords: Diabetes Mellitus, Black Onion Extract, *Binahong* Leaves, Blood Sugar Level, Mice (*Mus musculus*)

1. Introduction

Changes in lifestyle and socio-economics due to urbanization and modernization, especially in large cities in Indonesia, are the cause of the increasing prevalence of degenerative diseases and are thought to be the main cause of death in Indonesia. One thing to look out for is diabetes mellitus. The prevalence of diabetes mellitus is expected to increase every year. Whereas in patients who control, blood sugar levels are still largely difficult to control [1].

According to the World Health Organization (WHO, 2017) states that the incidence of diabetes mellitus was 108 million in 1980 to 422 million in 2014. In 2015 diabetes mellitus was the 6th deadliest disease in the world with 1.6 million people each year in the past 15 years. Based on epidemiology According to WHO (2013) 80% of DM sufferers in the world come from developing countries, one of which is Indonesia. The increase in the number of people with diabetes that

occurs consistently shows that DM is a health problem that needs special attention in health services in the community. Indonesia is ranked 7th in the world at 10.0 million people, where China ranked first with 109.6 million DM sufferers [2]. According to the Basic Health Research Report [3], the incidence of DM in East Java is 6.8% and ranks ninth of all provinces in Indonesia. The prevalence of diabetes in Indonesia is occupied by the province of East Java because diabetes is the top 10 most diseases. The number of DM patients according to Riskesdas has increased from 2007 to 2013 by 330,512 patients [4].

In the results of the study Suci, 7 out of 22 respondents (31.8%) had controlled blood glucose levels, ranging from 110 to below 145 mg/dl. This can be caused by several things such as proper nutrition diet, exercise, and regular treatment [1]. Masfufah's research (2013) states that of 36 patients who regularly check fasting blood sugar levels as many as 16.7% of patients have good blood sugar levels of less than 100

mg/dl, 5.5% of patients have blood sugar levels between 100 - 126 mg/dl, and as many as 77.8% have bad or uncontrolled blood sugar levels because more than 126 mg/dl in Makassar city health center.

Increased blood sugar levels caused by several factors including carbohydrates, physical activity, drug use, illness, stress, menstrual cycles, dehydration, alcohol consumption, these conditions will result in decreased glucose uptake due to decreased sensitivity of insulin receptors and decreased insulin action, if this allowed to cause hyperglycemia, and cause complications in the body's organs, namely acute and chronic complications.

The components in the management of diabetes mellitus are education, medical nutrition therapy, physical exercise, pharmacological medicine, and non-medical [5]. One pharmacological companion therapy that can be used is black onion extract and *binahong* leaves. Black onions are fresh garlic (*Allium sativum* L.) that has been heated for a while at controlled high temperatures (60-90°C) with controlled high humidity (80-90%). When compared with fresh garlic, black onions do not produce a strong offensive taste due to reduced levels of allicin. (Kim et al., 2013). Also, the research conducted by extracts of *binahong* leaves (*Anredera cordifolia* (Ten.) Steenis) contains alkaloids, flavonoids, saponins, and terpenoids. The main content of *binahong* leaves is flavonoids. *Binahong* leaf extract with a dose of 25 mg/kg bb provides the most maximum effect in reducing blood sugar levels in male Wistar strain rats [6].

2. Methodology

The design used in this study is Quasi-Experimental with *One Group pretest Posttest*. In the two experimental groups were given treatment, namely, the first group was given black onion extract, while the second group was given *binahong* leaves. In both groups, a pre-test was started, and after the treatment was completed, measurements were taken again (post-test). The sample used was 32 mice which were divided into 2 treatment groups, each with a total of 16 animals. This study aims to determine the decrease in blood sugar levels in the group by giving black onion extract and *binahong* leaf extract on mice (*Mus Musculus*). Data were collected by observation sheets and analyzed using *Kolmogorov-Smirnov* and *Independent sample T-tests*.

3. Research Result

3.1. Identification of Decreased Blood Sugar Levels by Giving Black Onion Extract

Table 1. Blood Glucose Levels Before And After Intervention Is Given To The Black Onion Extract Group.

Sampe Number	Glucose levels of Black Onion Extract (mg/dl)		Deviation mg/dl
	Pre	Post	
1	190 mg/dl	114 mg/dl	-76
2	255 mg/dl	88 mg/dl	-167
3	198 mg/dl	180 mg/dl	-18
4	226 mg/dl	158 mg/dl	-68

Sampe Number	Glucose levels of Black Onion Extract (mg/dl)		Deviation mg/dl
	Pre	Post	
5	190 mg/dl	138 mg/dl	-52
6	185 mg/dl	107 mg/dl	-78
7	200 mg/dl	150 mg/dl	-50
8	187 mg/dl	136 mg/dl	-51
9	182 mg/dl	120 mg/dl	-62
10	189 mg/dl	145 mg/dl	-44
11	234 mg/dl	167 mg/dl	-67
12	192 mg/dl	123 mg/dl	-69
13	214 mg/dl	179 mg/dl	-35
14	204 mg/dl	159 mg/dl	-45
15	182 mg/dl	101 mg/dl	-81
16	303 mg/dl	203 mg/dl	-100
Jumlah	3331	2268	-1063
Mean	208,1875	141,75	-66,43
Std. dev	32,69703	31,91551	33,38656

The results of the study on samples that were treated with black onion extract found that the amount of blood sugar levels from 16 samples amounted to 3331 mg/dl. The average blood sugar level before treatment was 208.19 mg/dl. Total blood sugar levels after treatment of 16 samples were 2268 mg/dl. While the average results of the examination of blood sugar levels after the action is 141.75 mg/dl. The highest decrease in blood sugar levels is 167 mg/dl and the lowest is 18 mg/dl. Based on these results, the overall reduction in blood sugar levels is 1063 mg/dl. The average decrease in blood sugar levels is 66.43 mg/dl with a standard deviation of 33.39.

3.2. Identification of Decreased Blood Sugar Levels by Providing Binahong Leaf Extracts

Table 2. Blood Glucose Levels Before and After Intervention in the Binahong Extract Group.

Sample Number	Glucose levels of Binahong Leaf Extract (mg/dl)		Deviation mg/dl
	Pre	Post	
1	244	188	-56
2	250	154	-96
3	192	180	-12
4	246	167	-79
5	190	128	-62
6	200	107	-93
7	190	135	-51
8	202	121	-81
9	199	135	-64
10	189	125	-64
11	210	159	-51
12	192	123	-69
13	214	156	-58
14	204	151	-53
15	196	103	-93
16	185	107	-78
Jumlah	3303	2243	-1060
Mean	206,4375	140,1875	-66,25
Std. dev	21,4413	26,02363	21,01904

The results of the study on samples given *binahong* leaf extract showed that the amount of blood sugar levels from 16 samples was 3303 mg/dl. The average blood sugar level before treatment was 206.44 mg/dl. The total blood sugar levels after the treatment of 16 samples were 2243. While the

average results of the examination of blood sugar levels after the action were 140.19 mg/dl. The highest decrease in blood sugar level is 96 mg/dl and the lowest is 12 mg/dl. Based on these results, the overall reduction in blood sugar levels is 1060 mg/dl. The average decrease in blood sugar levels is 66.25 mg/dl with a standard deviation of 21.02 mg/dl.

3.3. Analysis of the Difference in Decreasing Blood Sugar by Giving Black Onion Extract and Binahong Leaf Extract

Table 3. Analysis of the difference in decreasing blood sugar by giving black onion extract and binahong leaf extract.

Sample Number	Black Onion Extract Deviation	Binahong leaf extract Deviation
1	-76	-56
2	-167	-96
3	-18	-12
4	-68	-79
5	-52	-62
6	-78	-93
7	-50	-51
8	-51	-81
9	-62	-64
10	-44	-64
11	-67	-51
12	-69	-69
13	-35	-58
14	-45	-53
15	-81	-93
16	-100	-78
MEAN	-66,43	-66,25
p value	0,985	

The data obtained on the examination of blood sugar then carried out the Independent sample T-test using SPSS 16.0. Statistical test results using the *Independent sample t-test* in the comparison of the two groups seen from a decrease in blood sugar levels showed $p = 0.985$, with a significance level of 0.05 then $p = 0.985 > \alpha 0.05$. So H_0 was accepted and H_1 was rejected meaning there was no significant difference in blood glucose levels in the two groups of Black Onion Extract and Binahong Leaf Extract. Both are equally effective in reducing blood sugar levels.

4. Discussion

4.1. Identification of Decreased Blood Sugar Levels by Giving Black Onion Extract

The results showed that the average reduction in blood sugar of onions before 208.18 mg/dl and blood sugar after administration of extra onion 141.75 mg/dl. This study is under the theoretical suitability of some researchers reporting that many valuable components in black onions, especially polyphenols, flavonoids, and some substances in the Maillard reaction are known as anti-oxidant agents. Compared to garlic, black onions have richer nutrients and increased biological activity and broader application prospects [7].

The active compounds contained in black onions can help diabetics by guarding glucose in the blood and increasing

insulin sensitivity of these active compounds namely flavonoids and SAC. It was found that the total phenolic content in black onions is 5-8 times higher compared to garlic so that black onion has a higher antioxidant activity than garlic [8]. The process of reducing blood sugar is influenced by flavonoid compounds that can restore the sensitivity of insulin receptors on cells thereby reducing blood glucose levels, besides flavonoids as antioxidants can also repair pancreatic β cells that have been damaged by free radicals [9]. Based on (ADA, 2015) due to genetic factors, physiological responses, and stress levels, each sample was different in adapting to 40% dextrose.

Based on the analysis of researchers, the results obtained a decrease in blood glucose levels between before (pre) and after (post) obtained the highest decrease of 167 mg/dl and the lowest of 18 mg/dl. This indicates that after the intervention of black onion extract there was a decrease in blood glucose levels with a difference in the average of 66 mg/dl. In the group giving black onion extract, 3 samples had decreased glucose levels but were still in a state of hyperglycemia.

4.2. The Identification of a Decrease in Blood Sugar Levels by Administering Binahong Leaf Extract

The results showed that the average blood glucose level in the treatment group before administration of black onion extract was 206.43 mg/dl, and after administration of black onion extract, it dropped to 140.18 mg/dl.

This is consistent with the theory of some researchers reporting that the ability of *binahong* extract in reducing blood glucose levels in diabetic rats is related to the biological activity of compounds in *binahong* tubers. One of them is flavonoids which are thought to restore the sensitivity of insulin receptors on cells so that glucose levels decrease, besides flavonoids as antioxidants that can repair pancreatic β cells that have been damaged by free radicals [10]. One of the contents of *binahong* leaves is flavonoids. Flavonoid has the effect of inhibiting the enzyme α -glucosidase which functions to break down polysaccharide compounds into glucose monomers so that glucose absorption in the intestine is reduced and blood sugar levels decrease [11] This shows that the administration of *binahong* leaf extract has an influence on decreasing blood sugar levels This test animal is caused by the presence of saponin content in *binahong* leaves which has a role in lowering blood sugar levels of test animals. Saponins reduce blood sugar levels by inhibiting the activity of the alpha-glucosidase enzyme, enzyme indigestion that is responsible for converting carbohydrates into glucose [12]. Based on (ADA, 2015) due to genetic factors, physiological responses and stress levels in each sample that is different in adapting to 40% dextrose [13].

Based on the analysis of researchers found the highest decrease of 96 mg/dl and the lowest of 12 mg/dl. This indicates that after the administration of black onion extract intervention there was a decrease in blood glucose levels with a difference in the average reduction of 66 mg/dl. In the group giving black onion extract 2 samples had decreased

glucose levels but were still in a state of hyperglycemia.

4.3. Analysis of Differences in Decreasing Blood Sugar by Giving Black Onion Extract and Binahong Leaf Extract

Based on the results of research at PUSVETMA, the results of statistical tests using SPSS 16.0 using the independent sample T-test showed (2-tailed) = 0.985 because the value of $\alpha > 0.05$. The independent sample T-test obtained significance value $p = 0.985 > \alpha 0.05$. There is a significant difference in the difference in blood glucose levels before and after being given black onion extract and given *binahong* leaf extract, so it can be assumed that there is no difference in effectiveness in decreasing the diabetic sample.

The content factor that affects the process of reducing blood sugar in black onion extract is influenced by flavonoid compounds that can restore the sensitivity of insulin receptors on cells thereby reducing blood glucose levels, besides flavonoids as antioxidants can also repair pancreatic β cells that have been damaged by free radicals [9]. The content factor which affects the reduction in blood sugar levels of this test animal is due to the presence of saponin content in the leaves of *binahong* which has a role in reducing the blood sugar levels of the test animals [14]. Saponins reduce blood sugar levels by inhibiting the activity of the alpha-glucosidase enzyme, enzyme indigestion that is responsible for converting carbohydrates into glucose. Indri and the content of *binahong* leaves is flavonoid [12]. Flavonoids have the effect of inhibiting the enzyme α -glucosidase which functions to break down polysaccharide compounds into glucose monomers so that glucose absorption in the intestine is reduced and blood sugar levels decrease [15]. Also, research conducted by [7].

There is a difference in the results of the study showing the difference in blood glucose levels in the treatment group before and after administration of black onion extract of 66.43 mg/dl. Based on the theory of research conducted by Faisma Rosita (2016), regarding the effect of black onion extract that the same dose of black onion extract 500 mg/kg bb has the activity of reducing blood sugar levels. Whereas in the treatment group *binahong* extract obtained a difference in a decrease in blood glucose levels of 66.25 mg/dl. In the *binahong* leaf extract (*Anredera cordifolia* (Ten.) Steenis) contains alkaloids, flavonoids, saponins, and terpenoids. The main content of *binahong* leaves is flavonoids. *Binahong* leaf extract with a dose of 25 mg/kg bb provides the most maximum effect in reducing blood sugar levels in male Wistar strain rats.

5. Conclusion

Blood sugar levels in mice after administration of black onion extract decreased significantly, the overall reduction in blood sugar levels is 1063 mg/dl, the average decrease in blood sugar levels is 66.43 mg/dl with a standard deviation of

33.39. Blood sugar levels in mice given *binahong* leaf extract decreased significantly, the overall reduction in blood sugar levels is 1060 mg/dl, the average decrease in blood sugar levels is 66.25 mg/dl with a standard deviation of 21.02 mg/dl.

Test results using the *Independent sample t-test* in the comparison of the two groups seen from a decrease in blood sugar levels showed $p = 0.985$, with a significance level of 0.05 then $p = 0.985 > \alpha 0.05$. The administration of black onion extract and *binahong* leaf extract can significantly decrease blood sugar in mice and both are equally effective.

Conflict of Interest

The authors confirm that this article contains no conflict of interest.

Ethical Approval

This study was approved by the Health Research Ethics Committee (KEPK) University Airlangga, Surabaya. All participants were provided with a participant information sheet written in Bahasa Indonesia, and they signed the consent form prior to participating in the study.

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