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COMPARISON OF THE EFFECTIVENESS OF ETHANOL EXTRACT AND INFUSION OF LEAF OF BINAHONG (ANREDERA CORDIFOLIA STEEN) AS ANTIDIABETES IN MALE RATS ALLOKSAN INDUCED

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Abstract

Anredera cordifolia Steen. contains flavonoids, saponins, steroids and alkaloids. Flavonoid compounds have the same indications as glibenclamide to lower blood glucose levels. Saponin compounds in binahong leaves can lower blood sugar and cholesterol levels. This study aims to determine the comparison of the antidiabetic effect and dose between the extract and infusion of binahong leaves on male Swiss strain mice induced by alloxan. This type of research uses experimental methods with pre and post test with the controlled group design. The test animals used in this study were 40 male Swiss strain mice which were divided into 8 groups. The negative control group was only given 0.5% CMC Na, the positive control group was given glibenclamide for comparison, the treatment group was given extract and infusion of binahong leaves at a dose of 35 mg/KgBW, 70 mg/KgBW, and 140 mg/KgBW. The results of this study showed that there were differences in blood sugar levels before and after alloxan induction (sigh<0.05). Binahong leaf extract and infusion had effectiveness as antidiabetic in alloxan-induced Swiss male mice with the results showing that the three doses had an antidiabetic effect and the first dose of 35mg/KgBB of the extract gave the maximum effect of 40.6%, while the infusion dose was 40.6%. III 140mg/KgBB has a maximum effect of 30.5%. So it can be concluded that there is a statistically significant difference in blood sugar levels in the extract and infusion groups of binahong leaves.

Keywords: Diabetes Mellitus, Anredera Cordifolia, Alloxan, Glibenclamide.

INTRODUCTION

The International Diabetes Federation (IDF) states that Diabetes Mellitus (DM) is the seventh leading cause of death in the world(Atlas, 2015). The number of DM sufferers aged 20-79 years in the world is 463 million people in 2019, it is estimated that in 2045 the number of DM sufferers will increase to 700 million people (Sofyan, 2019). Diabetes mellitus is expected to continue to increase by around 578 million people in 2030 (Rahmadhani, 2021). The Province of the Special Region of Yogyakarta (DIY) occupies the third position with the highest number of diabetes cases in Indonesia in 2018 (Milita, Handayani, & Setiaji, 2021).

Drugs used in diabetes treatment are divided into several groups, namely sulfonylureas, meglitinide analogues, peptide analogues, biguanides,

thiazolidinediones and α-glycosidase inhibitors (Hardianto et al., 2020). Drugs used in diabetes treatment include glibenclamide, glimepirid, metformin and acarbose (Mufidah, 2017). Research conducted by Fatmawati (2019) states that side effects of diabetes treatment that often occur include hypoglycemia, pain and bloating.

The binahong plant (Anredera cordifolia Steen.) is known to have many benefits in traditional medicine. The roots, stems and leaves of the binahong plant have medicinal properties (Makalalag & Wullur, 2013). Binahong leaves can be efficacious as a medicine for burns, antioxidants and antiseptics (Hidayat & Sari, 2019). Empirically, several tribes in Indonesia use the binahong plant as a treatment or made into vegetables to lower blood sugar levels (Kusumanti & Sugiharto, 2017).

Research conducted by Nurtika (2017) found that binahong leaf extract at a dose of 25 mg/KgBW provided the maximum effect for reducing blood sugar levels in alloxan-induced rats. Research conducted by Dwitiyanti et al. (2021) that binahong leaf extract at a dose of 50 mg/KgBW had the maximum effect on reducing blood sugar levels in rats compared to doses of 25 mg/KgBW, 100 mg/KgBW and glibenclamide. Andrieyani et al. (2015) stated that binahong tubers can reduce blood sugar levels in rats, with the most appropriate dose being 25 mg/Kg BW. Meanwhile, according to research by Irfan (2018) states that the dose of binahong leaf infusion used in rats is 1 g/KgBW, 3 g/KgBW and 6 g/KgBW, where a dose of 6 g/KgBW has a higher percentage of effectiveness than the dosing others.

Based on this background, the authors wanted to compare the effectiveness of ethanol extract and infusion of binahong leaves in alloxan-induced male mice. The results of this study are expected to be useful for the community as an alternative diabetes treatment and used for further research development.

RESEARCH METHODS

This research is an experimental research with pre and posttest control group design. This research was conducted by making ethanol extract and infusion of binahong leaves which would be given to male mice at doses of 35 mg/KgBW, 70 mg/KgBW and 140 mg/KgBW(Hanafiah et al., 2021).

RESULT AND DISCUSSION

Mice were first adapted for 7 days at the Pharmacology Laboratory of the Indonesian Pharmacy Academy and fasted for 10 hours before treatment but were still given water to drink. The purpose of mice being fasted before treatment is so that there is no food intake that can affect the results of the study so that the results obtained are not biased (Fitrianingsih, 2015). Mice were checked for blood sugar levels before diabetes was induced. Checking the blood sugar levels of mice was done by slashing the tip of the tail of the mice using a cutter. The tools used to check blood sugar levels in mice were a check strip (Accu-chek® instant S) and a glucometer (Accu-chek® instant S). The chemical compound used to make diabetic mice is alloxan. The dose of alloxan given is 100 mg/KgBB (Chairunisa & Astuti, 2020). Giving alloxan 3 times every 4 days, namely day 1, day 4 and day 8. Treatment was given for 7 consecutive days. The final blood sugar level was checked again after being given treatment. Comparison of blood sugar levels before and after alloxan induction can be seen in table I.

Table I. Comparison of Blood Sugar Levels Before and After Alloxan Induction.

Group	Average blood sugar levels before and after alloxan administration (("X ") ± SD (mg/dL))				
	N	Before	After	Ascension	*P value*
CMC Na 0,5%	5	122 ± 25,4	165,6 ± 30,7	36,7	0,002*
Glibenklamid	5	97,6 ± 7,6	135,4 ± 8,3	39,5	0,002*
Ekstrak Dosis I	5	86,0 ± 8,9	157,2 ± 41,6	104,2	0,015*
Ekstrak Dosis II	5	116,0 ± 18,7	158,6 ± 10,0	39,5	0,009*
Ekstrak Dosis III	5	96,4 ± 36,8	148,2 ± 12,1	71,3	0,015*
Infusa Dosis I	5	104,2 ± 20,2	147,4 ± 29,9	41,4	0,000*
Infusa Dosis II	5	102,4 ± 13,3	136,4 ± 11,5	33,9	0,001*
Infusa Dosis III	5	98,6 ± 8,8	138,6 ± 16,5	40,5	0,001*

Glibenklamid : 0,65 mg/KgBB
Extract Dose I : 35 mgKgBB
Extract Dose II : 70 mg/KgBB
Extract Dose III : 140 mg/kgBB
Infusion Dose I : 35 mgKgBB
Infusion Dose II : 70 mg/KgBB
Infusion Dose III : 140 mg/kgBB

The results from table I show that there was a difference between the initial glucose before alloxan induction and after alloxan induction, the CMC Na 0.5% group showed an increase of 36.7%, the gkibenclamide group showed an increase of 39.5%, the dose group I 35 mg/d KgBW showed an increase of 104.2% for the second dose group of 70 mg/KgBW showed an increase of 39.5% and the third dose group of 140 mg/KgBW showed an increase of 71.3%.strain male mice swiss hyperglycemic. These results indicated that there was an increase in blood sugar levels in all groups after being induced with alloxan. The highest increase in blood sugar levels occurred in the first dose group of 35 mg/Kg BW with an increase of 104.2%. Likewise, the infusion group I dose of 35 mg/KgBW showed an increase of 41.4%, the second dose group of 70 mg/KgBW showed an increase of 33.9% and the third dose group of 140 mg/KgBW showed an increase of 40.5%. The highest increase in blood sugar levels occurred in the first dose group of 35 mg/Kg BW with an increase of 41.4%. The blood sugar level of mice is said to be hyperglycemic when > 126 mg/dL (Dewi, 2013). Research conducted by Irdalisa et al. (2015) stated that intraperitoneal induction of alloxan could increase blood sugar levels. Comparison of blood sugar levels before and after being given treatment can be seen in Table II.

Group	Average blood sugar levels before and after treatment (("X ") ± SD (mg/dL))				
	N	Before	After	drop	*P value*
CMC Na	5	165,6 ± 30,7	214,6±47,5	-15,78	0,052[a]
Glibenklamid	5	135,4 ± 8,3	115,6 ± 6,9	14,5	0,007*[,a,b]
Ekstrak Dosis I	5	157,2 ± 41,6	96,5 ± 12,0	40,6	0,008*[,a,b,c]
Ekstrak Dosis II	5	158,6 ± 10,0	113,6 ± 19,0	28,1	0,012*[,a]
Ekstrak Dosis III	5	148,2 ± 12,1	121,0 ± 9,6	18,2	0,002*[,a,c]
Infusa Dosis I	5	147,4 ± 29,9	122,6 ± 19,4	16,2	0,004*[,a,c]
Infusa Dosis II	5	136,4 ± 11,6	116,6 ± 9,8	14,5	0,001*[,a,d]
Infusa Dosis III	5	138,6± 16,5	96,2 ± 10,6	30,5	0,000*[,a,b,c]

Information:

Glibenklamid : 0,65 mg/KgBB
Extract Dose I : 35 mgKgBB
Extract Dose II : 70 mg/KgBB
Extract Dose III : 140 mg/kgBB
Infusion Dose I : 35 mgKgBB
Infusion Dose II : 70 mg/KgBB
Infusion Dose III : 140 mg/kgBB

Table II shows that the preparation of binahong leaf extract at the three doses, namely 35 mg/KgBW, 70 mg/KgBW and 140 mg/KgBW, had the effect of reducing blood sugar levels in male swiss. The best percentage reduction was found in the first dose of binahong leaf extract, which was 35 mg/KgBW with a reduction rate of 40.6%. This is comparable to research conducted by Nurtika (2017) and Andrieyani (2015) which stated that binahong leaf extract at a dose of 35 mg/KgBW had the maximum effect on lowering blood sugar levels. In line with research conducted by Hairunnisah (2019) that the higher the dose given, the greater the toxic symptoms that will appear. Toxic symptoms in this study were the mice's feces became soft and the mice experienced vomiting. While of binahong leaves at the three doses, namely 35 mg/KgBB, 70 mg/KgBB and 140 mg/KgBB, had the effect of reducing blood sugar levels in male swiss. The best percentage reduction was found in dose III of binahong leaf extract, which was 140 mg/KgBW with a reduction rate of 30.5%

Comparative data on the decrease in blood sugar levels before and after the treatment was then analyzed with SPSS with a 95% confidence level. The normality test was performed using the Shapiro-Wilk. The results show that the sig value (<0.05), it can be concluded that the data is not normally distributed. The data homogeneity test was carried out to find out whether the data variants obtained were the same or not. Homogeneity test was performed using Levene. The results show that the significance value is 0.002 (sig <0.05), so it can be concluded that the data is not homogeneous.

The statistical test was continued by Kruskal-Wallis to find out the differences in each group. The results show that the significance value is 0.001 (sig <0.05), so it can be concluded that there are differences between groups. The statistical test was continued with Mann-Whitney to find out the significant differences between groups.

The results showed that the negative control group had no effect on lowering blood sugar levels as indicated by the negative control group which differed significantly from the positive control group, ethanol extract and binahong leaf infusion doses I, II and III. In line with research conducted by Ilyas et al (2016) that CMC Na did not have the effect of reducing blood sugar levels but increased by 87.67 mg/dL.

The positive control group was significantly different from the first dose of binahong leaf extract (35 mg/KgBB), meaning that the first dose had a more maximal effect in lowering blood sugar levels as indicated by a decrease in blood sugar levels of 40.6%. The positive control group with binahong leaf extract doses II and III did not give significantly different results, meaning that the binahong leaf extract doses II and III had the same ability as the positive control group in lowering blood sugar levels, but decreased blood sugar levels using binahong leaf extract doses II and III were greater, namely 28.1% and 18.2%, while the positive control group with II and III doses of binahong leaf infusion did not give significantly different results, meaning

that the II and III doses of binahong leaf infusion had the same ability as the positive control group in lowering blood sugar levels, but the decrease in blood sugar levels using doses I and II of binahong leaf infusion was greater, namely 16.2% and 14.5% while the third dose of infusion showed a percentage decrease of 30.5%.

Based on research conducted by Ajie (2015) and Utami and Desty (2013) that binahong leaf extract can reduce blood sugar levels because it contains flavonoids and saponins. Flavonoids can reduce blood sugar levels by regenerating pancreatic β cells because flavonoids are one of the phenolic compounds (Parisa, Reza, Afsaneh, & Sarieh, 2016). Saponins have the activity of lowering blood sugar levels by increasing the number of pancreatic β cells so that insulin will increase so that it will help lower blood sugar levels (Yesinia, Yuliarti, & Puspitasari, 2018).

Based on the research that has been done, it can be concluded that the ethanol extract and infusion of binahong leaves are effective as antidiabetics. Ethanol extract and infusion of binahong leaves at doses of 35 mg/Kg BW, 70 mg/KgBW and 140 mg/KgBW can reduce blood sugar levels swiss in alloxan-inducedA dose of 35 mg/KgBB provides the maximum effect in reducing blood sugar levels as evidenced by a decrease in blood sugar levels of 40.6%, while infusion at a dose of 140 mg/KgBB provides the maximum effect in reducing blood sugar by 30.5%.

CONCLUSION

The ethanol extract of binahong leaves (Anredera cordifolia Steen.) has effectiveness as an antidiabetic in alloxan-induced swiss strain male mice showing that the three doses have antidiabetic effects and the first dose of 35mg/KgBW gives the maximum effect. Binahong leaf infusion (Anredera cordifolia Steen.) has effectiveness as an antidiabetic in alloxan-induced Swiss strain male mice with the results of the study showing that the three doses had an antidiabetic effect and dose III 140mg/KgBW provided the maximum effect. There is a comparison of the effectiveness as an anti-diabetic between ethanol extract and infusion of binahong leaves (Anredera cordifolia Steen.) in alloxan-induced swiss strain male mice.

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