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The Effect Of Extract Binahong Leaves (*Anredera cordifolia* Steenis) On Blood Urea Nitrogen (BUN) Creatinine Serum and Renal Histopathology Of Male White Rats (*Rattus norvegicus*) of Diabetes Mellitus

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ABSTRACT

Diabetic nephropathy is one of the complications of diabetes mellitus on the pancreas that can end up in chronic pancreas failure. Various treatment options to repair pancreas damage due to diabetic nephropathy, one of which is by using *Anredera cordifolia* leaves. This study aims to determine the content of secondary metabolites in *Anredera cordifolia* leaves ethanol extract, and to determine the effective dose of *Anredera cordifolia* leaves ethanol extract in regenerating male white rat kidney cells. This study uses a laboratory experimental method. This study used 30 rats divided into 6 treatment groups, each group consisting of 5 test animals, namely normal group, negative control, positive control, dose of 25 mg/kg BW, dose 50 mg/kg BW, and dose 100 mg/kg bw. The level of histological damage to the renal tubules was observed with HE staining using an Olympus CX23 microscope. The data from the scoring of the level of renal tubular damage were analyzed using the Kruskal-Wallis test followed by the Mann-Whitney test to see the differences between treatments. The results showed that the *Anredera cordifolia* leaves ethanol extract contained secondary metabolites of alkaloids, flavonoids, saponins, and tannins; *Anredera cordifolia* leaves ethanol extract has an effect on kidney cell repair; *Anredera cordifolia* leaves ethanol extract at a dose of 100 mg/kg bw is effective reducing urea and creatinine; with an average decrease of 17.0 and 0.71 mg/dL in repairing kidney cells with an average damage value of 1.
Keywords: *Anredera cordifolia* leaves; Kidney Histopathology; Urea and Creatinin Male White Rat.

INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disease characterized by blood glucose levels that can be dangerous due to the development of *Reactive Oxygen Species* (ROS). ROS mixtures can cause changes in lipids, *Deoxyribonucleic Acid* (DNA), and proteins in tissues. Increased ROS communicating with the lipid bilayer of individual cells results in normally occurring lipid peroxidases that are also markers of oxidative stress, especially *Malondialdehyde* (MDA). The receptive species response in the DNA particle damages the DNA structure. One of the organic limits that can be utilized in chaotic DNA is 8-Hydroxysideoxyguanosine (-OHdg). As a result, ROS causes hyperglycemia and kidney damage (Tandi *et al.,* 2016). Kidneys are one of the main organs of the body, and late recognition of kidney disease will be fatal from now on. Most people learn they have kidney disease only after experiencing serious kidney problems. Damage generally occurs to the kidneys due to the presence of toxic substances. The kidney is a duct that has no anastomoses from different supply routes. Diseases including kidney disease are high-risk cardiovascular diseases, that have high mortality rates and high therapeutic costs. Therefore a selective treatment was made involving natural plants as medicine, one of which is the *Anredera cordifolia* leaves plant *(Anredera cordifolia* Steenis*)* (Putra, 2019). *Anredera cordifolia* is a natural plant that has properties as a restorative plant used for various infectious diseases that do not disturb the body. *Anredera cordifolia* originates from the central region of China. Surprisingly, almost all parts of this plant can be used as medicine.

Research on the antibacterial power of *Anredera cordifolia* leaves and their auxiliary metabolites has been completed, *Anredera cordifolia* leaves Simplicia contain alkaloids, flavonoids, tannins, and saponins. This mixture can be useful for treating several diseases, such as DM, hepatitis, cardiovascular disorders, circulatory disorders, high blood cholesterol, and blood clots in blood vessels (Hariyanti *et al.,* 2017). Previous studies stated that 70% of ethanol extract of *Anredera cordifolia* leaves at a dose of 25 mg/kg, 50 mg/kg, and 100 mg/kg, at a dose of 25 mg/kg, had an effect on reducing blood glucose levels in

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alloxan-induced by Male white rat *(Rattus norvegicus).* In this study, *Anredera cordifolia* leaf extract at a dose of 25 mg/kg BW provided the maximum effect in reducing blood glucose levels in male Wistar rats (Nurtika, 2017). Based on previous research on DM, researchers were interested in knowing the relationship between Blood Urea Nitrogen (BUN) creatinine and histopathology kidney in male white rats with diabetes mellitus who were given *Anredera cordifolia* leaves of extract at doses of 25 mg/kg bw, 50 mg/kg bw and 100 mg/kg bw.

METHODOLOGY

Materials

Anredera cordifolia leaves determined at UPT. Biological Resources Tadulako University, Metformin 500 mg, aqua pro injection, streptozotocin 40 mg/kg bw, glucometer, rotary evaporatory (*(Eyela)*, microscope (Olympus CX21), a set of minor surgical tools; scalpel (*different knife*) operating scissors (*scissors for surgery*), anatomy tweezers (*to clamp tissue or organs*), Male White Rats aged 2 months with a body weight range of 150-180 gram.

Methods

This study was a true experimental method to evaluate the effectiveness of *Anredera cordifolia* leaves ethanol extract at doses of 25 mg/kg bw, 50 mg/kg bw, and 100 mg/kg bw Blood Urea Nitrogen (BUN) creatinine serum and renal histopathology of male white rats of diabetes mellitus was determined in male white Wistar rats (150-180 g, 3-4 months). For this purpose, 30 rats were randomly divided into 6 groups. This research has obtained ethical clearance No. 6940/UN28.1.30/KL/2022.

Preparation of *Anredera cordifolia* leaves ethanol extract

Anredera cordifolia leaves ethanol extract is made by maceration technique. *Anredera cordifolia* leaves powder that has been filtered using a cross-section filter mesh 40, weighed 1000 grams then put into 2 maceration containers 500 grams each containing 96% ethanol which can dissolve as much as 3 liters per 1.5 liters, closed, then left for 3 x 24 hours protected from light while stirring occasionally. The extract is then taken using channel paper to get the filtrate. Then at that time, it was concentrated using a Turning Vaccum Evaporator at a temperature of 40-60°C followed by drying which ended with a water bath at 60°C to obtain a thick concentrate is 30% Randemen.

Preparation of Metformin Suspension and Preparation Streptozotocin Solution

The adult dose of metformin is 500 mg per day, so the dose of metformin for male white rats is 9 mg/200 kg bw. Weigh the metformin tablet powder is 500 mg, then suspend it in 0.5% NaCMC to 100 ml, then shake until homogeneous. Streptozotocin was weighed as much as 0.32 grams then dissolved using citrate buffer solution with a pH of 4.5, then induced intraperitoneally in rats. The dose of streptozotocin is 40 mg/kg bw.

Analysis of BUN and Creatinine

The instrument used to measure urea levels in blood serum that works automatically is a UV-VIS spectrophotometer. The first BUN reagent composition consisted of reagent 1 { consisting of a buffer solution (Phosphate Buffer, pH < 13) 120 mmol/L and sodium hypochlorite 10 mmol/L }, R2 (urease > 500 KU/I.). The amount of blood taken from rats is 5 mL. The measurement of BUN begins with separating blood and serum samples by centrifugation for 15 minutes. The required sample amount is 10 µL. Then 1 1000 µL reagent was added. Then incubated for 5 minutes at 25^0C. After that, 1000 µL of reagent 2 was added. Let stand for 10 minutes at room temperature and then measured using a UV-VIS spectrophotometer at a wavelength of 578 nm, then the results of the urea adsorbent measurements are recorded.

The amount of blood taken from rats is 5 mL. The method of measuring creatinine begins with separating blood and serum samples by centrifugation for 15 minutes. The required amount of serum is 50 µL, then 1000 µL picric acid reagent (reagent 1) and 1000 µL sodium hydroxide reagent (reagent 2) are added (1:1), and mixed until evenly distributed. Set aside for 30 seconds, measured using a UV-VIS spectrophotometer at a wavelength of 492 nm, with two measurements where the first measurement was for 60 seconds and the second measurement was for 2 minutes then the creatinine adsorbent measurement was recorded (Amir *et al.,* 2015).

Preparation of Histopathology of kidney

The surgical process was carried out on the abdominothoracal section and a necropsy of the pancreatic organs was carried out, the organ was then rinsed with 0.9% NaCl physiological fluid to separate it from the blood or fats attached to the organ (Tandi, 2020). 3. Fixation Tissue samples were fixed with Buffered Neutral Formalin (BNF), the volume of Buffered Neutral Formalin (BNF)

was at least 10 times the tissue volume. In general, the time needed for perfect fixation is 48 hours. The specimen selected for examination is cut 0.5-1 cm thick. Pieces of specimens are put in the processing basket accompanied by a label with a specimen number written in pencil. The remaining specimens with Buffered Neutral Formalin (BNF) were stored in tightly closed bottles. Furthermore, these bottles are stored sequentially and discarded when they have exceeded 3 months, and written on the sample destruction form. The processing is carried out starting from the fixation process to preserve and harden the organs, the dehydration process to remove all the fluid contained in the fixed tissue, the clearing process to remove alcohol from the organs, and the impregnation process to remove toluene from the organs.

The embedding cassette which has been filled with organ specimens is inserted into the tissue processor with a time setting. The embedding cassette is removed from the tissue processor and continues with the embedding process. The embedding process is carried out to harden the organs so they can be easily cut using a microtome. Print is numbered along with a label so as not to be confused. After freezing (the paraffin has hardened) separate the mold from the basket. The next process is cutting with a microtome knife. The cutting process is carried out to obtain thin slices using a microtome. The process of cutting a network block is as follows. Take the network block then fix it on the microtome. The tissue block was cut with a coarse microtome to obtain a flat surface. Use a microtome knife that is still sharp, the thickness of the piece is 5-6 microns.

Select the best piece of tissue from the bands formed. The selected pieces are stretched in a floating out which has a temperature of around 40^0C which is more. The ideal temperature will cause the pieces of tissue to stretch perfectly, not wrinkled. Sprinkle 5 grams of gelatin powder with 100 cc of distilled water and let it dissolve completely. Good cuts, not scratched, not wrinkled are selected and taken with glass slides that are numbered according to the pathology number. The slide containing the patch of tissue is placed on the slide heating plate, for a minimum of two hours. The staining process is carried out to give color to the tissue that has been cut so that the tissue becomes contrasted so that it can be recognized and observed with a microscope. Before coloring, all dyes must be checked for clarity. After the coloring is done cover slipping, prepare enough cover slips by the amount of the preparation that has just been colored then put 1-2 drops of "entellan" on each cover slip. Turn it over and cover it on the slide that has just been colored, preventing air bubbles from forming, let the preparation that has been covered with a coverslip then leave it until it dries completely. Clean the slide glass with xylol and then give the number according to the number on the slide glass label and it is ready to be examined under a light microscope (Luna, 1968). Readings are taken under a microscope to see changes in the morphology of the organ being examined. The examination was carried out using an Olympus CX-23 microscope (Luna, 1968).

Data Analysis

The data obtained from microscopic examination was in the form of kidney histopathological scoring data of male white rats which were observed using an Olympus CX23 microscope, then a normal distribution test was carried out to know which sample data were normally distributed. Data were analyzed using the Kruskall-Wallis non-parametric static test and continued with the Man-Whitney test to determine differences between treatments. Data processing was carried out using the SPSS 25 software program.

RESULT AND DISCUSSION

The test material in this study was *Anredera cordifolia* leaves obtained from the city of Palu.The determination aimed to determine the accuracy of the test material employed. Determination of *Anredera cordifolia* leaves was carried out at UPT. Biological Resources Tadulako University, Central Sulawesi. The analysis revealed that the *Anredera cordifolia* leaves utilized in the study belonged to the family Basellaceae. The class of secondary metabolites found in *Anredera cordifolia* leaves extract as bioactive chemicals expected to have a role in delivering nefrotoprotective effects was determined through phytochemical testing. The ethanol extract of *Anredera cordifolia* leaves contained positive alkaloids, flavonoids, saponins, tannins, and phenolics, according to the results of phytochemical screening (Table I). *Anredera cordifolia* leaf extract contained a wide range of polar, semi-polar, and non-polar secondary metabolite chemicals.

Measurement of the initial Blood Urea Nitrogen (BUN) level was carried out on (day 0) to determine the BUN level before treatment. The mean value of initial BUN level measurement in normal control male white rats was 18.7 mg/dl, negative control was 18.3 mg/dl, positive control was 18.7, the treatment group was 25 mg/kg bw 18.7 mg/dl, the treatment dose was 50 mg/kg bw was 17.5 mg/dl, and the treatment group with a

Table I. The Results of Phytochemical Screening of *Anredera cordifolia* Leaves Extract

Chemical Compounds	Reagent	Result	Exp.
Alkaloids	Dragendorf	Red	+
Flavonoids	Mg powder + HCl	Red Yellow	+
Saponins	Water + HCl	Foam ± 1 cm	+
Tannins	$FeCl_3$ + NaCl 10%	Blackish green	+

Note: (+) : Detected

Table II. Average BUN Levels

Day	Average ± SD BUN Levels (mg/dl)					
	Normal Control	Negative Control	Positive Control	Dose 25 mg/kg bw	Dose 50 mg/kg bw	Dose 100 mg/kg bw
0	18.7±2.4	18.3± 1.4	18.7± 2.1	18.7± 2.1	17.5± 2.5	17.7± 1.6
21	19.5± 1.1	29.2± 0.8	29± 0.8	28.7± 0.8	28.8± 0.7	28.7± 1.7
28	17.8± 1.2	25.8± 0.9	23.3± 0.6	24± 0.8	23.7± 0.8	22.6± 1.1
35	8.4 ± 1.3	23.6± 0.8	18.5± 2.1	20.9± 0.9	20.1± 1.2	17± 1.1

dose of 100 mg/kg body weight was 17.7 mg/dl which means that the average BUN level of the test animals used was in the normal range where BUN levels were normal in rats is 15.0 – 21.0 mg/dl (Tandi, 2020). The results of the One Way Anova statistical test on day 0 showed that all treatment groups were not significantly different with a P value > 0.05 (P value = 0.898). This means that the BUN level at the beginning of the study was homogeneous with normal levels. The results of the one-way ANOVA test on day 21 showed that there were significant differences in all treatment groups with a P value <0.05 (P value = 0.000), so continued with *Duncan's* further test. *Duncan's* test results showed that the normal group was significantly different from all treatment groups. This means that the test animals in the treatment group were sick or had increased levels of BUN caused by the induction of high-fat feed and streptozotocin which would cause hyperglycemia which could increase the production of ROS due to their oxidative properties. stress occurs which interferes with the glomerular filtration rate and can reduce its function filtering the kidneys so that the level of BUN in the blood will increase (Tandi, 2020). The results of the one-way ANOVA test on day 28 showed that there were significant differences in all treatment groups with a P value <0.05 (P value = 0.000), so continued with Duncan's further test. Duncan's test results showed a dose of 25 mg/kg bw and a dose of 500 mg/ kg bw was significantly different between the normal control and negative control, while the dose of 100 mg/kg bw was not significantly different from the positive control, but significantly different from the normal control and negative control. This shows that the dose of 100 mg/kg bw has an effect but is not effective enough in reducing BUN levels.

The results of the One Way Anova statistical test on day 35 showed that there were significant differences in all treatment groups with a P value <0.05 (P value = 0.000) so it was continued with Duncan's test to see differences between all treatment groups. The results of Duncan's test showed that the positive control groups at doses of 50 mg/kg bw and 100 mg/kg bw were significantly different from the negative controls but not significantly different from the normal controls. The dose 25 mg/kg bw group was not significantly different from the 50 mg/kg bw group but significantly different from the positive normal control and the 100 mg/kg bw group. This shows that on the 35th day, BUN levels in male white rats decreased at a dose of 25 mg/kg bw, 50 mg/kg bw, and 100 mg/kg bw dose groups, with an average of 20.9 mg/dl, 20.1 mg/dl, and 17.0 showed that in all treatment groups the ethanol extract of *Anredera cordifolia* leaves with a duration of 14 days could reduce the BUN levels of the rats until they reached the normal control group BUN levels so that a lower dose was chosen, namely the dose of 100 mg/kg bw because the extract was given effective in reducing BUN levels where normal BUN levels in rats are 15-21 mg/dl.

The choice of this dose was because, at a dose of 100 mg/kg bw, it was due to the content of secondary metabolites found in *Anredera cordifolia* leaves such as alkaloids, flavonoids, saponins, and tannins which reduced BUN and creatinine levels

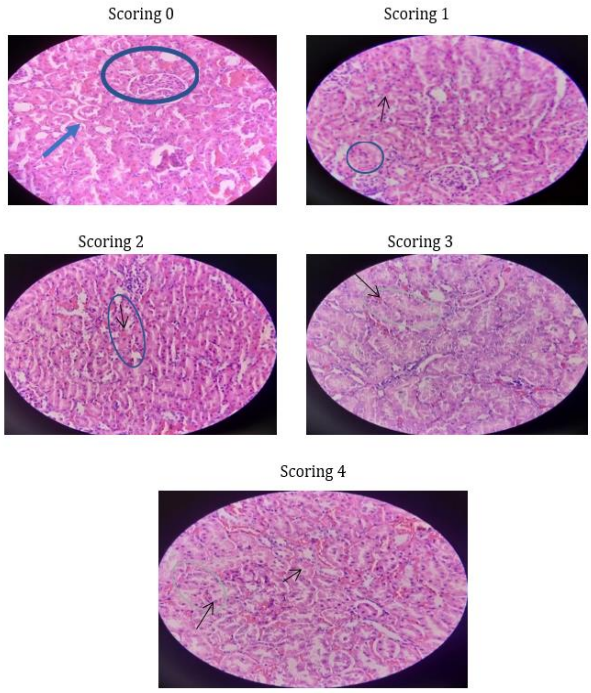

Figure 1. Histopathology of kidney of male white rats

Note : Scoring 0: there is a glomerulus within normal limits (blue circle) that looks like normal tubules consisting of cells with eosinophilic cytoplasm and basophilic nuclei (arrows); Scoring 1: atrophic tubules with their lining cells undergo necrosis as much as 1/3 of the visual field (green circle). Cells undergoing necrosis are characterized by cytoplasm; Scoring 2: atrophic tubules with their lining cells experiencing necrosis of 2/3 of the visual field (green circle). Cells undergoing necrosis are characterized by rather a pale cytoplasm, the nucleus shrinks (black arrow). not pale, basophilic nucleus but slightly pale (black arrow). there is a glomerulus within normal limits (blue circle); Scoring 3: atrophic tubules with their lining cells experiencing necrosis of more than 2/3 of the visual field (green circle). Cells undergoing necrosis are indicated by pale cytoplasm and the nucleus shrinks or disappears (black arrow). Scoring 4: atrophic tubules with cells covering almost the entire visual field experience necrosis (green circle). Cells undergoing necrosis are indicated by pale cytoplasm and the nucleus shrinks or disappears (black arrow).

Table III. Average Creatinine Levels

Day	Average ± SD Creatinine levels (mg/dl)					
	Normal Control	Negative Control	Positive Control	Dose 25 mg/kg bw	Dose 50 mg/kg bw	Dose 100 mg/kg bw
0	0,33±0,10	0.33± 0,10	0,45± 0,19	0,47± 0,19	0,38± 0,15	0,45± 0,24
21	0,53± 0,10	1,33± 0,35	1,42± 0,37	1,47± 0,25	1,51± 0,29	1,47± 0,25
28	0,51± 0,24	1,37± 0,24	1,14± 0,29	1,20± 0,24	1,14± 0,29	1,09± 0,24
35	0,58 ± 0,25	1,29± 19	0,67± 0,22	0,76± 0,15	0,76± 0,15	0,71± 0,19

in male white rats. In addition, *Anredera cordifolia* is a cultivated plant that grows well in the lowlands or highlands with a cold and humid climate so that *Anredera cordifolia* leaves will grow optimally so that the nutrients contained in *Anredera cordifolia* plants are properly fulfilled. The phytochemical content in a plant is influenced by several factors such as light, temperature, humidity, pH, nutrient content in the soil, and where it grows (Dewi *et al.,* 2021).

The measure of initial creatinine level (day 0) to determine creatinine level before treatment. The mean value of initial creatinine level measurement in normal control test animals was 0.33 mg/dl, negative control was 0.33 mg/dl, positive control was 0.45 mg/dl, the treatment group with a dose of 25 mg/kg bw was 0.47 mg /dl.

Table IV. Scoring Level of Rat Kidney Damage

Groups	Scoring Level					Average ± SD
	1	2	3	4	5	
Normal	0	0	0	0	0	0.0 ± 0.00
Negatif	3	4	3	3	1	2.8 ± 1.10
Positif	0	0	0	1	0	0.2 ± 0.45
Dose 25 mg/kg bw	1	2	4	3	3	2.6 ± 1.14
Dose 50 mg/kg bw	3	3	3	3	4	3.2 ± 0.45
Dose 100 mg/kg bw	1	1	1	1	1	1.0 ± 0.00

dl, the 50 mg/kg bw treatment group was 0.38 mg/dl, and the 100 mg/kg bw treatment group was 0.45 mg/dl indicating that the initial creatinine levels of male white rats were within the normal range. This is to the literature which states that normal creatinine levels in rats are 0.2 - 0.8 mg/dl. (Tandi, 2020). The results of the One Way Anova statistical test on day 0 showed that all treatment groups were not significantly different with a P value > 0.05 (P value = 0.636) meaning that the creatinine level at the start of the study was homogeneous with normal levels. The results of the one-way ANOVA test on day 21 showed that there was a significant difference in all treatment groups with a P value <0.05 (P value = 0.000), meaning that on day 21 there was an effect of giving streptozotocin so that it was continued so the test was continued. continued Duncan, the results of Duncan's further test showed that the negative control, and positive control, doses of 25 mg/kg bw, 50 mg/kg bw, and 100 mg/kg bw were significantly different from the normal group, meaning that the male white rats were in the sick treatment group, or experience an increase in creatinine levels caused by streptozotocin induction causing hyperglycemia which can increase ROS production as a result there will be oxidative stress which can interfere with glomerular filtration rate and can reduce kidney filtration function which causes blood creatinine levels to increase (Aji, *et al.,* 2016). The results of the One Way Anova statistical test on day 28 showed that there were significant differences in all treatment groups with a P value <0.05 (P value = 0.001) so it was continued with Duncan's test to see differences in all treatment groups. Duncan's test results showed that the negative control, positive control, doses of 25 mg/kg bw, 50 mg/kg bw, and 100 mg/kg bw were significantly different from the normal group. The results of the One Way Anova statistical test on day 35 showed that there were significant differences in all treatment groups with a P value <0.05 (P value = 0.000) so it was continued with Duncan's test to see differences between all treatment groups. The results of Duncan's test showed that the positive control group, namely the dose 25 mg/kg bw, 50 mg/kg, and 100 mg/kg bw doses, was significantly different from the negative control group but not significantly different from the normal control. This shows that on day 35 the creatinine levels in male white rats decreased in dose 25 mg/kg bw, 50 mg/kg bw, and 100 mg/kg bw with an average of 0.76 mg/dl, 0. 76 mg/dl and 0.71 mg/dl showed that in all treatment groups the ethanol extract of *Anredera cordifolia* leaves with a duration of 14 days could reduce the creatinine levels of the rats until they reached the normal control group creatinine levels so that a lower dose was chosen. namely a dose of 100 mg/kg bw as the dose of extract that is effective for reducing creatinine levels where the normal creatinine level of rat test animals is 0.2-0.8 mg/dl. The choice of this dose was because, at a dose of 100 mg/kg bw, it was due to the content of secondary metabolites found in *Anredera cordifolia* leaves such as alkaloids, flavonoids, saponins, and tannins which reduced urea and creatinine levels in male white rats. (Dewi *et al.,* 2021). (Table III).

Based on glomerular damage score data in 6 groups, it was found that the average group had a damage score of 0 (Figure 1) where there are no cylindrical and glomerular cells that undergo decay or apoptosis. This was because the general group was not given streptozotocin and was only given NaCMC suspension. In the negative group, streptozotocin can damage kidney cells. From the information obtained there tends to be moderate damage with a typical score of 2.8. (Figure 1) Where there is damage to the round cells and glomeruli of the kidney which produce sorbitol in the blood. In the positive group, it can have a score of 0.2 where there are no cylindrical and glomerular cells that experience irritation or apoptosis. Table IV.

This is because the positive group has been given metformin suspension to help treat high blood sugar levels in diabetes which can cause kidney damage. Metformin can also affect kidney cell repair (Bisala *et al.,* 2019) Based on score data

in the experimental group, the ethanol extract of *Anredera cordifolia* leaves at doses of 25 and 50 mg/kg bw had respective scores with average damage of 2.6 and 3.2, moderate damage occurred where the capsule enlarged and necrotic cells 25-50%. This was due to the administration of streptozotocin which could damage the kidney tubules of male white rats. At a dose of 100 mg/kg bw, it has an average damage score of 1 where no tubular and glomerular cells experience necrosis or apoptosis. (Table IV). This is because, at a dose of 100 mg/kg bw, it provides a better effect in preventing streptozotocin-induced kidney tubular damage in male white rats. Doses of 25 and 50 mg/kg bw did not repair kidney cells, whereas at a dose of 100 mg/kg bw could improve kidney cells.

The effective dose in repairing kidney cells is a dose of 100 mg/kg bw, this is because the *Anredera cordifolia* leaf extract can penetrate well at a dose of 100 mg/kg bw so the active substances contained in *Anredera cordifolia* leaves can be absorbed perfectly. by receptors so that it can provide maximum effect in repairing kidney cells. The healing effect caused by the administration of ethanol extract of *Anredera cordifolia* leaves against streptozotocin-induced male white rat kidney injury was caused by the presence of alkaloids, flavonoids, saponins, and tannins. This is by the results of the phytochemical screening test. Compounds contained in the ethanol extract of *Anredera cordifolia* leaves, namely alkaloids, have antioxidant properties by inhibiting oxidation reactions so that the formation of free radical chains is inhibited using proton donors to stabilize free radicals (Tandi *et al.,* 2017).

CONCLUSION

The results of the study showed that the ethanol extract of Anredera cordifolia leaves at a dose of 100 mg/kg BW with an average damage of 1.0 **±** 0.00 was an effective dose in repairing kidney cells, reducing levels of urea and creatinine in male white rats with an average of 17.0 mg/dl and 0.71 and able to repair kidney tissue damage in male white rats.

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