

# Potential of Anticholesterol Degenerative Drugs of Leaf Extract (*Catharanthus roseus* (L.) G. Don) On Wistar Rat (*Rattus norvegicus*)

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Article History: Submitted: 17.10.2019

Revised: 22.12.2019

Accepted: 10.01.2020

## ABSTRACT

Research on the potential of anticholesterol degenerative drugs extract of purple *C. roseus* leaf tea water (*Catharanthus roseus* (L.) G. Don) in white male Wistar rats (*Rattus norvegicus*) has been carried out. The purpose of this study was to determine the effect of giving extracts of water or steeping water of the *C. roseus* leaf in white male rats as a scientific study for the utilization of white or purple *C. roseus* leaves to be obtained degenerative especially to overcome excess cholesterol in humans. The method was carried out in stages starting with mouse rearing. White rat were previously induced with high fat from pigs for 40 days. The sample with two-color *C. roseus* leaf sampling, namely white and purple *C. roseus*. Drying and extraction with steeping simplicia in the form of tea, then treated to rat with atlibitum or drinking with a bottle sized for 10 days then blood analyzed with an enzymatic spectrometer. The treatments were divided into negative control, positive control and treatment with white *C. roseus* leaf tea 2 packs (4 g) and 1 pack (2 g) and purple white *C. roseus* leaf tea 2 packs (4 g) and 1 pack (2 g leaves tea powder), each brewed in 200 mL of hot water. The results showed that the water extract of the *C. roseus* leaves had an anti-cholesterol effect.

The best water extract of *C. roseus* leaf water was found in the treatment of one bag of purple flower *C. roseus* leaf water extract (2 g of powder) in 200 mL of hot water that is equal to 42.67 mg/dL. The average reduction in total cholesterol levels in the blood of white male rats treated by one tea bag (2 g) of purple *C. roseus* powder was 3.33 mg/dL. The extracted water of steeping *C. roseus* leaves with purple flowering is more effective in reducing total blood cholesterol levels compared to white flowering of *C. roseus*. The purple-flowered *C. roseus* has the potential to be used as an anti-cholesterol drug in degenerative diseases.

**Keywords:** Drug; Anti-cholesterol; Degenerative; *C. roseus*; *R. norvegicus*; *C. roseus*

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DOI: 10.5530/srp.2020.1.78

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## INTRODUCTION

Cancer and coronary heart disease including degenerative diseases are also called non-communicable diseases (PTM), which were previously not worrying compared to infectious diseases in Indonesia to be very worrying and require serious treatment. PTM is currently dominating the causes of death in North Sulawesi, including: coronary and cardiovascular heart disease, diarrhea, hypertension or stroke, mellitus, cancer [1]

Cholesterol is the main steroid compound in human and animal body tissues. Cholesterol also plays a role in the formation of cell membranes and plasma lipoproteins, as well as precursors for sex hormones, vitamin D and bile acids [2]. Cholesterol has an important role in the body to regulate chemical processes in the body, but cholesterol in high amounts or above 200 mg/dL can cause atherosclerosis (accumulation of cholesterol fat in blood vessels) which will eventually have an impact on cardiovascular disease [3].

The number of cardiovascular disease sufferers in Indonesia has increased from year to year. Lifestyle and eating patterns of modern society that tends to consume fatty foods and fast food in large quantities, and lack of exercise are bad habits that can lead to cardiovascular disease, such as coronary heart disease and stroke. The occurrence of coronary heart disease is positively correlated with blood cholesterol levels [2]. The state of

hypercholesterolemia (high cholesterol levels in the blood) increases the risk of cardiovascular disease, such as coronary heart disease and stroke. Coronary Heart Disease (CHD) is a form of cardiovascular disease which is the number one cause of death in the world. CHD is a degenerative disease associated with lifestyle, and socio-economic community. The World Health Organization (WHO) recorded more than seven million people died from CHD worldwide in 2002. This figure is expected to increase to eleven million by 2020 [4].

The country of Indonesia is a vast archipelago, having approximately 35,000 large and small islands with a very high diversity of flora and fauna. In Indonesia there are estimated to be 100 to 150 plant families, and of these most have the potential to be used as industrial plants, fruit plants, herbs and medicinal plants [5]. Efforts to research medicinal plants in Indonesia in order to be an alternative in overcoming various diseases have been carried out. One of the medicinal plants which is widely researched and efficacious in reducing high cholesterol levels in the blood is the *C. roseus* plant.

Tapak dara (*Catharanthus roseus* L. G. Don) (Figure 1) is one of the many plants that have been used as medicine [6] dan [7]. Traditionally the *C. roseus* plant has been used for the treatment of malaria, constipation, diuretics, diabetes mellitus, hypertension, and hypercholesterolemia [8]. *C. roseus* are useful for overcoming various diseases

because these plants contain various secondary metabolite compounds including flavonoids, saponins, tannins, and around 130 kinds of alkaloids such as vinblastin, vincristine, catarantin, leurosodin, leurosin, and ajmalisin [7].

Research on medicinal plants in connection with a decrease in high cholesterol levels in the blood has been reported by several researchers [8] to have examined the anti-cholesterol from ethanol extracts of *C. roseus* [9], but traditionally people often using *C. roseus* steeping brewing

water, so in this study has the aim to examine the effect of *C. roseus* brewing water as a hypercholesterolemia drug. Until now there has not been much information and research carried out in testing total cholesterol in the blood using tap water boiled water. Most anti-cholesterol test studies are conducted in general using white male Wistar rat test animals [10] dan [9]. Therefore this study is entitled "Anticolesterol Test for *C. roseus* Leaf Water Extract in White Male Wistar Rats".



Figure (1): Morphological appearance of Tapak Dara (*Catharanthus roseus* L. G. Don. (A). Flowering White, (B). Purple Flowering

## MATERIALS AND METHODS

### Location and Place of Research

This research was conducted in March to August 2019 at the Pharmacology Laboratory of the Faculty of Mathematics and Natural Sciences, Sam Ratulangi University, Manado for the maintenance of test and treatment animals, then blood analysis at the Clinical Chemistry Laboratory of the Analysis Department, Politeknik Kesehatan, Manado North Sulawesi Indonesia

### Materials and Research Tools

The mice used were obtained from the Biovina Herb Experimentation Laboratory. *C. roseus* used was obtained from the Biovina Herb Experimentation Laboratory. The tools used in this study include: mouse cages and accessories, gloves, drinking water containers and animal feed, glassware, scissors, MPW-56 centrifuge (MPW MED Instrument), ram wire, masks, stopwatches, glass jars, cotton, scales, tissue paper, blenders, mortars, micropipettes, glasses, cholesterol measuring devices (BTS-350 Bio System), pipettes, vortex wisel, five cc injections, laboratory coats, activator clot tubes, tea bags, scalpels, surgical scissors, hotplat, dispenser. The materials used in this study include: dried *C. roseus* leaves, simvastatin drug 10 mg, cuvette, 70% alcohol, ether, sawdust, 21 white male wistar rats with a body weight between 100-200 g, pig fat, and rat food.

### Experiment Design Research

This research is experimental with a Completely Randomized Design (CRD), the sample used is the *C. roseus* leaf with leaf parameters with purple and white flowers. The study was conducted with seven treatments namely, Group I (C): three male Wistar rats as a control, where the rats were only given normal food (without given fatty food), Group II (CN): three male Wistar rats as negative controls, were given fatty food and not given the drug Simvastatin 10 mg, Group III (CP): three male Wistar rats as positive control were given fatty food and given the drug simvastatin 10 mg, Group IV (P1): three male Wistar rats were given fatty food and given one tea bag treatment of white flowered *C. roseus* leaf extract in 200 mL hot water, Group V (P2): three male Wistar rats were fed with fatty food and treated two tea bags of white flowered *C. roseus* leaf extract in 200 mL hot water, Group VI (U1): three male Wistar rats were fed with fat and were treated with one tea bag of purple flowered *C. roseus* leaf extract in 200 mL hot water, Group VII (U2): three Wistar rats males were fed with fatty food and were treated with the extract of the *C. roseus* leaf extract of two tea bags in 200 mL of hot water. The design of the treatment can be seen as in Table 2. Feeding the male wistar rats is carried out orally for 40 days with pig fat then for *C. roseus* leaf extract water treatment is done by giving drinking water to the rats which is done every two days once, the treatment is carried out for 10 days.

Table (2). The design of the research treatment

Repetition	Control (C)	Control Negatif (CN)	Control Positif (CP)	P1	P2	U1	U2
I	C1	CN1	CP1	P1.1	P2.1	U1.1	U2.1
II	C2	CN2	CP2	P1.2	P2.2	U1.2	U2.2
III	C3	CN3	CP3	P1.2	P2.3	U1.3	U2.3

Note:

C (control): Given normal or nonfat feed and drinking water.

CN (Negative control): Given pig fatty food and drinking normal drinking water.

CP (Positive control): Given pig fatty food and given the drug Simvastatin 10 mg.

P1 (*C. roseus* has white flowers 1): Fatty feed and water extract of white flowered *C. roseus* leaf water one (1) tea bag in 200 mL of hot water.

P2 (*C. roseus* has white flowers 2): Fatty feed and water extracts of white *C. roseus* leaves with two (2) tea bags in 200 mL of hot water.

U1 (*C. roseus* has purple flowers 1): Fatty feed and water extract of purple flowered *C. roseus* leaves one (1) tea bag in 200 mL of hot water.

U2 (*C. roseus* has purple flowers 2): Fatty feed and water extracts of purple tara leaves with two (2) tea bags in 200 mL of hot water.

## RESEARCH PROCEDURE

### Early Rats Rearing

White male wistar rats are kept in a closed room, rat are kept in their respective cages that have been equipped with drinking water bottles and food containers. Wistar rats were adapted to laboratory conditions for one week with standard food and drinks. After the adaptation period, one rat then analyzed its total cholesterol level of the blood while the other rats were kept for 40 days by being fed with a fat ratio of two portions of lard and one portion of rats feed. Substitution of fatty food is done three days once [11].

### Collection and preparation of Samples

Fresh *C. roseus* leaves are taken and then cleaned after that take 250 g (purple and white flowers), then air dried until dry. Dried *C. roseus* leaves are then ground using a blender to powder. *C. roseus* leaf powder and then taken as much as two g and put in a tea bag. The teabag is then brewed in 200 mL of hot water while stirring for 30 minutes then the water extract is put into a rat drinking bottle that has been labeled according to treatment [11].

Provision of treatment in accordance with the study design in Table 2. Provision of negative control and control treatments, Wistar rats were given normal drinking water while administering positive control treatments, Wistar rats were given the drug simvastatin 10 mg in 200 mL of water. Specifically for the administration of water extracts of white and purple flowered *C. roseus* leaves treated with several treatments namely, one tea bag in 200 mL of hot water and one tea bag in 200 mL of hot water.

### Measurement of cholesterol levels before treatment

Wistar rat blood examination was carried out in three stages namely, initial blood sampling was carried out after the adaptation period to analyze the initial total cholesterol level then blood sampling would be carried out after 40 days of pig fatty feeding to analyze how much increased the total cholesterol level of Wistar rat blood, after administration treatment for 10 days wistar rats will

take blood samples back to analyze the effects of anticholesterol from the treatment that has been given. Wistar rat blood sampling method, first wistar rats were anesthetized using ether for five minutes then the wistar rat was tethered to a surgical board where all four limbs were pointing up. Then the wistar rat will dissect the abdominal cavity containing the heart after which blood is drawn from the heart using a five cc syringe of two (2) cc. The blood is then transferred into a clot activator tube to be continued for further blood tests [11].

### Measurement of cholesterol levels after water extract of *C. roseus* treatment

Procedure of rat blood examination is done by taking rat blood serum. The rat blood serum was separated from other blood components by centrifuging with MPW-56 Centrifuge (MPW MED Instrument) for 10 minutes at a speed of 400 rpm. Blood serum is at the top of a clear colored tube. The serum is then processed to determine its total cholesterol content [11]. Then the blood serum was further analyzed using the Biosystem BTS-350 procedure with the BTS 350 Photometer (Biosystem). Data obtained from Biosystem is in mg/dL units. The measurement is done duplicate and repeated 3 times. Measurement data 3 times or about 6 data is averaged so that the data can be as in Table 4.

### Data Analysis

Tabulation and average data is done using the Excel program. Analysis of research data was performed using the one-way ANOVA test with the Statistica 6 program which 3 x repetition. If a F count < F table is obtained at a minimum level of confidence of 95% (0.05), then it is declared insignificant.

## RESULTS AND DISCUSSION

### 1. Effect of Fatty Feed on Weight Gain of Wistar Rats for 40 Days (Pre-treatment)

Fatty feeding of wistar rats using lard can increase the body weight of rats in the pre-treatment period. Based on body weight data before fat feeding (initial data) and after

fat feeding for 40 days as a pre-treatment. Data on rat weight gain during this period can be seen in Table 3.

Table (3). Rats weight gain (g) during pre-treatment (fatty feed).

Rats Group	Repetition 1	Repetition 2	Repetition 3	Total Treatment	Average (g)	Devisi Standard
C	94	102	83	279	93.00	± 9.54
CN	106	100	96	302	100.66	± 5.03
CP	72	81	103	256	85.33	± 15.95
P1	102	98	71	271	90.33	± 16.86
P2	23	69	98	190	63.33	± 37.82
U1	92	56	64	212	70.66	± 18.90
U2	34	56	35	125	41.66	± 12.42
<b>Total</b>	523	526	550			
<b>Average</b>	74.71	80.28	78.57	163.5		

Based on the ANOVA test results (Table 5), the results were not significantly different from the body weight gain of rats when feeding fatty foods during the pre-treatment period (40 days)  $F_{hitung} < F_{tabel}$  (0.05 and 0.01), this means that the rats during pretreatment gives a

homogeneous response to the fatty food. The weight condition and weight gain of rats in the pre-treatment period are ideal conditions for further treatment with a Completely Randomized Design (CRD).

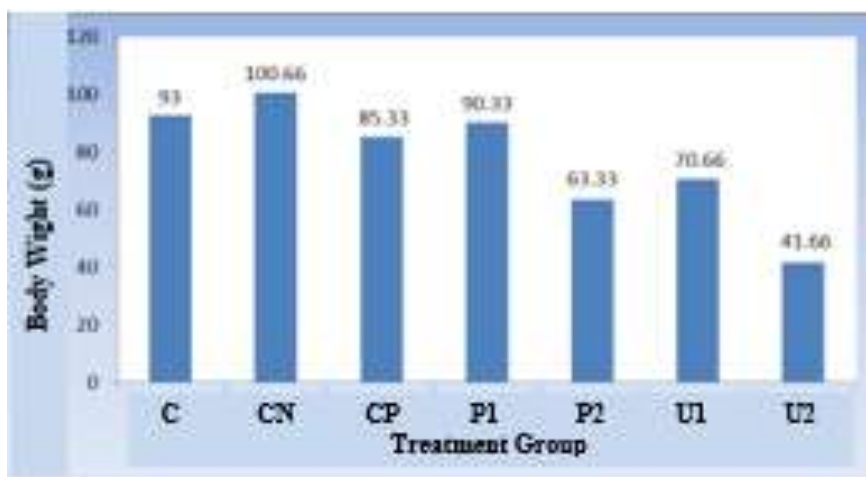


Figure (2). Graph of Weight Body Rats (g) during Pre-Treatment.

The average daily body weight during pre-treatment can be illustrated in Figure 2. Figure 2 shows the daily weight gain after fatty feeding. Based on the ANOVA test results stated daily weight gain during pre-treatment at each treatment was not significantly different although from the average weight gain there was a difference between controls and each treatment. The highest daily body weight gain was found in rats with pre-treatment position for negative control (CN) then followed by control (C), pre-treatment for P1, positive control (CP), pre-treatment for U1, pre - treatment for P2, and the lowest pre-treatment for U2. The highest body weight of rats occurred at CN of 100.66 g while the lowest body weight occurred at U2 of 41.66 g (Table 3).

## 2. Drinking Water Extract *C. roseus* Tea Consumption Daily Treatment of Wistar Rats

During the work process this research found that there were differences in drinking water consumption from each treatment. Consumption of drinking water treated by rats is influenced by genetic factors, body weight, age, body physiology and environmental factors (temperature and air). Therefore, measured consumption of rat treated drinking water based on the remaining drinking water of

rats during the treatment period or for 10 days [11]. The treatment in this study was the water extract of white and purple flowered *C. roseus* leaves given in the form of a drinking water dish. Consumption of drinking water daily treatment of wistar rats during the study can be seen Figure 3.

Based on theoretical phenomena, the function of drinking water is to meet the body's need for water. High and low consumption of drinking water contained daily treatment for test animals depends on several factors such as temperature, body weight, physiological status, and taste factors. Drinking water is colorless (clear), odorless, and tasteless (tasteless). Basically, all of these factors include: temperature, weight, and physiological status are declared homogeneous while the taste factor must have changed where there are treatment components that change color, odor, and of course taste so that in this study the average consumption of drinking water the treatment C (control) was higher than the other treatments that was 85.2 mL/day while the lowest average consumption was found in the U2 treatment which was 51.1 mL/day (Table 4). The average daily drinking water consumption of wistar rats can be seen in Figure 3 and Table 4.

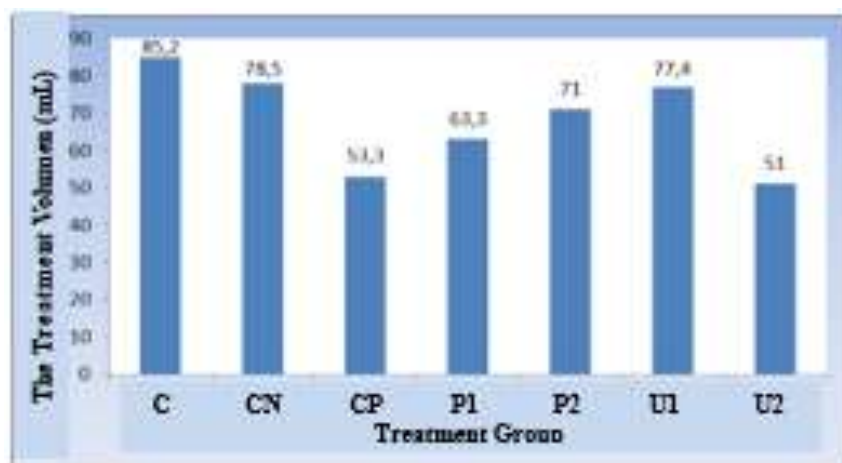


Figure (3). Graph of daily drinking water treatment (mL) consumption of wistar rats for 10 treatment days.

3. Testing the Effect of *C. roseus* Leaf Water Extract on Wistar Rat Total Blood Cholesterol Levels.

The average of 3 replications of data on blood cholesterol content of male wistar rats can be seen in Table 4. From the preliminary data a statistical analysis was carried out

through the Statistica 6 program with a 95% confidence level or 0.05 significance level, the results obtained are as shown in Table 5. After the ANOVA test showed a very significant difference between one variable and another (Table 5). To see the distinguishing variables followed by Duncan's further test as in Table 6.

Table (4). Average water consumption (mL) treatment and average total cholesterol level (mg/dL).

Treatment	Average consumption treatment drinking water (mL)	Average of cholesterol Total (mg/dL)
C	85.2	46.00
CN	78.5	46.00
CP	53.6	45.33
P1	63.33	51.00
P2	71.16	64.33
U1	77.43	42.67
U2	51.10	88.33

This variation is related to the administration of treatment through drinking water in an ad libitum where it is expected that the anti-cholesterol effects contained there in. Thus the variation of the average total cholesterol level of the blood is strongly associated with drinking water consumption of Wistar rats. It can be seen that cholesterol levels between U2 and U1, higher U2 cholesterol levels compared with U1 cholesterol levels with respect to the average consumption of drinking water contained treatment where U1 consumes 77.43 mL/day while U2 is 51.1 mL/day, whereas for P1 the average cholesterol is

lower compared to the average cholesterol P2 where the average consumption of drinking water is P1 63.33 mL/day and P2 71.16 mL/day respectively. The highest consumption of drinking water was found in control wistar rats of 85.2 mL/day (Table 4). The pH is close to 7.0, while the treatment of the water properties has changed both in color and taste, thereby reducing the drinking water consumption of Wistar rats. The pattern of the relationship between the average consumption of drinking water contained in the treatment and the average total cholesterol level of rat blood can be seen in Figure 4.

Effect	Univariate Tests of Significance for Kolesterol (mg/dL) (Data Kolesterol)				
	SS	Degr. of Freedom	MS	F	p
Intercept	45602.00	1	45602.00	890.2777	0.000000
Extract Tipe	684.33	2	342.17	6.6800	0.011225
<i>C. roseus</i> Colour	174.22	1	174.22	3.4013	0.089962
Extract Tipe X <i>C. roseus</i> Colour	100.78	2	50.39	0.9837	0.402145
Error	614.67	12	51.22		

Table (5). Analysis of variance data on cholesterol levels (mg / mL) of total blood of wistar rats treated with water extract of *C. roseus* leaves in purple and white flowers

From Table 5 it can be seen that there are significant differences, then further tests are seen with Duncan's

further tests (Table 6). From the results of further tests that the real difference in the extract type variables 1 and 2 tea

packages or containing 2 and 4 grams of *C. roseus* leaf powder. It turns out that a higher composition of 1 tea bag

of *C. roseus* leaves lowers cholesterol and in purple leaf extracts.

White											
Duncan test; variable Kolesterol (mg/dL) (Data Kolesterol)											
Probabilities for Post Hoc Tests											
Error: Between MS = 51.222, df = 12.000											
Cell No.	Extract Tipe	<i>C. roseus</i> Colour	{1}	{2}	{3}	{4}	{5}	{6}			
			45.000	45.333	51.000	42.667	64.333	53.667			
1	0	White		0.955559	0.348072	0.696837	0.010356	0.194041			
2	0	Purple	0.955559								
3	1	White	0.348072	0.351496		0.672321	0.010338	0.199527			
4	1	Purple	0.696837	0.672321	0.210591		0.005636	0.111200			
5	2	White	0.010356	0.010338	0.049962	0.005636		0.093065			
6	2	Purple	0.194041	0.199527	0.656452	0.111200	0.093065				

Test of SS Whole Model vs. SS Residual (Data Kolesterol)											
Dependnt Variable	Multiple R	Multiple R <sup>2</sup>	Adjusted R <sup>2</sup>	SS Model	df Model	MS Model	SS Residual	df Residual	MS Residual	F	p
Kolesterol	0.780697	0.609488	0.446774	959.3333	5	191.8667	614.6667	12	51.22222	3.745770	0.028274

Table (6). Further Duncan tests of ANOVA results in total cholesterol content (mg/mL) using the Statistica 6 program with a 95% confidence level.

The treatment of purple flowering *C. roseus* steeping with 1 teabag in the U1 treatment group showed significant cholesterol reduction activity compared to the control group and other treatment groups. This shows steeping purple *C. roseus* steeping has an anti-cholesterol effect. The plant *C. roseus* has significant antidiabetic, antihyperlipidemic and antioxidant effects by reducing biochemical and physiological changes in the body. So that *C. roseus* can be used as prophylaxis for the prevention and development of lipid abnormalities based on the effects of essential antioxidants, antidiabetic compounds and phytonutrients [16]. Even the anti-cholesterol effects of *C. roseus* are also accompanied by a lowering effect of triglyceride levels in the blood [19].

Pharmacological effects of *C. roseus* are related primarily to the alkaloids found in almost all parts of the plant. *C. roseus* is a medicinal plant that has two indole terpenoid alkaloids (TIA) namely vincristine and vinblastine which are able to treat tumors and other malignancies such as

leukemia. The content of flavonoids glucoside has anti-inflammatory activity, also contains polyphenols, steroids, anthocyanins and Iridoid glucosides. The ethnobotany significance of *C. roseus* as traditional medicine for various diseases including cancer. TIA is a compound that has high toxicity [17],[18],[20].

Not all pharmacological effects of a drug will increase with increasing dose. Even in some cases there will be a "rebound effect" a condition where the effect that occurs is the opposite of the pharmacological effect. "Rebound effect" often occurs in several drug compounds that have very strong effects or activities with a wide range of toxic [21]. TIA alkaloids are active compounds that have high toxicity [17], so that in this study the U2 treatment group did not show any activity to decrease serum cholesterol levels, what actually happened was a significant increase in serum cholesterol when compared with other treatment groups.

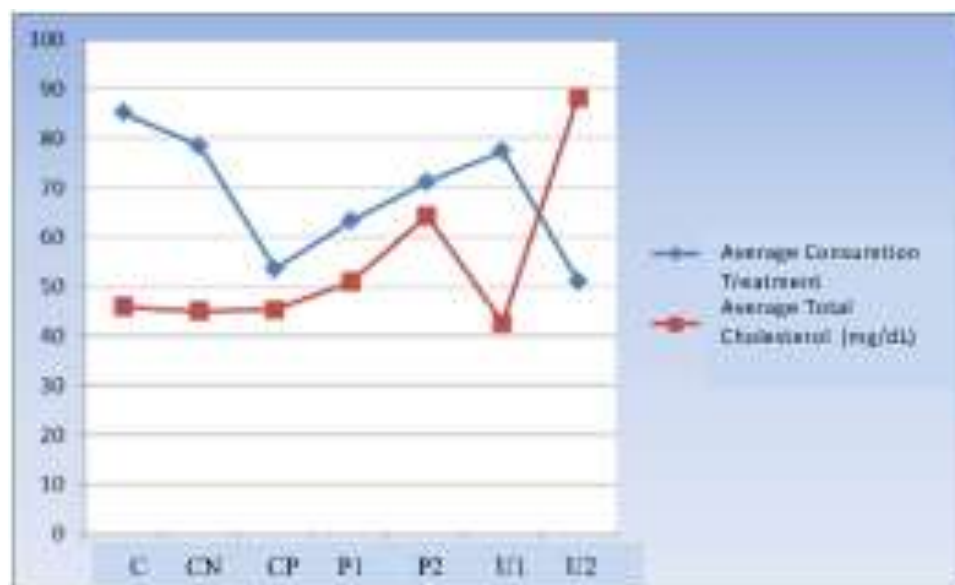


Figure (4). The Relationship Pattern of Average Water Consumption (mL) Contained Treatment of Average Total Cholesterol (mg/dL) of Rat Blood.

*C. roseus* leaf water extract in principle reduces total blood cholesterol levels, this can be seen in the treatment C (control) of 46 mg/dL experienced a decrease in the treatment of U1 (treatment of water extracts of *C. roseus* leaves of purple flowers with one bag) by 42.67 mg/dL. But it can be seen that the treatment of U2 (administration of two bags of purple *C. roseus* leaf water extract) did not reduce the total cholesterol level of blood of Wistar rats. This is thought to be caused by the enzyme HMG-CoA reductase in the wistar rat's body. According to [12], the HMG-CoA reductase enzyme functions to control rat cholesterol synthesis. At certain times the enzyme HMG-CoA reductase also has a feedback system with rat cholesterol synthesis. This enzyme is stimulated by conditions such as fasting, feeding, variations in day length, insulin and thyroid hormones which are highly variable for each individual which depends on the internal physiological and psychological conditions of each individual. Other assumptions in P2 and U2 treatments were higher cholesterol levels because at the time of sampling the Wistar rats the state of total cholesterol was high if observations on other days would be different (there is a possibility of decline). The effect of decreasing serum cholesterol from *C. roseus* can occur in normal conditions of mice and one component of cholesterol that can experience a significant decrease is triglycerides [22]. Control of cholesterol synthesis carried out in the body of rats occurs naturally. There was a marked decrease in HMG-CoA reductase activity in rats in cholesterol synthesis. On the other hand, enzyme activity correlates well with cholesterol synthesis. Siper-stein has proposed a feedback mechanism whereby HMG CoA reductase in the liver is inhibited by cholesterol. Because direct inhibition by cholesterol cannot be demonstrated, cholesterol can work by suppressing the synthesis of new reductases or the synthesis of enzymes that degrade existing reductases. It has also been argued that LDL cholesterol can inhibit cholesterol synthesis in the enzyme work process. Based on the results of the research shown in Table 4, it shows that the extract of purple flowered *C. roseus* leaves has a smaller total cholesterol content compared to the total cholesterol content of the white flowered *C. roseus* treatment. According to [6] dan [7] that the white flowered *C. roseus* leaves are more effective to cure leukemia cancer and contain more vinblastine and vincristine which have been commercialized into cancer drugs which are very expensive in price [13]. Whereas purple *C. roseus* leaves contain more ajmalicin which acts to reduce blood sugar levels [14], [15]. It is probable that the most dominant alkaloid and tannin content in the purple flower footprint play an important role in reducing cholesterol levels but further research is still needed. Based on the research that has been done, it can be concluded that the extract of the *C. roseus* leaf water has an anti-cholesterol effect. The best water extract of *C. roseus* leaf water was found in the administration of one bag of purple flower *C. roseus* leaf water extract (2 g of powder) in 200 mL of hot water that is equal to 42.67 mg/dL. The average reduction in total cholesterol in the blood of male rats treated with one tea bag (2 g) of powder was 3.33 mg/dL. The extracted water of steeping *C. roseus* leaves with purple flowering is more effective in reducing total blood cholesterol levels compared to white flowering.

For further research with a similar treatment, it should be continued to examine secondary metabolite compounds that play a role in reducing cholesterol levels in the purple flowered *C. roseus* leaves. Then it is also suggested that it is necessary to apply the direct method of extracting the *C. roseus* leaf water extract in the rats.

## CONCLUSIONS

The conclusions of the research showed that the water extract of the *C. roseus* leaves had an anti-cholesterol effect. The best water extract of *C. roseus* leaf water was found in the administration of one bag of purple flower *C. roseus* leaf water extract (2 g of powder) in 200 mL of hot water that is equal to 42.67 mg/dL. The average reduction in total cholesterol levels in the blood of white male rats treated by one tea bag (2 g) of purple *C. roseus* powder was 3.33 mg/dL. The extracted water of steeping *C. roseus* leaves with purple flowering is more effective in reducing total blood cholesterol levels compared to white flowering. The purple-flowered leaves tea *C. roseus* has the potential to be used as an anti-cholesterol drug in degenerative diseases. This data is new data that has never been published, especially in relation to the induction with high fat pork is something that is very rare. Likewise, the relationship with *C. roseus* as an anticholesterol agent has not yet provided many scientific data. Moreover, comparing the effect of *C. roseus* leaf extracts purple and white flowers are still very rare.

## ACKNOWLEDGMENT

Ministry of Research, Technology and Higher Education based on Agreement / Contract no 206/SP2H/LT/DRPM/2019 with the Research and Service Institute (LPPM) of Sam Ratulangi University (Unsrat) on March 2019 and the contract between the Chairperson of LPPM UNSRAT with Researcher Number 132/UN12.13/LT/2019 on April 2019. We thank you for funding this research from the Indonesian get a Research Budget management this research.

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