

DOI: <http://dx.doi.org/10.33846/hn50903>
<http://heanoti.com/index.php/hn>



RESEARCH ARTICLE

URL of this article: <http://heanoti.com/index.php/hn/article/view/hn50903>

Potential of Antihypercholesterol Extract of Sempur Fruit Peel (*Dillenia serrata*) with In Vivo Study on Male White Rats (*Rattus novergicus*)

Sainal Edi Kamal¹, Zulfiah², Rina Asrina³, Megawati⁴, Sulfiyana H. Ambo Lau⁵, Muh. Farid⁶, Herman⁷, Murniati⁸, Gerfan Patandung⁹, Yuniharce Kadang¹⁰, Alfreds Roosevelt¹¹, Nurul Izza¹², Agust Dwi Djajanti¹³, Rafika¹⁴, Rusli^{15 (CA)}

¹Polytechnic of Sandi Karsa in Makassar, Indonesia; sainedikamal@gmail.com

²Polytechnic of Sandi Karsa in Makassar, Indonesia, piamuchtar@gmail.com

³Polytechnic of Sandi Karsa in Makassar, Indonesia, rheymizzath@gmail.com

⁴Polytechnic of Sandi Karsa in Makassar, Indonesia, apt.megawatisyafrin@gmail.com

⁵Polytechnic of Sandi Karsa in Makassar, Indonesia, fhysulfiyana@gmail.com

⁶Polytechnic of Sandi Karsa in Makassar, Indonesia, mfaridhasyim@gmail.com

⁷Polytechnic of Sandi Karsa in Makassar, Indonesia, hermanhafidepid@gmail.com

⁸Polytechnic of Sandi Karsa in Makassar, Indonesia, murniatinaurah@gmail.com

⁹Polytechnic of Sandi Karsa in Makassar, Indonesia, gerfanp666@gmail.com

¹⁰Polytechnic of Sandi Karsa in Makassar, Indonesia, yuniharce@gmail.com

¹¹Polytechnic of Sandi Karsa in Makassar, Indonesia, alfredsroosevelt90@gmail.com

¹²Polytechnic of Sandi Karsa in Makassar, Indonesia, lulu.ranie@gmail.com

¹³Academy of Pharmacy Yamasi in Makassar, Indonesia, mamasasa71@gmail.com

¹⁴Health Polytechnic of Ministry of Health in Makassar, Indonesia, rafika@poltekkes-mks.ac.id

^{15(CA)}Health Polytechnic of Ministry of Health in Makassar, Indonesia, rusfar67@yahoo.com

ABSTRACT

Sempur (*Dillenia serrata*) is one of the most commonly found local fruits and comes from South Sulawesi. The peculiarity of this sempur fruit is mainly in its refreshing sour taste and attractive fruit color. Phytochemical test of Sempur fruit peel extract contains alkaloids, flavonoids, saponins, polyphenols and triterpenoids. The research objectives are 1). The purpose of this study was to determine the potential of sempur fruit peel (*Dillenia serrata*) to reduce total cholesterol levels in white rats (*Rattus novergicus*) and 2). To determine the average value of the decrease in total cholesterol levels in male white rats (*Rattus novergicus*) after being given sempur fruit peel extract (*Dillenia serrata*). The research used was Experimental Laboratory which was carried out at the Pharmacognosy-Phytochemical Laboratory and the Pharmacy Biology Laboratory of the Pharmacy Department of the Sandi Karsa Polytechnic. The method used is the induction of Propylthiouracil and the administration of high fat by measuring total cholesterol levels in male white rats with a glucometer and using the maceration extraction method. The 15 male rats used were divided into 5 groups, namely negative control (Na.CMC 1% w/v), Sempur fruit peel extract 0.5% w/v, Sempur fruit peel extract 1% w/v, Sempur fruit peel extract 1.5% w/v and positive control (Simvastatin). Observations on the decrease in total cholesterol levels were carried out 1 day after treatment. The administration of sempur fruit peel extract 0.5% w/v, 1% w/v, and 1.5% w/v gave the effect of reducing total cholesterol levels in male white rats and at a concentration of 1.5% w/v which showed an effect the best for reducing total cholesterol levels in white rats. Based on the results of the paired sample t test with SPSS which shows significantly that the value of sig. (2-tailed) obtained was 0.023 < 0.05 and the mean decrease was 36 mg/dl.

Keywords: Sempur fruit peel, antihypercholesterolemia and invivo study

INTRODUCTION

Background

Cholesterol is one of the solid fats (lipids) in the form of wax. Cholesterol is atherogenic or very easy to stick which then forms plaque on the walls of blood vessels. In the human body, cholesterol is spread in certain body parts such as skin, muscles, nerves, brain and heart. Under normal circumstances a person has cholesterol levels of 160-200

mg and can be said to be in a dangerous phase if it exceeds 240 mg which can lead to stroke. If you don't want to be at risk of experiencing various diseases due to cholesterol, then that means you have to be aware of the characteristics of high cholesterol early on. And here are the characteristics if you have high cholesterol, namely tingling, frequent nausea and vomiting, loss of balance, neck and back pain, very tired body, experiencing leg and hand pain, unstable emotions, red face, headache, weak leg muscles, difficulty breathing, chest pain.⁽¹⁾

Blockages that occur in the coronary arteries of the heart will cause coronary heart disease (CHD). Not only that, blockage (atherosclerosis) can also occur in the walls of the blood vessels of the brain, kidneys, locomotion, and various other organs.⁽²⁾ Basically, high cholesterol levels are not the main cause of a person's mortality. There is not much data that states that high cholesterol levels can directly cause death in a person, but what is very surprising is that high cholesterol levels turn out to be the etiology that very often causes atherosclerosis, stroke, and cardiovascular disease.^(2,3)

Epidemiological data on cerebrovascular, cardiovascular and coronary heart disease are poor. WHO reports that cardiovascular disease is the cause of 30% of deaths worldwide and is predicted to be the leading cause of death in the world in the next two decades. The death rate from coronary heart disease in 2002 in Indonesia reached 100,000 to 499,999 people.⁽⁴⁾

Based on the above epidemiological data, efforts should be made to reduce the prevalence and mortality from cerebrovascular, cardiovascular and coronary heart diseases associated with risk factors for hypercholesterolemia. Management of hypercholesterolemia is divided into two, namely by drugs (pharmacological) and non-pharmacological. Statins (3-hydroxy-3-methylglutaryl coenzyme-A reductase inhibitors), the drugs most commonly used by clinicians to treat hypercholesterolemia, have dangerous side effects for patients such as myopathy, significant hepatotoxicity and cognitive impairment. Other pharmacological agents commonly used for the management of hypercholesterolemia are bile salt sequestrates, cholesterol absorption inhibitors, niacin, and fibrates, but these drugs are also associated with various adverse effects that can hinder treatment and quality of life.⁽⁵⁾

Sempur (*Dillenia serrata*) is one of the most commonly found local fruits and comes from South Sulawesi. Sempur is widespread in Luwu Regency. Perfect plants grow wild in forests and community yards. The peculiarity of this sempur fruit is mainly in its refreshing sour taste and attractive fruit color. In addition to its exotic appearance, perfect fruit contains more than 84% vitamin C which is good for consumption by the body.¹³

Purpose

The aims of this research are 1). The purpose of this study was to determine the potential of sempur fruit peel (*Dillenia serrata*) to reduce total cholesterol levels in white rats (*Rattus novergicus*) and 2). To determine the average value of the decrease in total cholesterol levels in male white rats (*Rattus novergicus*) after being given sempur fruit peel extract (*Dillenia serrata*).

METHODS

This research was a laboratory-scale experimental study, to determine the potential of sempur fruit peel (*Dillenia serrata*) to reduce total cholesterol levels in white rats (*Rattus novergicus*) and determine the average value of decreasing total cholesterol levels in male white rats (*Rattus novergicus*) after were given sempur fruit peel extract (*Dillenia serrata*). This research was carried out in June 2021 at the Pharmacognosy-Phytochemical Laboratory and the Pharmacy Biology Laboratory of the Pharmacy Department of the Sandi Karsa Polytechnic.

The tools used are cholesterol measuring instrument, a set of glassware and equipment for extraction equipment and tools used for the treatment of test animals.

The materials used were aquadest, 15 white rats, 1% sodium carboxymethylcellulose (Na-CMC), simvastatin tablets (comparison), sempur fruit peel (*Dillenia serrata*), propylthiouracil, high cholesterol foods such as cheese, alcohol as a wound cleanser in rat, cotton, 96% ethanol solvent, tissue.

Treatment of Test Animals and Cholesterol Level Reduction Test

In this study, the test animals were weighed and cholesterol levels were measured in three periods. Period I (initial cholesterol levels), period II (hyperlipidemia), period III (after treatment). The number of rats used in this study were 15 rats, which were divided into 5 treatment groups. Each treatment group consisted of 3 rats that had previously been induced by 0.36% PTU and were fed a high-fat diet.

As for these groups, group I was treated with Na suspension. CMC 1% w/v as a negative control, groups II, III and IV were given orally suspension of ethanol extract of sempur fruit peel (*Dillenia serrata*) with a concentration of 0.5% w/v, 1% w/v and 1.5% w /v and group V were given orally suspension of simvastatin 0.0059% w/v.

Blood sampling in rat that had been induced by PTU 0.36% and given a high-fat diet for 3 to 7 days, blood was drawn using a syringe in the tail vein area of rats to determine total cholesterol levels in hypercholesterolemic rats. All treatment groups were given treatment according to their respective groups.

The measurement of total cholesterol levels on day 0 aims to determine the initial cholesterol level, then the measurement of cholesterol levels is carried out again after being induced by 0.36% PTU and given a high-fat diet by testing on day 7 to determine the condition of hypercholesterolemia in rats. During this time period, hypercholesterolemia was found in rats, so it could be continued in the treatment of test animals. The treatment on the test animals was carried out for 3 days, after the treatment the test animals were measured again the next day to determine the decrease in total cholesterol levels by reading the results on the glucometer strip.

The data obtained based on the observations were then analyzed statistically using the SPSS for windows program. To determine the effect of treatment, the data were analyzed by using the paired sample t test.

RESULTS

Table 1. Potential results of sempur fruit peel extract (*Dillenia serrata*) on reducing total cholesterol levels in white rats (*Rattus novergicus*)

Treatment	Replication	Cholesterol levels in the blood mg/dl		
		Initial cholesterol measurement	Post-induction cholesterol measurement	Measurement of post-treatment cholesterol
Negative control (Na. CMC 1% w/v)	1	157	244	238
	2	130	219	210
	3	125	184	179
Sempur fruit peel extract 0.5 % w/v	1	109	194	164
	2	118	205	177
	3	110	200	174
Sempur fruit peel extract 1 % w/v	1	105	150	122
	2	102	180	152
	3	114	200	166
Sempur fruit peel extract 1.5 % w/v	1	130	240	193
	2	117	150	119
	3	145	219	189
Positive control (simvastatin)	1	157	190	137
	2	129	158	107
	3	158	195	141

Table 2. Percent decrease in total cholesterol levels after treatment in white rats

Replication	Treatment				
	Na. CMC 1% w/v	Sempur fruit peel extract 0.5 % w/v	Sempur fruit peel extract 1 % w/v	Sempur fruit peel extract 1.5 % w/v	Simvastatin
1	6.89	35.29	62.22	42.72	160.61
2	10.11	32.18	35.89	93.93	175.86
3	8.47	28.88	39.53	40.54	145.94
Total	25.47	96.36	137.64	177.19	482.41
Average	8.49	32.11	45.88	59.06	160.80

DISCUSSION

Cholesterol is an important fat, but if too much in the blood can be harmful to health, when viewed from a chemical point of view, cholesterol is classified as a lipid (fat) with steroid alcohol components. In general, lipids in the body consist of two main components, namely cholesterol and triglycerides. Triglycerides come from the breakdown of fat from food while cholesterol is a form of fat that is in the human blood circulation.

This study aims to determine the potential of sempur fruit peel (*Dillenia serrata*) to reduce total cholesterol levels in white rats (*Rattus novergicus*) and to determine the average value of decreasing total cholesterol levels in male white rats (*Rattus novergicus*) after being given the sempur fruit peel extract (*Dillenia serrata*), by using rats as test animals as many as 15 tails which were given appropriate treatment and the volume of oral administration.

The effect of reducing total cholesterol levels on the sempur fruit peel, an oral hyperlipidemia drug, namely simvastatin, was used as a comparison. Before treatment, white rats were fasted for 8 hours but were still given drinking water. This is so that there is no food intake that can affect the testing process, while the administration of PTU is intended as an inducer to raise the total blood cholesterol level of white rats above the normal value, PTU works to inhibit the synthesis of thyroid hormone, namely thyroxine. Thyroxine hormone has the effect of lowering cholesterol levels, so that inhibition of thyroxine hormone by PTU will cause an increase in blood cholesterol levels. Male rats were chosen because they have a small amount of the hormone estrogen and are more stable than female rats which produce the hormone estrogen which can affect the metabolism of fat and cholesterol so that it will affect the lipid profile.

Based on the results of the study, it can be seen that when the fruit peel extract was given 0.5% w/v, 1% w/v and 1.5% w/v, there was a decrease in the average total cholesterol level of 32.11%, respectively. , 45.88%, 59.06% while in the administration of simvastatin suspension there was a very large decrease in the average cholesterol level of 160.80%, in the treatment group with Na. CMC 1% also has a small average decrease in cholesterol levels, namely 8.49%. In this study, researchers will test the ability of sempur fruit peel extract in lowering total cholesterol levels in male white rat blood so that later it can be used as a reference for inventorying natural ingredients that have the potential to reduce total cholesterol levels. In this study, the optimal decrease in total cholesterol levels for the treatment group using sempur fruit peel extract 0.5% w/v, 1% w/v and 1.5% w/v was found at a concentration of 1.5% w/v. although at concentrations of 0.5% w/v and 1.5% w/v also showed total cholesterol-lowering but the effect was lower.

The research data above was processed using the IBM SPSS 22 program. The first analysis was the Shapiro-Wilk method to determine the normality of the data as a condition for analyzing the data with the paired sample t test. sig value. for Pre-Test Na. CMC 1% was 0.817 and Post-Test Na. CMC 1% is 0.944, the value of sig. for Pre-Test Extract 0.5% w/v was 0.900 and Post-Test Extract 0.5% w/v was 0.424, sig. for Pre-Test Extract 1% w/v was 0.780 and Post-Test Extract 1% w/v was 0.605, sig. for Pre-Test Extract 1.5% w/v was 0.430 and Post-Test Extract 1.5% w/v was 0.092 and sig. the Pre-Test for Simvastatin was 0.238 and the Post-Test value for Simvastatin was 0.206. Based on the output of SPSS Tests of Normality, the value of sig is obtained. which is greater than the value of 0.05 so it can be concluded that the data variance of the five groups is the same or homogeneous, so the assumption of homogeneity in the paired sample t test is fulfilled.

The potential of sempur fruit peel (*Dillenia serrata*) to decrease total cholesterol levels in white rats (*Rattus norvegicus*) it can be seen in the results of the paired sample t test output paired samples statistics which show the pre-test extract value of 0.5% w/v of 199.67 and experienced a decrease in cholesterol levels in the post-test extract of 0.5% w/v to 171.67, a decrease also occurred in the 1% w/v extract, namely the pre-test value of 176.67 experienced a decrease in cholesterol levels in the post-test. -test with a value of 146.67, in the pre-test extract 1.5% w/v with a value of 203.00 also decreased cholesterol levels in the post-test to 167.00. However, a large decrease occurred in the administration of simvastatin, the pre-test value was 181.00 to 128.33 at the post-test.

Determine the average value of decreasing total cholesterol levels in male white rats (*Rattus norvegicus*) after being given sempur fruit peel extract (*Dillenia serrata*).

The paired sample t test can also show the average value of decreasing total cholesterol levels in male white rats (*Rattus norvegicus*) after being given sempur fruit peel extract (*Dillenia serrata*) with several interpretations as follows:

1. At the output of the paired samples test, namely in pair 2, the sig value is obtained. (2-tailed) of 0.002 is smaller than 0.05, it can be concluded that there is a difference in the average decrease in cholesterol levels for the pre-test extract of 0.5% w/v and the post-test extract of 0.5% w/v with the average value of the decline is 28,000.
2. At the output of the paired samples test, namely in pair 3, the sig value is obtained. (2-tailed) of 0.004 is smaller than 0.05, it can be concluded that there is a difference in the average decrease in cholesterol levels for the pre-test extract 1% w/v with post-test extract 1% w/v with an average value a decrease of 30,000.
3. At the output of the paired samples test, namely in pair 4, the sig value is obtained. (2-tailed) of 0.023 is smaller than 0.05, it can be concluded that there is a difference in the average decrease in cholesterol levels for the pre-test extract 1.5% w/v with post-test extract 1.5% w/v with the average value of the decline is 36,000.
4. At the output of the paired samples test, namely in pair 5, the sig value is obtained. (2-tailed) of 0.000 is smaller than 0.05, it can be concluded that there is a difference in the average decrease in cholesterol levels for the pre-test of simvastatin drug and post-test of simvastatin drug with an average decrease of 52.667.

CONCLUSION

Based on the results of research, data analysis and discussion, it can be concluded that:

1. Giving sempur fruit peel extract (*Dillenia serrata*) at a concentration of 0.5% w/v, 1% w/v and 1.5% w/v showed the potential for reducing total cholesterol levels in white rats (*Rattus norvegicus*).
2. Giving sempur fruit peel extract (*Dillenia serrata*) at a concentration of 1.5% w/v was more optimal in reducing total cholesterol levels in white rats (*Rattus norvegicus*) with an average decrease of 36,000 compared to a concentration of 0.5% w/v and 1% w/v but still lower than simvastatin, namely a decrease with an average value of 52,667.

REFERENCES

1. Patasik, Madyana et.al. Penentuan Jenis Diet Gizi Pasien Penyakit Hipertensi, Diabetes, dan Kolesterol dengan Metode Forward Chaining. Prosiding Seminar Ilmiah Sistem Informasi dan Teknologi Informasi. 2019.
2. Garnadi Y. Hidup Nyaman dengan Hiperkolesterol. Jakarta; Agro Media; 2012.

3. Hananta et al. Pola Hidup Sehat untuk Lansia. Jakarta: CV Toga Putra; 2011.
4. WHO. Maternal Mortality. Geneva: World Health Organization; 2014.
5. Perhimpunan Dokter Spesialis Kardiovaskular Indonesia (PERKI). Pedoman Tatalaksana Dislipidemia. Jakarta: PERKI; 2013.
6. Alamsyah, Muhammad Amin Bayu Oktarian. Pengaruh Glukomanan Terhadap Penurunan Risiko Penyakit Stroke Iskemik. Jurnal Ilmiah Kesehatan Sandi Husada. 2019;10.
7. Graha K. 100 Questions and Answers Kolesterol. Jakarta: PT. Elex Komutindo Kelompok Gramedia; 2010.
8. Hasrianti. Studi Pembuatan Permen Buah Dengan. Makassar: Program Studi Ilmu dan Teknologi Pangan, Jurusan Teknologi Pertanian Fakultas Pertanian, Universitas Hasanuddin; 2012.
9. Maryati H. Hubungan Kadar Kolesterol Dengan Tekanan Darah Penderita Hipertensi di Dusun Sidomulyo Desa Rejoagung Kecamatan Ploso Kabupaten Jombang. Jurnal Keperawatan. 2017;8
10. Mubarak S. Pengaruh Senam Aerobik Intensitas Ringan Dan Sedang Terhadap Kadar Kolesterol Total Pada Perempuan Obes di Kota Batu. Jurnal Ilmu Keolahragaan Universitas Negeri Malang. 2019.
11. Nailufar F, et.al. Jumlah Konsumsi dan Metode Memasak Ikan Terhadap Kejadian Dislipidemia. Jurnal Gizi Klinik Indonesia. Jurnal Gizi Klinik Indonesia. 2013;10(1).
12. Nasrullah et.al. Pengaruh pemberian ekstrak etanol daun simpur (*Dillenia Indica* Linn) terhadap Indeks Organ Jantung, Hati dan Lambung Pada Tikus Putih (*Rattus norvegicus*) Galur Wistar. Jurnal Fakultas Kedokteran Universitas Tanjungpura. 2017.
13. Ilma N. Studi Pembuatan Dodol Buah Dengan (*Dillenia serrata thumb*). Makassar: Teknologi Pangan, Fakultas Pertanian, Universitas Hasanuddin; 2012.
14. Pelima JN. Potensi Buah Jongi (*Dillenia serrata thumb*) Sebagai Sumber Pangan Fungsional Berbasis Lokal. Prosiding Konser Karya Ilmiah Nasional 2019. 2019.
15. Pramudyawardani A. Hubungan Tekanan Darah, Lingkar Pinggang, Asupan Vitamin C Dengan Kadar Kolesterol Pasien Hiperkolesterolemia Rawat Jalan di RSUD Dr. Moewardi Surakarta. Surakarta: Institut Teknologi Sains dan Kesehatan PKU Muhammadiyah Surakarta; 2019.
16. Putri NI. Hubungan Asupan Serat dan Lemak Total dengan Kadar Kolesterol Total Pada Anggota Polisis Polres Rembang. Surakarta: Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surakarta; 2016.
17. Rahmat D, Wiradimaja R. Pendugaan Kadar Kolesterol Daging dan Telur Berdasarkan Kadar Kolesterol Darah Pada Puyuh Jepang. Jurnal Ilmu Ternak. 2011;11(1).
18. Saesarwati D, Satyabakti P. Analisis Faktor Risiko yang Dapat Dikendalikan Pada Kejadian PJK Usia Produktif. Jurnal Promkes. 2016;4.
19. Senge CE, et.al. Hubungan Kadar Lipid Serum dengan Nilai Estimasi Laju Filtrasi Glomerulus pada Penyakit Ginjal Kronik. Jurnal e-Clinic. 2017;5.
20. Simanjuntak LCH. 2013. Histomorfologi tubulus seminiferus dan kelenjar prostat tikus (*Rattus norvegicus*) serta Konsentrasi Hormon Androgen Pasca Pemberian Ekstrak Purwoceng. Bogor: Institut Pertanian Bogor; 2017.
21. Sumoked PDD. Profil Lipid Wanita Menopause di Panti Werdha. 2016.
22. Rusli, Wahyuni CU, Suharjono. Indeks Prediksi Keamanan Pengobatan Sendiri Masyarakat Makassar. Surabaya; Program Studi Ilmu Kesehatan, Universitas Airlangga, Fakultas Kesehatan Masyarakat; 2017.
23. Wulandari N, Hernawati H. Fraksinasi Minyak Sawit Kasar dengan Pelarut Organik dalam Pembuatan Konsentrat Karotenoid. Jurnal Mutu Pangan. 2017;4.
24. Yani M. Mengendalikan Kadar Kolesterol Pada Hiperkolesterolemia. Jurnal Olahraga Prestasi. 2015;11.
25. Zuhriyyah SF, et.al. Hubungan Aktivitas Fisik dengan Kadar Kolesterol Total, Kolesterol Low-Density Lipoprotein, dan Kolesterol High-Density Lipoprotein pada Masyarakat Jatinangor. Jurnal SK. 2017;2.
26. Zulharmita et.al. Pembuatan dan Karakterisasi Ekstrak Kering Daun Jambu Biji (*Psidium guajava L.*). Jurnal Farmasi Higea. 2012.