E-ISSN: 2476-9606
Abstract Proceedings International Scholars Conference
Volume 7 Issue 1, October 2019, pp.716-726

https://doi.org/10.35974/isc.v7i1.2076

Effectiveness of Boiled Cherry Leaf (*muntingia calabura L*) and Figs Leaves (*Ficus Carica*) Toward SGOT SGPT Serum of Male Wistar Strain Rats with Acute Hepatitis Models

Merza Rivano Lalihatu[1], Untung Sudharmono[2]
[1]Student of Nursing Faculty, Adventist University, Bandung
[2]Faculty of Nursing, Adventist University, Bandung *merzarivano4@gmail.com*

ABSTRACT

Hepatitis is inflammation of liver cells. There are two contributing factors: infectious factors and non-infectious factors. Factors causing infection include hepatitis viruses and bacteria. Non-infectious factors for example of drugs usage. The purpose of this study was to determine the effectiveness of boiled cherry leaves (muntingia calabura L) and Figs leaves (Ficus Carica) to reduce SGOT SGPT levels. The objects in this study were 30 male Wistar strain rats aged 2-3 months with a weight of 180-200 grams. Rats were divided into 3 groups randomly: negative control group, positive control group and treatment group. The positive treatment and control group was induced paracetamol 120 mg / day orally for 7 days. 0.4 grams of Figs leaves (Ficus Carica) and 5 grams of Cherry leaves (muntingia calabura L) is boiled in 200 cc of water to 100 cc of water given as much as 3.6cc orally for 7 days in the treatment group. Data were analyzed with SPSS version 24, ANOVA test was performed to compare SGOT SGPT levels. The results showed there were significant differences in SGPT SGPT levels between the treatment and positive control groups ($p < 0.05$). In conclusion, the boiled water of Figs leaves (Ficus Carica) and cherry leaves (muntingia calabura L) have an effect in decreasing SGOT SGPT serum in male wistar strain rats with acute hepatitis model.

Keywords: Paracetamol, SGOT, SGPT, Cherry Leaves (muntingia calabura L), Tin Leave (Ficus Carica).

INTRODUCTION

The tradition that is still very attached to Indonesian society is the use of medicines with natural ingredients of plants. The herbs that they believe as medicine have several important properties, including being able to maintain endurance, prevent disease, and can also be used for

beautifying the skin. However, most Indonesian have the view that medicines with natural ingredients of plants do not have side effects (Sudharmono, 2014). Traditional medicine is often consumed by society in Indonesia in the form of herbs and medicinal plants, this kind of herbs is still believed to be able to reduce disease due to its pharmacological effects (Tandi, Roem, Yuliet, , 2017).

The easiest way to make medicine with natural ingredients is to boil the plants. This method is easy to do by the community because it does not require expensive costs, it is easy to do and does not require a long period of time for making it. The method of boiling uses water as the solvent, causing polar compounds to be attracted (Tukayo, Titihalawa, and Paepadaseda, 2018).

Figs Leaf (Ficus Carica L.) is a plant commonly known as a source of antioxidants, The use of tin leaves in Indonesia for the treatment of hypertension, diabetes, and kidney stones (Wijaya). This plant classification is Kingdom: Plantae, Division: Magnoliophyta, Class: Magnoliopsida, Order: Rosales, Family : Moraceae , Genus : Ficus , Subgenus : Ficus , Species : Ficus carica L (wikipedia). The fig tree is a plant that is widely spread in tropical and subtropical regions. Therefore, in Indonesia itself, Figs leaf is used as a medicine to overcome various diseases including hypertension, kidney stones, and diabetes. Based on the results of several studies that have been conducted, it was found that the boiled water and methanol extract from Figs leaves have an effect in reducing blood sugar levels (Wijaya).

Not only used as antioxidant Figs also has benefits as hepatoprotectant, antimicrobial, antibacterial, antipyretic, immunomodulatory and antidiabetic. Figs leaves contain many alkaloids, saponins, polyphenols and flavonoids. By the times, Figs leaves began to be widely used by people in Indonesia, therefore some industries have begun to make dried Figs leaves in the form of bags such as tea bags so that they can be reached by the public and are easy to make, to use them most people use boiling water or by boiling fig leaves because it is feared that the antioxidant will potentially decrease due to high temperatures (Putri, 2018).

Cherry (Muntingia calabura) is a plant that can grow in tropical climates. The classification of these plants is Kingdom: Plantae, Division: Spermatophyta, Class: Dycotiledoneae, Order: Malvales, Genus: Muntingia, Spies: Muntingia calabura Linn (Damara, Sukohar, 2018).

Ethanol contained in cherry leaves has an effect on reducing total cholesterol in the blood (Putri, Yuliet, Khaerati, 2018). Cherry plants are rich with antioxidants. Cherry leaves contain flavonoid, tannins, triterpene, saponins, polyphenols which show the presence of antioxidant activity. Flavonoids can function as antimicrobial, antiviral, antioxidant, antihypertensive, stimulate estrogen formation and treat impaired liver function (Damara, Sukohar, 2018) .

Cherry leaves contain flavonoids, tannins, triterpene, saponins, polyphenols which indicate the presence of antioxidant activity. Flavonoid compounds can reduce uric acid levels by inhibiting the xanthine oxidase enzyme (Ilkafah, 2018). The efficacy of cherry leaves is not much different from fig leaves because it has similar substances.

The liver has an important role in metabolizing drugs and ASING substances that enter the body. The indicator of damaged liver is by the Increases of SGOT and SGPT serum that exceed normal levels (Nurfatwa, 2018). Patients with hepatitis are increasing, therefore a proper treatment is needed because most acute hepatitis can become chronic hepatitis and will become cirrhosis (Ghozali, Arsito, 2012).

Damage to the liver can be determined by liver biochemical examination using SGOT and SGPT enzymes. It can also be examined if there are signs and symptoms such as fatigue, light colored stools, dark colored urine, jaundice, etc. (Muyassar, Ariosta, Retnoningrum, 2019). Paracetamol is a metabolite toxic that is metabolized by the cytochrome P450 enzyme in the liver that can produce N-acetyl-para-benzoquinoneimine (NAPQI) which have toxic properties as a result of their electrofility. NAPQI that has been formed will then be excreted in the urine after going through a detoxification process that carried out by glutathione then forming cysteine conjunctions and mercapturic acid. NAPQI bonds will be encouraged by hepatocyte protein due to lack of glutathione and will cause liver damage. In addition, the amount of free radicals will increase due to the oxidative reaction of cytochrome P450 so that calcium ions and fluids in the cytosol will be disrupted and cause depression in mitochondrial function, causing necrosis or death of hepatocytes (Bardos, Dalimunthe, Harahap, 2018).

Paracetamol can produce reactive and unstable metabolites toxic that are hepatotoxic namely N-acetyl-p-benzoquinone. The structure of cell membranes can be damaged due to the oxidation of paracetamol which produces very reactive free radicals. Centrolobular necrosis is one of the liver damages caused by paracetamol. Damage to cells in the liver can release liver enzymes into the blood vessels and increase levels of intracellular enzymes in the blood. Increased Glutamate Oxaloacetate (GOT) and Glutamate Pyruvate Transaminase (GPT) is one indicator of liver cell damage. At a single dose of 10-15 grams within 48 hours after paracetamol can cause paracetamol hepatotoxicity that occurs in humans which will increase the enzyme transaminase, bilirubin and prolongation of prothrombin time. In another study used 2.5 gram single dose paracetamol to trigger liver damage in male and female Wistar rats turned out to be insignificant results. The parameters used to assess liver damage are SGPT levels or an increase that occurs in SGPT levels . (Astykasary, Masjhoer, 2006).

The Paracetamol was given for 7 days or more so that it can manage a liver damage its indicated by swelling of hepatocyte cells to degenerate the liver cells. There is a Changing in the liver microscopic picture after paracetamol administration. Hepatoxic effects can occur with excessive consumption (Pestalozi, 2014).

Acute hepatitis is a disease caused by viruses, alcohol, drugs and ischemic conditions characterized by increased levels of Serum Glutamate Oxaloacetate Transaminase (SGOT) and Serum Glutamate Pyruvate Transaminase (SGPT) in the liver. (MOH RI, 2007).

Hepatitis is all types of inflammation in liver cells that are usually caused by infections; viruses, bacteria and parasites, it is also caused by drugs including traditional medicines, autoimmune diseases, excess fat and also alcohol consumption. Indonesia itself is the second highest country after Myanmar with high endemicity of hepatitis B (MOH Infodatin). It can be seen that in the incidence of 10% of hepatitis virus infection will become chronic and in 20% of patients with chronic hepatitis will be complicated such as hepatocellular carcinoma and cirrhosis. (Helilintar, Rochana, Ramadhani, 2017).

The purpose of this study was to determine the effectiveness of cherry leaf (muntingia calabura L) and Fogs leaves (Ficus Carica) decoction for 7 days as much as 3.6 cc / day orally against a decrease in SGOT levels of SGPT induced by paracetamol.

METHODS

The method used in this study is an experimental laboratory. In this study, measuring the SGOT and SGPT levels is conducted to assess the level of liver damage in male Wistar strain rats as a tested animal induced by paracetamol. The objects in the study were 30 male Wistar strain rats aged 2-3 months and weighing 180-200 grams. Rats were divided into 3 groups: the treatment group, the positive control group, and the negative control group. Before being divided into groups, the rats was adapted for 7 days fed and watered. Male wistar strain rat body weight should not be ± 10% of the specified limit. Cherry leaves are taken from the Parongpong West Bandung, while Figs leaves are obtained from purchasing dried Figs leaf products. Making boiled water from 0.4 g of dried Figs leaves (Ficus Carica) and 5 grams of cherry leaves (Muntingia Calabura) with 200 cc of boiling water to 100 cc. Figs and Charry leaves decoction was put in a bottle and given orally to the treatment group for 7 days as much as 3.6 cc / day. How to draw blood to check urea and creatinine is to cut the rat's tail in the treatment group then the tail is squeezed to bleed.

Research procedure. Wistar strain male rats were adapted for 7 days in the laboratory, rats with acute hepatitis model will be given paracetamol orally at a dose of 120 mg / day for 7 days then do SGOT and SGPT checks and then be given boiled water of fig leaves and cherry leaves at a dose of 3.6 cc / day orally for 7 days.

1. Negative control group : 10 mice were given food and drink.
2. Positive control group : 10 rats fed and watered and given paracetamol orally 120 mg / day for 7 days
3. Treatment group : 10 rats were given food and drink and were given paracetamol orally 120 mg / day for 7 days and also given boiled water of Figs leaves and cherry leaves as much as 3.6 cc / day for 7 days.

Treatment on Rats :

1. Days 1-7: Rats were adapted in the laboratory
2. Day 8: Checking the body weight of all groups of rats
3. Day 9-15: In the positive control group and the treatment group paracetamol was induced as much as 120 mg / day orally
4. Day 16: Checking the SGOT and SGPT in all groups
5. Days 16-22:
    1) Negative control group: Rats were fed and watered normally and Regularly.
    2) Positive control group: Rats were given normal food and watered and were given paracetamol 120 mg / day orally
    3) Treatment group: Rats were given normal food and drink and were given paracetamol as much as 120 mg / day orally and were given boiled water leaves as much as 3.6 cc per day orally.
6. Day 23: urea and creatinine check of all groups for data collection.

Making the boiling water of 0.4 grams of dried Figs leaves (Ficus carica) and 5 grams of cherry leaf (Muntingia Calabura) simmered in boiling water 200 cc to 100 cc. Charry leaf and Figs leaves decoction was put in a bottle and given orally to the treatment group for 7 days given at a dose of 3.6 cc / day

RESULTS

Table 1. **One Way ANOVA test, the comparison of the SGOT level before figs leaves and cherry leaves decoction treatment at a dose of 3.6 cc / day orally in male wistar strain with acute hepatitis models.**

sgot_pre	Negative Control	Positive Control	-226.92000 *	16,41799	0 , 00
		Treatment	-192.77000 *	16,41799	0 , 00
	Positive control	Negative Control	226.92000 *	16,41799	0 , 00
		Treatment	34,15	16,41799	.113
	Treatment	Negative Control	192.77000 *	16,41799	0 , 00
		Positive Control	-34,15	16,41799	.113

* The mean difference is significant at the 0.05 level.

In the table above it is explained that SGOT levels on the 16th day before giving boiled water treatment of figs leaves and cherry leaves at a dose of 3.6 cc / day orally for 7 days on Wistar strain male rats induced by paracetamol 120 mg / day orally for 7 days, it was found that in the negative control group compared with the positive control group and the treatment group the results were significant ($p < 0.05$), this was happen because in the negative control group the male Wistar strain rats were not damaged by the liver with paracetamol of 120 mg / day orally for 7 days and only fed and watered as usual, whereas the positive control group and the liver treatment group were equally damaged by administering paracetamol as much as 120 mg / day orally but the difference was in the treatment group of male rats Wistar strain was given therapy with Figs leaves and cherry leaves decoction at a dose of 3.6 cc / day orally for 7 days. Then in the positive control group compared with the treatment group the results showed no significant difference ($p = 0.113$) this happened because in the treatment group and in the positive control group the liver was equally damaged with paracetamol at dose of 120 mg / day orally for 7 days, both experienced an increase in SGOT levels. So it can be concluded that administering paracetamol at dose of 120 mg / day orally for 7 days can increase SGOT levels in male wistar strain rats aged 2-3 months. Paracetamol given in high doses for 7 days causes inflammation and necrosis. An increase in SGOT levels indicates that administration of paracetamol is toxic which causes damage to liver cells (Sukohar, Soleha, Hafizfadillah, 2019).

Table 2. **One Way ANOVA test table comparing SGOT levels after treatment of figs leaves and cherry leaves decoction at a dose of 3.6 cc / day orally in male wistar strain rats with acute hepatitis models.**

sgot_post	Negative Control	Positive Control	-963.23000 *	15,16017	0 , 00
		Treatment	-58.58	15,16017	0.002
	Positive Control	Negative Control	963.23000 *	15,16017	0.0 0
		Treatment	904.65000 *	15,16017	0 , 00
	Treatment	Negative Control	58.58000 *	15,16017	0.002
		Positive Control	-904,65000 *	15,16017	0 , 00

* The mean difference is significant at the 0.05 level.

Table 2 shows the results of SGOT test in male Wistar strain rats that were given paracetamol at dose of 120 mg / day orally for 7 days, in the 22nd day right after the male Wistar strain rats were treated with water treatment of figs leaves and cherry leaves decoction at a dose of 3.6 cc / day orally for 7 days showed the results of a comparison in the negative control group compared with the positive control group and the treatment group shows a significant difference ($p < 0.05$) because in the negative control group the liver of rats did not damaged with paracetamol as much as 120 mg / day orally for 7 days and only fed and watered normally, whereas in the positive control group and the treatment group the liver was equally damaged by administering paracetamol at the dose of 120 mg/ day orally for 7 days. In other findings, there are a difference between the treatment group that were treated by Figs leaves and cherry leaves decoction at dose of 3.6 cc / day orally for 7 days whereas in the positive control group were given paracetamol of 120 mg / day orally for 7 days to increase SGOT levels in male Wistar strain rats but were not given a boiled water treatment of figs leaf and cherry leaves at a dose of 3.6 cc / day orally for 7 days. This is supported by the SGOT examination in the treatment group compared to the positive control group

Table 3. **One Wa y ANOVA test table comparing the levels of SGPT before boiled water treatment of fig leaves and cherry leaves at a dose of 3.6 cc / day orally in male wistar strain rats with acute hepatitis models.**

sgpt_pre	Negative Control	Positive Control	-83.17000 *	10.0799	0 , 00

		Treatment	-96.44 thousand *	10.0799	0 , 00
	Positive Control	Negative Control	83.17000 *	10.0799	0 , 00
		Treatment	-13.27	10.0799	0.399
	Treatment	Negative Control	96.44000 *	10.0799	0 , 00
		Positive Control	13.27	10.0799	0.399

* The mean difference is significant at the 0.05 level.

Table 3 is a comparison between SGPT levels, in the 16th day before being given boiled water treatment of fogs leaves and cherry leaves at a dose of 3.6 cc / day orally for 7 days in male Wistar strain rats that was given a paracetamol at a dose of 120 mg / day per oral for 7 days. From the table above it can be seen that the negative control group compared with the positive control group and the treatment group shows a significant difference ($p < 0.05$), this is because in the negative control group the liver of male Wistar strain rats are not damaged by paracetamol at a dose of 120 mg/ day orally for 7 days and only fed and drinking as usual, whereas in the positive control group and the treatment group the liver was equally damaged by administering paracetamol as much as 120 mg/ day orally but the difference was in the treatment group Wistar strain male was given therapy of figs leaves and cherry leaves decoction at a dose of 3.6 cc / day orally for 7 days. Then in the positive control group compared with the treatment group the results showed no significant difference ($p = 0.339$) this happened because in the treatment group and in the positive control group the liver was equally damaged with paracetamol 120 mg / day orally for 7 days both experienced an increase in SGPT levels in the treatment group and positive control group. So it can be concluded that administration of paracetamol as much as 120 mg/ day orally for 7 days can increase SGPT levels in male wistar strain rats aged 2-3 months. Administering Paracetamol can increase SGPT serum in the liver of male wistar rats (Nagara, 2016). An increase in SGP T levels indicates that administration of paracetamol is toxic which causes damage to the liver cells (Sukohar, Soleha, Hafizfadillah, 2019). SGPT enzymes will be released in large quantities because of damage to the liver cells. This happens because the enzyme transaminase that is in the liver comes out and will enter the bloodstream, resulting in an increase in serum Glutamate Pyruvate Transaminase (SGPT) (Sujono, Wahyuni , Da'i, et al, 2015).

Table 4. **One Way ANOVA test table comparing SGPT levels after treatment of figs leaves and cherry leaves decoction at a dose of 3.6 cc / day orally in male wistar strain rats with acute hepatitis models.**

sgpt_post	Negative Control	Positive Control	-986,37000 *	18.03119	0.00
		Treatment	-31,39	18.03119	.209
	Positive Control	Negative Control	986.37000 *	18.03119	0.00
		Treatment	954.98000 *	18.03119	0.00
	Treatment	Negative Control	31,39	18.03119	.209
		Positive Control	-954.98000 *	18.03119	0.00

* The mean difference is significant at the 0.05 level.

The table shows the results of SGPT examination in male Wistar strain rats that were given paracetamol at a dose of 120 mg / day orally for 7 days, in the 22nd day, after the male Wistar strain rats were given boiled water treatment of figs leaves and cherry leaves at a dose of 3.6 cc / day orally for 7 days showed the results of the comparison in the negative control group compared with the positive control group shows significant difference ($p < 0.05$) because in the negative control group the liver of male Wistar strain rats were not damaged by paracetamol as much as 120 mg / day orally for 7 days and only fed and watered normally, whereas in the positive control group the liver was damaged by administering paracetamol at the dose of 120 mg / day orally for 7 days. Then in the negative control compared to the treatment group the result shows no significant difference ($p = 0.209$) this happened because in the negative control group the male Wistar strain was not damaged in the liver and only fed and drank normally but in treatment group the liver of male Wistar strain rats were damaged with paracetamol as much as 120 mg / day orally for 7 days but the rats were treated with figs leaves and cherry leaves decoction at a dose of 3.6 cc / day orally orally for 7 days so that the levels SGPT in the treatment group was almost close to the normal rate in the negative control group. This is supported by a comparison in the treatment group and positive control group. The result shows a significant difference ($p < 0.05$) this can occur because in the treatment group is damaged with paracetamol as much as 120 mg / day orally for 7 days and its given boiled water treatment of figs leaves and cherry leaves at a dose of 3.6 cc / day orally for 7 days. In the positive control group the liver of male wistar strain rat was damaged with paracetamol 120 mg / day orally for 7 days but was not given boiled water treatment of figs leaves and cherry leaves at a dose of 3.6 cc / day orally for 7 days

Conclusion

Administering paracetamol at a dose of 120 mg/ day orally for 7 days can increase the levels of SGOT and SGPT serum in male Wistar strain rats. The boiled water of cherry leaves (Muntingia calabura L) and Figs leaves (Ficus Carica) at a dose of 3.6 cc / day orally given for 7 days has an effect in decreasing SGOT and SGPT serum in male wistar strain rats.

REFERENCES

Astykasary, A.D., Masjhoer, M. (2006). The Effect of Andrographis paniculata Extract (Sambiloto) to The Serum Glutamat Piruvat Transaminase (SGPT) Level in Wistar Rats Administered with Paracetamol. *Skripsi.* Fakultas Kedokteran. Universitas Dipenogoro. Semarang.

Bardos, J., Dalimunthe, A., Harahap, U. (2018). Aktivitas Hepatoprotektor Ekstrak Etanol Kulit Bawang Merahminah (Allium Cepa L Corium) Terhadap Mencit Jantan Yang Diinduksi Paracetamol. *Talenta Conference Series: Tropical Medicine (TM).* 1(3), 1-6. doi: 10.32734/tm.v1i3.252

Damara, A., Sukohar, A. (2018). Efektivitas Infusa Daun Kersen (Muntingia calabura L.) Sebagai Antidiabetik. *Jurnal Agromedicine*. Vol 5(1), 534-539.

Depkes RI, (2007), Pharmaceutical Care untuk Penyakit Hati, Departemen Kesehatan RI, Jakarta. Retrieved from http://www.depkes.go.id/resources/download/pusdatin/infodatin /infodatin-hepatitis.pdf.

Ghozali, M.T., Arsito, P.N. (2012). Uji Aktivitas Hepatoprotektif Teh Hijau Kombucha Pada Tikus Putih Yang Diinduksi Parasetamol. *Jurnal Ilmiah Farmasi*. 9(2),

Ilkafah. (2018). Daun Kersen (Muntingia Calabura L.) Sebagai Alternatif Terapi Pada Penderita Gout Artritis. *Pharmacy Medical Journal.* 1(1), 33-41.

Muyassar, A.M., Ariosta, Retnoningrum, D. (2019). Pengaruh Ekstrak Daun Kumis Kucing (Orthosiphon ARISTATUS) Terhadap Fungsi Hepar Tikus Wistar Yang Diinduksi Plumbum Asetat. *Jurnal Kedokteran Diponegoro.* 8(2), 596-605

Nagara, B.P.S. (2019). Pengaruh Pemberian Ekstrak Daun Kluwih (Artocarpus Camansi) Terhadap Penurunan Aktivitas SGPT Tikus (Rattus Norvegicus) Jantan Galur Wistar Yang Diinduksi Parasetamol Dosis Tinggi. *Jurnal Agri-Tek Jurnal Penelitian Ilmu-Ilmu Eksakta.* 20(1), 37-40. doi:10.33319/agtek.v20i1.36

Nurfatwa, M. (2018). Uji Toksisitas Akut Ekstrak Buah Okra (Abelmoschus Esculatus L. Moench) Terhadap Parameter Kadar Sgot Dan Sgpt Serta Histopatologi Hepar Tikus Galur Wistar. *Journal of Pharmacopolium.* 1(2), 88-93.

Pestalozi, G. (2014). The Effect Of Tempe Extraxt On Damage Liver Cells In White Rat With Paracetamol-Induce. *Fakultas Kedokteran Universitas Lampung Medula*. 2(4), 33-38

Putri, O.K. (2018). Kadar Fenolik Total Dan Flavonoid Total Seduhan Daun Tin (Ficus Carica) Segar Dan Kering Dengan Air Mendidih. *Journal Cis-Trans.* 2(2), 7-12. doi: http://dx.doi.org/10.17977/um026v2i22018p007

Putri, C.A., Yuliet., Khaerati, K. (2018). Efektivitas Ekstrak Daun Kersen (Muntingia calabura L.) Terhadap Penurunan Kadar Kolesterol Total Tikus Jantan (Rattus Norvegicus L.) Yang Diinduksi Pakan Tinggi Lemak. *Biocelebes.* 12(1), 65-72.

Risa, H., Siti, R., Risky, R.A. (2017). Perancangan Sistem Diagonosa Penyakit Hepatitis Menggunakan Metode Knn. *Jurnal Ilmiah ILKOM.* 9(2), 145-152 doi: https://doi.org/10. 33096/ilkom.v9i2.129.145-152

Sudharmono,U (2014). Uji Keamanan Keamanan Ekstrak Etanol Daun Mindi (Melia Azedarach L.) Pada Tikus Galur Wistar Berdasarkan Dosis Letal 50 Serta Gambaran Histopatologi Hepar dan Ginjal. *E-journal stikes santo borromeus.* 3(1).

Sujono, T.A., Wahyuni, A.S., Da'i, M., Kusumowati, I.T.D., Suhendi, A., Munawaroh, R., Pratiwi, N., Fauziyyah, S., Rahadini, R., Lestari, S. (2015). *Pengaruh Pemberian Ekstrak Etanol Meniran (Phyllanthusniruri L) Selama 90 Hari Terhadap Fungsi Hati Tikus. The 1st University Research Colloquium (URECOL) 2015* (pp. 136-142). Surakarta., Indonesia.

Sukohar, A., Soleha, T.U., Hafizfadillah, D. (2019). Pengaruh Ekstrak Etanol Belimbing Wuluh (Averrhoa Bilimbi Linn) Sebagai Antioksidan terhadap Kadar SGPT (Serum Glutamic Pyruvate Transaminase) serta SGOT (Serum Glutamic Oxaloacetic Transaminase) Tikus Galur Sprague dawley yang Diinduksi Parasetamol. *JK Unila*. 3(1), 123-128.

Takuyo, L.A., Titihalawa, D.R., Paepadaseda, M.F. (2018). Rebusan Daun Kersen (Muntingia Calabura L.) Menurunkan Glukosa Darah Pada Kelinci (Oryctolagus Cuniculus). *Gema Kesehatan*, 10(1), 9-15.

Tandi, J., Roem, M., Yuliet. (2017). Efek Nefroprotektif Kombinasi Ekstrak Daun Gedi Merah Dan Daun Kumis Kucing Pada Tikus Induksi Etilen Glikol. *Journal of Tropical Pharmacy and Chemistry.* 4(1), 27-34. doi: https://doi.org/10.25026/jtpc.v4i1.129

Wijaya, Z.A. *Antidiabetes Ekstrak Etanol Daun Tin (Ficus Carica L.) Pada Mencit (Mus Musculus) Yang Diinduksi Aloksan.* Prosiding Seminar Nasional Kesehatan *(pp.* 1-9).

Tin. (2019). Retrieved from Wikipedia: https://id.wikipedia.org/wiki/Tin