

## DECREASING CHOLESTEROL AND TRIGLYCERIDE LEVEL ON BLOOD BY ADDING ORANGE (*Citrus sinensis*) WASTE ON PADJAJARAN I SHEEP

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### Abstract

Sweet orange (*Citrus sinensis*) waste content of flavonoids, namely quercetin and kaempferol, which is expected to inhibit the growth of bacteria. Kaempferol have antibacterial activity, denature bacterial cell proteins and cell membranes without damage irreparable. While quercetin has increased permeability porin protein activity on other bacteria. Research about Decreasing Cholesterol and Triglyceride Level on Blood by Adding Sweet orange (*Citrus sinensis*) waste (SOW) on Sheep Padjadjaran I. This research was done by using Completely Randomized Design with four treatments level i.e. 0, 4, 6 and 8% SOW in ration and repeated five times. The observed variables were blood's lipid profile, consists of cholesterol, HDL, LDL, and triglyceride. The observation showed that level of blood's lipid profile were not significantly changed, but the trend of cholesterol, HDL, LDL, and triglyceride was decreased. The conclusion is using sweet orange waste (SOW) until 8% has not showed statistically significant differences but have positive effect on lowering blood lipids, i.e. cholesterol level decreased 8.05%, LDL 10%, triglyceride 23.4 % on R4 (8%) while using 4% SOW, triglycerides level decreased 24.8% and decreased 33.53% on using 6%.

**Keywords:** sweet orange waste, blood lipid, cholesterol, triglyceride, Padjadjaran I sheep.

### INTRODUCTION

The sheep is the fourth meat producer after poultry, cattle and swine. Currently, the sheep contributes 16.12% for national meat production while the population almost 59.52% in West Java (Agriculture Ministry/Deptan, 2013). The excellence mutton have full-flavored high typical, but their meat has high fat and cholesterol levels which in turn has impact on health. Hence some people assumed that consume mutton can trigger vascular disease and atherosclerosis.

The production of a citrus fruit in Indonesia are 2.355.550 tons per year (Agriculture Ministry/Deptan, 2010), and the orange waste almost 60%, which is composed of skin, the membrane and seeds. Considering the waste potential sweet orange can be used as feed supplements that play a role in improving the profile of blood fat.

### MATERIALS AND METHODS

According to Bandiati (2012), Padjadjaran I sheep is a local genetic material that has been cross bred and still in Garut sheep family that came from Wanaraja Garut regency, still in

breeding process for meat sheep with white hair and wide years as their identity.

This research used 20 Padjadjaran I sheep with body weight averages  $30.42 \pm 4.50$  kg. Sheep breeding cages are obtained from Padjadjaran Station Farm, University Padjadjaran. The research conducted during 8 weeks. The rations consist of 40% concentrates and 60% is *Brachiaria brizantha* grass lawn and *Pennisetum purpureum* mixed grass. The content of the feed materials of food substances of rations of dried materials based on the research are presented in Table 1.

Table 1. Nutrient Composition (%)

Ingredient	Nutrient Content						
	BK	Ash	CP	CF	CF	BETN*	TDN*
Rice Brand	87.70	13.60	11.00	14.00	8.60	40.50	67.90
Palm oil Cake	86.00	4.10	15.00	22.00	11.90	33.00	79.00
Tofu Waste	14.60	5.10	30.30	22.20	9.90	32.50	77.90
Coconut Cake	86.00	8.20	19.00	14.00	10.90	33.90	78.00
<i>Citrus sinensis</i>	90.01	7.70	6.50	12.76	3.40	59.65	79.00
CGF	90.40	4.33	17.71	20.11	5.40	42.85	73.68
Skin Bean	90.75	24.30	9.18	25.80	4.49	26.98	50.70
Molases	82.40	11.00	3.90	0.40	0.30	66.80	70.70
Pollard	88.50	5.90	18.50	9.80	3.90	50.40	69.20
Cassava cake	79.80	2.40	1.80	8.90	0.30	66.40	78.30

Source: Proximat analysis Laboratorium Ternak Ruminansia and Kimia Makanan Ternak, Animal Husbandry University Padjadjaran (2010)

## Data Analysis

The data were analysis to know the differences between the treatments with Duncan test. The parameters are: Blood cholesterol, HDL (High Density Lipoprotein), LDL (Low Density Lipoprotein) and triglyceride

## RESULTS AND DISCUSSIONS

The effect of using sweet orange (*Citrus sinensis*) waste meal in the ration on cholesterol levels LDL, HDL and triglycerides blood sheep Padjajaran 1, in Tables 2 and Figure 1.

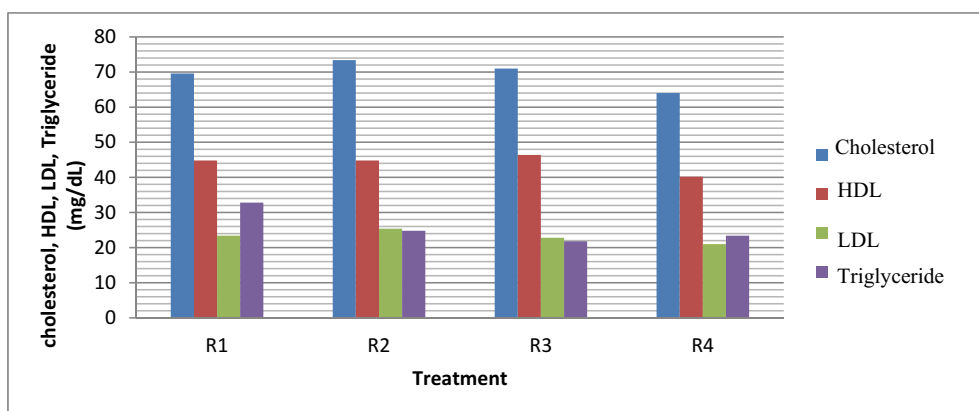


Figure 1. The effect of Sweet Orange Waste meal on Padjajaran 1 Sheep on blood cholesterol, HDL, LDL, Triglyceride

From Figure 1, it shows that the highest cholesterol level is 73.40 mg/dL (P2=4% SOW), while the lowest cholesterol is 64.00 mg/dL (P4=8% SOW). And for HDL, the highest is 46.40 mg/dL (P3 = 6% SOW) and the lowest is 40.20 mg/dL (P4 = 8% SOW). For the highest LDL is 25,40 mg/dL (P2 = 4% SOW) while the lowest LDL is 21.00 mg/dL (P4 = 8% SOW). The highest triglycerides are 34.80 mg/dL (P1 = placebo), while the lowest triglyceride is 21.80 mg/dL (P3 = 6%). The results of the analysis range shows that giving SOW has no significant ( $P < 0.05$ ) in decreasing blood cholesterol levels, LDL, HDL, and triglycerides Padjajaran sheep, but the trend is decrease.

Based on the results of Duncan multiple range test, that the granting of SOW in all cases, indicating that the results did not differ significantly compared with R1 (placebo).

Table 2. The Cholesterol , HDL, LDL, and Triglyceride Blood on Padjajaran 1 Sheep

Treatment	Cholesterol	HDL	LDL	Triglyceride
	mg/dL			
R1	69.6	44.8	23.4	32.8
R2	73.4	44.8	25.4	24.8
R3	71	46.4	22.8	21.8
R4	64	40.2	21	23.4

Notes:

R1 = Control diet (Placebo)

R2 = Control diet + sweet orange waste 4%

R3 = Control diet + sweet orange waste 6%

R4 = Control diet + sweet orange waste 8%

Table 3. Duncan Test Effects treatment on Cholesterol, HDL, LDL, and triglyceride Blood Level on Padjajaran 1 Sheep

Treatment	Significancy 0,05			
	Cholesterol	HDL	LDL	Triglyceride
R1	a	a	a	a
R2	a	a	a	a
R3	a	a	a	a
R4	a	a	a	a

Note: same superscripts indicate non significantly different effect ( $P > 0.05$ ).

Although the results are not significantly different (Table 3), but there is a tendency to decrease the cholesterol in R4, LDL in R3 and R4, and the triglycerides in R2, R3, and R4. This indicates that the active substances contained in SOW can work to decrease cholesterol, LDL, and triglycerides level. This

is consistent with Chaudry et al., (2004), which states that the granting of orange waste powder with 5% decreased blood level sheep lipoproteins. The reduction in blood cholesterol may result from the fusion of active substances and crude fiber contained on orange waste powder. The crude fiber foods tend to accelerate the rate of passage of food in the digestive tract, so the absorption of cholesterol and other substances will also decrease. According to Lovita et al., 2013, such circumstances are strengthened, that cholesterol levels dropped in line with rising crude fiber content because of the orange waste in rations. A sweet orange waste is rich of pectin that helps in the process of lowering blood cholesterol due to molecular interaction between lipid and pectin (Jenkins et al., 1976; Selvendran, 1978). Pectin can increase the fat excretion due to anaerobic fermentation in the digestive tract (Dutta and Hlasko, 1985). Pectin may reduce the absorption of fat, so the absorption of triglycerides decreased (Sutardi, 1992). Flavonoid is vital in oranges, the hesperidin has been proven to lower high blood pressure and cholesterol in animal experiments, and has anti-inflammatory properties (Lovita et al., 2013). The flavonoid is vital in oranges, the hesperidin has been proven to lower high blood pressure and the cholesterol in animal experiments, and has anti-inflammatory properties. Most of these phytonutrients found in the white part and possibly beyond the meat of the citrus, not at the center of the orange liquid, and these compounds will be damaged by the processing. When the animals with high cholesterol are given feed that contains 1% PMFs (especially tangeretin), the levels of total cholesterol, VLDL and LDL is reduced until 19-27, 32 and 40%, and when the animals were given feed containing a mixture of 3% of two different flavonones (naringin and hesperidin) grapefruit, cholesterol decreased, caused by tannins and saponins in sweet orange that is preventing an increase in the secretion of bile salt so can inhibited the formation of

cholesterol. Cholesterol decreasing also caused by the role of flavonoids and essential oil in inhibiting the early stages of the reaction by freeing 1 H atoms of the hydroxyl cluster, and attached with 1 free radicals. This bond will stabilize the radical peroxide who made the activation energy is reduced, and will further inhibit the oxidation of LDL cholesterol (Nurwahyunani, 2006). The oxidation reaction inhibits the enzyme work i.e. 3-Hydroxy-3-metilglutaril-CoA (HMG-CoA reductase), acts as a catalyst for the biosynthesis of cholesterol (Martin et al., 1981). The sheep blood triglyceride levels decrease due to the content of the active substance contained in the waste of sweet orange. The active substances such as antioxidant flavonoids reduce inflammation and can capture free radicals or oxygen compounds (Reynertson, 2007) and ultimately inhibit the synthesis of triglycerides. The initial formation of the triglycerides compound of glycerol-3-phosfat from glycerol, di-hydroxide acetone phosphate that are experiencing reduction in the presence of NADH, to synthesize Glycerol-3-Phosphate of disease (GPDH) for the synthesis of triglycerides.

He et al. (2009) reported that the essential oil was decrease the activity of Glycerol-3-Phosphate of disease (GPDH) enzyme, which is involved in the biosynthesis of triglycerides. Free radicals oxidize the cholesterol, so it works after oxidized cholesterol does not stick to the walls of the arteries that build the plaque, can eventually grow and large enough to hinder or completely blocked the blood flow and vitamin C contained in flour sweet citrus waste can neutralize free radicals.

The saponins have a lipophilic molecule that is able to dissolve fats and emulsions that can lower serum cholesterol (Harborne, 1987) and can lower blood cholesterol levels of animals (Francis et al., 2002). Then saponins may decrease the animal hypercholesterolemia. Saponin in feed containing triglycerides formed a bond that difficult to absorbe by the intestines, so the absorption of triglycerides is hampered. Tannins in the body will bind the

protein and will coat the intestinal wall, so the mucus layer compaction in the digestive tract and inhibit the absorption of food substances, including cholesterol. In accordance with the research, the tannins may increase the excretion of cholesterol. Tannins in the body shall be bound to a protein that will coat the intestinal wall.

The reduction in blood cholesterol levels can be due to a combination of active substances and crude fibers contained in flour sweet citrus waste. Giving a rough fibers tend to accelerate the rate of passage.

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## CONCLUSIONS

1. The blood cholesterol level decreased when the sheep has been given 8% orange waste meal, from 69.6 mg/dL to 64 mg/dL, and also the LDL decreased with 10%, while the HDL has not increased. The LDL : HDL ratio are better, because the ratio are more wider than the ratio that has not been added with sweet orange waste meal.
2. The triglyceride level in sheep blood has been decreased although according statistical analysis were non-significant; the sheep that given SOW meal 4% has 24.8% , 33.53% in 6% SOW and 23.4 % in 8% SOW compared with the placebo
3. The sweet orange waste meal can be used as cholesterol and triglyceride decreasing in sheep blood. The optimum is 8% orange waste meal.

## REFERENCES

Chaudry M.A., Badshah Bibi N., Zeb A, Ahmed T., Ali S., Termeulen U., 2004. Citrus Waste Utilization in Poultry Rations. *Archiv Geflugelkunde*.  
Deptan. 2010, 2013. Prospek dan Arah Pengembangan Agribisnis Jeruk. [Online]. [Http://www.litbang.deptan.go.id/special/komoditas/b3jeruk](http://www.litbang.deptan.go.id/special/komoditas/b3jeruk). (Diakses tanggal 10 November 2011 jam 21.30)

Dutta S.K., Hlasko M., 1985. Dietary Fiber in Pancreatic Disease: Effect er on Fat Malabsorption in Pancreatic Insufficiency and In Vitro Study of The Interaction of Dietary Fiber With Pancreatic Enzymes. *Am. J. Clin. Nutr.* 41 (3), p.517-525.

Francis G., Zohar Kerem, Harindes P., Makkar P., Becker N., 2002. The Biological Action of Saponins in Animal System. *Journal of Nutrition*, 88, p.587-605.

Harbone J.B., 1987. *Metode Fitokimia*. Edisi II. Bandung: Penerbit ITB. Hal.152.

He M.L., W.Z. Yang, J.S. You, A.V. Chaves, P.S. Mir, C. Benchaar, T.A. McAllister, 2009. Effect of Garlic Oil on Fatty Acid Accumulation and Glycerol-3-Phosphate Dehydrogenase Activity in Differentiating Adipocytes. *Asian-Aust. J. Anim. Sci.* 22, p.1686-169.

Jenkins D.J.A., D.V. Goff, A.R. Leeds, K.G. Alberti, T.M.S. Wolever, M.A. Gassull, T. D. R. Hockaday, 1976. Unabsorbable carbohydrates and diabetes: Decreasedpostprandial hyperglycaemia. *Lancet* 2, p.172–174.

Kurnia Y., Nur A., Aila M., Ula Firdausy, 2010. Pengaruh Pemberian Air Rebusan Daun Pare (*Momordica charantia L.*) Terhadap Kadar Kolesterol Total Serum Darah Tikus Putih (*Rattus norvegicus*) Dengan Induksi Hiperkolestemia. Program Kreativitas Mahasiswa. Universitas Sebelas Maret, Surakarta.

Laboratorium Nutrisi Ternak Ruminansia and Kimia Makanan Ternak, 2010. Analisis Proksimat Tepung Limbah Jeruk Manis (*Citrus sinensis*). Fakultas Peternakan, Universitas Padjadjaran. Bandung.

Lovita, et al., 2013. Effects of Sweet orange (*Citrus sinensis*) waste meal in ration on Blood glucose, cholesterol level in Meat quails. *Animal Husbandry*, Universitas Padjadjaran.

Martin D.W., P.A. Mayes, V.W. Rodwell, 1981. *Harper's Review of Biochemistry*. Eighteen Edition. Lange Medical Publication, Los Altos, California.

Nurwahyunani A., 2006. Efek Ekstrak Daun Sambung Nyawa Terhadap Kolesterol LDL and Kolesterol HDL Darah Tikus Diabetik Akibat Induksi Streptozotocin. Universitas Negeri Semarang, Semarang.

Oluremi O.I.A., A. Andrew, 2007. Phytonutrients in Citrus Fruit Peel Meal and Nutritional Implication for Livestock Production. University of Agriculture.

Proximat analysis Laboratorium Ternak Ruminansia and Kimia Makanan Ternak Fakultas Peternakan Universitas Padjadjaran, 2010. Universitas Padjadjaran.

Reynertson K.A., 2007. *Phytochemical Analysis of Bioactive Constituents from Edible Myrtaceae Fruit*. Dissertation. The City University of New York. New York.

Sutardi E., 1992. *Pengawetan Pangan: Pendinginan dan Pengeringan*. PAU Pangan and Gizi. Universitas Gadjah Mada. Yogyakarta.

Sri Bandiati Komar Prajoga, 2012. *Domba Pedaging Padjadjaran-1*. Kementrian Pendidikan dan Kebudayaan . Universitas Padjadjaran.