

EFFECTS OF SWEET ORANGE (*CITRUS SINENSIS*) WASTE MEAL IN RATION ON BLOOD GLUCOSE, CHOLESTEROL LEVEL IN MEAT QUAIL

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Sweet orange (*Citrus sinensis*) is one of Indonesia's citrus production, is great and widely used in beverage processing, therefore, is quite a lot of waste. Citrus waste containing chemical components such as essential oils, flavonoids, pectin, tannins, saponins are believed to reduce cholesterol and fat in the meat of quail.

Essential oils are volatile compounds that have many benefit function. In general, essential oils consist of carbon (C), hydrogen (H), and oxygen (O), sometimes made up of nitrogen (N) and sulfur (S). Essential oils of citrus waste, limonene works improving blood circulation and inhibit the HMG-CoA enzyme. Inhibition of HMG-CoA reductase causes a decrease in the synthesis of cholesterol and increase HDL receptors (Singh, 2006).

Saponin are glycosides that found in plants. Saponins have a characteristic form of froth. When saponin is reacted with water and whipped it will form a froth that can last a long time. Saponin soluble in water. Saponins in sweet citrus waste to decrease cholesterol and triglycerides which can form insoluble complexes bond with cholesterol and triglycerides from food in the intestines, so that the cholesterol can not be absorbed, saponins can combine with bile acids and cholesterol from food to form micelle (Kurnia et al., 2010)

Tannins are substances widespread in plants. Tannin in sweet citrus waste in the body will bind with protein and will coat the intestinal wall. Triglyceride absorb will inhibit by compaction of mucous layer the digestive tract, including triglycerides and cholesterol in the intestine (Kurnia et al., 2010).

Pectin is found in sweet orange waste, can reduce the absorption of food in the intestines by binding bile acids, thus fat, cholesterol absorb will decrease, and will be released in faeces (Almatsier, 2003).

MATERIAL AND METHODS

In this research used 100 heads female quails *Coturnix coturnix japonica*-6-week-old, were seper-

ated and divided randomly into 20 unit, so each unit contain five heads. In this research, quails was given *Citrus sinensis* waste meal since the six weeks, for four weeks, The treatments are 5 rations, and repeated 4 times. Quail weight in a relatively homogeneous with coefficient of variation is 8.20%.

Samples were taken 20 heads for blood glucose, one head for each cage, also for meat cholesterol. Blood Sampling was taken on 4 weeks, at the end of the experiment.

Ration experiments used followed by NRC (1994), which is 20% Protein and Metabolizable Energy 2900 Kkal/kg.

The parameters measured in this study are :

1. Meat Cholesterol, mg/100gr

Cholesterol levels are measured in the breast and thigh meat. Determination of cholesterol meat can be made based on the Lieberman Burchard method ;

2. Blood glucose, mg/dl

Blood glucose measured by glucosa hexokinase.

Quails were divided into following four groups of three animals each, and repeated five times

The treatment was continued for 5 weeks.

The Experiment using completely Randomized Design (CRD) which consist of five treatments, four times repeated, each cages consisted five male quails, so the total used 100 heads.

The treatment of the study were:

R1 = basal ration

R2 = ration containing sweet orange waste meal 3%

P2 = Rations + sweet orange waste 6%

P3 = Rations + sweet orange waste 9%

P4 = Rations + sweet orange waste 12%

RESULTS

Based on Duncan's multiple test table shows that the R2, R3, R4, and R5 ($P < 0.05$) decreased cholesterol meat levels than R0. The ration content waste

Table 1. Effects *Citrus sinensis* on quails meat cholesterol and blood glucose

Treatment	Lowering Meat Cholesterol, %	Blood Glucose, mg/dL
R1	-	268
R2	58.86	277
R3	49.59	278
R4	41.13	290
R5	6.9	289

Table 2. Duncan test meat cholesterol dan blood glucose

Treatment	Significancy (0.05)	
	Lowering Meat Cholesterol	Blood Glucose
R1	a	a
R2	c	a
R3	b	a
R4	b	a
R5	a	a

Description: Lowercase different in significance column indicates significantly different results.

citrus orange, have the bioactive compound which can reduce cholesterol level by preventing reabsorption and increase fecal excretion. Flavonoids may inhibit endogenous cholesterol synthesis by inhibiting the enzyme HMG - CoA reductase which acts as the synthesis of mevalonate which eventually became cholesterol. These result are accordance with those presented by **Son et al.**, (2007), and **Bariyah** (2008), in study reported that Diosgenin (steroidal saponins) is a compound that is very useful for controlling hypercholesterolemia by inhibiting cholesterol absorption and increases excretion of cholesterol, also that the saponin surfactants are compounds that have the ability to lower the surface tension of the cell and can increase bile acids that are synthesized from cholesterol in the liver thus reducing blood cholesterol levels. The reduced blood cholesterol levels followed by decrease LDL cholesterol. LDL and cholesterol have a relationship (the higher blood cholesterol level, the higher levels of LDL and vice versa). This is similar by **Montgomery et al.** (1993) that provides a role in LDL cholesterol in the body tissues, resulting in blood levels of LDL cholesterol is affected by the concentration.

Flavonoids may inhibit endogenous cholesterol synthesis by inhibiting the enzyme HMG - CoA reductase which acts as the synthesis of mevalonate which eventually became cholesterol. Flavonoids in orange is naringenin can

inhibit HMG - CoA reductase in lowering plasma cholesterol (**Lee et al.**, 2002). Pectin can increase the viscosity and affect the process of digestion and absorption of food (**Marounek et al.**, 2007). This causes why the cholesterol in food is not optimally absorbed by the small intestine so that blood cholesterol levels decreased, which in turn would reduce cholesterol meat. In accordance with the statement **Mosenthin et al.** (1994), the pectin is mixed in the ration can decrease protein digestibility and organic matter digestion in the small intestine.

Citrus sinensis contain vitamin C, it can prevent the increase in oxidized LDL and raise HDL cholesterol levels (**Elzbietha et al.**, 2000). Vitamin C has the effect of helping the hydroxylation reaction in the formation of bile acids thereby increasing the excretion of cholesterol. Niacin in citrus also can increase levels of apolipoprotein A - 1 plasma levels of HDL cholesterol. Oranges contain fiber (3g/130g) were able to inhibit the absorption of fat in the intestine so that cholesterol in the blood will reduced (**Mayes in Murray**, 2003). This causes the cholesterol in meat was reduced.

In this study, cholesterol levels of meat quails decreased in adding until 12% sweet orange citrus waste and the optimal treatment is adding 3% in lowering cholesterol levels quail meat. *Citrus sinensis* effectively resolved hypoglycemia often required to normalize blood glucose (**McTavish L et al.**, 2011).

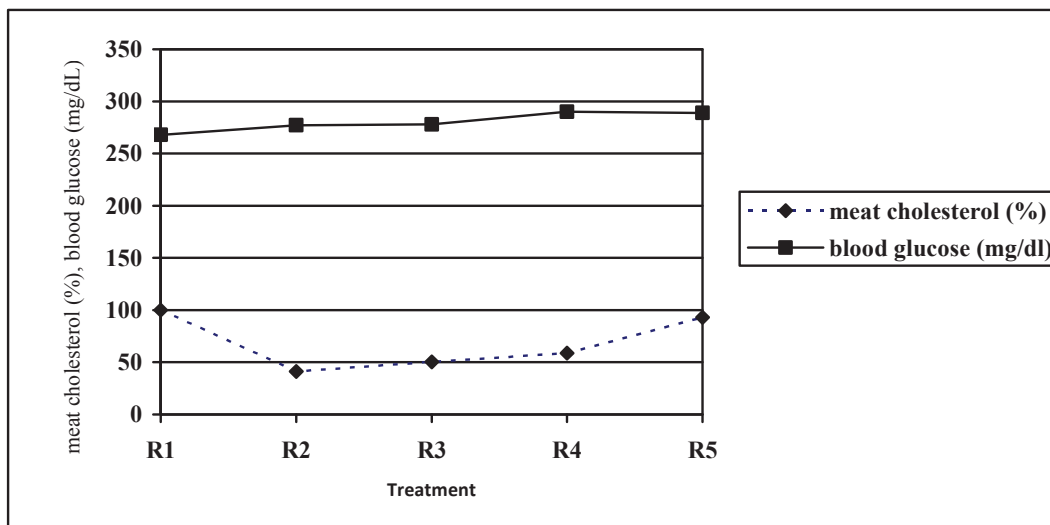


Illustration 1. Effects *Citrus sinensis* on meat cholesterol and blood glucose

. However, there is an increase in the R2 treatment (3%), R3 (6%), and R4 (9%) but R5 (12%), in the ration has taste sour, and bitter thereby it can reduce the ration palatability, followed by reduced consumption ration

CONCLUSIONS

From the results and discussion, it can be concluded that using waste sweet orange meal (*Citrus sinensis*) in ration up to 12%, can reduce cholesterol level quail meat, and the optimal rates is adding 3% waste sweet orange, reduced cholesterol meat quails until 58.8%. The blood glucose in all treatment has not significantly effect

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SUMMARY

Sweet orange waste, contain bioactive substances such as pectins, saponins, tannins, atsiri and flavonoids.

This research has been conducted in the Faculty of Animal Husbandry Universitas Padjadjaran on August 5, 2013 until September 27, 2013. This research aims to determine the effect of waste sweet orange meal in the ration on Blood glucose and Cholesterol level in Quails. The study was conducted with an experimental method using a Completely Randomized Design (CRD) consisting of five treatments (R1 = 0%, R2 = 3%, R3 = 5%, R4 = 7%, and R5 = 9% of sweet orange waste), each treatment was repeated four times, so the total is 100 female quails, aged 6 weeks. The result of the study based on statistical analysis showed that using sweet orange waste meal in ration has significant ($P < 0.05$) for reducing cholesterol meat at level 3, 6, 9 and 12 %, while blood glucose level is not significant ($P > 0.05$). The conclusion is sweet orange waste meal can reduce cholesterol meat quails, and the lowest cholesterol meat content at level 3%

Key words: *sweet orange waste, blood glucose, cholesterol meat, quails*

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