THE EFFECT OF *Curcuma xanthorhiza* ROXB SUPPLEMENTATION INTO THE CHOLESTEROL CONTENT IN BLOOD SERUM, EGG YOLK AND FECES OF LAYING HENS

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ABSTRACT

Curcuma xanthorhiza, Roxb is one of the Indonesian natural plants containing curcumoids compound. Cholesterol content can be decresed in the body by manipulation of intestinal diet system to remove the cholesterol through feces following total bile acid mechanism. One hundred and twenty birds of laying hen were randomly distributed in some cages. A three by two factorial experimental design (*Curcuma* levels of 0; 0.5; and 1.0 % time coconut levels of 0 and 1.0 %) was employed to investigate the effect of *Curcuma* sp and coconut oil, and their interaction in cholesterol content of blood, egg yolk and feces of laying hens. All rations were formulated as iso-nutrient and the birds were fed and supplied with drinking water *ad libitum* for six weeks. There was no significant interaction of *Curcuma* sp and coconut oil in all parameters measured. Cholesterol was not significantly reduced in blood serum and egg yolk given the *Curcuma* sp supplement up to 1 %, but it tend to increase in feces of 1% coconut oil supplement.

Key words : Cholesterol, *Curcuma* sp, Laying hen.

INTRODUCTION

Blood cholesterol is affected by fat content in diet depending on its type and amount. Although relatively low amount of energy being supplied by the fat, an increase consumption of condensed fatty acid will increase blood cholesterol and triglyceride content. Both cholesterols of feed and hepatic synthesis origin are known to be excreted through egg in the body are essential. Therefore, the present studies will not eliminate cholesterol from eggs but will attempt to produce low cholesterol eggs.

Temulawak (*Curcuma xanthorhiza*, Roxb) has shown to have an activity to produce and secrete bile. Djamhuri (1981), the previous studies in rats and dogs fed on curcumoid supplement had shown to increase secretion of bile and pancreatic fluid and excretion of cholesterol through feces. Hadi (1985), the purpose of this study is it investigates the effects in eggs and its optimum level in diet of laying hen.

Hypothesis includes (1) there is an interaction between fat content in diet and temulawak concentration in reducing cholesterol level in eggs of laying hen; (2) high fat content in diet will increase cholesterol level in eggs; and (3) temulawak could reduce cholesterol in eggs.

MATERIALS AND METHODS

One hundred and twenty layers of 20 weeks old and Lohmann strain were used in this study. The hens were randomly divided and distributed into some individual battery cages. A Complete Random experiment design of 2 x 3 factorial (Steel and Torrie, 1993) was employed for this study dividing into 2 levels of vegetable oil (non-coconut oil and 1% coconut oil) and 3 levels of temulawak (*Curcuma* sp) powder (0; 0.5%; and 1.0%)

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with 5 treated groups of 4 hens each group. Ration was formulated as iso-caloric (2,700 kcal/kg) and iso-protein (17%). The main compositions of feed include layer concentrate, yellow corn and rice bran. Feed additives were also applied for the ration including Rhodiamix, methionine, choline, probiotic starbio and quixalud. *Curcuma* sp was analyzed laboratorically containing 8.44% curcuminoid and nutrient content are illustrated in Table 1.

Parameters were analyzed for cholesterol content in blood, egg yolk and feces. Blood cholesterol was determined accordingly to Enzymatic Cholesterol High Performance CHOP-PAP KIT method (Boechringer Mannheim EmBh Diagnostica, 1987). The concentration of blood cholesterol was calculated as cholesterol (mg/100 ml) = Sample absorbance x 853. While the concentrations of cholesterol in egg yolk and feces were determined according to Lieberman-Burchord Method (Kleiner and Dotti, 1962) as in the following formula:

$$\text{Egg yolk cholesterol (mg\%)} = \frac{\text{Sample absorbance}}{\text{standard absorbance}} \times 0.4 \text{ (standard concentraton)} \times \frac{100}{\text{Sample weigh}}$$

RESULT AND DISCUSSION

The assessment of blood, egg yolk and faecal cholesterol in laying hens is shown in Table 2. Statistical analysis shown that oil concentration, *Curcuma* sp supplementation and interaction of ration and *Curcuma* sp did not significantly affect the concentration tend to significantly different in a ration with different fat content at the level of 7.5%

Table 1. The composition of basal ration nutrient in treated ration of laying hen

Ingredients	Ration A (% in diets)	Ration B (% in diets)
Layer concentrate	34.80	33.80
Yellow corn	44.74	29.83
Rice bran	19.88	34.80
Rhodiamix	0.17	0.17
Methionine	1.10	0.10
Choline	0.10	0.10
Starbio	0.20	0.20
Quixalud	0.01	0.01
Palm oil	0.00	1.00
Total	100.0	100.0
Chemical Analysis *		
Dry matter, %	88.11	88.76
Crude protein, %	17.52	17.63
Fat, %	3.81	5.18
Crude fibre, %	6.32	7.53
Ash, %	11.40	12.51
Calcium, %	3.15	3.11
Phosphor, %	0.97	1.22
Metabizable Energy, kcal/kg	2682	2728

Note : *Animal Nutrition Laboratorium, Animal Husbandry Faculty. IPB.

Table 2. The effects of diet in blood, egg yolk and faecal cholesterol in laying hens.

Parameters	Diets	Supplementation of *Curcuma* sp (%)			Average
		0.0	0.5	1.0	
Serum Cholesterol	A	156.95	152.00	153.45	154.14
(mg/100ml)	B	150.38	143.48	147.14	147.00
	Average	153.67	147.74	150.30	
Egg yolk cholesterol	A	293.34	287.12	301.61	297.36
(mg/egg)	B	269.93	318.48	273.16	287.19
	Average	281.63	307.80	287.39	
Feces Cholesterol *	A	9.77	10.37	10.70	10.28[a]
(mg/g)	B	11.38	11.17	11.22	11.26[b]
	Average	10.58	10.77	10.95	

Note : *Subscript indicates significantly (P<.075)

(P<.075). Since there was no interaction factor will not also occurred between both rations and *Curcuma* sp. supplementation against cholesterol concentration. Both ration A and B did not significantly affect blood cholesterol.

Blood cholesterol was detected at 154.14 mg/100 ml in ration A and 147.00 mg/100 ml in ration B. An addition of 1% coconut oil into ration B did not change the concentration of condensed fatty acid compared to ration A. Blood cholesterol change is a response to the degree of fatty acid condensation in a ration. More condensed fatty acid in a ration will increase blood cholesterol level (White *et al.*, 1964; Irawan and Sastroamidjojo, 1977; Linder, 1992). An addition of 3.5% corn oil into a ration (8.5% fat ration) could reduce cholesterol level in blood, but did not affect both HDL and LDL in serum (Utami, 1994). The mechanism of cholesterol change does not depend on the concentration of cholesterol in blood, but will occur as a response to bile requirement and bile production is achieved from the availability of blood cholesterol (Djamhuri, 1981).

The supplementation of *Curcuma* sp in the diet did not significantly affect the concentration of cholesterol in serum. Results of the present study revealed that the supplementation of *Curcuma* sp up to 1% or equally to 0.084% curcumoid into the diet was still too low to fore the role of curcumoid to accelerate the production of bile from blood cholesterol has not been optimal. It has also been reported previously by Soebiantoro (1989) that blood cholesterol did not reduced when broilers were fed on 400 mg/kg body weight of *Curcuma* sp or equally to 0.034% curcumoid. However, total blood cholesterol could be reduced in rats fed on 0.5% curcumoid supplement (Sunaryo *et al.*, 1985).

Egg cholesterol was produce at 297.36 mg/egg from ration A and 287.19 mg/egg from ration B or equally to 20.147 mg/g and 19.63 mg/g egg yolk respectively. Cholesterol content of egg was not affected significantly by the treated ration due to a minimum concentration of cholesterol in the ration (Hargis, 1988). Most of the blood cholesterol produce from synthesis is required for eggs, while an addition of 1% coconut oil into ration B has not change the proportion of different condensed fatty acids compared to ration A. An addition of 3 : 5% coconut oil into a ration appeared to be significantly formed cholesterol in eggs than 3.5% corn oil or control (Bintarningsih, 1994). The supplementation of *Curcuma* sp in the diet did not also affect significantly the concentration of cholesterol in eggs.

It is suggested that the insignificant change in cholesterol content due to *Curcuma* sp could not load to the change of LDL and HDL ration. An increase of HDL concentration will reduce cholesterol. Linder (1992) has also supported that a decrease of cholesterol content could be due to the synthesis block of VLDL and LDL and will increase HDL. However Beyer and Jensen (1993) reported that barley could reduce more than 50% of VLDL in plasma compared to control but was followed by the reduction of cholesterol in eggs.

The average concentration of faecal cholesterol was determined at 10.28 mg/g in ration A and 11.26 mg/g in ration B. There were excretion of cholesterol being occurred though feces in ration B than ration A due to high fat content in ration B. Faecal excretion of cholesterol frequently occurred in the form of neutral steroid following the pH level ranging from 6.72 to 6.75. According to Hargis (1988), steroid faecal excretion was a high variable and more depended on properties and amount of fat in the diet. Birds that fed on a commercial feed with low concentration of fat will excrete steroid through faeces less than 10 mg/bird/day. Similarly to the supplementation of Curcuma will not significantly affect faecal cholesterol. The present study reveals that low concentration of *Curcuma* sp being supplemented into the diet to which curcumoid has not been optimal to stimulated the production and secretion of bile into duodenum for the absorption of fat. Therefore, cholesterol excretion either in the form of steroid and secondary bile acids in a ration supplemented with *Curcuma* sp did not significantly difference to control diet (without coconut oil supplement).

CONCLUSION

There were no interaction occurred between coconut oil and *Curcuma* sp up to 1% or 0.084% curcumoid supplemented diet to reduce cholesterol in eggs.

Diet with 1% did not affect blood, egg yolk and faecal cholesterol but the last tend to increase when supplemented with 1% coconut oil.

SUGGESTION

The curcumoid level of *Curcuma* sp and coconut oil origin needs to be further investigated by increasing its concentration both in laying hens and broilers of less than one week old.

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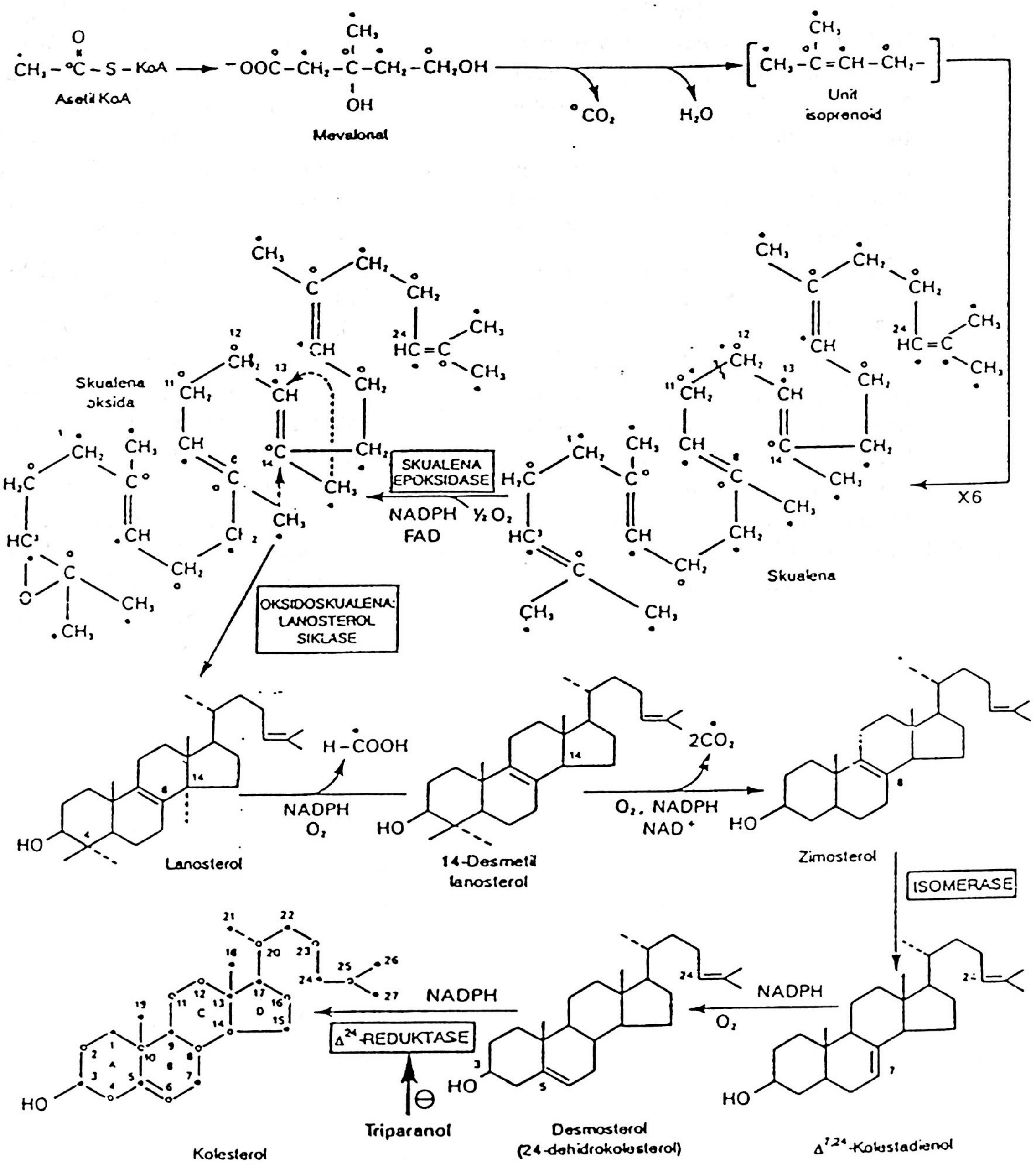
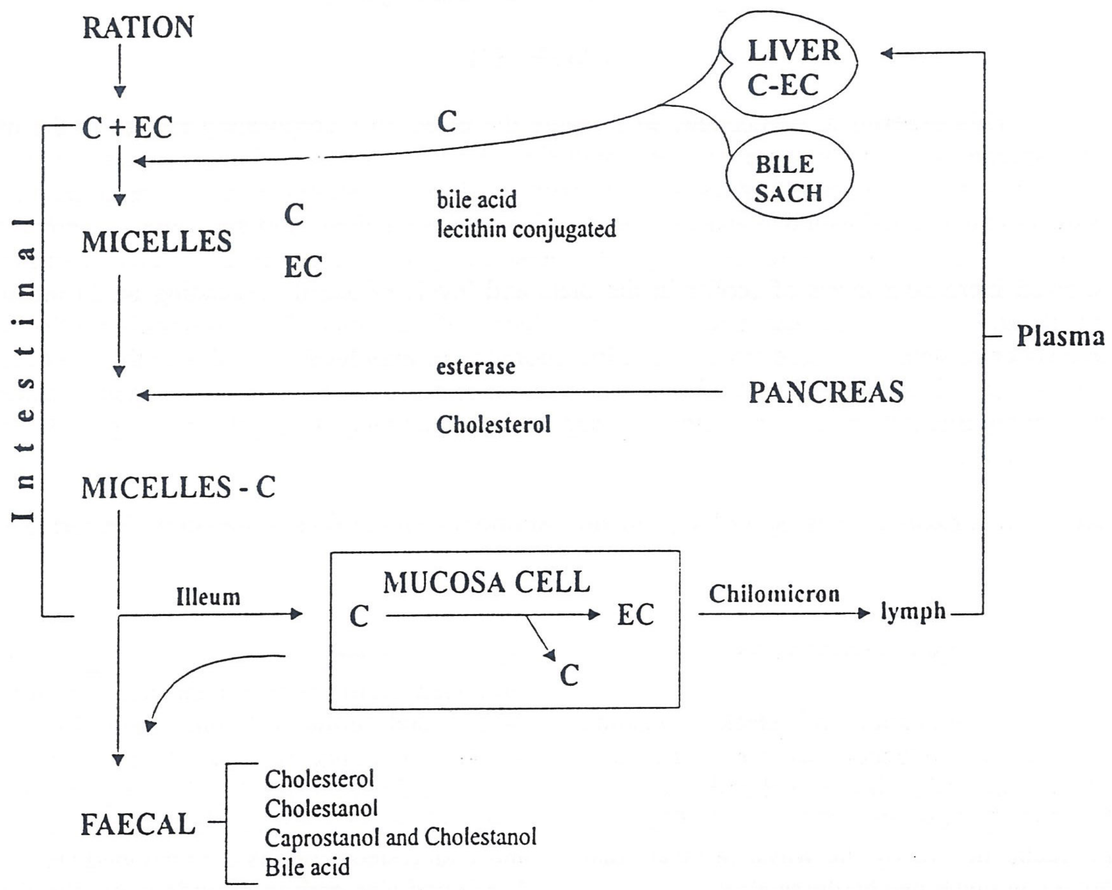
Appendix 1. Cholesterol biosynthesis (Mayes, 1995)



Appendix 2. Digestation and Cholesterol absorbtion (Ismadi and Ismadi, 1993)



Note : C = Cholesterol
EC = Ester Cholesterol