Performances and Meat Cholesterol Content of Fat Tail Sheep Fed Diets Supplemented with Sardinella Fish Oil Based Ca-soap Mixed with Herbal

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Abstract

Previous results showed that sardinella fish oil based Ca-soap supplementaion at level a of 3.0% in ration reduced meat LDL cholesterol of lamb by 49% and improved feed utilization efficiency by 13%. However, sardinella fish oil based Ca-soap had bad fishy smell causing low palatability of feed and reduced feed intake. In Indonesian tradition, fishy smell is ussualy overcomed by applying herbal. This experiment aimed to elaborate herbal meal addition (ginger, turmeric, and beluntas leaf) into sardinella fish oil based Ca-soap in reducing its fishy smell, and subsequently improve its palatability. Sixteen male fat tail sheep were allocated into four experimental treatments with four replicates and arranged in a block randomized design. The experimental period lasted for 14 weeks and the animals had free access to feed (concentrate: native grass in ratio of 1:1) and water. At the end of experiment, two sheep from each treatment were slaughtered. The treatments were T0 (without herbal addition), T1 (with turmeric addition), T2 (with ginger addition), and T3 (with beluntas leaf addition). Herbal Ca-soap, at level of 3%, were mixed thoroughly with feed ingredients to produce concentrate diet. The variables measured were feed intake, daily weight gain, feed conversion ratio, blood triglicerides and meat cholesterol content. The results showed that addition of sardinella fish oil based Ca-soap mixed with herbal slightly reduced feed intake and daily gain, but improved feed efficiency utilization. Herbal addition reduced cholesterol, but increased triglicerides content of blood plasm. Herbal addition, except for beluntas leaf, also reduced cholesterol content of meat. It is concluded that sheep fed sardinella oil based Ca-soap with turmeric addition had better performance and lower cholesterol of meat.

Key words: calcium-soap, herbal, meat cholesterol, sardinella fish oil

Introduction

Ruminant meat contains high saturated fatty acids (laurate, myristate, and palmitate) that caused high cholesterol in the blood plasm (Grande, 1975). Substitution saturated fatty acid with polyunsaturated fatty acid could reduce total cholesterol, including LDL-cholesterol (Marsic and Yodice, 1992). Lamb contains higher cholesterol than beef, i.e. 94 mg/100g vs 87 mg/100g. People that consumed food containing high cholesterol can cause *atherosclerosis* leading to coronary heart disesase. Omega-3 polyunsaturated fatty acids (PUFA) can reduce risk of atherosclerosis (IGER, 2003). Source of PUFA containing high omega-3 concentration is fish oil, e.g., from sardinella fish. Sardinella fish oil is easy to obtain in Indonesia. It is a waste product of fish canning industry spreaded out in eastern part of East Java Province.

Results of the previous experiment showed that feeding sardinella oil based Ca-soap at level of 3.0% decreased LDL cholesterol of lamb by 49% (Sudarman *et al*., 2008[a]) and feed utilization efficiency increased by 13% (Sudarman *et al*., 2008[b]). This indicates that lipid profile of lamb can be altered by feeding Ca-soap. However, feeding Ca-soap caused feed intake to decrease. This was probably caused by bad fishy smell of Ca-soap causing the palatability of diet to decrease.

When cooking fish materials in Indonesia, it is a tradition to add herbals to overcome the fishy smell. The herbals that are usually used are ginger (*Zingiber officinale* Rosc.), turmeric (*Curcumae domestica*) and beluntas leaf (*Pluchea indica* Less).

The objective of this experiment was to evaluate the effects of herbal addition into sardinella oil based Ca-soap on the reduction of its fishy smell. This will, subsequently, improve palatability of the diet and performance of sheep, and reduce low cholesterol lamb.

Materials and methods

Sixteen male growing fat tail sheep (approx. 8 m.o.) were allocated into four experimental diets with four replicates and arranged in a block randomized design. They were reared in individual cage for two months. Feed (concentrate : native grass in ratio of 1:1 dry matter base) were given *ad libitum* (110% of previous day intake) at 07.00 and 17.00. The animals had free access to water. The ingredients of concentrate were pollard, cassava wate meal, coconut meal, rice bran, palm kernel meal, soybean meal, molasses, $CaCO_3$, urea, and DCP. Nutrients composition based on proximate analysis was 16% crude protein, 5% of extract ether, 10% crude fiber and totally had70% TDN.

The experimental treatments were T1= basal diet (containing 5% fat), T2= T1 + 3% Ca-soap with turmeric meal, T3= T1 + 3% Ca-soap with ginger meal, and T4=

T1 + 3% Ca-soap with beluntas leaf meal. Ca-soap complex was made based on the method used in the previous experiment (Sudarman *et al*., 2008[b]) and the herbal were added before mixing with other feed ingredients for making concentrate.

At the end of experiment, blood samples from two sheep of each treatment were collected from jugular vein for analyzing cholesterol and trigliceride contents of blood plasm. Total cholesterol was measured by the CHOD-PAP method. Triglyceride determinations were performed using the GPO-PAP method. Subsequently, two sheep of each treatment were slaughtered for analyzing meat cholesterol content using Lieberman Burchard method (Kleiner and Dotti, 1962).

Data of sheep performances were subjected to Analyzes of Variance (ANOVA) and any different means were further tested using LSD (Steel and Torrie, 1980). Other data were analyzed using descriptive statistics. The variables measured were dry matter intake, weight gain, feed conversion ratio, blood plasm cholesterol and triglicerides, and meat cholesterol content.

Results and discussions

Range of ambient temperature and humudity during the experimental study were 22.2-33.8 °C and 83.7-92.3%, respectively.

Sheep Performances

Data of dry matter intake, daily weight gain and feed conversion ratio (FCR) were shown in Table 1. Dry mattter intake of sheep of all treatment groups were not significantly different. This indicated that herbal addition was not able to improve the palatability of feed added sardinella oil based Ca-soap. Intake of sheep in this experiment (4.0% BW vs 2.5% BW) was higher than that of sheep in previous results (Sudarman *et al*., 2008[b]). This discrepancy was possibly due to the difference in breed of sheep used. Previous experiment used thin tail sheep breed with average body weight of 16.9 kg, while the present experiment used thick tail sheep breed

Table 1. Performance of sheep fed sardinella fish oil base Ca-soap with different herbal addition (± SD)

Treatments	Dry matter intake (g/head/day)	Daily gain (g/head/day)	FCR
T0	1,080 ± 63	148 ± 26	7.44 ± 1.33
T1	1,058 ± 106	162 ± 21	6.60 ± 0.95
T2	1,021 ± 128	148 ± 41	7.14 ± 1.29
T3	1,041 ± 40	131 ± 15	8.02 ± 0.80

Note: T0 (basal diet), T1 (T0 + turmeric), T2 (T0 + ginger), and T3 (T0 + beluntas leaf).

with average body weight of 25.2 kg. Daily weight gain of sheep of all treatment groups were also not significantly different, but turmeric addition resulted in 9.5% daily gain higher than that of control group. Feed utilization efficiency (FCR) was slightly better for those given sardinella oil based Ca-soap added with turmeric, eventhough it was not statistically significantly different.

Plasm Cholesterol and Triglicerides

Cholesterol and triglicerides of blood plasm were presented in Table 2. Blood cholesterol of sheep fed Ca-soap with herbal addition were slightly lower than that of control group. Blood composition including blood cholesterol was always in dynamic condition. It is affected by type of feed ingested. Blood triglicerides of sheep given Ca-soal with all herbal addition were consistently lower than that of control group.

Table 2. Blood cholesterol and and trigliserides of sheep fed sardinella fish oil based Ca-soap with different herbal addition (± SD)

Treatments	Plasm Cholesterol (mg%)	Plasm Trigliserides (mg%)
T0	83.86 ± 11.46	16.85 ± 5.35
T1	74.41 ± 11.60	34.83 ± 20.47
T2	60.63 ± 27.02	30.34 ± 14.27
T3	80.71 ± 15.29	32.02 ± 8.68

Note: T0 (basal diet), T1 (T0 + turmeric), T2 (T0 + ginger), and T3 (T0 + beluntas leaf).

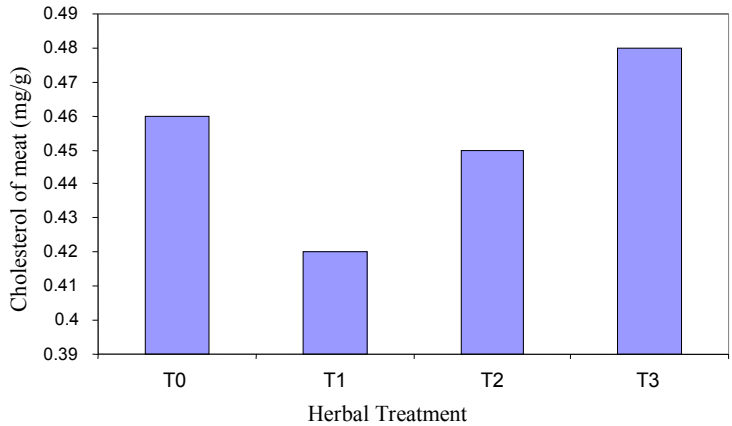

Figure 1. Cholesterol contents of meat of sheep fed experimental diets: T0 (basal diet), T1 (T0 + turmeric), T2 (T0 + ginger), and T3 (T0 + beluntas leaf)

Meat Cholesterol

Meat cholesterol contents of all groups are presented in Figure 1. Giving Ca-soap with herbal addition into diet did not consistently affect meat cholesterol content. Turmeric addition was able to reduce meat cholesterol better than with the addition of other herbals. Previous results (Sudarman *et al*., 2008[a]) showed that adding sardinella oil based Ca-soap at level of 3% without herbal addition decreased LDL cholesterol of 49%.

Conclusion

Herbal addition is not able to improve palatability of diet supplemented with Ca-soap fish oil. Sheep fed sardinella oil based Ca-soap with turmeric addition had better performance and lower cholesterol of meat.

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