Evaluation Model of Protected Fish Oil Supplementation to Realize The Quality and Productivity of Goat in The Doko District

Dyah Lestari Yulianti, Aju Tjatur Nugroho Krisnaningsih, and Tri Ida Wahyu Kustyorini

Animal Husbandry Faculty, Kanjuruhan University, Malang
Jl. S. Supriyadi No. 48 Malang, Phone (0341)801488
Email: triida@unikama.ac.id

ABSTRACT

The aim of this study was to evaluate the protected fish oil supplementation by calcium hydroxide in the diets for productivities of goat. The method in this study was *in vivo* assigned into randomized block design with 3 treatments and three groups body weight. The treatments were R_0: basal diet without oil supplementation, R_1: basal diet + 4% fish oil, R_2: basal diet + 4% Ca-fish oil. The variables measured [were] blood profile and body weight gain. Data analysis using Varian analysis, if the treatment showed significant difference, we used performed Duncan Multiple Range Test. The results showed that supplementation of protected fish oil by calcium hydroxide gave the real difference ($P<0.05$) on decreased of total cholesterol (R2=13.67±7.02 mg/dl), decreased of LDL (R2=1.33±1.53 mg/dl), and did not significantly ($P>0.05$) on decreased of HDL (R2=0.33±1.15 mg/dl), and gave very real difference ($P<0.01$) on body weight gain (R2=50.00±2.01 g/d). It was concluded that supplementation of protected fish oil by calcium hydroxide (R2) decreased the highest blood profile and increased the highest of body weight gain.

Key Words: Fish Oil Protected, Calcium Hydroxide, Productivity, Quality, Goat

INTRODUCTION

Goat is a commodity that has great potential to be developed. This is because goats are relatively inexpensive when compared to large ruminants. Besides raising goats can be done with a relatively small capital , so it is very suitable commodity for farmers in Indonesia , especially for small -scale family farmers - ranchers. Goats are also more efficient in utilizing feed with faster growth than large ruminants. With several advantages possessed by these goats commodity , then the goat farm potential to be developed. To realize the development of business opportunities such as the selection of feed ingredients that have economic value and high nutrition to achieve optimal production and quality. Productivity and quality of results depends on the quality of livestock feed. Oil supplementation in ruminant rations are often used to improve the productivity and quality of livestock carcasses. Lemuru oil, often used as an energy source and a source of unsaturated fatty acids in ruminant rations.

Ruminant animal feed ingredients that contain fatty acids long-chain polyunsaturated (poly unsaturated fatty acids/PUFA) often become inefficient for ruminants because PUFA will in biohidrogenasi in the rumen became saturated fatty acids / saturated fatty acids. PUFA changes into saturated fatty acids will make the high saturated fatty acids in livestock.

Oil supplementation in ruminant rations can disrupt rumen microbial growth, because unsaturated fatty acids may interfere with the growth of microbes (Adawiah et al, 2006). Fat as non-polar compounds, not easily soluble in rumen fluid medium, because it is fat tend to associate with food particles and rumen microbes, association forms a physical surface closure by fat (Pantoja et al., 1994), so the high fat content in ration interfere with the growth of rumen microbes.

Oil supplementation protected aimed so that the oil does not disturb the fermentation in the rumen and provide fatty acids for the land lord. The use of oils in ruminant rations in addition to

supply essential fatty acids are also expected to be a precursor for the synthesis of fatty acids that are beneficial to health such as low levels of cholesterol in animal products.

Adawiah (2006) supplementation of fish oil and vegetable oils with levels of 1.5 % does not interfere with the digestive system in the rumen. In addition the use of oil supplementation with 3% level and the level of 4.5% by Jenkins and Palmquist (1984).

Increased levels of unsaturated fats in ruminants results difficult to achieve due to the consumption of unsaturated fatty acids will experience biohidrogenasi in the rumen, so as to increase the levels of unsaturated fat that is achieved by preventing biohidrogenasi unsaturated fatty acids by way of protective fatty acids / oils . Type of protection is carried out in this study with the addition of calcium on fish oil.

MATERIALS AND METHODS

This study uses 9 tails goats as experimental animals. Feed used in this study consisted of elephant grass as a basal feed and concentrate with content of crude protein 15.13% and added of protected fish oil by calcium hydroxide and unprotected fish oil as a treatment.

Research carried out by using the experimental method randomized block design with 3 treatments and 3 replications. The feed treatments as follows:

R0: forage + concentrate (without treatment)

R1: forage + concentrate + 4% fish oil

R2: forage + concentrate + 4% protected fish oil

The feed were *Pennisetum purpureum* cv. Moot and concentrated. DM ration of forage: concentrate = 50: 50%. R1 and R2 on the treatment of oil addition were as much as 4% of the ration. Provision of oil mixed with the concentrate just before given to goat.

This study covers two periods of the protected fish oil manufacturing and in vivo experimental phase. In phase two trial in vivo include the period of adaptation period and the period of data collection. Principle of protected fish oil is hydrolyzed by calcium hydroxide into glycerol and fatty acid. Preliminary phase made for 1 week to allow time for adaptation to the conditions of the study, especially the goat enclosure and feed. The phase of data collection were carried out for 4 weeks to determine the effect of fish oil supplementation protected to blood profile and body weight gain. At this phase each of the goats were fed according to treatment. Provision of drinking water was adlibitum.

Variables observed in this study that the blood profile (decreased levels of cholesterol and LDL, and HDL levels) and body weight gain. The data in this study were tabulated and analyzed by analysis of variance (variance) of experiments using randomized block design.

RESULTS AND DISCUSSION

High blood fat levels are some of the excess fat component of blood, especially the increase in total cholesterol levels. The amount of fat in the blood indicates the number of levels of fat in the meat of cattle. Cholesterol is very worried today because it can lead to atherosclerosis, where there is accumulation of materials containing cholesterol on the walls of the blood vessels that cause clotting, causing blockage of the arteries. Mean blood profiles during the study are presented in Table1.

Based on the results of analysis of variance, a protected fish oil supplementation gave the real effect ($P<0.05$) for total cholesterol. The highest of cholesterol decreased on treatment R2 (protected fish oil) were13.67±7.02 mg/dl. The lowest cholesterol decreased in the treatment of fish oil supplementation were -3.33±0.58 mg/dl or an increase of 3.33±0.58 mg/dl.

The treatment of fish oil and control gave higher values of total cholesterol when compared with treatment protected fish oil indicate that the absorption of saturated fatty acids in the treatment of both higher. The high absorption of saturated fatty acids is determined by two factors:

consumption fatty acid saturated or unsaturated fatty acid consumption is high but has biohidrogenation by rumen microbes.

Table1. Mean blood profiles during the study.

Treatment	Blood profile (mg/dl)		
	Cholesterol decreased	LDL decreased	HDL indcreased
R0	-1.00 ± 1.73[a]	-1.00 ± 0.01[a]	-0.53 ± 0.58
R1	-3.33 ± 0.58[a]	-1.33 ± 0.58[a]	-0.33 ± 1.15
R2	13.67 ± 7.02[b]	1.33 ± 1.53[b]	0.33 ± 1.15

Description: [ab] Different superscript in the same column are the real difference effect (P<0.05)

On protected fish oil treatment decreased total cholesterol biohidrogenation more due process can be prevented, which is the process of fat protection with calcium hydroxide. Calcium hydroxide compounds are base that can be used in the saponification process of calcification phase. Protected oil was used so for did not interfere with rumen fermentation system and can provide essential fatty acids to the post-rumen. Protected fatty acid is formed from the reaction of saturated and unsaturated fatty acids with ions calcium (Fernandez, 1999).

On protected fish oil treatment decreased total cholesterol biohidrogenation more due process can be prevented , which is the process of fat protection with calcium hydroxide . Calcium hydroxide compounds are basic compounds that can be used in the saponification process of calcification phase. Protected oil is used so much oil supplementation does not interfere with rumen fermentation system and can provide essential fatty acids to the post- rumen. Protected oil leak acid is formed from the reaction of saturated and unsaturated fatty acids with calcium ions (Fernandez , 1999). Levels of unsaturated fatty acids contained in fish oil can stimulate the secretion of cholesterol via the bile from the liver into the intestine and stimulates catabolism and LDL cholesterol in the liver back into bile acids, causing cholesterol levels down (Sudibya, 1998). This suggests that the unsaturated fatty acids contained in the soap calcium and fish oil successfully protected so not degraded in the rumen.

Results of research conducted by Adawiah, et al (2006), fish oil supplementation of calcium soaps produce lower cholesterol levels (74 mg/dl) compared to fish oil supplementation without protection (81 mg/dl). Joseph (2007) added the results of the study, a protected fish oil supplementation on sheep produce lower levels of cholesterol (69.37 mg/dl) compared to fish oil supplementation without protection (140.32 mg/dl).

Mechanism of protected fish oil by calcium hydroxide is not based on the melting point of fatty acids, but based on the level of acidity or pH. Protected fish oil calcium hydroxide is still intact on the acidity of the neutral atmosphere, and separately on the high level of acidity in the abomasum pH range 3 (Fernandez, 1999). It is suitable for protected fish oil supplementation where bonding calcium and unsaturated fatty acids on ruminal pH will be stable and will be released in the abomasum pH, so that the host animal is able to utilize without having saturated fatty acids in the rumen biohidrogenation process.

Kook et al., (2002) reported that fish oil is not protected increases serum cholesterol bovine blood. It is seen in sheep fed rations with fish oil supplements and corn oil (81 and 83 mg/dl) had higher cholesterol levels than fish oil supplements calcium soap and corn oil calcium soaps. While cholesterol sheep fed fish oil diet zinc soap and zinc soap corn oil (96 and 84 mg/dl) compared with sheep serum cholesterol fed fish oil and corn oil without protection. This suggests that making soap with mineral zinc is ineffective, remains unsaturated fatty acids are degraded in the rumen there by increasing sheep blood serum cholesterol levels.

Based on the results of analysis of variance, the protected fish oil supplementation calcium hydroxide gave significant effect (P <0.05), in the decrease of LDL levels. The highest LDL reduction at protected fish oil supplementation treatment were 1.33 ± 1.53 mg/dl, and lowest decrease occurred in fish oil supplementation were -1.33 ± 0.58 mg/dl or an increase of 1.33 ± 0.58 mg/dl but

not significantly different from the control treatment-1.00 ± 0.01mg/dl or an increase of 1.00±0.01mg/dl.

The low levels of LDL lowering fish oil supplementation in the treatment and control treatment due to process biohidrogenation unsaturated fatty acids by rumen microbes to saturated fatty acids. While on treatment of protected fish oil supplementation of calcium hydroxide to give value decreased levels of LDL substantial due process minimum biohidrogenation unsaturated fatty acids in the diet because of the oil protection by calcium hydroxide. A decreased level of LDL pattern follows the pattern of decline in total cholesterol levels.

Based on the results of analysis of variance, a protected fish oil supplementation did not significant (P>0.05) to increase HDL levels. HDL levels provide a relatively equal value, but there is a trend protected fish oil supplementation treatment gives a higher value when compared with other treatments. This is because the protein components of HDL were same on all treatments.

In general, protection of unsaturated fatty acids in fish oil consistently lowers blood lipid profiles; this is in accordance with the opinion of Engle et al (2000) which states that, poly unsaturated fatty acids (PUFA) affect hepatic gene transcription, thus affecting the metabolism of fat. Ω = 3 (PUFA, n = 3) down regulated sterol regulatory binding protein - 1 mRNA and sterol regulatory binding protein release from the endoplasmic reticulum, which affect lipogenic gene transcription. Ω - 3 bond with activated proliferators peroxisomee recepto - α increases lipoprotein lipase trascription so triasil glycerol catabolism faster.

Average of body weight gain over the period of data collection are presented in Table 2.

Table 2. Body weight gain averaging over the period of data collection

Treatment	Body weight Gain (g/day)
R0	36.11 ± 2.41^{a}
R1	43.06 ± 2.40^{b}
R2	50.00 ± 2.01^{c}

Description: ^{ac} Superscript different in the same column showed very real differences (P<0.01)

Based on the results of analysis of variance, fish oil supplementation protected by calcium hydroxide gave very real differences (P < 0.01) of the body weight gain. The average of the highest body weight gain on protected fish oil supplementation treatment were 50.00 ± 2.01 g/head/day. Whereas fish oil supplementation in the treatment gives a lower value is 43.06 ± 2.40 g/head/day, although values tended to be higher when compared to the control treatment 36.11 ± 2.41 g/head/day.

The body weight gain on oil supplementation treatment tended to produce greater when compared to the control treatment, because oil has a caloric value of 2.25 greater when compared with carbohydrate calories, because oil has a balance of carbon and hydrogen with oxygen greater than carbohydrates , so it has the oil level low oxidation (Parakkasi, 1999). The high energy produced by the fat, then carbohydrates and proteins that should be degraded to energy deposited in the body, so the body weight increases. While oil supplementation protected tend to give higher values when compared with oil supplementation without protected. This is because the oil protected by Ca does not interfere with the activity of rumen microbes that feed degradation and more optimal nutrient absorption.

This is supported by the results of the study Joshep (2007) stated that the addition of 5% fish oil protected the sheep give the body weight gain reaches104g/head/day and the addition of 10% to 106 g/head/day. The results provide the body weight gain value is lower than the results of the study Joshep (2007) due to the same type of animal experiments in which the body weight gain is also not influenced by the type of livestock.

CONCLUSION

It was concluded that supplementation of fish oil protected by calcium hydroxide (P2) decreased the highest cholesterol (13.67 ± 7.02 mg/dl) and LDL (1.33 ± 1.53 mg/dl) and increased the highest of HDL (0.33 ± 1.15 mg/dl) and body weight gain (50.00 ± 2.01 g/day).

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