

Effect of feeding level on growth rate, carcass characteristics and meat quality of thin tailed lambs

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ABSTRACT

A study was conducted to investigate the growth rate and carcass characteristics of lambs under different feeding levels. Twenty one lambs (3 months old) were allocated into 3 treatments of feeding levels, namely 4% of body weight (BW) (T1), 5.5% of BW (T2) and provided ad libitum (T3). The diet contained 13.74% of CP and 61.79% of TDN. The lambs were raised to reach 25 kg BW, before being slaughtered. The parameters observed were dry matter intake (DMI), dry matter digestibility (DMD), body weight gain (BWG), feed conversion ratio (FCR), carcass production, meat-bone ratio (MBR), fat distribution, chemical composition of meat and fatty acids profile. The data obtained were analyzed by analysis of variance and continued by Duncan's multi-range test if there was any significant difference among the treatments. The results showed that the average of DMD was 59.71% ($P>0.05$). The lambs fed T3 had the highest BWG (203 g/day), the lowest FCR (6.8) and the shortest rearing time (67 days) ($P<0.01$). The average of carcass percentage was 46.36% and meat production was 6,931 g ($P>0.05$). The lambs of T3 had the heaviest carcass fat (2,698 g), the lightest carcass bone (1,985 g), the highest MBR (3.6), and the highest PUFA to SFA ratio (0.55). It can be concluded that the higher the feeding level resulted in the higher growth rate, the lower feed conversion ratio, higher meat-bone ratio and higher carcass fat production, lower feed conversion ratio and the shorter rearing time; but did not affect the meat quality.

Keywords: carcass production, feed efficiency, feeding level, lambs, growth rate.

INTRODUCTION

Growth rate has an important role in a fattening system of lambs (Petrovic *et al.*, 2011). On the other hand, the difference in growth rate may cause a change in the carcass composition and meat quality. The meat-bone ratio increases

with maturity and body weight (Perez *et al.*, 2002; Hopkins *et al.*, 2007 and Schreurs and Kenyon, 2017). Carcass characteristics such as dressing percentage, fatness level and meat quality are associated with slaughter weight, age of lambs and feed (Somasiri *et al.*, 2015; Camacho *et al.* 2017; Schreurs and Kenyon, 2017; Phrache

et al. 2021;). Many studies have been conducted to increase carcass production through high nutrient intake (Simoes *et al.*, 2021). High feed intake induces high growth rate (Jaborek *et al.*, 2018; Lara *et al.*, 2021). When the growth rate is high, the slaughter weight can be achieved in a shorter time (Prakash *et al.*, 2012; Rios-Rincon *et al.*, 2014).

However, lambs with high growth rate have high carcass fat content (Papi *et al.*, 2011). Nowadays, fat content is one of the important parameters to evaluate meat quality in relation to the prevention of several human diseases (Martemucci and D'Alessandro 2013). Consumers are more preferring to meat with low fat content (Schumacher *et al.*, 2022). Too high fat content in meat is associated with an increased incidence of coronary heart disease, obesity and cancer (Vannice and Rasmussen, 2014). Meat should contain 3%-7.3% intramuscular fat (Hopskin and Mortimer, 2014) and the ratio of high polyunsaturated fatty acid (PUFA) to saturated fatty acid (SFA) in order to maintain the human health (Camacho *et al.* 2017). Attention should be devoted to the determination of the feeding level to produce high meat yield with high feed efficiency (Brito *et al.*, 2017) and optimum fat content.

However, The studies that have already been carried out were on the effect of feed quality on carcass and meat characteristics when the animals were slaughtered at same age, so that they had different body weight. The animals with higher growth rate were slaughtered at higher

body weight, while the animals with lower growth rate were slaughtered at lower body weight. These caused the comparison between the meat characteristics of the animals were not possible to do. There are limited studies examining the effect of different feeding levels with the same feed quality on growth rate, feed efficiency and meat quality when the animals are slaughtered at the same body weight.

Based on the above explanation, this study was carried out to investigate the effect of feeding levels on growth rate, feed efficiency and meat quality in Thin-tailed Lambs when they were slaughtered at the same body weight. The results were expected to be able contribute development of lambs fattening program to produce healthy meat.

MATERIALS AND METHODS

Animals and Diets

Twenty one male thin-tailed lambs (weighed 11.93 ± 0.14 kg; aged 3-4 months) were used in this study. Feed was given in the form of pellets. The feed consisted of 20% sugarcane shoots, 15% rice bran, 36% cassava flour, 11% pollard, 10% soybean meal, 6% molasses, 2% minerals. Feed nutrients are presented in Table 1.

The experimental design used in this study was a completely randomized design. The lambs were randomly allocated into 3 treatments of feeding levels, namely 4% of BW (T1), 5.5% of BW (T2) and provided ad libitum (T3) following

Table 1. Nutrients content of feed

Nutrients	%
Dry Matter	90.06
Organic matter	79.13
Crude Protein	13.74
Ether Extract	2.27
Crude Fibre	18.37
Ash	20.87
Neutral Detergent Fibre	54.88
Acid Detergent Fibre	39.99
Gross Energy, kcal/kg	3,477

the finding of Prima *et al.* (2019) and Tejeda Aroyo *et al.* (2015) that dry matter intake (DMI) on lambs was 6,27 %. Adaptation stage in this study found that DMI of thin-tailed lambs was 7.9% BW.

Procedures

The study was carried out in 4 stages, namely the adaptation stage (2 weeks), the preliminary stage (1 week), the treatment stage (the period for raising the lambs to reach 25 kg BW), and the slaughter stage. In the adaptation stage, lambs were adapted to the environment used in this study and were given deworming medicine to eliminate worm parasites in the lambs. In the preliminary stage, the animals were randomized to obtain feed treatment. Then lambs were fed according to the treatment to eliminate the effects of the previous feed. At the treatment stage, lambs receiving T1 and T2 were fed every morning and afternoon, while feed for lambs receiving ad libitum was always available throughout the day. The refusal was weighed in the next morning before feeding. In the sixth week of treatment period, a total collection of faeces and urine was carried out for 7 days to determine digestibility and nutrient retention. Samples of feed, the refusals and faeces were analysed to determine the nutrient contents of the samples. The analysis of the dry matter and crude fat content was carried out according to AOAC standard procedure (2016), the nitrogen content of feed, faeces and urine were analysed using Kjehldahl method (AOAC, 2016). The energy content of feed, faeces and urine was analysed using Automatic Ballistic Bomb Calorimeter.

The lambs were raised until their body weight reached 25 kg following Prima *et al.* (2019) that found fattening Thin-tailed lambs could achieve slaughter weight 26.85 kg. and then they were slaughtered. Before being slaughtered, the lambs were fasted for 12 hours to reduce the digesta in the digestive tract. During fasting, the lambs were still given water ad libitum. The lambs were slaughtered by cutting the jugular vein, oesophagus and trachea (Andres *et al.*, 2019). When the carcasses formed then all

components were weighed.

Parameters and measurements

The parameters observed in this study were nutrients intake (NI), nutrient digestibility (ND), body weight gain (BWG), feed conversion ratio (FCR), length of rearing period, carcass production, carcass meat production, carcass fat production, carcass bone production, meat-bone ratio (MBR), rib eye muscle area (REA), fat and protein content of meat, fat distribution, and fatty acids profile of meat.

The parameters were measured as following: Nutrient intake (NI) (g/day) = dietary nutrient provided - dietary nutrient refused; Total NI (g) = the sum of NI during the rearing period; Nutrient digestibility = (NI - nutrient in the faeces) / Nutrient intake x 100. Body Weight Gain (BWG) (g/d) = (final BW - initial BW) / length of rearing period; Feed conversion ratio (FCR) = DMI (g) / BWG (g); Carcass percentage = (hot carcass weight / slaughter BW) x 100%; Carcass meat, carcass fat and carcass bone weight were obtained by weighing; The meat-bone ratio = carcass meat weight / carcass bone weight; and REA was measured between the 12th and 13th ribs (right side), using a plastic grid. Fat was taken from Longissimus dorsi according to Camacho *et al.* (2017) and fatty acids profile was determine as described by Utrilla *et al.* (1993)

Statistical analysis

Data were analysed using analysis of variance (ANOVA). If there was any difference in the 5% level, then Duncan's multiple-range test was applied.

RESULTS AND DISCUSSION

Nutrients Intake and Digestibility

The treatment applied had a significant effect on the nutrient intake ($P < 0.01$). Lambs fed T3 had the highest NI, followed by T2 and T1 (Table 2). Dry matter intake (DMI) of lambs fed T3 was 7.9% of BW. This figure was higher than that of Tejeda-Aroyo *et al.* (2015) that DMI of Assaf lambs fed ad libitum was 6.27%BW. The

lamb in the study of Tejeda-Aroyo *et al.* (2015) was weaned lambs at age of aged 3 months, and received diet containing 16.2% of crude protein. Dry matter intake of the lamb fed T3 was also higher than the statement of Jayanegara *et al.* (2017) that DMI of local sheep in Indonesia was 3.82% BW. This is probably due to the age of the lambs in this study was still young as well as low body weight, so that the nutritional requirements for growth were relatively high. Riaz *et al.* (2014) stated that nutritional needs was proportional to body weight. The smaller the body size of an animal, the higher maintenance requirements per unit of body weight.

The highest DMI of the lamb of T3 resulted in the highest OM, CP and energy intakes ($P < 0.01$) followed by those of T2 and T1. This is because the higher DMI, the intake of organic matter, crude protein, and energy also increased (Table 2). Lara *et al.* (2019) has shown that the higher dry matter intake also promote nutritional component intake in it.

The results of this study showed that the higher the feeding level, the lower the total DMI during raising period ($P < 0.01$). The highest daily DMI of T3 caused lambs fed T3 reached 25 kg of BW in the shortest period (67 d) with 203 g/d of BWG. This followed by T2 (118 d of raising period and 129 g/d BWG) and T1 (184 d of raising period and 74 g/d BWG). This study resulted in the lowest total DMI in lambs fed T3, followed by T2, and the total DMI of T1 was the highest. This was due to the higher the DMI, the more efficient the feed utilization to increase body weight. Abouheif *et al.* (2016) and Neto *et al.* (2011) stated that the high growth rate of animals is caused by the high availability of energy and protein.

Digestibility and retained nutrients are presented in Table 2 where feeding level had no significant effect ($P > 0.05$) on digestibility of DM, OM, CP, and energy. The average digestibility of DM, OM, energy and CP in this study were 59.71%; 67.51%; 61.40% and 83.78%, respectively. The results in this study were not in line with the statement of NRC (2007) that claims that the higher the intake of feed, the fast-

er the rate of feed in the digestive tract, thereby reducing its digestibility. The non-significant different on digestibility in this study was due to the high NDF content in the diet. Riaz *et al.* (2014) stated that sheep has a good response to the NDF content. The higher NDF in the diet makes the feed easy to digest and absorb. Zebeli *et al.* (2012) claimed that high effective fiber (NDF) increase chewing activity and saliva production, so that it could increase nutrient absorption and maintain ruminal pH. The results of this study were in line with those of Riaz *et al.* (2014), that sheep fed diet containing 12.4% of CP, 52.0 % of NDF, 36.4% of ADF has 58.0% of dry matter digestibility.

The lamb of T3 had the highest absorption and retention of DM, OM, Energy and CP ($P < 0.01$), followed by that of T2 and T1. This was due to the fact that feeding level did not significantly affect ($P > 0.05$) the nutrient digestibility and retention, so that the amount of nutrients absorbed from the digestive tract and retained in the body varied with the feeding level. The energy retention per energy digestibility in this study was 86.3%. These results were in agreement with the finding of the study by Xu *et al.* (2015) that weaned Droper x Thin-tailed lambs fed ad libitum had 82% energy retention per energy digestibility. The diet in Xu *et al.* (2015) study contained 2,323 kcal/kgDM and 13.1% of CP.

Productivity

The feeding level had an effect on BWG in Thin-Tailed lambs ($P < 0.01$). The higher the feeding level, the higher the BWG can be achieved. Lambs fed T3 had the highest BWG, and followed by lambs fed T2 and T1 (Table 3). The high feed intake and retention of nutrients caused the increase of Thin-tailed lambs growth. The BWG of lambs fed T3 was higher than those of Prima *et al.* (2019) that Thin-tailed lambs had BWG of 151 g/d. That was due to differences in the nutrition of the feed given where study Prima *et al.* (2019) were fed ad libitum with a protein intake of 201 g/day and a CP content of 15.5%, NDF 52.7%, and ADF 33.3%.

The results showed that the higher the feed-

Table 2. Nutrient Intake, Digestibility and Retention of Thin-tailed lambs fed different feeding levels

Parameters	T1	T2	T3	P value
Nutrient Intake				
DM intake (g/d)	736 ^A	1075 ^B	1516 ^C	0.00
Total DM intake during rearing (kg)	136 ^C	127 ^B	101 ^A	0.00
OM intake (g/d)	582 ^A	851 ^B	1200 ^C	0.00
CP intake (g/d)	101 ^A	148 ^B	208 ^C	0.00
Energy intake (kcal/d)	1975 ^A	2780 ^B	4861 ^C	0.00
Nutrient digestibility				
DM digestibility (%)	60.70	59.04	59.41	0.74
OM digestibility (%)	68.53	66.87	67.13	0.64
CP digestibility (%)	84.22	83.80	83.31	0.81
Energy digestibility (%)	62.40	60.63	61.09	0.71
Digestible nutrient intake (g/d)				
Digestible DM intake (g/d)	446.76 ^A	635.16 ^B	901.19 ^C	0.00
Digestible OM intake (g/d)	399.04 ^A	569.18 ^B	805.61 ^C	0.00
Digestible CP intake (g/d)	85.16 ^A	123.77 ^B	173.57 ^C	0.00
Digestible energy intake (kcal)	1236 ^A	1687 ^B	2980 ^C	0.00
Retained nutrient (g/d)				
Energy (kcal/d)	1111 ^A	1454 ^B	2488 ^C	0.00
CP (g/d)	59.95 ^A	94.47 ^B	134.09 ^C	0.00
Nutrient retention (%)				
Energy	54.93	52.35	51.89	0.32
CP	59.44	64.21	64.37	0.40

DMI: dry matter; OM: organic matter; CP: crude protein;
Superscript in the same row indicate a very significant difference (P<0.01)

ing level, the lower the feed conversion ratio (P<0.01). The lambs fed T3 had the lowest FCR (6.4) then followed by T2 (8.5) and lambs fed T1 had the highest FCR (10.7). The high level of feeding increase the nutrients intake and productivity significantly. The higher the intake of DM, OM, CP and energy, the higher the nutrients that can be utilized to increase the growth rate so that it can reduce the conversion value. Oksbjerg and Therkildsen (2017) stated that the higher rate of muscle growth, the higher the average daily gain where meat content in the carcass increase in short time and reduce feed conversion ratio. The FCR in this study was lower than that of Prima *et al.* (2019) which showed that Thin-tailed lambs fed a diet with a CP of 15.5%, NDF 52.7%, and ADF 33.3% had a feed conversion of 9.1.

Production and carcass characteristics in this study are shown in Table 3. The carcass pro-

duction was not significantly different (P > 0.05) in all treatments; the average was 46.36%. This was because the slaughter weight of this study was same. Valizadeh *et al.* (2021) claimed that carcass weight increased with increasing slaughter weight. Schreurs and Kenyon (2017) stated that carcass production ranged between 40% and 52%. Previous study by Prima *et al.* (2019) showed that carcass production of Thin-Tailed lambs with slaughter weight of 25.76 kg was 47.67%. The study of Purbowati *et al.* (2021) showed that Thin-tailed lambs with slaughter weight of 20,03 kg had 40.0% of carcass production.

Meat production in this study was not significantly different (P>0.05). The average of meat weight in this study was 6,931 g. This study indicated that meat weight was parallel with the body weight and carcass weight. In this study showed that muscle of Thin-tailed lambs had a

high growth rate and as long as a high body weight, the rate of muscle growth decreased and fat growth increases. Schreurs and Kenyon (2017) stated that proportion of muscle in the carcass decreased and the proportion of fat increased as along as the increase of body weight. The results of the current study was same with Prima *et al.* (2019) which showed that Thin-tailed lambs with 25.76 kg of slaughter weight had 6,700 g of meat weight. The meat weight in this study was higher than that of Purbowati *et al.* (2021) which showed that Thin-tailed lambs with 20.03 of slaughter weight had meat weight of 4,500 g.

The results showed that the higher the level of feed, the lower the bone weight ($P<0.01$). Lambs fed T3 had the lowest bone weight ($P<0.01$) in comparison to that of T2 and that of T1. These result indicates that the growth of bone in Thin-tailed lambs cannot be accelerated or stimulated by increasing feed intake. The lambs of T3 achieved slaughter weight in an younger age. In this study, the bone weight was relatively small as compared to the lamb of T1 that was slaughtered at the age of 5 months. Rios-Rincon *et al.* (2014) stated that bone growth occurs in line with age. Brito *et al.* (2017) and Herath *et al.* (2021) stated that high growth rate caused the slaughter weight can be achieved sooner. Moloney and McGee (2017) also stated that bone growth will continue until the growth plates close at post-puberty where skeletal size in mature sheep is reached.

The higher the feeding level, the higher the fat content in the carcass ($P<0.01$). Lambs fed T3 had the highest carcass fat (2,698 g) then followed by that of T2 (2,143 g) and that of T1 (1,955 g). In this study, lambs of T3 had high nutrient deposition so that it could be used to fulfil the nutrients needed for maintenance, production and increase adipose tissue. This study showed that lambs fed T3 utilized the high nutrient intake for fat deposition (Table 3). Phrache *et al.* (2022) and Merrismen and Smith (2005) state that excess energy supply is used to increase the growth of adipose tissue. The results of the study of McLeod *et al.* (2007) and Jaborek *et al.*

(2018) show that the more energy is retained, the greater adipose tissue is deposited. Paredes *et al.* (2013) and Santos *et al.* (2018) stated that the growth rate of fat tissue increased when the lambs had reached maturity. Phrache *et al.* (2022) stated that fat develops in the order of abdominal, intermuscular, subcutaneous then intramuscular.

The results the current study showed that the meat-bone ratio of lambs of T3 was the highest ($P<0.01$), followed by that of T2 and that of T1. This was attributed to the fact that the lambs of T3 produced higher muscle weight with lower bone weight compared with the lambs of T2 and T1. This finding was in agreement with the statement of Purslow, (2017) that when the animal grows rapidly, the muscle grows faster than the bone, so that the meat-bone ratio increases. The meat-bone ratio of the lambs of T3 in this study was higher than that of Purbowati *et al.* (2019), namely 2.84. This difference is due to differences in nutrient composition the diet given. The study of Purbowati *et al.* (2019) used feed with 10.78% CP, 56.25% TDN, and had the carcass weight of 8.4 kg.

The lambs of T3 had higher subcutaneous fat and intermuscular fat weight ($P<0.05$) than those of T1 and T2 (see Table 3). It was due to the lambs of T3 had a lot of nutrients to digest and could be metabolized and then deposited as subcutaneous fat and intermuscular fat. Study of Phrache *et al.* (2022) and Purbowati *et al.* (2021) showed that fat was deposited in most tissues in the body and in four parts, namely abdominal, subcutaneous, intermuscular and intramuscular. Paredes *et al.* (2013) and Santos *et al.* (2018) stated that the growth rate of fat tissue is still low at birth then slowly increases at first and increases more rapidly when the lambs reach maturity. A high amount of feed can cause high growth rate of lambs so that adipose fat tissue can increase.

Meat Quality

The chemical composition of the meat are shown in Table 4. The results showed that the level of feedings did not affect ($P<0.05$) the wa-

Table 3. Productivity and fat distribution of Thin-tailed lambs fed different feeding levels

Parameters	T1	T2	T3	P value
BWG (g)	74 ^A	129 ^B	203 ^C	0.00
FCR (g feed / g ADG)	10.7 ^C	8.5 ^B	6.8 ^A	0.00
Rearing period (d)	184 ^C	118 ^B	67 ^A	0.00
Dressing percentage	46.5	46.9	45.3	0.44
Meat (g)	6,788	6,889	7,116	0.63
Fat (g)	1,955 ^A	2,143 ^A	2,698 ^B	0.00
Bone (g)	2,194 ^B	2,251 ^B	1,986 ^A	0.00
Meat-bone ratio	3.1 ^A	3.1 ^A	3.6 ^B	0.00
Subcutaneous fat (g)	1.057 ^a	1.350 ^b	1.503 ^c	0,02
Intermuscular fat (g)	755 ^A	793 ^A	1196 ^B	0,00
Kidney and pelvic fat (g)	176	150	136	0,32
Abdominal fat (g)	609	617	675	0,56

BWG: body weight gain; FCR: feed conversion ratio; REA: rib eye muscle area
Superscript in the same row indicate a very significant difference (P<0.01)

Table 4. Chemical composition and Fatty acids profile as a percentage of *Longissimus dorsi* in Thin-tailed lambs fed different feeding levels

Parameters	T1	T2	T3	P value
Chemical composition				
Water	72.55	72.70	73.06	0.86
Protein	21.83	21.67	22.23	0.24
Fat	5.06	5.75	5.38	0.69
Saturated fatty acid				
Lauric (C12:0)	0.25	0.33	0.31	0.47
Myristic (C14:0)	2.68	2.33	2.21	0.19
Palmitic (C16:0)	13.52 ^b	14.28 ^b	11.89 ^c	0.00
Stearic (C18:0)	20.74 ^b	19.07 ^b	18.49 ^c	0.00
Mono unsaturated fatty acid (MUFA)				
Heptadecanoic (17:1)	0.37	0.30	0.28	0.79
Oleic (C18:1)	33.08 ^a	34.73 ^{ab}	35.80 ^{bc}	0.05
Poly unsaturated fatty acid				
Linoleic (C18:2)	5.92 ^a	8.11 ^b	9.10 ^{bc}	0.04
Linolenic (C18:3)	2.77 ^a	3.28 ^b	3.10 ^c	0.00
Eicosapentaenoic (EPA/C20:5)	2.62	2.79	2.29	0.26
Docosahexaenoic (DHA)	2.46 ^a	2.16 ^a	3.78 ^b	0.00
SFA	37.19 ^b	36.01 ^b	32.90 ^a	0.00
MUFA	33.45 ^a	35.04 ^b	36.07 ^b	0.02
PUFA	13.77 ^a	16.34 ^b	17.97 ^c	0.00
MUFA/SFA	0.91 ^a	0.98 ^a	1.10 ^b	0.00
PUFA/SFA	0.37 ^a	0.45 ^b	0.55 ^c	0.00

ter, protein and fat content of the lamb meat. The average water, protein and fat content of the meat in LD were 72.77%, 21.91% and 5.40%, respectively. This indicated that the nutrients

content of the meat were not affected by level of feeding. This was due to lambs were slaughtered at the same weight and still relatively young (under 1 year old). A study by Camacho *et al.*

(2017) showed that chemical compositions of meat were affected by slaughter weight. The higher the slaughter weight, the higher the protein and fat percentage. Phrache *et al.* (2021) claimed that the age of lamb also affects the fat content of meat. The older the animal, the higher the fat content. The results of this study were similar to those of Camacho *et al.* (2017) who found that chemical composition of Caranian lamb slaughtered at a slaughter weight of 25 kg contains 72.7% water, 21.86% protein and 3.07% fat. Lopez-Bate (2017) claimed that lamb meat consisted of 72-80% water, 16-22% protein and 2.5% fat.

The level of feed had a significant effect ($P < 0.01$) on saturated fatty acids, especially at C16:0 (palmitate) and C18:0 (stearate). The higher the level of feed, the lower the palmitate and stearate content. The level of feed increased mono-unsaturated fatty acid (MUFA), namely C18:1 ($P < 0.05$) and PUFA, especially at 18:2 ($P < 0.05$); C18:3 and DHA ($P < 0.01$). The high levels of MUFA and PUFA in lambs fed T3 were due to the high feed intake, so that increasing the intake of feed components consisting of grains such as soybean meal, pollard and rice bran. Prache *et al.* (2021) stated that feed ingredients from grains are relatively rich in linoleic acid (LA). The results of a study by Ladeira *et al.* (2014) also showed that soybean meal increased C18:2 and C18:3 levels in beef. This result was similar to the study of Romero-Bernal *et al.* (2017) that soybean meal supplementation significantly increased C18:1 level. The high levels of C18:2 and C18:3 fatty acids in this study increased DHA levels. This was because the DHA was derived from essential fatty acids, namely C18:2 and C18:3.

Lambs fed T3 had a ratio of 0.55 and higher than that of T1 and T2 ($P < 0.01$). This was due to the increased levels of PUFA fatty acids and decreased levels of SFA in lambs of T3. The results of this study were higher than that of by Santos *et al.* (2018) which showed that the PUFA/SFA ratio in sheep fed ad libitum with a slaughter weight of 27 kg was 0.40. The total UFA/SFA in this study was similar to the findings of Ladeira

et al. (2014) that sheep fed with soybean meal supplementation had a UFA/SFA of 1.31. The high levels of PUFA and MUFA in this study indicated that the meat produced was very good for health. Vannice and Rasmussen (2014) stated that an increase in the value of UFA/SFA can reduce cholesterol levels especially low-density lipoprotein (LDL), while MUFA, in addition to lowering total cholesterol, decreased LDL and increased high-density lipoprotein (HDL).

CONCLUSION

Based on the results of this study, it can be concluded that feeding level had no significant effect on feed digestibility. Therefore, the higher the feeding level, the higher the amount of nutrient absorbed from the digestive tract. This in turn increased BWG of lambs and decreased feed conversion ratio. The higher feeding level reduced the length of period and the total feed needed by the lambs to reach slaughter weight (25 kg). The higher feeding level also resulted in a higher fat production, lower bone production and high PUFA to SFA ratio. So that, it is recommended to raise weaned lambs intensively with complete feed ad libitum.

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