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Artigo

Effects of Energy Levels and growth performance on Physical Characteristics of Iranian Lambs Meat

Efeitos de níveis de energia e desempenho de crescimento nas características físicas da carne de cordeiros iranianos

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Abstract: This study was looking for the effects of energy levels and growth performance on physical characteristics of Iranian lambs' meat. Forty-eight male lambs (initial BW 31.6kg) and 5-month age were assigned to a completely randomized design with factorial method includes fattening periods (12weeks and 15weeks) and levels of metabolism energy (ME) (2.36 and 2.62 ME M cal/kg DM intake). Diets were iso-nitrogenous (14.1 percent crud protein on DM). The rations were mixed and have been fed *ad-libltum*. The lambs were weaned at 90±5 days of age and divided randomly in two fattening periods groups includes 12weeks and 15weeks (2×24 lambs) and each fattening periods split in two energy levels (2×12). At the end of each fattening period, half of the lambs (24 lambs) were randomly selected and after 18h fasted slaughtered. After trimming and skinning, all the abdominal and interior organs were removed and weighed. The warm carcasses were chilled at 3±2ºc for 24 h and weighed, after that their carcass cuts composition was measured. All data were analysed as a completely randomized design with factorial experiment using the GLM procedure of SAS (2010). The average of final, metabolic and hot carcass weight for 12 weeks fattening were 48.1, 18.2 and 25.5 kg and for 15 weeks fattening were 50.9, 19.1 and 27.5 kg ($p < 0.05$). Among fattening period (12weeks and 15weeks) and different levels of metabolism energy for final, metabolic and carcass weight had significant ($p < 0.05$). The total mean of dressing percentage between fattening periods and different levels of energy was not significant. The mean of total carcass meat, bone, and subcutaneous fat and fat-tail percent for 12weeks fattening were 46.7, 11.7, 15.3 and 22.5 percent and 15weeks fattening were 45.9, 11.7, 16.1 and 23.6 percent respectively. But between fattening period and different levels of energy for carcass meat, bone, subcutaneous fat and fat-tail percent were not significant. However, the 12weeks fattening period and 2.36 M Cal ME/kg DM of metabolism energy positive effects on some carcass characteristics, because lower subcutaneous fat and fat-tail percent and carcass composition were not significant.

Keywords: Meat, Fattening performance, Metabolizable energy levels, Carcass characteristics.

Resumo: Este estudo procurou os efeitos dos níveis de energia e desempenho de crescimento nas características físicas da carne de cordeiros iranianos. Quarenta e oito cordeiros machos (PC inicial 31,6kg) e 5 meses de idade foram distribuídos em delineamento inteiramente casualizado com método fatorial incluindo períodos de engorda (12 semanas e 15 semanas) e níveis de energia metabólica (EM) (2,36 e 2,62 EM M cal/kg ingestão de DM). As dietas foram isonitrogenadas (14,1 por cento de proteína bruta sobre a MS). As rações foram misturadas e fornecidas ad-libltum. Os cordeiros foram desmamados aos 90±5 dias de idade e divididos aleatoriamente em dois grupos de períodos de engorda incluindo 12 semanas e 15 semanas (2×24 cordeiros) e cada período de engorda dividido em dois níveis de energia (2×12). Ao final de cada período de engorda, metade dos cordeiros (24 cordeiros) foram selecionados aleatoriamente e após 18h de jejum abatidos. Após o desbaste e esfola, todos os órgãos abdominais e internos foram retirados e pesados. As carcaças quentes foram resfriadas a 3±2ºC por 24 horas e pesadas, após o que foi mensurada a composição dos cortes da carcaça. Todos os dados foram analisados em delineamento inteiramente casualizado com experimento fatorial utilizando o procedimento GLM do SAS (2010). As médias de peso final, metabólico e de carcaça quente para 12 semanas de engorda foram 48,1, 18,2 e 25,5 kg e para 15 semanas de engorda foram 50,9, 19,1 e 27,5 kg ($p< 0,05$). Entre o período de engorda (12 semanas e 15 semanas) e diferentes níveis de energia metabólica para o peso final, metabólico e de carcaça houve significância ($p< 0,05$). A média total de porcentagem de rendimento entre os períodos de engorda e diferentes níveis de energia não foi significativa. A média de carne totals da carcaça, osso e gordura subcutânea e gordura da cauda para 12 semanas de engorda foram 46,7, 11,7, 15,3 e 22,5 por cento e 15 semanas de engorda foram 45,9, 11,7, 16,1 e 23,6 por cento, respectivamente. Já entre o período de engorda e os diferentes níveis de energia para os percentuais de carne da carcaça, osso, gordura subcutânea e gordura da cauda não foram significativos. No entanto, o período de engorda de 12 semanas e 2,36 M Cal EM/kg MS de energia metabólica efeitos positivos sobre algumas características da carcaça, porque a menor gordura subcutânea e percentual de gordura na cauda e composição da carcaça não foram significativos.

Palavras-chave: Carne, Desempenho de engorda, Níveis de energia metabolizável, Características de carcaça

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Intruduction

Lamb meat production is the main purpose of most sheep breeding enterprises throughout the world (YAKAN AND UNAL, 2010). Locally available breeds of livestock are important economic resources. Meat production from sheep has remained economically important for centuries in Iran. Lamb meat from local breeds is sought after in some parts of the world (DEVENDRA AND BUMS, 1983). Research for lamb meat from fat-tailed sheep breeds, might be associated with the fact that weight for weight they have a higher lean content in the carcass. Growing demand for lamb from local breeds and the inability of many countries to provide adequate supplies has resulted in an increase in the price of such meat leading to the establishment of semi-intensive to intensive feeding systems largely based on concentrates (HADJIPANAYIOTOU, 1988; 1990). The proper growth and development of growing lambs depends seriously on the animal's level of nutrition energy. The primary principle of the intensive lamb fattening process is concerned with the use of intensive feed ingredients in order to benefit the high rate of development in the lambs early ages. Energy is the major dietary element that is responsible for the different utilization of nutrients and thereby the productivity and gain of an animal (HOSSEINI et al., 2008). On the other hand, The knowledge of lamb carcass composition, the quantitative accretion of each carcass component and changes in growth patterns at various stages of growth or fattening periods is important both in nutrition studies (in which energy levels are being determined) and in production system analyses that attempt to optimize profit. Proper understanding of the quality and distribution of dissectible body components such as bone, fat and lean throughout the carcass is also required not only to assess the animal as a meat producer, but also to market the meat efficiently (NEGUSSIE et al., 2004).

The chalishtory fat-tail sheep is common native breed in the south west part of Iran and so sheep are important meat – producing animal in Iran. These sheep found in the province of Chaharmahal & Bakhtiari provience, Eastern of Zagross Mountains in the west of Iran are tolerant to extreme cold temperatures, poor feeding and diseases. Traditional breeders generally rear these sheep that graze in the outskirts of the villages, along the riverbanks and by the roadside (KARAMI, 1998). Growth in animal is defined by an increase in body cells and growth and differentiation of body cells (Bathaei and Leroy, 1996; Orr, 1982) that is achieved by both hypertrophy and hyperplasia until a mature size is reached. The development of an animal can be defined as changes in body conformation and form until maturity is reached (LAWRIE, 1998). Growth–rate and body size along with changes in body composition are of great economic importance for efficient production of meat animals. Berg and Walters (1983) have reported that fast growing lean in animal breeds are more growing fatter breeds. Growth rate of lambs, particularly during the early stages of growth, is strongly influenced by breed (genotype), milk yield of the ewe, the environment under which the animals are maintained including levels of metabolizable energy and length of fattening periods (AL JASSIM, et al., 1996; BATHAEI and LEROY, 1996; BURFENING and KRESS, 1993; NATTER and COPENHAVER, 1980). Level of nutrition is known to influence body or carcass composition significant (BLACK, 1983; BUTLER-HOGG, 1984). Supporting such theory, Aziz, et. al. (1992) has observed that the body fat of sheep serves as an immediate source of energy during under nutrition. In a study by canton et al. (1992) it was reported that nutrition influences carcass yield and quality, fat deposition and composition while breed effect was observed to be greatest in influencing carcass conformation as well as carcass composition. Body weight is the main determinant of body composition of animals of the same breed and sex group regardless of age or nutritional level (TURGEON, et al., 1986). This study is carried out to evaluate use of Therefore, the goal of this study was effects of interaction between levels of energy and fattening periods on growth and carcass composition in chalishtory male lambs one of the Iranian native lambs. Murphy (2003) reported that energy source had a significant impact average daily gain, feed efficiency and days on feed, with the high concentrate diet being superior to the TMR and high forage diet for both feed efficiency and days on feed.

Materials and Methods

Forty-eight male fat- tailed native lambs (all from the same farm) 5 months old with an initial live body weight of 31.4± 0.6 kg were divided randomly into two fattening periods and two energy levels (four equal groups with 12 animals each) as follow: The lambs were allowed to adapt to the conditions for 2weeks. After the adaptation period, the lambs were weighed and randomly assigned to 2*2 factorial design according to different fattening periods (12weeks and 15weeks) and energy levels (2.36 and 2.62 M Cal/kg DM. The lambs were kept in individual boxes and fed individually. The composition of 2.36 M Cal ME/kg DM diet was 60 percent forage (alfalfa) and 40 percent concentrate consisted 60 percent forage (alfalfa) and 40 percent concentrate (15 percent barley, 10 percent beet pulp, 6 percent wheat bran, 8 percent cottonseed meal, 0.05 percent mineral supplement and 0.05 percent salt). The composition of 2.62 M Cal ME/kg DM diet was 40 percent forage (alfalfa) and 60 percent concentrate consisted (35 percent barley, 7 percent beet pulp 7 percent wheat bran, 10 percent cottonseed meal, 0.05 percent mineral supplement and 0.05 percent salt). During the feeding trial, animals were weighted monthly and nutrients requirements were adjusted according to the change in their live body weight. The diets were prepared weekly as totais mixed rations and animals consumed diets ad- libitum daily, feed refused were daily weighed to calculate dry matter intake (DMI). Drinking water was available for all animals during the whole feeding trial.

After feeding the experimental diets for 12weeks and 15weeks (end of each experiment periods), half of the lambs (12 lambs) were weighed following an overnight fast and subjected to the Halal slaughter at the Animal Science Department Abattoir.

Slaughter was performed by severing the jugular vessels, the esophagus and the trachea without stunning. Carcasses were weighed and after trimming, skinning and severance of head and feet, all of the abdominal and interior organs were removed and weighed. Internal fat tissues, which internal fat included peritoneal and mesenteric, kidney, heart and channel fats depots, were weighed separately. The carcass was then chilled for 24 h at 2- 3°C. Post chilling carcass weight was recorded 24 h post mortem and then the carcass was split into two equal, left and right, halves using an electric saw. The right half carcass was weighed and then cut into six primal cuts: neck, shoulder, breast-flank, loin, leg and fat-tail, the method of dissecting described by Farid et. al. (1993). The cuts were weighed and expressed as a percentage of the total weight of the right half carcass. Each cut was dissected into components of lean meat, bone, subcutaneous fat and intermuscular fat.

All data were analyzed as a completely randomized design with A 2*2 factorial experiment (Fattening periods* Energy levels) was employed for carcass composition with using the General Linear Model (GLM) procedure of the SAS statistical package (SAS Ver 9.1, Institute, Inc.). The initial weight and hot carcass were used in the model as covariate, because they had significant effect on some variables. If covariance was not significant effects were deleted from the final model. The significance of the differences among least square means of main effects was tested by Duncan's new multiple-range test. Interactions between main effects were tested and those with no significant effects were deleted from the final model.

Results and Discussion

The lambs consumed all the diets (2.36 and 2.62 M Cal/kg DM) offered. The average of final, metabolic and hot carcass weight for 12 weeks fattening wre 48.1, 18.2 and 25.5 kg and for 15 weeks fattening were 50.9, 19.1 and 27.5 kg ($p < 0.05$). least square mean of fattening period (12 weeks and 15 weeks) and different levels of energy (2.36 and 2.62 M Cal/kg DM) for final weight, metabolic weight, hot and cold carcass weight (Table 1) were significant ($p < 0.05$).

Table 1. Carcass characteristics of lambs in different fattening performance (12 weeks and 15 weeks) and Energy levels (2.36 and 2.62 ME M cal/kg DM)

	Fattening performance				Energy levels			
	12 weeks		15 weeks		2.36		2.62	
Parameter	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Initial weight (kg)	31.4[a]	0.6	31.3[a]	0.6	31.1[a]	0.6	32.1[a]	0.6
Final weight (kg)	48.1[b]	0.5	50.9 [a]	0.5	48.4[b]	0.6	50.5[a]	0.6
Metabolic weight (kg)	18.2 [b]	0.2	19.1[a]	0.2	18.4[a]	0.2	18.9 [a]	0.2
Hot carcass (kg)	25.5[b]	0.4	27.5 [a]	0.4	25.9[a]	0.5	27.1[a]	0.5
Cold carcass (kg)	24.9 [b]	0.4	27.1[a]	0.4	25.5[a]	0.4	26.5[a]	0.4
Dressing out (%)	53.6[a]	0.4	53.7[a]	0.4	54.1[a]	0.4	53.3[a]	0.4
Mesentery fat (%)	2.23[a]	0.3	2.91[a]	0.3	2.6[a]	0.3	2.6[a]	0.3
Kidney fat (%)	0.33[b]	0.03	0.43[a]	0.03	0.33[a]	0.03	0.38 [a]	0.03
Heart fat (%)	0.15[a]	0.01	0.15[a]	0.01	0.15[a]	0.01	0.15[a]	0.01
Channel fat (%)	0.87[a]	0.1	0.92[a]	0.1	0.77[a]	0.1	1.02[a]	0.1
Total meat (%)[1]	46.7[a]	0.9	45.9[a]	0.9	47.4[a]	0. 9	46.5 [a]	0.9
Total bone (%)[1]	11.7[a]	0.2	11.7[a]	0.2	11.6[a]	0.2	11.7[a]	0.2
Total subcutaneous fat (%)[1]	15.3[a]	0.6	16.1[a]	0.6	15.1[a]	0.6	16.4[a]	0.6
Fat-tail (%)	22.5[a]	0.8	23.6[a]	0.8	22.4[a]	0.9	23.3[a]	0.9
Neck (%)	6.49[a]	0.2	6.89[a]	0.2	6.53[a]	0.2	6.85[a]	0.2
Leg (%)	23.9[a]	0.3	24.1[a]	0.3	23.5[b]	0.3	24.4[a]	0.3
Shoulder (%)	13.9[b]	0.3	14.7[a]	0.3	14.8[a]	0.3	14.9[a]	0.3
Loin (%)	15.1[a]	0.3	15.7[a]	0.3	15.5[a]	0.3	15.3[a]	0.3
Breast and flank (%)	15.9[a]	0.3	14.9[b]	0.3	15.2[a]	0.3	15.6[a]	0.3

Cont. Table 1. Interaction of different fattening performance (12 weeks and 15 weeks) and Energy levels (2.36 and 2.62 ME M cal/kg DM) in Carcass characteristics of lambs

	Fattening performance (weeks)							
	12 weeks				15 weeks			
	Energy levels				Energy levels			
	2.62		2.36		2.62		2.36	
Parameter	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Initial weight (kg)	32.1[a]	0.9	30.7[a]	0.9	32.2[a]	0.9	30.5[a]	0.9
Final weight (kg)	47.9[b]	0.7	48.1[b]	0.7	52.9[a]	0.8	48.9[b]	0.8
Metabolic weight (kg)	18.3[b]	0.2	18.2[b]	0.2	19.6[a]	0.2	18.5[b]	0.2
Hot carcass (kg)	25.9[b]	0.6	25.2[b]	0.6	28.3[a]	0.6	26.7[ab]	0.6
Cold carcass (kg)	25.4[b]	0.5	24.7[b]	0.5	27.7[a]	0.5	26.2[ab]	0.5
Dressing out (%)	53.7[ab]	0.5	53.5[ab]	0.5	52.8[b]	0.5	54.6[a]	0.5
Mesentery fat (%)	2.26[a]	0.4	2.19[a]	0.4	2.81[a]	0.4	3.02[a]	0.4
Kidney fat (%)	0.28[a]	0.04	0.38[a]	0.04	0.29[a]	0.04	0.37[a]	0.04
Heart fat (%)	0.14[a]	0.01	0.15[a]	0.01	0.14[a]	0.01	0.15[a]	0.01
Channel fat (%)	1.02[a]	0.14	0.72[a]	0.14	1.02[a]	0.14	0.83[a]	0.14
Total meat (%)[1]	47.1[a]	1.24	46.5[a]	1.24	47.5[a]	1.25	47.7[a]	1.25
Total bone (%)[1]	11.8[a]	0.28	11.7[a]	0.28	11.9[a]	0.28	11.5[a]	0.28
Total subcutaneous fat (%)[1]	16.0[a]	0.94	15.4[a]	0.94	16.3[a]	0.94	15.7[a]	0.94
Fat-tail (%)	23.7[a]	1.2	23.2[a]	1.2	22.6[a]	1.2	21.9[a]	1.2
Neck (%)	6.88[a]	0.26	6.09[b]	0.26	6.82[a]	0.26	6.96[a]	0.26
Leg (%)	24.4[a]	0.45	23.4[a]	0.45	24.4[a]	0.45	23.6[a]	0.45
Shoulder (%)	13.6[b]	0.37	14.3[ab]	0.37	14.6[a]	0.37	14.7[a]	0.37
Loin (%)	15.9[a]	0.38	15.2[a]	0.38	15.6[a]	0.38	15.8[a]	0.38
Breast and flank (%)	15.7[a]	0.47	16.2[a]	0.47	15.4[ab]	0.47	14.3[b]	0.47

[a,b]Means within rows with different superscripts are different ($P< 0.05$).

[1]Total per carcass as half carcass x 2.

The higher final and metabolic weight related to 15 weeks fattening periods and 2.62 M Cal/kg DM diet and higher hot and cold carcass weight was similar too. Results in this study are in agreement with reports by AL JASSIM, et al. (1996). Talebi (2004) and Fruzandeh, A. D. (2001) that they showed length of fattening periods have significant effect on daily weight gain. Studies by McDowell and Bove (1977) also indicated that dressing percentage or the edible proportion of a meat animal is within the range 35% to 60% and this differs from country to country.

That in the present study the mean dressing percentage in the Chalishtory ram lamb breed under different fattening periods and energy levels equaled 53. 7% is in line with literature report by Macit, (2002). In this study, no significant difference was observed between the dressing percentage of fattening period (12 and 15 weeks) and different levels of energy. However, Mahgoub and Lodge (1994) reported a significant difference among the different sexes of Omoni local sheep. The mean of dressing percentage between hot and cold carcass weights were not different ($p>0.05$) among treatments. Similarly, there were no differences ($p>0.05$) in the percentages of the mesentery. Karami (2002) reported dressing percentage of the Lory-Bakhtiari male lamb (Most Iranian native sheep breed) was 52.1 percent and Fruzandeh (2001) reported dressing percentage of Naeini male lamb with 2.25 and 2.5 MCal ME/kgDM intakes were 52.3 and 55.7 respectively. Mahgoub et al. (2000) studied the effects of dietary energy density on feed intake, body weight gain and carcass chemical composition of Omani growing lambs and found that meat production from sheep in Oman was improved in the form of higher body weight gains and better carcass composition by increasing energy levels in the diet. However, carcass characteristics, generally, were similar among treatments. The percentage of kidney fat were higher ($p<0.05$) for 120 days fattening period than for 90 days. The other differences in the percentages of the kidney, heart and channel fat among treatments were not significant.

The measurements of the percentage of meat, bone and subcutaneous fat and dissectible carcass cuts composition were conducted of carcass (Table 2). In this study, except for shoulder meat at 2.62 M Cal/kg Dm energy level ($P < 0{\cdot}05$) there were no significant effects on the Meat, bone and subcutaneous fat of different cuts of lamb carcass. However, the least-square means in this table show a slightly higher fat rather than to meat for longer fattening period and high energy level of diet compared with short period and low energy diet. Although no clear increasing or decreasing trend was observed, the fat or meat was lower and higher in some cuts of carcass respectively at 12 weeks fattening period and 2.36 M Cal/ kg DM ME.

Table 2. Least square means of proportions (%) of meat, bone and subcutaneous fat intramuscular fat in fferent areas of the carcass of lambs in different fattening performance (12 weeks and 15 weeks) and ergy levels (2.36 and 2.62 ME M cal/kg DM)

Parameter	Fattening performance				Energy levels			
	12 weeks		15 weeks		2.36		2.62	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Leg	23.9[a]	0.3	24.1[a]	0.3	23.5[b]	0.3	24.4[a]	0.3
Meat	62.1[a]	0.9	65.9[a]	0.9	63.3[a]	0.9	64.7[a]	0.9
Bone	14.1[a]	0.2	13.5[a]	0.2	13.9[a]	0.2	13.7[a]	0.2
Subcutaneous fat	21.6[a]	1.1	19.3[a]	1.1	20.9[a]	1.1	19.9[a]	1.1
Shoulder	13.9[b]	0.3	14.7[a]	0.3	14.8[a]	0.3	14.9[a]	0.3
Meat	67.9[ab]	0.8	66.8[ab]	0.8	65.1[b]	0.8	69.1[a]	0.8
Bone	16.5[a]	0.3	15.6[b]	0.3	15.9[ab]	0.3	16.1[ab]	0.3
Subcutaneous fat	14.8[b]	0.9	16.7[ab]	0.9	13.9[b]	0.9	17.5[a]	0.9
Loin	15.1[a]	0.3	15.7[a]	0.3	15.5[a]	0.3	15.3[a]	0.3
Meat	58.6[a]	1.1	55.7[a]	1.1	56.5[a]	1.1	57.7[a]	1.1
Bone	20.7[a]	0.4	20.0[a]	0.4	19.7[a]	0.4	21.0[a]	0.4
Subcutaneous fat	19.7[a]	1.2	23.4[a]	1.2	21.8[a]	1.2	21.3[a]	1.2
Neck	6.49[a]	0.2	6.89[a]	0.2	6.53[a]	0.2	6.85[a]	0.2
Meat	66.6[a]	0.9	68.4[a]	0.9	64.9[a]	0.9	70.1[a]	0.9
Bone	18.3[a]	0.8	20.1[a]	0.8	19.7[a]	0.8	18.7[a]	0.8
Subcutaneous fat	8.2[a]	0.9	11.2[a]	0.9	8.1[b]	0.9	11.4[a]	0.9
Breast and flank	15.9[a]	0.3	14.9[b]	0.3	15.2[ab]	0.3	15.6[ab]	0.3
Meat	57.8[ab]	1.3	54.2[b]	1.3	52.2[b]	1.4	59.8[a]	1.4
Bone	11.1[a]	0.3	10.9[a]	0.3	10.8[a]	0.3	11.2[a]	0.3
Subcutaneous fat	29.8[b]	1.4	33.1[ab]	1.4	27.7[b]	1.4	35.2[a]	1.4

Cont. Table 2. Least square means of proportions (%) of meat, bone and subcutaneous fat intramuscular fat in different areas of the carcass of lambs in interaction between different fattening performance (12 weeks and 15 weeks) and Energy levels (2.36 and 2.62 ME M cal/kg DM)

Parameter	Fattening performance							
	12 weeks				15 weeks			
	Energy levels				Energy levels			
	2.36		2.62		2.36		2.62	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Leg	22.7[b]	0.32	23.5[b]	0.32	23.4[b]	0.32	24.6[a]	0.32
Meat	61.4[b]	1.32	62.8[b]	1.32	65.2[b]	1.32	66.7[a]	1.32
Bone	14.5[a]	0.33	13.7[ab]	0.33	13.3[b]	0.33	13.7[ab]	0.33
Subcutaneous fat	21.5	1.47	21.8	1.47	20.1	1.47	19.5	1.47
Shoulder	14.3[ab]	0.37	13.6[b]	0.37	14.7[a]	0.37	14.6[a]	0.37
Meat	65.7[b]	1.21	70.1[a]	1.21	65.4[b]	1.21	68.1[ab]	1.21
Bone	16.5	0.43	16.4	0.43	15.5	0.43	15.7	0.43
Subcutaneous fat	16.9[a]	1.33	12.7[b]	1.33	18.1	1.33	15.2	1.33
Loin	15.2	0.38	15.9	0.38	15.8	0.38	15.6	0.38
Meat	58.4	1.57	58.8	1.57	55.6	1.57	54.7	1.57
Bone	20.1[ab]	0.62	21.5[a]	0.62	19.4[b]	0.62	20.6[ab]	0.62
Subcutaneous fat	20.7[ab]	1.49	19.7[b]	1.49	23.9[a]	1.49	24.0[a]	1.49
Neck	6.11[b]	0.26	6.88[a]	0.26	6.96[a]	0.26	6.82[a]	0.26
Meat	63.4[b]	1.42	69.8[a]	1.42	66.5[ab]	1.42	70.2[a]	1.42
Bone	18.6	1.11	18.1	1.11	20.9	1.11	19.3	1.11
Subcutaneous fat	14.1[a]	1.26	8.24[b]	1.26	8.65[b]	1.26	7.74[b]	1.26
Breast and flank	16.1[a]	0.47	15.7[a]	0.47	14.3[b]	0.47	15.4[ab]	0.47
Meat	53.1[bc]	1.98	62.6[a]	1.98	51.4[c]	1.98	56.9[b]	1.98
Bone	10.7	0.48	11.2	0.48	10.9	0.48	11.1	1.98
Subcutaneous fat	34.5[a]	1.99	25.1[b]	1.99	35.8[a]	1.99	30.3[ab]	1.99

[a,b] Means within rows with different superscripts are different ($P< 0.05$).

The mean of total carcass meat, bone, and subcutaneous fat and fat-tail percent for 12weeks fattening were 46.7, 11.7, 15.3 and 22.5 percent and 15weeks fattening were 45.9, 11.7, 16.1 and 23.6 percent respectively. But between fattening period and different levels of energy for carcass meat, bone, subcutaneous fat and fat-tail percent were not significant. Results in this study are in agreement with reports by Fruzandeh, (2001) and TURGEON, et al., (1980). The shoulder meat and subcutaneous fat related to 2.5 MCal/kg ME diet was significantly higher than other diet ($p<0.05$) and similarly fattening periods. Breast subcutaneous fat in 2.62 MCal/kg ME diet was significantly higher than other diet ($p<0.05$) and 12 weeks fattening periods and similarly 15 weeks fattening periods. However, between fattening period and levels of energy influence on some carcass characteristic. Howere, we recommended fattening period 12 weeks with 2.36 MCal ME/kg DM, because higher daily weight gain, lower daily feed intake, better of feed conversion ratio and carcass composition were not significant.

Conclusion

In conclusion, this study shows that the 12 weeks fattening period and 2.36 M Cal ME/kg DM of metabolism energy improved some carcass characteristics, because lower subcutaneous fat and fat-tail but carcass composition were not significant among others treatments. The most important effects of the fattening periods and energy levels on carcass tissue composition were with regard to fat depot being the greatest effect in subcutaneous fat.

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