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Effect of Feeding Frequency on Some Growth Performance, Some Carcass Characteristics And Chemical Meat Composition

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Abstract

This study was conducted on 16 male Karadi lambs, with an average initial body live weight of 27.00±0.10 kg and 4 to 5 months old were used in this experiment. Lambs were randomly allocated to 4 treatments (4 lambs for each treatment). Feeding frequency started following an adaptation period to the end of the experiment which lasted for 60 days at one meal daily (M1: control treatment), two meals daily (M2: two treatment), three meals daily (M3: three treatment), and four meals daily (M4: fourth treatment).All lambs were received an equal daily allowance of concentrate diet (3%of the live body weight). Straw was given *ad libitum*. Results showed that lambs fed 4 meals daily had significantly (*P≤0.05*) higher live body weight (40.80kg) as compared with fed once, twice and thrice daily at the end of the experimental period. Lambs fed on 2 or 4 meals daily consumed significantly (*P≤0.05*) more feed daily than those fed on once or thrice meals daily. Also, average daily gain(0.217kg), hot carcass weight (20.05kg) and chilled carcass weight (19.89kg) was significantly *(P≤0.05)* higher for lambs fed on 4 times a day as compared to lambs fed once, twice and thrice daily. Lambs fed 4 times daily had significantly *(P≤0.05)* higher the dressing percentage 1 (49.14%) and 2 (53.83%), as compared with lambs fed once (46.41 vs 52.10%), twice (47.69 vs 52.80%) and 3 meals daily (46.50vs 52.05%). Results indicated that lambs fed on 4 meals daily had significantly (*P≤0.05*) larger rib-eye muscle area (17.90cm^2) as compared with lambs fed once, twice and thrice daily. Lambs fed 4 meals daily had significantly (*P≤0.05*) thinner fat over *longissimusdorsi* muscle and deposit lower percentage as internal fats than those fed less feeding frequency. Lambs fed 4 meals daily had significantly (*P≤0.05*) higher percentage of lean (57.55%)in their carcasses as compared with the percentage of lean (55.37%)in lambs fed once daily (control).

Introduction

Sheep breeding is one of the most common farm animals in Iraq. Karadi (Kurdi) sheep are considered to be the largest size of local breed raised in the mountainous region of Iraqi Kurdistan. The nutrition of sheep is the most important factor affecting growth performance, which varies with different feeding system. In many animal production systems, approximately two-third of improvements in livestock productivity can be attributed to improve nutrition. In a sheep farm feedstuff expenses have a total of 70% of the costs *[1]*.

In most farm feedlot operation, ruminants are fed more than once a day, feeding multiple times during the day is believed to keep feed fresh, reduce digestive upsets and improve performance. Studies showed that increased meal frequency would promote the appetite of lambs and have an influence on their growth performance and carcass weight *[2]*.

Feeding ruminants at frequency intervals establishes a reasonably steady - state conditions for both digestion and metabolism, also give a steady supply of nutrient and increase a microbial efficiency and tended to have

a stabilizing effect on ruminal fermentation and thereby a more efficient digestion, nevertheless, increased frequency of daily feeding may increase the rate ingest removal from rumen resulting in greater escape of potentially degradable substrate *[3]*. this study is to investigate the effect of once, twice, thrice and fourth meals per day feeding frequency on some growth performance, some carcass characteristics and chemical meat composition.

Materials and Methods

This study was carried out at the animal production field, Department. of Animal production, College of Agriculture Sciences of University of Sulaimani, Bakrajo, Sulaimani, Iraq, during the period from 21-7-2015 to 20-9-2015. Sixteen male Karadi lambs purchased from a known local contractor in Kurdistan region with an average live body weight of 27.00±0.10 kg and aged 4-5 months old were used in this experiment. After a 14 days adaptation period, lambs were identified by ear tags, weighted, and were assigned randomly to four treatment group according to their initial live body weight and penned individually to be feed at different interval namely 24, 12, 8 and 6 hrs, respectively. The ration were gradually introduced to the lambs during a period of 2 weeks as adaptation period, at the same time, the lambs were drenched orally against internal worms, *Ascarida* , Lung and tape worms by using Levozani at the start of the experiment and 21 days later. Promectine is used also against external parasites at the beginning of the experiment and after 10 days. The lambs were also vaccinated using Cogiavax (Vaccine) polyvalent inactivated vaccine against *Clostridial infections* in ruminants, adjuvated with aluminum hydroxide gel which was used at the beginning of the experiment**.** Lambs were raised under similar environment and management conditions. Each lamb was kept in individual pen (1x1.5 m^2).

Clean water and mineral block were available constantly. The experimental diet was prepared based on nutritional requirement of lambs, the feed frequency was performed at different intervals namely;24hr, 12hr, 8hr,6 hr. At the end of each feeding interval the refusal was collected and weighted on the next day before morning feeding.

All lambs were received an equal daily allowance of concentrate ration (3% of the body weight).The chemical composition of concentrate content crude protein (13.5%). Straw was given *ad libitum*. Daily feed intake and refusal was measured for 60 days. The lambs were weighed once weekly from the beginning till the end of the experiment.

Lambs were weighed individually on the same day each week, and individual fed intakes were recorded daily for 60 days, feed conversion ratio per week was calculated by dividing total feed intake by live weight gain during the week. At the end of the experiment, all lambs were weighed and slaughtered after 12 hr of fasting free access to water according to the Islamic method. Immediately after slaughter and dressed carcass, hot carcasses were weighed immediately after slaughtering. Carcasses from each treatment were refrigerated at 4 c^0 for 24 hours to determine chilled carcass weight, dressing percentages were calculated as a percent of hot carcass weight to either slaughter weight or empty live body weight.

Rib-eye-area over the *longissimusdorsi* (LD) muscle at the 12-13th ribs was measured by tracing the muscle on waxed paper, the area was measured by using a Planimeter. Fat thickness over L.D muscle was measured by vernier device at the cross section of the12-13thribs.After cutting of left half carcasses, all cuts were kept at 4^0Cfor 24 hours, then each cut was weighed and dissected into lean, fat and bone by knives and dissection tools, in a cold room *[4]*. The three carcass tissues were weighed separately to determine their percentages. After physical dissection of primal cuts, *longissimusdorsi* (LD) muscles were removed and kept at -18°Cfor determination chemical analysis , moisture, protein and ash was determined according to AOAC, (2004) *[5]*. The crud lipid extract was determined according to Folch, *et al.,* (1957) *[6]*.

Statistical Analysis: Data were analyzed by using XlStat (2004) *[7]* version 7.5, complete Randomized Design(CRD) and significant between means was determined using Duncan's multiple range tests under the probability ($P \leq 0.05$) *[8]*.

Results and Discussion

A. *Live Body Weight Changes*

The effect of feeding frequency on growth performance was shown in Table 1 and Figure 1. Initial body weights were similar across treatments. It appears that lambs fed on 4 meals per day had significantly ($P \leq 0.05$) higher final body weight (40.80 kg) as compared to lambs fed once daily (37.75 kg), twice daily (37.95 kg) and three times daily (36.67 kg). It was found no significant differences in final body weight for lambs fed once, twice and thrice meals a day (Table 1).

This result indicate that lambs fed on 4meals per day had higher daily gain as compared to the other treatments which may be attributed to a stimulation of the gastrointestinal system, the saliva glands and /or rumen secretions *[9]*. Also, Demirören (2002) *[10]* reported that lambs fed eight times a day had higher daily gain than those fed once a day, Shabi *et al*., (2009)*[11]* showed that increased feeding frequency in cows enhanced total dry matter digestibility.

It seems from the figure 1 that no significant differences exist during the first two weeks of the experiment. During the third to fifth week of the experiment, lambs of T4 surpassed significantly lambs of T3 only. However, the body weight of lambs in T4 treatment was significantly higher as compared with treatment 1, 2 and 3 respectively.

It was observed from Figure (1) that lambs fed on 3 meals per day gave a lower live body weight (36.67 kg) at the end of the experimental period. This result can be attributed to decrease feed intake and daily gain weight may be attributed to individual variation in their genetic up.

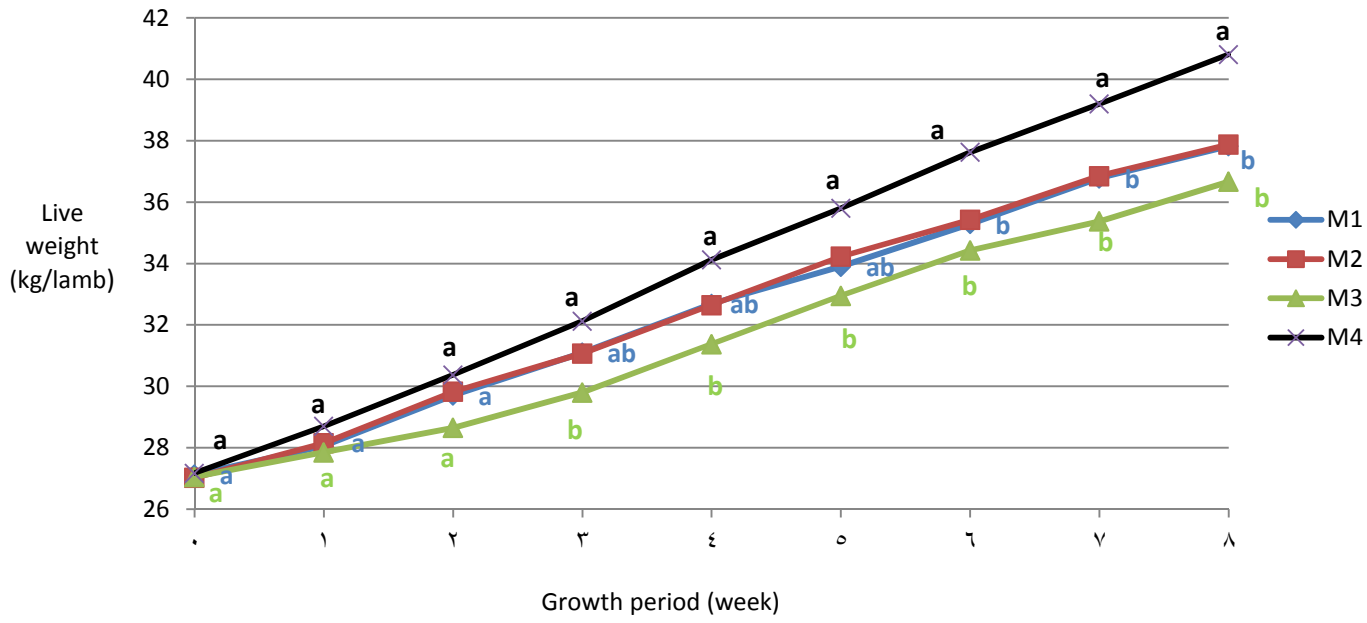

Figure -1: Effect of feeding frequency on live body weights of experimental lambs during the growth period.

B. *Growth Performance*

It appears from results given in Table (1)that average daily gain was significantly ($P \leq 0.05$)higher for lambs fed 4 times per day (0.217 kg) as compared to lambs fed once daily (0.168 kg), twice daily (0.174 kg) and thrice daily (0.154 kg). Previous researchers showed that feeding multiple times during the day may have affected ruminal comfort positively *[11]*, Also, it was found that the fluctuation in ruminal ammonia-N concentration was lower when cows fed four times a day compared to twice a day. In addition, multiple feedings may help to maximize an individual animals access to feed. Similarly other studies reported that lambs fed six or eight times a day had higher daily gain, than those fed once or thrice times a day *[10; 12]*.

From the results given in Figure 2 and Table 1.it was noted that lambs fed on thrice or once times daily consumed less ($P \leq 0.05$) daily feed than those fed on 2 or 4 meals daily, especially after sixth week from experimental period, which reflected on their live body weights. During experimental period, average daily feed intakes were0.92, 0.97, 0.91 and 1.00 kg for lambs fed on 1, 2, 3 and 4 meals daily respectively. This could be attributed to the fact that increased feeding frequency tends to increase feed passage through the gastrointestinal tract . In the present study, feed intake was higher in 4 or 2 meals daily but feed conversion ratio was not affected significantly (Table 1). Therefore, suggesting that increasing nutrient availability caused an increasing the digestibility, seeing and smelling fresh feed and being conditioned by the presence of the stockman feeding could have stimulated their appetite *[2]*.Previous studies showed that lambs fed every 2 hours or 4 hours had higher feed intake than those fed every 8 hours or 24 hours *[12]*.

Results in the table (1). indicated that feed conversion ratio were not affected by either once or twice or thrice times a day feeding, but there was significant ($P \leq 0.05$) differences in feeding conversion ratio between lambs fed thrice and fourth meals daily feeding . These results agree with previous studies that feed conversion ratio for both lambs or beef steers *[12; 13]*.

Table- 1: Effect of feeding frequency on growth performance of Karadi lambs (Mean± S.E).

	Feeding frequency			
Traits	***1M***	***2M***	***3M***	***4M***
Initial body weight(kg)	*a* *27.13±0.083*	*a* *27.03±1.27*	*a* *27.05±0.90*	*a* *27.18±0.69*
Final body weight(kg)	*b* *37.75±0.49*	*b* *37.95±0.45*	*b* *36.67±0.35*	*a* *40.80±0.81*
Daily gain(kg)	*b* *0.168±0.01*	*b* *0.174±0.011*	*b* *0.154±0.016*	*a* *0.217±0.07*
Daily feed intake(kg)	*b* *0.92±0.04*	*a* *0.97±0.04*	*b* *0.91±0.03*	*a* *1.00±0.04*
Feed conversion ratio(kg/kg)	*ab* *5.48±0.44*	*ab* *5.57±0.49*	*a* *5.91±0.59*	*b* *4.61±0.24*

Means with different letters within each row significantly different (P≤0.05). 1M: 1meal daily, 2M: 2meals daily, 3M: 3meals daily and 4M: 4meals daily.

The positive effects of increased meal frequency is may be to a more stable rumen environment and there by more efficient digestion and weight gain *[11]*. Other studies showed that the improved feed conversion ratio for lambs fed 4 times per day can be attributed to increased digestibility of dry matter, crude protein, and crud fiber *[13]*.

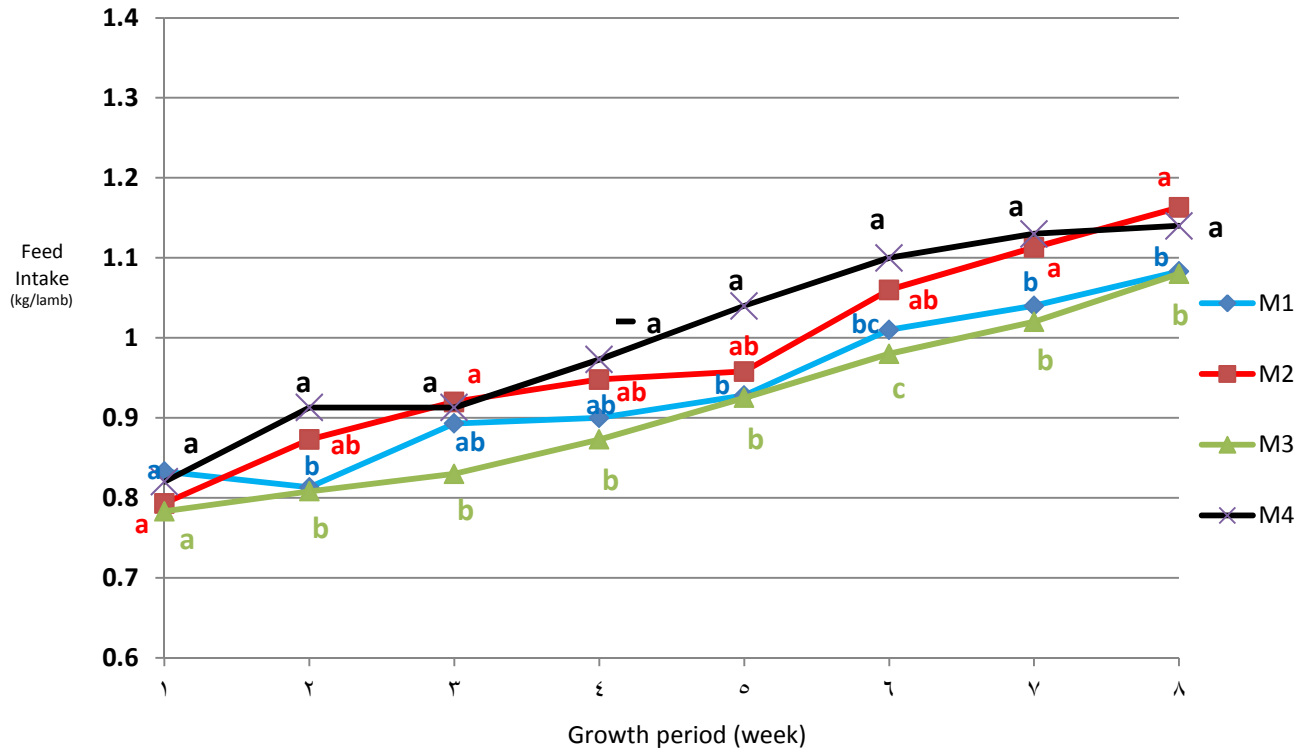

Figure- 2: Effect of feeding frequency on feed intake of experimental lambs during growth period.

C. Slaughter parameters

In the present study, empty body weight of lambs fed 4 meals was significantly ($P \leq 0.05$) higher (37.25 kg) than those fed 1 (33.63), 2 (34.28) and 3 (32.76 kg) meals daily. This result could be attributed to an increase in final live body weight, as well as the gut content of lambs fed 4 meals daily was significantly ($P \leq 0.05$) lower component with other treatment (Table 2).

D. Carcass weight

It seems from table (2) that hot carcass weight of lambs was significantly increased ($P \leq 0.05$) with increasing feeding frequency. This result may be attributed to an increase slaughter weight and decreased offal's weights of lambs fed on 4 meals daily (Table 2 and 3). Results in table (2) showed that lambs fed on 4 times daily had higher ($P \leq 0.05$) chilled carcass weight (19.89kg) than those less feeding frequency feeding. The average chilled carcass weights were 17.36, 17.94 and 16.89kg for lambs fed on 1, 2 and 3 times daily respectively. The lost in chilled carcass weight of lambs may be due to the moisture evaporation during chilling of carcasses. It was observed that both hot and chilled carcass weight for lambs fed on 1, 2 and 3 meals daily were not different significantly, this can be attributed to the similar slaughter body weight for those treatments (table 2).

E. Dressing percentage

In the present study, dressing percentage 1 and 2 were similar among lambs fed on once daily feeding (46.41 vs. 52.10%), twice daily (47.69vs.52.80%) and 3 times daily (46.50vs.52.05%) but lower than those it is fed 4 times daily (49.14vs.53.83%) for both dressing percentages 1,2 respectively (Table 2). These results may be due to higher slaughter body weight, carcass weight, and partially due to lower gut content in lambs fed 4 meals. Abouheif et al., (2010) *[14]*showed that feeding ruminants less frequency can result in the similar carcass weight of stomach parts. Similar results reported by Schutz et al., (2011)*[13]* that no differences in hot carcass weight and dressing percentage based on full live body weight among lambs fed once, twice and thrice daily feeding.

It appears from table (2) that lambs fed on 4 times daily caused increasing ($P \leq 0.05$) in dressing percentages 1(49.14%) and 2(53.83%) compared to those lambs fed less frequency. which resulting from increased slaughter body weight that were existed in the lambs fed 4 meals daily (table 2). Towhidi et al., (2010) *[15]* showed that calves fed on 7 times a day had higher dressing percentage based on empty body weight as compared with dressing percentage for calve fed on 2 times daily.

Table-2: Effect of feeding frequency on slaughter weight and carcass characteristic of Karadi lamb (Mean ± S.E).

Traits	Feeding frequency			
	1M	2M	3M	4M
Slaughter body weight(kg)	b 37.75±0.494	b 37.95±0.452	b 36.67±0.352	a 40.80±0.813
Hot carcass weight(kg)	b 17.52±0.292	b 18.10±0.379	b 17.05±0.126	a 20.05±0.541
Chilled carcass weight (kg)	b 17.36±0.292	b 17.94±0.379	b 16.89±0.126	a 19.89±0.536
Gut weight	a 4.13±0.066	bc 3.67±0.020	ab 3.90±0.049	c 3.55±0.156
Empty body weight (kg)	b 33.63±0.431	b 34.28±0.432	b 32.76±0.385	a 37.25±0.677
DP% slaughter body weight(1)	b 46.41±0.202	b 47.69±0.587	b 46.50±0.186	a 49.14±0.345
DP% empty body weight(2)	b 52.10±0.251	ab 52.80±0.556	b 52.05±0.269	a 53.83±0.467

Means with different letters within each row significantly different (P≤0.05). 1M: 1meal daily, 2M: 2meals daily, 3M: 3meals daily and 4M: 4meals daily.

F. Wholesale Cuts

In the present study, there were no significant differences among lambs feed on once daily (control), twice, thrice and forth times a day on the percentages of leg, flank, rack, shoulder, fore-shank and neck cuts (Table 3). A similar trend was recorded by Keskin et al., (2007) *[12]*. who found no significant differences among lambs fed every 24, 12, 8 and 4 hours daily for shoulder, neck, ribs and flank cuts expressed as a percentage of cold carcass weight. Also, Schutz et al., (2011) *[13]* reported that no differences between calves fed 2 times a day for neck, and shoulder and round cuts as a percentage of hot carcass weight.

In this study, feeding frequency only affected ($P \leq 0.05$) loin, breast and tail-fat. It was observed that lambs carcasses fed 3 meals daily had higher percentage of loin (10.75%) compared with those feed once (9.95%), twice (9.46%) and fourth (9.27%) meals daily. Higher percentage of breast (8.28 and 8.35% vs. 7.21 and 7.35%) as compared with lambs fed once daily (control) and thrice daily. It may due to the differences in the growth patterns of different regions of carcass may responsible for this result *[16; 17]*. The proportions of early development joints (leg, loin, rack) are reduced by increasing slaughter weight and carcass weight, on the whole, results suggest that primal cuts proportions are more affected by variations in the slaughter weight than for the feeding strategy applied to lambs. This result is in agreement with Santos et al., (2000) *[17]* who showed that the difference in the growth patterns of carcass composition of lambs was affected by slaughter weight rather than by feeding system. In contrast, the breast cut is an important indicator with fat deposition that reflect by a greater proportion when the live body weight at slaughter increased, as it was the case of lambs fed 2 or 4 meals daily than lambs fed once or thrice daily in this study (table 3).

It was observed from results in table (3) that lambs fed more frequently (4 meals daily) had lower ($P \leq 0.05$) proportion of tail-fat as compared with lambs fed less frequently. This result possibly is may be due to an increase feeding frequency, resulted in a decrease fat synthesis and deposition in the body via changes in the insulin or growth hormone concentrations *[18; 15]*.

Table- 3:Effect of feeding frequency on proportions of wholesale cuts of Karadi lamb carcass% (Mean±S.E).

Trait	Feeding frequency (daily)			
	1 M	2 M	3 M	4 M
Chilled carcass wt. (kg)	b 17.36±0.29	b 17.94±0.38	b 16.89±0.13	a 19.89±0.54
Leg	a 29.74±0.24	a 29.17±0.61	a 30.19±0.55	a 29.38±0.18
Loin	b 9.59±0.25	b 9.46±0.31	a 10.75±0.16	b 9.27±0.13
Flank	a 4.16±0.28	a 4.29±0.20	a 4.06±0.03	a 4.39±0.07
Rack	a 10.08±0.11	a 10.01±0.23	a 10.17±0.66	a 9.97±0.04
Shoulder	a 19.15±0.16	a 20.10±1.29	a 19.04±0.90	a 20.32±0.45
Breast	b 7.21±0.29	a 8.28±0.50	b 7.35±0.35	a 8.35±0.16
Fore-shank	a 5.36±0.44	a 4.96±0.57	a 5.03±0.10	a 5.93±0.09
Neck	a 5.11±0.43	a 5.28±0.33	a 4.99±0.29	a 5.58±0.16
Tail-fat	a 9.14±0.20	b 7.36±0.10	b 7.88±0.28	c 6.37±0.23

Means with different letters within each row significantly different (P≤0.05). 1M: 1meal daily, 2M: 2meals daily, 3M: 3meals daily and 4M: 4meals daily.

G. Rib-eye Muscle Area and Fat Thickness

The effect of feeding frequency on rib-eye muscle area and fat thickness of Karadi lambs are shown in table (4). The result indicated that lambs fed on 4 meals daily had larger ($P \leq 0.05$) rib eye muscle area (17.90 cm^2) as compared with lambs fed once daily (13.02 cm^2), twice daily (11.56cm^2) and thrice daily (14.05cm^2). This result indicated that rib eye muscle area tended to increase with increasing feeding frequency, which resulted in a trend toward increased muscle tissue accretion in the carcass as shown in table(4). Similar trend was, reported by Towhidi et al., (2010) *[15]* who showed that calves fed 7 times daily had larger rib-eye muscle area as compared with calves fed 2 times daily (control).

In this study, it was observed that the more frequent feeding regimens as practiced in lambs fed on 4 meals daily resulted in a significantly (*P≤0.05*) decreasing fat thickness (1.78mm) compared to those fed twice(2.42mm). Previously, Towhidi et al., (2010) *[15]* showed that calves fed on 7 times daily had lower fat thickness than in the calves fed on 2 times daily. In the present study, increasing the feeding frequency significantly ($P \leq 0.05$) decreased fat thickness in lambs carcass. It possibly due to the increasing feeding frequency caused decreased fat thickness and deposition in the body *[11]*.

Previous studies showed that increasing the frequency in calves led to increasing leptin hormone and decreasing insulin concentrations in the blood, leptin, a hormone that is primarily secreted by adipose tissue, has a direct effect on body fat deposits and increases lipolysis *[19; 20]*. Therefore, these studies suggested that hormone acted as a partitioning hormone, which mobilized energy and nutrients from adipose tissue toward muscle tissue, these, studies suggest that increasing the feeding could improve bioenergetics efficiency and nitrogen retention in fatting ruminants *[11; 15 ; 18]*. Therefore, the role of these hormone an affected by frequent feeding is worth to investigate.

Table-4: Effect of feeding frequency on rib eye muscle area and fat thickness of Karadi lamb carcass (Mean±S.E).

Trait	***Feeding frequency***			
	1M	***2M***	***3M***	***4M***
Rib eye area(cm^2)	***c*** ***13.02±0.22***	***d*** ***11.56±0.10***	***b*** ***14.05±0.05***	***a*** ***17.90±0.26***
Fat thickness (mm)	***ab*** ***2.04±0.11***	***a*** ***2.42±0.26***	***ab*** ***2.02±0.09***	***b*** ***1.78±0.06***

Means with different letters within each row significantly different (P≤0.05). 1M: 1meal daily, 2M: 2meals daily, 3M: 3meals daily and 4M: 4meals daily.

H. Carcass Tissue Distribution

In the present study, results demonstrated in table (5) that lambs fed 4 meals daily had higher ($P \leq 0.05$) percentage of lean (57.55%) as compared with percentages of lean (55.37%) in lambs fed once daily (control). Whereas, it was observed from results given in table (5) that no differences exist among lambs fed 1, 2 and 3 meals daily in the percentage of lean, fat and bone.

It appears from results presented in table (5) that increasing feeding frequency of lambs may be increased proportion of the lean and decreased the proportion of fat in this experiment, which could be attributed to stimulate protein deposition and decrease fat deposition in their carcasses than those fed less frequently. Previous studies were showed that increasing feeding frequency of diets containing higher proportions of concentrate may improve ruminal fermentation and nutrient utilization and stabilized ruminal PH, provided more constant supplies of microbial fermentation and product such as volatile fatty acids and peptides, these changes could lead to improve efficiency of microbial growth and may enhance protein deposition and daily gain *[21]*. The results in this study are in agreement with the findings of Towhidi et al., (2010) *[15]* who observed a decrease in carcass fat deposition and increase muscle ratio in the carcasses of calves fed 7 times a day than those fed 2 times a day.

Table-5: Effect of feeding frequency on Physical structure of Karadi lamb carcass% (Mean±S.E).

Treatment	***Lean%***	***Fat%***	***Bone%***
1M	*b* *55.37±0.98*	*a* *20.14±1.53*	*a* *24.21±0.80*
2 M	*ab* *56.54±0.62*	*a* *19.53±1.52*	*a* *23.93±0.71*
3 M	*ab* *55.81±0.73*	*a* *19.13±1.58*	*a* *25.06±0.75*
4 M	*a* *57.55±0.65*	*a* *17.45±1.46*	*a* *25.00±0.77*

Means with different letters within each column significantly different (P≤0.05). 1M: 1meal daily, 2M: 2meals daily, 3M: 3meals daily and 4M: 4meals daily.

I. Chemical Composition of Meat

There were a significant effect ($P \leq 0.05$) of treatment on chemical composition (moisture, fat and protein contents) of lean meat of Karadi lambs (Table 6). Results showed that lean meat samples of carcasses of lambs fed 2, 3 and 4 meals daily had higher ($P \leq 0.05$) moisture content than control treatment (fed once daily). However, that lambs fed on 4 times a day gave higher moisture content in their lean meats as compared with other treatments (Table 6).

In this study, a lower ($P \leq 0.05$) fat content (2.20%) in lean meat from the carcasses of lambs fed 4 meals daily was recorded as compared with fat content in lean meat samples from the carcasses of lambs fed once daily (5.51%) twice (4.86%) or thrice daily (4.32%)(Table 6).

Results demonstrated in table (6) showed that lambs fed on 4 times daily resulted in a higher ($P \leq 0.05$) protein content (21.10%) in lean meat, compared with lean meat those fed once daily (19.17%), twice (19.47%) and thrice (19.29%). It was observed no significant differences in ash content in lean meat samples among treatment (table 6).

In the present study, results indicate that moisture and protein contents increases whereas fat content decreases, was with increasing feeding frequency. According to Theriez et al., (1981) *[22]* who found that moisture and protein contents decreased when the fat content of lambs increased in the separable lean. Previous studies, showed that increasing feeding frequency from 2 times daily to 4 times daily for calves contributed to decrease fat deposition and improved protein accretion *[15]*. According to Foster et al., (2000) *[18]* who suggested that increasing feeding frequency could decrease fat synthesis and increased nitrogen retention, which may be due to the role of insulin in reducing lipolysis and the stimulatory effect of growth hormone on lipogenesis and protein deposition.

Table- 6: Effect of feeding frequency on proximate analysis (moisture, protein, fat and ash) (Mean ± S.E).

Treatment	***Chemical composition (%)***			
	moisture	***Fat***	***protein***	***ash***
1 M	*d* *73.59±0.06*	*a* *5.51±0.03*	*c* *19.17±0.02*	*a* *1.06±0.018*
2 M	*c* *74.06±0.02*	*b* *4.86±0.02*	*b* *19.47±0.03*	*a* *1.09±0.03*
3 M	*b* *74.71±0.07*	*b* *4.32±0.04*	*c* *19.29±0.09*	*a* *1.03±0.04*
4 M	*a* *75.22±0.05*	*c* *2.20±0.01*	*a* *21.10±0.06*	*a* *1.01±0.01*

Means with different letters within each Column significantly different (P≤0.05). 1M: 1meal daily, 2M: 2meals daily, 3M: 3meals daily and 4M: 4meals daily.

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