

## A COMPARATIVE STUDY ON GROWTH, CARCASS TRAITS AND BODY COMPOSITION OF AWASSI AND KARADI LAMBS RAISED UNDER TWO LEVELS OF FEEDING AND SLAUGHTERED AT DIFFERENT WEIGHTS: 1- GROWTH PERFORMANCE AND CARCASS TRAITS

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### ABSTRACT

Sixteen weaned (3.5-4 months) entire male lambs from each of Awassi and Karadi were weighed and randomly divided equally into two groups to receive concentrate (16% crude protein and 2769 kcal energy) either *ad libitum* or 3% of their body weights, and to be slaughtered at 36 or 44 kg. Results revealed that overall means of daily gain in weight, dressing percentage based on slaughter and empty body weight, rib eye area and fat thickness were  $0.258 \pm 0.01$  kg,  $46.54 \pm 0.49\%$ ,  $54.35 \pm 0.40\%$ ,  $14.98 \pm 0.44$  cm<sup>2</sup> and  $2.86 \pm 0.12$  mm, respectively. It seems that Awassi lambs significantly surpass Karadi lambs in dressing percentage based on slaughter weight and had thicker subcutaneous fat, only. Also, lambs fed *ad lib* excell significantly those lambs fed 3% in daily gain in weight, dressing percentage based on slaughter weight, and fat thickness. Lambs slaughtered at 44 kg had significantly higher dressing percentage, rib eye area and fat thickness.

**Keywords:** growth, carcass traits, awassi, karadi.

الشيرواني والقس

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دراسة مقارنة النمو وصفات الذبيحة وتركيب الجسم للحملان العواسية والكرادية والمغذاة على مستويين من التغذية ومذبوحة عند وزنين مختلفين: 1- كفاءة النمو وصفات الذبيحة.

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المستخلص

تم توزيع 16 حملاً مفطوماً (3.5 - 4 شهراً) من كل من العواسي والكرادي بعد وزنها عشوائياً الى مجموعتين متساويتين لتتغذى احدهما على عليقة بصورة حرة واما المجموعة الثانية فتتغذى على نسبة 3% من وزن جسمها على ان تذبح عند اوزان 36 و 44 كغم. تشير النتائج بان المعدل العام للزيادة الوزنية اليومية، نسبة التصافي محسوبة على الوزن عند الذبح وكذا على وزن الجسم الفارغ، مساحة العظلة العينية وسمك الطبقة الدهنية قد بلغت  $0.258 \pm 0.01$  كغم،  $46.54 \pm 0.49\%$ ،  $54.35 \pm 0.40\%$ ،  $14.98 \pm 0.44$  سم<sup>2</sup> و  $2.86 \pm 0.12$  ملم على التوالي. كما اتضح تفوق العواسي معنوياً على الكرادي في نسبة التصافي محسوبة على الوزن عند الذبح وسمك الطبقة الدهنية. كما تفوقت الحملان المغذاة بصورة حرة تطيراتها المغذاة ب 3% من الوزن الحي معنوياً في معدل الزيادة الوزنية اليومية ونسبة التصافي المحسوبة على اساس الوزن الحي وسمك الطبقة الدهنية. الحملان المذبوحة بوزن 44 كغم تفوقت معنوياً على تلك المذبوحة بوزن 36 كغم في نسبة التصافي ومساحة العظلة العينية وسمك الطبقة الدهنية.

الكلمات المفتاحية: النمو، صفات الذبيحة، العواسي، الكرادي.

## INTRODUCTION

It is well known that small ruminant constitute the majority of the ruminant population in developing countries (37), and are considered the key resource within the frame of future international agriculture species (18), and contribute significantly to household economy (34). In Iraq, sheep including Awassi and Karadi which comprise almost 60 and 20%, respectively of the population are considered the most important farm animals, and the greatest portion of income comes from the sale of lambs (3). Evaluation of the carcass is essential to determine the relative production efficiency of the animals in converting feed to animal tissue (16). Lamb carcass traits and meat quality are affected by several factors, such as breed, sex, age, feeding system, slaughter weight and carcass weight (28, 36, 38). Moreover, it was generally agreed that daily live weight gain in lambs slaughtered at different weights decreases with increasing slaughter weights (2, 8, 14, 22, 31). Moreover, there is a great variation in lamb's carcass quality due to the number and diversity of breeds and crosses in lamb production. Also, lamb breed influences the pattern of development of important carcasses traits (21). Therefore characterization of carcass composition of different breeds is essential in identifying the genetic resources for lean lamb production, as well as increasing the understanding of management alternations for different genotype (35). The effect of nutrition on animal growth and development are well documented. It was found that lambs fed high energy diet had higher daily body weight, feed conversion ratio, body weight, and carcass weight and dressing percentage than lambs fed medium and low energy diets (4, 20). Thus knowledge of the effect of breed, nutrition and stage of maturity on growth performance of lambs must be applied to obtain efficient conversion of feed by the growing lambs into production of muscle with optimum amount of fat and minimum bone (25). For this reason, the aim of the current study is to evaluate Awassi and Karadi for growth performance and carcass traits raised under two level of feeding and slaughtered at two different weights. Body composition and carcass tissue

distribution will be presented in the second part of this series.

## MATERIALS AND METHODS

### Animals and experimental design

Sixteen weaned (3.5-4 months) entire male lambs from each of Awassi and Karadi with an average initial weight of  $25.625 \pm 0.576$  and  $25.563 \pm 0.736$  kg, respectively raised at Grdarasha field, College of Agricultural Engineering Sciences, Salahaddin University were used in the present work. After an adaptation period for 10 days, lambs from each breed was weighed and randomly divided equally into two sub groups (8 Lambs) to receive either ad lib concentrate or 3% concentrate of their body weights and to be slaughtered either at 36 or 44kg (4 lambs each group). Each group of lambs was kept in a separate pen and fed on a group bases. The concentrate (16% crude protein and 2769 Kcal energy) in the form of pellet was offered at 8.30 am and 8.30 pm after quantifying and discarding the residue of the previous day. Clean water, multi vitamin and mineral blocks were available constantly. All lambs were weighed at weekly intervals before feed was offered in the morning, and accordingly the offered feed was adjusted.

### Slaughtering of the animals

All Lambs were slaughtered when each lamb has reached its target slaughter weight (36 or 44 kg) following fasting for 12 hours, with free access to water. The lambs were slaughtered according to Islamic method at abattoir, by severing the throat and major blood vessels in the neck. Immediately after skinning was completed, evisceration was carried out and the carcass and non-carcass components were weighted. Hot carcass includes kidney and kidney fat, edible offal's comprised of tests, spleen, liver, heart, lung and trachea, and inedible offal's constitute head, feet and skin were weighed. Omental, mesenteric, cardiac and scrotal fat were separated and weighed. The gastro-intestinal tract was weighed, then emptied of their content, washed and re-weighed to facilitate calculation of empty body weight by subtracting the weight of the gut content from the slaughter weight.

### Carcass traits

Following chilling the carcass at 4°C for 24 h, cold carcass was weighed, then kidney and pelvic fat were removed and weighed separately. The carcass was split along the vertebral column into two halves by electric saw. The left side of the carcass was cut into nine whole sale cuts and weighed. The area of *longissimus dorsi* muscle at the 12<sup>th</sup> rib was measured by a placom digital planimeter. Fat thickness over the midpoint of *L- dorsi* muscle perpendicularly was recorded using Digital Caliper device.

### Statistical analysis

The statistical analysis of data was conducted using the GLM (general linear model) within SAS (29) to study the effect of breed, level of feeding and slaughter weight on studied traits. Duncan multiple range tests (12) were used to test the differences between the sub classes of each factor. Since the interaction of studied traits was not significant, the interaction was excluded from the results.

## RESULTS AND DISCUSSION

### Growth performance

Results related to growth performance including initial and final weights. Fattening period and average daily gain in weight of Awassi and Karadi lambs maintained under two different feeding level and slaughtered at two different weights are given in Table (1). Daily gain in weight averaged  $0.267 \pm 0.016$  and  $0.250 \pm 0.014$  kg, for Karadi and Awassi, respectively and the difference between them was not significant ( $P < 0.05$ ). The average daily gain recorded in the current work for Awassi and Karadi lambs is almost comparable with those obtained earlier for the same breeds by Alkass and Kak (5), Sefdeen & Alkass (31), Alkass and Hassan (4) and Oramari et al. (22). However, the average daily gain obtained herein for Awassi is higher than those recorded earlier for the same breed by Alkass et al. (6), Alkass et al. (7), Rashid et

al. (26) and Al-Jaryan et al. (2), as well as for Karadi lambs (7). Such findings could be attributed to variation in genetic makeup as well as environmental factors and feeding practices in particular. Similarly, several authors found genetic variation among breeds for growth (10, 11, 13). In the current investigation, the effect of level of feeding on daily gain in weight shows that lambs fed ad lib was significantly ( $P < 0.01$ ) higher in daily gain ( $0.292 \pm 0.013$  kg) than did lambs maintained on 3% of their body weights ( $0.224 \pm 0.012$  kg) (Table 1). Similarly, it has been indicated that lambs received a high level of feeding gained higher weight than lambs fed a restricted ration (16, 17, 21). Daily gain in weight averaged  $0.246 \pm 0.020$  and  $0.271 \pm 0.008$  kg, for lambs slaughtered at 36 and 44 kg, respectively, and the difference between them lacked significance. It is generally agreed that daily live weight gain in lambs slaughtered at different weight decrease with increasing slaughter weight (1, 26, 31), mainly due to fat deposition. However, this result agree with the finding of Balci and Karakas, (8) who showed that there were no significant differences among the lambs slaughtered at different weights. Fattening period for Karadi and Awassi lambs was almost similar ( $P < 0.05$ ) being 56.06 and 58.18 days, respectively (Table 1). Also, the result revealed that lambs fed ad lib attained their prescribed slaughter weight in a significantly ( $P < 0.05$ ) shorter period ( $51.12 \pm 5.11$  days) than lambs fed 3% ( $63.12 \pm 5.00$  days) (Table 1). This result was in accordance with the finding of Alkass and Hassan (4). It is obviously that lambs required shorter time (41.68 days) to attain their target slaughter weight of 36 kg as compared with those slaughtered at 44 kg (72.56 days) (Table 1).

**Table 1. Effect of breed, level of feeding and slaughter weight on growth performance of Karadi and Awassi lambs**

Effects	No.	Initial Wt. (kg)	Final Wt. (kg)	Period (day)	ADG (kg)	Feed Conversion Ratio (kg)
Overall mean	32	25.594 ± 0.460	39.988 ± 0.726	57.125 ± 3.682	0.258 ± 0.011	4.212
Breed	Karadi	25.563 ± 0.736 a	39.988 ± 1.046 a	56.063 ± 5.398 a	0.267 ± 0.0166 a	4.194
	Awasi	25.625 ± 0.576 a	39.988 ± 1.040 a	58.188 ± 5.172 a	0.250 ± 0.0146 a	4.230
L. of Feeding	3%	25.563 ± 0.753 a	40.00 ± 1.037 a	63.125 ± 5.004 a	0.224 ± 0.0123 b	3.979
	ad lib	25.625 ± 0.554 a	39.975 ± 1.0495 a	51.125 ± 5.119 b	0.292 ± 0.0139 a	4.447
Slaughter Wt.	36kg	26.563 ± 0.532 a	35.950 ± 0.0447 b	41.688 ± 3.695 a	0.246 ± 0.0203 a	4.329
	44kg	24.625 ± 0.682 b	44.025 ± 0.0323 a	72.563 ± 3.257 b	0.271 ± 0.008 a	4.156

Means with different letters within each column differ significantly ( $P < 0.05$ ) according to Duncan's test

### Feed conversion ratio

Total feed intake required to produce one kilogram live weight gain by Karadi and Awassi lambs was almost the same being 4.19 and 4.23 kg/kg, respectively. Also, feed conversion ratio of lambs fed 3% concentrate is slightly lower (3.97 kg/kg) than lambs fed ad lib (4.44 kg/kg). Feed to gain ratio increased from 4.15 kg to 4.32 kg/kg in lambs slaughtered at 36 and 44 kg, respectively which may be is due to the deposition of fat. Similar findings have been reported earlier (22, 31, 32). It is of interest to note that no statistical analysis was carried out for this trait because of lambs are fed on a group basis. Moreover, the feed conversion ratio obtained in the current work is lower than those reported earlier for Karadi and Awassi lambs by Alkass and Kak, (5) and Alkass and Hassan (4).

### Carcass traits

The overall means of dressing percentage based on the slaughter weight and empty body weight were  $46.54 \pm 0.49$  and  $54.35 \pm 0.40\%$ , respectively (Table 2). Examination of the effect of breed on dressing percentage based on slaughter weight reveals that Awassi lambs yielded significantly ( $P < 0.05$ ) higher value ( $47.31 \pm 0.51\%$ ) than Karadi lambs ( $45.77 \pm 0.81\%$ ) (Table 2). However, differences in dressing percentage based on empty body weight between the two studied breeds lacked significance ( $53.87$  vs.  $54.84\%$ ) (Table 2). The reason for such difference could be attributed to the lower gut content of the Awassi ( $13.71 \pm 0.77$ ) as compared with Karadi ( $15.09 \pm 0.62\%$ ). Similarly, Alkass and Hassan

(4) found that Awassi lambs had numerically higher (50.29%) dressing percentage based on slaughter weight, than Karadi lambs (49.62%). Similar results have been reported earlier by other investigators (15, 24, 27). It can be observed from Table (2) that lambs fed 3% concentrate had significantly ( $P < 0.01$ ) lower dressing percentage based on slaughter weight ( $45.66 \pm 0.58\%$ ) than did lambs fed ad lib ( $47.43 \pm 0.75\%$ ), but the difference in dressing percentage based on empty body weight lacked significance possibly due to higher gut content of lambs fed adlib (15.85%) as compared to lambs fed 3% (12.94%). It has been reported generally that lambs fed a high level of feeding tends to have a higher dressing percentage compared to those fed low level of feeding (9, 16, 30). The dressing percentage of lambs slaughtered at 36 kg had significantly ( $P < 0.01$ ) lower dressing percentage than those slaughtered at 44 kg based either on slaughter weight (44.72 vs. 48.36%) or empty body weight (53.24 vs. 55.47%) (Table 2). Also, previously it was indicated that dressing percentage usually tend to increase as slaughter weight increases (1, 14, 33). Shrinkage averaged  $2.85 \pm 0.06\%$  (Table 2), and neither breed nor level of feeding had a significant effect on this traits. However, lambs slaughtered at 36 kg had significantly ( $P < 0.01$ ) higher shrinkage ( $3.04 \pm 0.06\%$ ) as compared with lambs slaughtered at 44 kg ( $2.65 \pm 0.08\%$ ) (Table 2). This is possibly due to the thicker subcutaneous fat in lambs slaughtered at 44 kg ( $3.05 \pm 0.16\text{mm}$ ) as compared with lambs slaughtered lighter ( $2.67 \pm 0.17\text{mm}$ ) (Table 2). In the current

investigation, rib eye area averaged  $14.98 \pm 0.44$  cm<sup>2</sup> (Table 2). This value is slightly higher than the value obtained earlier for Awassi lambs (4, 5, 7, 22) as well as for Karadi lambs (4, 5). Results reveal that neither breed nor level of feeding had a significant effect on this trait. Such result is in agreement with those reported on the effect of breed (4, 21, 24, 35), and on the effect of level of feeding (4, 16, 21). Rib eye area of lambs slaughtered at 44 kg was significantly ( $P < 0.01$ ) larger ( $16.76 \pm 0.51$  cm<sup>2</sup>) compared to lambs slaughtered at 36 kg ( $13.20 \pm 0.37$  cm<sup>2</sup>) (Table 2). Similarly, Rashed et al (26), Macit (19), Balci and Karakas (8) and Sefdeen and Alkass (31) reported that when slaughter weight increases the rib eye area was

expanded. Also, lambs fed ad lib had significantly ( $P < 0.05$ ) thicker fat than did lambs fed 3% concentrate ( $3.08 \pm 0.14$  vs.  $2.64 \pm 0.17$  mm). Also, carcass fat thickness increased significantly ( $P < 0.05$ ) as slaughter weight increased ( $3.05 \pm 0.16$  vs.  $2.67 \pm 0.17$  mm) (Table 2). Similarly, Rashid et al (26), Macit (19), Balci and Karakas (8), Sefdeen and Alkass (31) indicated that when the slaughter weight increased, fat was found to be thicker. In this study, fat thickness averaged  $2.86 \pm 0.12$  mm, and Awassi lambs laid significantly ( $P < 0.01$ ) higher subcutaneous fat over L-dorsi muscle than laid Karadi lambs ( $3.13 \pm 0.13$  vs.  $2.41 \pm 0.12$  mm) (Table 2). This result is in accordance with those of other workers (4, 22, 35).

**Table 2. Effect of breed, level of feeding and slaughter weight on some carcass characteristics of Karadi and Awassi lambs**

Effects	No.	Slaughter Wt. (kg)	Hot carcass wt. (kg)	Chilled carcass wt. (kg)	Shrinkage %	Dressing %/ live wt.	Dressing % / empty body wt.	Rib eye area Cm <sup>2</sup>	Fat thickness mm	
Overall mean	32	39.988 ± 0.726	18.687 ± 0.493	18.160 ± 0.486	2.850 ± 0.064	46.546 ± 0.495	54.357 ± 0.404	14.988 ± 0.448	2.863 ± 0.121	
Breed	Karadi	16	39.988 ± 1.046 a	18.391 ± 0.744 b	17.871 ± 0.730 b	2.851 ± 0.088 a	45.773 ± 0.815 b	53.870 ± 0.701 a	15.181 ± 0.590 a	2.413 ± 0.122 b
	Awasi	16	39.988 ± 1.040 a	18.982 ± 0.663 a	18.448 ± 0.658 a	2.850 ± 0.094 a	47.319 ± 0.518 a	54.844 ± 0.388 a	14.794 ± 0.690 a	3.314 ± 0.136 a
L. of Feeding	3%	16	40.00 ± 1.037 a	18.314 ± 0.631 b	17.784 ± 0.616 b	2.904 ± 0.076 a	45.661 ± 0.589 b	54.258 ± 0.582 a	15.031 ± 0.596 a	2.644 ± 0.178 b
	ad lib	16	39.975 ± 1.0495 a	19.059 ± 0.767 a	18.536 ± 0.761 a	2.797 ± 0.102 a	47.431 ± 0.750 a	54.456 ± 0.578 a	14.944 ± 0.689 a	3.083 ± 0.149 a
Slaughter Wt.	36kg	16	35.950 ± 0.0447 b	16.081 ± 0.183 b	15.591 ± 0.176 b	3.045 ± 0.065 a	44.729 ± 0.498 b	53.242 ± 0.460 b	13.206 ± 0.372 b	2.671 ± 0.172 b
	44kg	16	44.025 ± 0.0323 a	21.293 ± 0.257 a	20.729 ± 0.258 a	2.656 ± 0.086 b	48.363 ± 0.570 a	55.473 ± 0.544 a	16.769 ± 0.518 a	3.056 ± 0.161 a

Means with different letters within each column differ significantly ( $P < 0.05$ ) according to Duncan's test.

#### Whole sale cuts

Comparison between the two studied breeds reveal that Karadi lambs had a significantly ( $P < 0.05$ ) higher proportion of leg as compared to Awassi lambs (29.90 vs. 28.76%), conversely, the percentage of rack and fore shank are significantly ( $P < 0.05$ ) higher in Awassi as compared to Karadi (Table 3). On the effect of level of feeding on carcass cuts it appears from Table (3) that lambs fed 3% concentrate had significantly ( $P < 0.05$ ) higher

percentage of loin as compared with lambs received ad lib feeding (9.28 vs 8.73%). Also, as slaughter weight increased, percentages of leg, neck, shoulder decreased, and the percentage of loin and fat tail increased (Table 3) reflecting the influence of fat deposition. These changes reflect the different rates of maturity among the whole sale cuts previously reported by Palsson and Verges (23). These changes are similar to those reported by Sents et al (32) and Sefdeen and Alkass (31).

**Table 3. Effect of breed, level of feeding and slaughter weight on carcass cuts of Karadi and Awassi lambs**

Effects	No.	As a % of chilled carcass wt.								
		Legs wt.	Loin wt.	Neck wt.	Shoulder wt.	Fore shank wt.	Breast wt.	Rack wt.	Flank wt.	Fat tail wt.
<b>Overall mean</b>	<b>32</b>	<b>29.335 ± 0.327</b>	<b>9.012 ± 0.156</b>	<b>7.371 ± 0.149</b>	<b>18.077 ± 0.271</b>	<b>4.098 ± 0.083</b>	<b>9.804 ± 0.224</b>	<b>6.777 ± 0.196</b>	<b>2.702 ± 0.082</b>	<b>12.825 ± 0.617</b>
<b>Breed</b>	<b>Karadi</b>	<b>29.905 ± 0.464 a</b>	<b>8.836 ± 0.268 a</b>	<b>7.357 ± 0.221 a</b>	<b>17.700 ± 0.355 a</b>	<b>4.384 ± 0.105 a</b>	<b>10.095 ± 0.362 a</b>	<b>6.448 ± 0.187 b</b>	<b>2.542 ± 0.112 a</b>	<b>12.732 ± 0.946 a</b>
	<b>Awasi</b>	<b>28.765 ± 0.429 b</b>	<b>9.187 ± 0.158 a</b>	<b>7.385 ± 0.206 a</b>	<b>18.455 ± 0.397 a</b>	<b>3.811 ± 0.080 b</b>	<b>9.513 ± 0.257 a</b>	<b>7.105 ± 0.330 a</b>	<b>2.862 ± 0.108 a</b>	<b>12.917 ± 0.822 a</b>
<b>L. of Feeding</b>	<b>3%</b>	<b>29.308 ± 0.330 a</b>	<b>9.289 ± 0.210 a</b>	<b>7.515 ± 0.184 a</b>	<b>18.168 ± 0.374 a</b>	<b>4.170 ± 0.124 a</b>	<b>9.813 ± 0.334 a</b>	<b>6.940 ± 0.331 a</b>	<b>2.672 ± 0.108 a</b>	<b>12.125 ± 0.632 a</b>
	<b>ad lib</b>	<b>29.362 ± 0.578 a</b>	<b>8.735 ± 0.216 b</b>	<b>7.226 ± 0.234 a</b>	<b>17.987 ± 0.402 a</b>	<b>4.025 ± 0.110 a</b>	<b>9.795 ± 0.310 a</b>	<b>6.613 ± 0.213 a</b>	<b>2.733 ± 0.126 a</b>	<b>13.525 ± 1.052 a</b>
<b>Slaughter Wt.</b>	<b>36kg</b>	<b>30.211 ± 0.446 a</b>	<b>8.686 ± 0.197 b</b>	<b>7.767 ± 0.185 a</b>	<b>18.747 ± 0.323 a</b>	<b>4.158 ± 0.099 a</b>	<b>9.625 ± 0.242 a</b>	<b>6.907 ± 0.272 a</b>	<b>2.683 ± 0.141 a</b>	<b>11.215 ± 0.753 b</b>
	<b>44kg</b>	<b>28.459 ± 0.377 b</b>	<b>9.337 ± 0.219 a</b>	<b>6.975 ± 0.190 b</b>	<b>17.407 ± 0.373 b</b>	<b>4.037 ± 0.134 a</b>	<b>9.983 ± 0.381 a</b>	<b>6.647 ± 0.286 a</b>	<b>2.721 ± 0.088 a</b>	<b>14.435 ± 0.812 a</b>

Means with different letters within each column differ significantly ( $P < 0.05$ ) according to Duncan's test

## CONCLUSION

From the results presented in the text, it can be concluded that Awassi and Karadi lambs grew at a similar rate, and Awassi excelled Karadi in dressing percentage, had a thicker fat and smaller area of L-dorsi muscle. Also, lamb fed ad lib grew faster than those received 3% concentrate.

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