THE IMPACT OF DOCKING KARADI LAMBS ON GROWTH PERFORMANCE, CARCASS TRAITS AND BODY COMPOSITION

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ABSTRACT

Twelve new born Karadi lambs were docked within 3 days of their birth using rubber-rings, and left with their mothers till weaning (2.5 months). Another 12 weaned Karadi lambs obtained from local market were left intact. Following an adaptation period of a week, the docked and intact lambs with an average initial weight of 16.83±1.522 and 19.92± 0.748kg were randomly divided into three equal groups to be slaughtered at 20, 30 and 40kg. 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 0.261±0.014kg, 45.956±0.428%, 53.933±0.678%, 11.288±0.488cm^2 and 2.023±0.76mm, respectively, and no significant difference exist between them except dressing percentage based on empty body weight. It appears that carcasses of intact lambs compared to docked lambs contained significantly higher lean (62.79 vs. 59.85%), lean: fat (5.319 vs. 4.142), lean: bone (2.772 vs. 2.489) and numerically lower fat (16.058 vs. 14.042%) and bone (23.172 vs. 24.096%). Also, it was noticed as slaughter weight increase, there is an increase in dressing percentage, rib eye area, fat thickness, fat content of their carcass with a lower proportion of lean and bone.

Keywords: daily gain, carcass traits, docking, tissue distribution, lambs.

تاثير قطع الالية للحملان الكرادية في اداء النمو، صفات الذبيحة وتركيب الجسم

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المستخلص

تم في هذه الدراسة قطع الالية لـ 12 حمل كرادي عند عمر ثلاثة ايام باستخدام الحلقات المطاطية وتركت مع امهاتها لحين الفطام (2.5 شهر) وثم شراء 12 حمل مفطوم من الاسواق المحلية. وبعد فترة تاقلم لمدة اسبوع تم توزيع كل من الحملان المقطوع الالية والاعتيادية وباوزان الابتدائية 16.83 19.92 كغم عشوائياً لتذبح عند اوزان 20، 30 و 40 كغم. اشارت النتائج بان المعدل العام للزيادة الوزنية اليومية، نسبة التصافي منسوبة الى الوزن عند الذبح والوزن الفارغ ومساحة العظلة العينية وسمك الطبقة الدهنية قد بلغت 0.261±0.014، 45.956±0.428%، 53.933±0.678%، 11.288±0.488سم^2 و 2.023±0.76ملم على التوالي, ولم تكن هناك فروقات معنوية بين المعاملتين في جميع الصفات الانفة الذكر باستثناء نسبة التصافي منسوبة الى الوزن الفارغ. كما لوحظ احتواء ذبائح الحملان العادية معنوية على نسبة اعلى من اللحم (62.79 مقارنة بـ 59.85)، نسبة اللحم: الدهن (5.319 مقارنة بـ 4.142) ونسبة اللحم: العظم (2.772 مقارنة بـ 2.489) ونسبة اوطأ من الدهن (16.058 مقارنة بـ 14.042) والعظم (23.172 مقارنة بـ 24.096%). كما وجد بان زيادة الوزن عند الذبح قد صاحبه زيادة في نسبة التصافي، مساحة العظلة العينية وسمك الطبقة الدهنية و محتوى الذبيحة من الدهن وانخفاض نسبتي اللحم والعظم.

الكلمات المفتاحية: زيادة الوزنية، صفات الذبيحة، قطع الالية، توزيع الانسجة، الحملان.

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INTRODUCTION

The fat-tail type of sheep is probably the most important in the world in terms of its overall contribution to mankind, and as stated by Shelton (52) that about one third of the world's population consist of fat-tailed sheep. The fat tail plays an important role in adaptation of sheep raised under the harsh feeding condition of availability of foodstuffs and particularly of good quality roughage is seasonal (4). Furthermore, the major biological role of fat is to serve as an energy source, providing the survival buffer against periodic food scarcity such as drought in winter (38, 39, 40). Although removal of fat-tail (docking) is not common practice in this area that rises fat-tailed sheep (7, 35), however, it is assumed that docking early in life would improve the efficiency of growth by eliminating the deposition of large amount of fat in the tail and thus a greater function of the absorbed nutrients are more available for body gain (17, 53), as well as dressed lamb carcasses have a neater appearance and thus receive higher market prices (25). Additionally, consumers are now more diet conscious and are changing their eating habits in order to consume leaner meat (5, 29). It is known that Karadi sheep have an excessively large tail that ends in a thin nonfat terminal extended beyond the fatty lobes (8). Therefore, this study was intended to investigate the effect of docking Karadi lambs on growth, carcass trait and body composition slaughtered at different weights.

MATERIALS AND METHODS

Animal and Experimental design

In the present experiment, twelve new born lambs were docked within 3 days of their birth using rubber-rings between the 1st and 2nd vertebrae down the tail, and left with their mothers till weaning (2.5 months). Another 12 weaned male lambs obtained from local market were left intact. Following an adaptation period of a week, the docked and intact lambs with an average initial weight of 16.83± and 19.92± kg were randomly divided into three equal groups to be slaughtered at 20, 30 and 40kg. Each group was housed in a separate pen and fed a pelleted diet containing 16% crude protein and 2769 Kcal energy and straw *ad libitum*. The concentrate 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.

Health control: During preparatory period, all lambs were injected subcutaneously with Panmectine* and drenched orally with Levozan** against internal and external parasites, and repeated 15 days later. Also the lambs vaccinated against enterotoxaemia*** which also repeated after 21 days to prevent pulpy kidney disease occurrence during adaption period.

Slaughtering of the animals: All Lambs were slaughtered when each lamb has reached its target slaughter weight (20, 30 and 40 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 4^0c 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^{th} rib was measured by a placom digital planimeter. Fat thickness over the

(PANMECTINE 10), Pantex Holland. Each ml
* contains: 10 mg ivermectin.
** Levozan. Deworming. Amman-Jordan Manufactory Company.
*** Enterotoxaemia (Coglaxoid). Polyvalent Inactivated Vaccine. Manufactured by: LLC "AGROVET" located in Russia.

midpoint of *L- dorsi* muscle perpendicularly was recorded using Digital Caliper device.

Physical dissection: Each cut of the left half carcasses were weighed and dissected completely into lean, fat and bone. The three components were weighed separately to determine their percentages. Carcass fat including subcutaneous and intermuscular fat was separated from each cut. Non-carcass fat was the sum of the omental, mesenteric, pelvic, kidney, scrotal and cardiac fat.

Statistical analysis: The statistical analysis of data was conducted using the GLM (general linear model) within SAS (49) to study the effect of docking lambs and slaughter weight on studied traits. Duncan multiple range tests (21) were used to test the differences between the sub classes of each factor.

RESULTS AND DISCUSSION

Growth performance: Growth performance as affected by docking and slaughtered at different weights are presented in Table (1). In the current investigation, daily gain in weight averaged 0.261±0.01 kg which is comparable to those obtained for the same breed by Alkass and Kak (9), Sefdin and Alkass (50), Alkass and Hassan (6) and Al-Sherwany and Alkass (10). Daily gain for docked and intact lambs averaged 0.265±0.021 kg and 0.256±0.021 kg, respectively and the difference between them lacked significance (P>0.05). Similarly, Ahtash, et al., (1), Bingol, et al., (14), Dahal, (18) Isani, et al., (27) indicated that the difference between docked and undocked lambs was not significant in daily gain in weight. It was noticed in the current investigation, that lambs slaughtered at 20kg had significantly (P<0.01) lower gain (0.197±0.020kg) than those either slaughtered at 30kg (0.294±0.024 kg) or 40kg (0.291±0.015 kg). (Table 1). However, such lower daily gain of lambs slaughtered at 20kg could be possibly due to the impact of docking on growth at early life. It is generally agreed that daily live weight gain in lambs slaughtered at different weight decrease with increasing slaughter weight (2, 44, 50), mainly due to fat deposition. However, this result agree with the finding of Balci and Karkas (12) and Al-Sherwany and Alkass (10) who noticed an increase in average daily gain with the increasing slaughter weight of lambs. Fattening period for docked and undocked lambs being 49.67 and 37.83 days, respectively and the difference was not significant (Table 1). It is obviously that lambs required shorter time (23.00 days) to attain their target slaughter weight (20kg) compared to those slaughtered at (30kg) (40.25 days) and (40kg) (68.00 days) (P<0.01). This result was in accordance with the finding of Alkass and Hassan (6).

Feed conversion ratio: Total feed intake required to produce one kilogram live weight gain by docked and intact lambs was 2.813 and 3.185 kg/kg, respectively (Table 1). Also, feed to gain ratio increased from 2.13 kg to 3.45 kg/kg in lambs slaughtered at 20 and 40 kg, respectively which may be is due to the deposition of fat. Similar findings have been reported earlier (13, 18, 22). 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, (9), Alkass and Hassan (6) and Al-Sherwany and Alkass (10).

Table 1. Effect of docking of Karadi male lambs slaughtered at different weight on growth performance

Effects		No.	Initial Wt. (kg)	Final Wt. (kg)	Period (day)	ADG (kg)	Feed Convention Ratio (kg)
Overall mean		24	18.375± 0.889	30.063± 1.709	43.750± 5.289	0.261± 0.014	2.975
Docking		12	16.833± 1.522 b	30.033 ± 2.463 a	49.67 ± 5.732 a	0.265 ± 0.021 a	2.813
Intact		12	19.917 ± 0.748 a	30.092 ± 2.480 a	37.833 ± 8.819 a	0.256 ± 0.0210 a	3.185
Slaughter Wt.	20kg	8	15.500± 1.570 b	20.088± 0.134 c	23.000± 7.581 c	0.197± 0.020 b	2.131
	30kg	8	18.625 ± 0.920 ab	29.950± 0.143 b	40.250± 4.435 b	0.294± 0.024 a	2.539
	40kg	8	21.000± 1.521 a	40.150± 0.078 a	68.000 ± 7.166 a	0.291± 0.015 a	3.435

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

Carcass traits

The overall means of dressing percentage based on the slaughter weight and empty body weight were 45.956±0.428 and 53.933±0.678 %, respectively (Table 2). Examination of the effect of docking lambs on dressing percentage based on slaughter weight reveals that docked lambs had numerically higher dressing percentage than undocked lambs (46.291 vs. 45.621%) (Table 2). However, Docked lambs yielded significantly (P<0.05) higher value (55.434 ± 0.711%) than intact Karadi lambs (52.433 ± 1.005%) on dressing percentage based on empty body weight (Table 2), which is mainly due to differences in gut content. Similarly, some authors reported that docked lambs had higher dressing percentage than intact lambs (1, 7, 25, 27, 28, 53). Although lambs slaughtered at 30 kg had significantly (P<0.01) lower dressing percentage (44.32%) based on slaughter weight than did lambs slaughtered at 20kg (45.86%) and 40kg (47.69%). However, a significant (P<0.05) increase in dressing percentage based on empty body weight was recorded being 52.17, 54.37 and 55.27% for lambs slaughtered at 20, 30 and 40kg, respectively (Table 2). Also, previously it was indicated that dressing percentage usually tend to increase as slaughter weight increases (2, 24, 51). Shrinkage averaged 4.108±0.254% (Table 2), and docking lambs had no significant effect on this traits. However, lambs slaughtered at 20 kg had significantly (P<0.01) higher shrinkage (5.633±0.186%) as compared with lambs slaughtered at 30 kg (3.774±0.162%) and 40kg (2.918±0.162%) (Table 2). This is possibly due to the thicker subcutaneous fat in lambs slaughtered at 40 kg (2.886±0.104mm) as compared with lambs slaughtered at 30kg (1.988±0.235mm) and 20kg (1.196±0.185mm) (Table 2)**.** In the current investigation, rib eye area averaged 11.288±0.488 cm^2 (Table 2). Results reveal that docking had no significant effect on this trait, being 11.067 and 11.508 cm^2 for docked and intact lambs, respectively. Such result resemble those reported earlier on the effect of docking (7, 22, 25). Rib eye area of lambs slaughtered at 40 kg was significantly (P<0.01) larger (14.038±0.424cm^2) compared to lambs slaughtered at 30kg (11.038±0.384 cm^2) and slaughtered at 20kg (8.788±0.20cm^2) (Table 2). Similarly, Rashed et al (44), Macit (32), Balci and Karakas (12) and Sefdeen and Alkass (50) reported that as slaughter weight increases the rib eye area was expanded **.**In this study, fat thickness averaged 2.023±0.176 mm, and docked lambs laid significantly (P<0.01) higher subcutaneous fat over L-dorsi muscle than laid undocked lambs (2.366±0.211 vs. 1.681±0.251 mm) (Table 2). This result is in accordance with those of other workers (5, 7, 54). Also, carcass fat thickness increased significantly (P<0.01) as slaughter weight increased being (2.886±0.104 vs. 1.988±0.235 and 1.196±0.185mm) for lambs slaughtered at 40, 30, and 20kg, respectively (Table 2). Such result is in accordance with those reported by Rashid et al (44), Macit (32), Balci and Karakas (12), Sefdeen and Alkass (50) demonstrated that as the weight of slaughter increased, there is an increase in subcutaneous fat.

Table 2. Effect of docking of Karadi male lambs slaughtered at different weight on some carcass characteristics

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^2	Fat thickness mm
Overall mean		24	30.063± 1.709	13.876± 0.855	13.370± 0.848	4.108± 0.254	45.956± 0.428	53.933± 0.678	11.288± 0.488	2.023± 0.176
Docking		12	30.033 ± 2.463 a	13.921± 1.208 a	13.385± 1.217 a	4.173± 0.438 a	46.291± 0.654 a	55.434± 0.711 a	11.067± 0.680 a	2.366± 0.211 a
Intact		12	30.092 ± 2.480 a	13.832± 1.264 a	13.354± 1.236 a	4.043± 0.278 a	45.621± 0.566 a	52.433± 1.005 b	11.508± 0.725 a	1.681± 0.251 b
Slaughter Wt.	20kg	8	20.088± 0.134 c	9.210± 0.135 c	8.743± 0.134 c	5.633± 0.186 a	45.864± 0.741 b	52.168± 1.651 b	8.788± 0.200 c	1.196± 0.185 c
	30kg	8	29.950± 0.143 b	13.275± 0.189 b	12.775± 0.194 b	3.774± 0.162 b	44.315 ± 0.487 c	54.365± 0.433 ab	11.038± 0.384 b	1.988± 0.235 b
	40kg	8	40.150± 0.078 a	19.144± 0.172 a	18.591± 0.170 a	2.918± 0.162 c	47.691 ± 0.456 a	55.268± 0.947 a	14.038± 0.424 a	2.886± 0.104 a

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

Whole sale cuts

Two ways were used to examine the effect of docking on whole sale cuts, the first was based on absolute weight of each cut excluding fat tail whereas, the second way was expressed as a percentage of chilled carcass weight excluding fat tail. It seems from Table (3) that the weight of leg, neck, shoulder in docked lambs excelled significantly (P<0.01) those intact lambs, accordingly the expensive muscle (leg + loin + shoulder) was amounted to 4.366 and 3.817 kg for docked and intact lambs, respectively, which means an extra of 12.6% of docked over intact lambs was noticed. When cuts are expressed as a percentage of chilled carcass weight, it was found that only percent of leg in docked lambs was significantly (P<0.05) higher (36.855%) than intact lambs (35.504%) (Table 4). It is obvious that with the increasing slaughter weight there is a significant (P<0.01) increase in all cuts (Table 3). Therefore, the weight of whole sale cuts of lambs slaughtered at 40kg was significantly (P<0.01) higher than other slaughter weights. These changes reflect the different rates of maturity among the whole sale cuts previously reported by Palsson and Verges (42). Such changes are similar to those reported by Gokdal, *et al.*, (25), Moharrery, (36), Tilki, *et al.*, (54) and Isani, *et al.*, (27).

Table 3. Effect of docking of Karadi male lambs slaughtered at different weight on the weight of carcass cuts (kg)

Effects		No.	Weights (Kg)							
			Legs	Loin	Neck	Shoulder	Fore shank	Breast	Rack	Flank
Overall mean		24	2.261± 0.144	0.582± 0.037	0.519± 0.039	1.249± 0.074	0.298± 0.015	0.704± 0.057	0.444± 0.028	0.171± 0.015
Docking		12	2.446± 0.240 a	0.596± 0.057 a	0.540± 0.064 a	1.324± 0.126 a	0.319± 0.025 a	0.713± 0.072 a	0.458± 0.044 a	0.170± 0.020 a
Undocking		12	2.075± 0.150 b	0.567± 0.048 a	0.498± 0.049 b	1.175± 0.079 b	0.278± 0.016 b	0.695± 0.091 a	0.430± 0.036 a	0.172± 0.024 a
Slaughter Wt.	20kg	8	1.477± 0.024 c	0.391± 0.009 c	0.328± 0.011 c	0.879± 0.019 c	0.222± 0.004 c	0.433± 0.007 c	0.314± 0.005 c	0.102± 0.006 c
	30kg	8	2.265± 0.064 b	0.550± 0.014 b	0.465± 0.011 b	1.186± 0.031 b	0.290± 0.007 b	0.623± 0.021 b	0.403± 0.013 b	0.148± 0.011 b
	40kg	8	3.040± 0.156 a	0.804± 0.022 a	0.764± 0.029 a	1.683± 0.077 a	0.383± 0.017 a	1.056± 0.048 a	0.615± 0.025 a	0.263± 0.011 a

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

Table 4. Effect of docking of Karadi male lambs slaughtered at different weight on carcass cuts (as a percentage of chilled carcass weight excluding fat tail)

Effects		No.	As a % of chilled carcass wt. excluding fat tail							
			Legs	Loin	Neck	Shoulder	Fore shank	Breast	Rack	Flank
Overall mean		24	36.330± 0.402	9.371± 0.135	8.214± 0.156	20.237± 0.249	4.896± 0.087	11.099± 0.290	7.176± 0.103	2.678± 0.111
Docking		12	37.155± 0.447 a	9.119± 0.142 a	8.073± 0.225 a	20.259± 0.367 a	4.962± 0.110 a	10.831± 0.148 a	7.025± 0.129 a	2.577± 0.116 a
Undocking		12	35.504±0 .592 b	9.623± 0.212 a	8.355± 0.218 a	20.215± 0.353 a	4.831± 0.136 a	11.366± 0.562 a	7.327± 0.153 a	2.780± 0.190 a
Slaughter Wt.	20kg	8	35.628± 0.459 b	9.436± 0.181 a	7.891± 0.234 b	21.201± 0.467 a	5.360± 0.053 a	10.448± 0.120 b	7.582± 0.092 a	2.454± 0.139 b
	30kg	8	38.180± 0.399 a	9.283± 0.192 a	7.863± 0.204 b	19.996± 0.253 b	4.888± 0.078 b	10.499± 0.218 b	6.792± 0.105 b	2.500± 0.189 b
	40kg	8	35.182± 0.688 b	9.394± 0.331 a	8.887± 0.215 a	19.513± 0.333 b	4.441± 0.068 c	12.348± 0.656 a	7.154± 0.199 b	3.082± 0.177 a

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

Tissue distribution in the carcass

In general, relatively few studies have been previously carried out to investigate the carcass composition of docked .vs. entire male lambs, it show are based only on the dissection of only one cut of the carcass, whereas in the present work full dissection of the half carcass was performed. The proportion of separable carcass tissue of cuts and carcass side of docked and intact Karadi lambs slaughtered at 20, 30 and 40 kg are given in Tables (5 and 6). It seems from Table (5) that lean percentage of intact lambs surpass significantly (P<0.01) docked lambs in the leg, rack and fore shank cuts. Conversely, the proportion of lean in the neck cut only was significantly higher (P<0.01) in docked lambs. Moreover, lean percent is almost similar in the loin, shoulder,

breast and flank cuts. With respect to percent fat in the different cuts, results reveal that fat percentage of docked lambs was significantly (P<0.01) higher in the leg and neck percentage (P<0.05) than undocked lambs, and the difference in fat proportion of remaining cuts were not significant. Also, the proportion of bone in docked lambs was significantly higher in rack, fore shank (P<0.01) and shoulder cuts (P<0.05) only. Additionally, muscle content varied according to its location in the carcass. For example, the higher muscle content was in the shoulder (65.798%), whereas the lowest was in the fore shank (48.63%) and the breast (51.488%) in docked lambs. Also, in the intact lambs, the highest lean content was in the shoulder (66.482%) and the lowest in the breast (51.225%) and the fore shank (51.426%) (Table 5). Such variation in muscle mass is primarily attributed to differences in the total number of muscle fiber. Possibly the evolutionary increases in muscle fiber size is limited by physiological status in that normal cell function is maintained only as long as certain limit in cell size is not exceeded (45).Thus as it appears from Table (6) that whole side of the carcass of undocked lambs as compared with docked lambs contained significantly (P<0.05) higher proportion of lean (62.786 vs. 59.846%), lean to fat ratio (5.319 vs. 4.142) and lean to bone ratio (2.722 vs. 2.489) and numerically lower proportion of fat (14.042 vs. 16.058%) and bone (23.172 vs. 24.096%). Similarly, Alkass, et al., (7), Bicer, et al., (13) and Gokdal et al., (25) found that the carcass of docked lambs had lower lean percentage than intact lambs. Also, Alkass, et al., (7), and Mona Mohammady, et al., (37) noticed that the carcasses of docked lambs tended to have a higher proportion of fat, and Dahal, (18) noticed that intact lambs had lower bone proportion than docked lambs (P>0.05). It appears from Table (5) that with exception of fore shank cuts, the lean proportion decreased significantly (P<0.01) in the leg, rack, shoulder, neck and breast cuts (P<0.05) as slaughter weight increases. Such result could be attributed mainly to the fact that muscle is relatively considered early maturing tissue (15). Conversely, the fat content in all cuts in the carcass as well as the whole carcass side increased significantly (P<0.01) with increasing slaughter weight (Tables 5 & 6). It is well known that the fat is a late growing body tissue and therefore its proportions in the carcass greatly changed with the progress of growth (15). With exception of neck carcass cuts, a significant (P<0.01) (P<0.05) decrease in the proportion of bone was noticed of all cuts with increasing slaughter weights. It is well known that bone is an early maturing carcass component so it grows at slower rate during post-natal life, and consequently decreasing with increasing body weight (31, 34). Several investigators noted that as slaughter weight increased, there is mainly an increase in fat and a decrease in bone proportion of the carcass carcass (3, 10, 23, 41, 50). From the results given in Table (6), it appears that lambs slaughtered at 20kg had significantly (P<0.01) higher lean: fat ratio (6.926±0.575) as compared with lambs slaughtered at 30kg (4.232±0.467) and 40kg (3.034±0.317), while lean: bone ratio increased numerically by increasing slaughter weight from 20 to 30kg and 20 to 40kg, and the difference was not significant. Previous workers also reported decreasing carcass lean: fat ratio (30, 55) and increasing lean: bone ratios (11, 20, 47), with increasing weight at slaughter.

Partitions of fat: It is known that fat is the most variable tissue in the carcass, and it varies not in its total amount but also in its distribution between the various deposits which alter markedly during growth, and the proportion and location of fat in the body are important in meat animals (33). Result of the present work reveal that docked lambs as compared with entire lambs had numerically higher carcass fat (2.173 vs. 1.779 kg) and non-carcass fat (0.611 vs. 0.535 kg) and significantly (P<0.01) lower fat tail (0.000 vs. 1.885 kg). Thus, it seems from Table (7) that carcasses of docked lambs contained significantly (P<0.01) higher proportion of carcass fat as compared to intact lambs (76.255 vs 39.715%) and non-carcass fat (23.74 vs 13.90%) and lower proportion of fat tail (00.00 vs. 46.38%). Similarly, Gokdal, et al., (25) reported that the docked lambs contained a higher proportion of subcutaneous fat (P<0.01) and intermuscular fat (P<0.05) than the intact lambs. Also, it is in agreement

with those of Demiruren et al., (19), Gursoy et al., (26) and Cengiz and Arik (16) who reported that carcasses of docked lambs tended to have a higher proportion of intermuscular and subcutaneous fat deposits and less tail fat than intact lambs and are thus more desirable to consumers. Lambs slaughtered at 40 kg had significantly (P<0.01) higher carcass fat, non-carcass fat, fat tail and total body fat compared with lambs slaughtered at 20 and 30 kg (Table 7). As the animal grew up, and fat is a late maturing tissue therefor the deposition of fat increased. These results are in agreement with those reported earlier by Santos et al. (48), Rodrigues et al (46) and Rajkumar et al. (43). However, as a percentage of total body fat, it can be observed from Table (7) that carcass fat increased significantly (P<0.01) and non-carcass fat decreased significantly (P<0.01) with the increasing slaughter weight. This result is resemble to Butterfield (15) who stated that relative to the growth of the total dissectible fat of the Merino rams to the partitions of fats grow on the following impetus patterns from about 20% mature to maturity intermuscular low subcutaneous average carcass fat low non-carcass fat high

CONCLUSION

From the results presented in the text, it can be conclude that no adverse effect of docking on growth and carcass traits was noticed. However, docked lambs content higher fat and lower proportion of lean in their carcasses compared to intact lambs.

Table 5. Effect of docking of Karadi male lambs on physical dissection of whole sale cuts

Effects		Overall mean	Docked	Intact	Slaughter Wt. 20kg	30kg	40kg
%	No.	24	12	12	8	8	8
Legs	Lean	62.837± 1.232	59.358± 1.745 b	66.316± 1.051 a	67.669± 0.821a	61.951± 2.230 b	58.891± 1.909b
	Fat	16.585± 1.348	20.180± 1.921 a	12.990± 1.248 b	10.775± 0.968c	17.697± 2.293b	21.283± 1.887a
	Bone	20.578± 0.325	20.462± 0.576 a	20.694± 0.325 a	21.556± 0.744a	20.352± 0.318 ab	19.826± 0.398 b
Loin	Lean	63.050± 1.446	62.645± 2.300 a	63.456± 1.852 a	65.909± 1.570 a	66.121± 1.406 a	57.121± 2.940 b
	Fat	14.609± 1.479	14.668± 1.969 a	14.550± 2.297 a	7.297± 0.510 c	15.187± 1.340 b	21.344± 2.314 a
	Bone	22.340± 1.039	22.687± 1.556 a	21.994± 1.439 a	26.793± 1.736 a	18.692± 1.214 b	21.536± 1.151 b
Rack	Lean	57.180± 1.187	55.071± 1.441 b	59.290± 1.733 a	61.145± 1.288 a	56.985± 2.095 b	53.411± 1.885 b
	Fat	13.280± 1.269	12.833± 1.632 a	13.728± 2.010 a	7.194± 0.423 c	14.070± 1.416 b	18.577± 2.076 a
	Bone	29.539± 0.847	32.097± 0.805 a	26.982± 1.077 b	31.660± 1.456 a	28.945± 1.790 ab	28.013± 0.846 b
Shoulder	Lean	66.140± 0.539	65.798± 0.617 a	66.482± 0.901 a	67.502± 0.574 a	66.987± 0.710 a	63.931± 0.981 b
	Fat	9.417± 0.687	9.316± 0.742 a	9.518± 1.192 a	5.699± 0.518 c	10.205± 0.510 b	12.347± 0.912 a
	Bone	24.444± 0.402	24.886± 0.459 a	24.001± 0.654 b	26.800± 0.306 a	22.808± 0.379 c	23.723± 0.321 b
Neck	Lean	62.461± 1.065	63.834± 0.934 a	61.089± 1.879 b	67.663± 0.705 a	61.837± 1.314 b	57.884± 1.431 c
	Fat	10.716± 0.843	9.525± 0.577 b	11.908± 1.542 a	7.871± 0.451 b	11.383± 0.776 a	12.894± 2.073 a
	Bone	26.822± 0.711	26.642± 1.041 a	27.003± 1.013 a	24.466± 0.405 b	26.779± 1.654 ab	29.222± 0.687 a
Fore shank	Lean	50.028± 0.510	48.631± 0.535 b	51.426± 0.668 a	49.714± 0.984 a	50.512± 0.901 a	49.859± 0.856 a
	Fat	4.458± 0.351	4.306± 0.441 a	4.609± 0.561 a	2.693± 0.227 c	4.689± 0.313 b	5.992± 0.523 a
	Bone	45.514± 0.636	47.063± 0.754 a	43.965± 0.828 b	47.594± 1.105 a	44.799± 0.813 b	44.149± 1.071 b
Breast	Lean	51.356± 0.991	51.488± 1.416 a	51.225± 1.447 a	54.562± 1.254 a	51.549± 0.691 ab	47.957± 2.121 b
	Fat	25.770± 1.524	24.729± 2.190 a	26.812± 2.172 a	19.187± 1.063 c	25.907± 1.089 b	32.216± 2.906 a
	Bone	22.874± 0.801	23.784± 1.049 a	21.964± 1.196 a	26.251± 0.396 a	22.544± 1.561 b	19.826± 0.868 b
Flank	Lean	72.520± 2.217	72.692± 3.547 a	72.348± 2.822 a	73.514± 1.491 b	82.078± 1.974 a	61.969± 3.637 c
	Fat	27.480± 2.217	27.308± 3.547 a	27.652± 2.822 a	26.486± 1.491 b	17.922± 1.974 c	38.031± 3.637 a

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

Table 6. Effect of docking of Karadi male lambs slaughtered at different weight on lean, fat, and bone percentages

Effects		No.	Total % Lean	Fat	Bone	Lean: Fat Ratio	Lean: Bone Ratio
Overall mean		24	61.316± 0.901	15.050± 1.069	23.634± 0.368	4.731± 0.425	2.606± 0.050
Docked		12	59.846± 1.232 b	16.058± 1.445 a	24.096± 0.441 a	4.142± 0.433 b	2.489± 0.058 b
Intact		12	62.786± 1.218 a	14.042± 1.583 a	23.172± 0.578 a	5.319± 0.711 a	2.722± 0.068 a
Slaughter Wt.	20kg	8	64.732± 0.697 a	9.712± 0.636 c	25.556± 0.235 a	6.926± 0.575 a	2.535± 0.043 a
	30kg	8	61.789± 1.228 b	15.486± 1.147 b	22.726± 0.660 b	4.232± 0.467 b	2.740± 0.115 a
	40kg	8	57.427± 1.466 c	19.953± 1.418 a	22.620± 0.230 b	3.034± 0.317 c	2.542± 0.075 a

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

Table 7. Effect of docking of Karadi male lambs slaughtered at different weight on fat partitioning

Effects		No.	Kg				%								
			Carcass Fat	Non-Carcass Fat	Fat tail	Total body Fat	Carcass Fat	Non-Carcass Fat	Fat tail	Subcutaneous	Intermuscular	Omental	Mesenteric	Kidney and pelvic	Heart	Scrotal
Overall mean		24	1.976± 0.242	0.573± 0.056	0.942± 0.232	3.491± 0.395	57.985± 4.049	18.823± 1.612	23.191± 4.900	44.928± 3.330	13.057± 0.902	5.476± 0.476	4.420± 0.422	4.783± 0.860	1.519± 0.165	2.627± 0.362
Docking		12	2.173± 0.357 a	0.611± 0.075 a	0.00± 0.00 b	2.784± 0.425b	76.255± 1.556 a	23.745± 1.556 a	0.00± 0.00 b	59.627± 1.562 a	16.628± 0.902 a	7.154± 0.571a	5.696± 0.448a	5.201± 0.403a	2.085± 0.201a	3.609± 0.597a
Intact		12	1.779± 0.331 a	0.535± 0.086 a	1.885± 0.254a	4.198± 0.616a	39.715± 2.331 b	13.902± 2.008 b	46.383± 1.623 a	30.229± 2.156 b	9.487± 0.523 b	3.798± 0.331b	3.143± 0.498b	4.365± 1.701a	0.952± 0.122b	1.644± 0.129 b
Slaughter Wt.	20 kg	8	0.783± 0.050 c	0.342± 0.013 c	0.539± 0.207c	1.663± 0.173c	51.754± 7.187 b	22.554± 2.847 a	25.692± 9.719 a	37.742± 5.645 b	14.012± 1.802 a	6.502± 0.597a	5.954± 0.854a	5.050± 0.664a	1.699± 0.226a	3.349± 0.926a
	30 kg	8	1.793± 0.165 b	0.562± 0.101 b	0.800± 0.304b	3.155± 0.192b	59.544± 7.778 a	18.203± 2.975ab	22.25± 8.46 ab	47.844± 6.363 a	11.700± 1.591 a	4.145± 0.653b	3.831± 0.457b	6.329± 2.435a	1.445± 0.190a	2.454± 0.476 a
	40 kg	8	3.353± 0.259 a	0.815± 0.070 a	1.489± 0.573a	5.656± 0.553a	62.658± 6.357 a	15.713± 2.284 b	21.630± 8.324 b	49.198± 5.076 a	13.460± 1.353 a	5.780± 1.016a	3.473± 0.553b	2.969± 0.304a	1.413± 0.418a	2.077± 0.296 a

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

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