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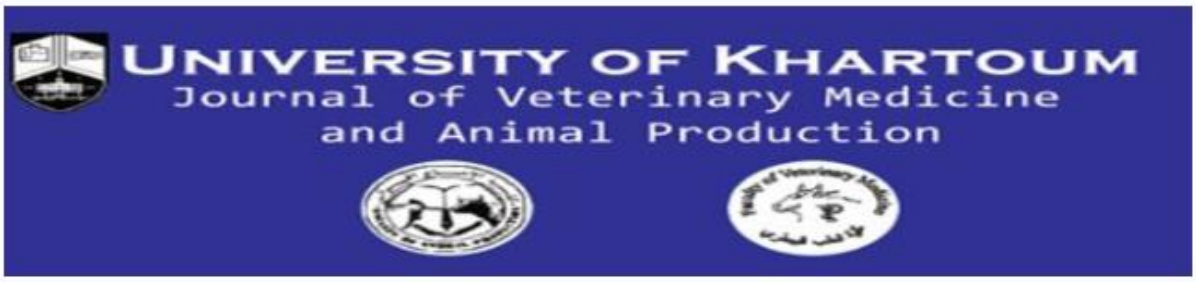

Characteristics of Body Composition in a Group of Local South Darfur Male Goats

1: Carcass Characteristics

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Abstract

Two groups of local intact black and intact white male goats were studied for body composition. These goats were born in the University farm and they were individually fed for 60 days in the post weaning period when they were 17.81± 1.36 Kg and 15.95± 0.61 Kg, respectively. The age of the two groups was 165 – 277 days and 540 – 584 days, respectively. The two groups did not show sizeable parameter variations to suggest genetic differences in their performance. The effect of age was significantly favourable for most parameters, especially when expressed as weights, to have bigger values. The carcass and its tissue components were evaluated under the effects of slaughter and hot carcass weights. A further evaluation of these was also conducted under the status of body maturity measured in terms of either slaughter or empty body weight relative to the birth weight of the individual animal. The heavier slaughter and hot carcass weights were associated with more carcass and tissue weights, higher dressing percent; relevant to the empty body weight, higher percent lean and fat and more tissue ratio values except for a lower percent bone, and lean: fat ratio values.

Greater body maturity, in either respects, SW or EBW, was associated with heavier half carcass, greater carcass length and higher dressing percent (per empty body weight) values. It also yielded more tissue weights and higher percent values of the total lean and fat but non-significantly lower percent values for bone. There were also greater ratio values for carcass compactness, lean: bone, fat: bone, but lesser ratio values for lean: fat in the greater mature bodies.

Key words: Black goats, White goats, slaughter weight, hot carcass weight, body maturity, carcass characteristics.

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المستخلص

تمت دراسة مجموعتين من ذكور الماعز المحلى الأسود و الأبيض بعد إنتاجهما فى مزرعة الجامعة عند بلوغ 17.81±1.36 كجم و 15.95± 0.61 كج من الوزن الحى على التوالى و فى مجموعتين عمريتين الأولى من 165 إلى277 يوما و الثانية من 540 إلى 584 يوما. تم إعلافها فى حظائر إنفرادية لفترة 60 يوما ذبحت بعدها لتقييم المكون الجسمانى. ولما لم يلاحظ على مجموعتى البشرتين الجسمانيتين فروقات معنوية يمكن الأستدلال بها على وجود اثار مورثية تم إستبعاد لون البشرة و إعتبار الكل مجموعة واحدة. و عوملت جميع سمات الأنتاج التى رصدت على ذلك النحو. كان لفارق العمر أثر معنوى إلى جانب غالبية السمات لأن تكون لها قيم أكبر عند التعبير عنها بصورة صرفة, على وجه الخصوص. تمت مقابلة الذبيحة و مكونات أنسجتها لأثرى وزن الذبح و وزن الذبيحة غير المبردة. كما جرى تقييم إضافى لهاتين السمتين تحت أثر حالة النضج الجسمانى المقاس بنسبة وزن الذبح أو وزن الجسم الخال إلى وزن ميلاد الفرد من الحيوانات. و قد إرتبطت أوزان الذبح و الذبيحة غير المبردة الأثقل بإزدياد أوزان الذبيحة و الأنسجة المكونة لها، زيادة نسبة التصافى المقروءة على الجسم الخالى, إرتفاع النسبة المئوية لنسيج العضلات و الدهن و قيم النسب النسيجية ما عدا النسبة المئوية المتدنية لمكون العظم و القيمة النسبية لنسيج العضلات: الدهن. لقد إرتبط النضج الجسمانى الأعظم، مقاساً بإيٍ من الأعتبارين (وزن الذبح أو وزن الجسم الخال) بوزن نصف ذبيحة أكثر ثقلا، بذبيحة أكثر طولاً، قيم نسبة تصافى (مقروءة على وزن جسمانى خال) أعلى. كما نتج عنهم كذلك نسيج أكثر ثقلا و قيم للنسب المئوية أعلى لنسيج العضلات و الدهن الكليين, بينما صاحب ذلك قيم متدنية للنسب المئوية للعظم. ترافق ذلك أيضا مع قيم نسبية أعلى لإكتناز الذبيحة، نسيج العضلات:العظم، الدهون:العظم لكن تدن فى قيمة نسبة نسيج العضلات:الدهون فى هذه الذبائح متقدمة النضج.

Introduction

There exists in the Sudan a wide range of goat groups which exhibit a variety of size, coat colour and productivity characteristics being ecologically or tribally stigmatized as was shown by many authors, for example Mcleroy (1961); Tleimat *et al.* (1983,) and Mohammed (2006). Because of its huge population size, which was estimated to comprise over 30 million heads (MARF, 2012), the goat provokes sincere attention to evaluate its probable impact on the social and economic status of the human population of this country. Some of the prevailing studies are those of Osman and Mukhtar (1970); Sulieman and El Shfei (1984); Khalafalla and Suleiman (1990); Ahmed (1993); Gubartalla *et al.* (2002) and Mohammed *et al.* (2007). It was formerly indicated by Sands and McDowell (1978) that most of the goats are described as dual purpose milk and meat producers.

The goat meat production plays an important role in the rural social life where a goat is occasionally killed for alms, to honour a friend or to provide a meat meal to a by-passing guest. Eating goat meat, unlike a daily goat milk supply, is predominantly an infrequent choice for the poor to a meal containing meat. Hence more concern about goat meat is currently developing in the environment of soaring other livestock meat prices. Thus promoting local goat meat production will support local meat consumption, keeping other meats for better economy. Revenue from improved goat meat local marketing will create an opportunity for cash which will enable the poor family, being engaged through systematic killing of male kids for market, to better livelihood. Some earlier studies in this area include those conducted by for example El Gaili *et al.* (1972); El KHidir (1989); Hassaballa (1996) and Yassin (2006) who noted in each particular study various trends in the properties of the goats studied for meat production parameters. The objectives of this work are to study body composition in the local goat with special consideration to carcass

compactness and carcass tissues distribution and their relations.

Materials and Methods

Experimental Procedure

About 37, white (30) and Black (7), intact male goats born in the farm of the Faculty of Veterinary Science were collected for this study. They were 17.81± 1.36 Kg for the black and 15.95± .61 Kg for the white and were treated in two age groups of 165 – 277 days and 540 – 584 days each age. The main goat flock belonged to the joint Welfare project raised by the University of Nyala and the Muslim Aid Organization (Muslim Aid, UK), Sudan Office. The Project provided facilities to research for better milking capacity and helping humanity. For the later purpose about 250 heads of milking goats were forwarded in a contribution to improve poor families' livelihood. Males were killed for the study and as a demonstration to improve meat production for the family and community as well. In the process about 400 Kg edible meat was distributed to such families after the needed scientific data were obtained.

Housing

This was composed of reticulated bamboo slats in the kraaling area. Partial shading was provided to alleviate the stress of rain and direct sun rays during the day. The experimental male goats were kept in individual pens to facilitate recording of the performance. Feeding utensils, waterers, mineral salt blocks and animal and pen identification were made accessible. Due attention to hygiene, medical care and preventive measures were strictly considered.

Feeding and slaughter procedures

The routine feeding practice in the farm was to allow all the flocks to graze and browse in the early morning and turn them back in the early evening into the kraaling pens. At times, when scarcity ensues in range material, supportive kraal feeding was resorted to, whence agricultural by-products and supplemental feed mix were provided. The experimental animals were ad lib fed a meshed ration consisting of *Sorghum vulgare* (caudatum) grains, undecorticated groundnut cakes and groundnut hulls (Table 1). Common salt and calcium carbonate were given at the rate of 20 g/Kg in the fed ration. The ration was provided, for 60 days in the morning with topping in the evening and taking records on the weigh-back the following morning to permit calculating daily consumption. It was moistened in the feeder every time it was introduced to reduce the risk of its inhalation by the feeding animal. At the end of the trial the final live weight/slaughter weight was taken as an average of three consecutive 12 hours fasted live weight for each animal and all animals were immediately killed thereafter following Muslim rituals at an average slaughter weight of 15.95±0.61Kg (for the whites) and 17.81±1.36 Kg (for the blacks).

Data preparations

These included the weights (Kg) of the following:-

1- Feed intake (FI)

2- Slaughter weight (SW).

3- Hot carcass weight (HCW).

4- The empty body weight (EBW) was calculated as the slaughter weight less the weight of the gastrointestinal tract contents.

5- The dressing percentage was calculated using the HCW in relation to the slaughter or empty body weights (each) times 100.

6- The hot carcass was weighed and then split along the vertebral column into two closely symmetrical left-and right-hand sides

7- The left-hand side was weighed and a measure was taken for the distance between the anterior edge of the symphysis pubis to the anterior edge of the first rib, to denote the carcass length (CL) in cm, which was also used to measure carcass compaction in relation with the half carcass (HC) weight as (HC:CL), Kg/cm.

8- Then this half carcass was physically dissected into the three basic carcass tissues i.e. total lean, TL (muscle, nerves, and small blood vessels), total fat, TF (subcutaneous + intermuscular) and total bone, TB (bone + cartilage + ligament). Each of these tissues was expressed as weight, (Kg), and as percentage, (%) of the half carcass weight and as a ratio, (Kg: Kg) between carcass tissue weights.

9- According to the inference of Meyer (1964) sheep lambs are only4 -5% of their bodies mature at birth. Based on this two indicators for body maturity were estimated for this study by dividing either slaughter weight or the empty body weight of the individual animal by its birth weight. These two indicators were used to study the compositional characteristics of the animals slaughtered in this study.

Statistical analysis

The data obtained were statistically manipulated using the analysis of variance and the linear model and t-test of the SPSS version 14. Means ($\overline{\times}$) and standard errors were obtained and compared for the different parameters under colour, age, slaughter weight, hot carcass weight, body maturity, effects and the response to each effect on relevant parameters was compared and tested for statistical significance (P). The effect of coat colour variation was ruled out, being not significant and they were pooled over for the test of the remaining effects.

Results and discussion

The results of this study are presented in various tables of which Table (2 A) shows some of the slaughter parameters of these goats. Goat colour (designating breed type) had no significantly discriminate influence on either of the parameters investigated, but the mean values tending to be larger for the black goats except for dressing percent, which tended to be slightly bigger in the white goats. On the other hand age effect (table 2 B) is clearly expressed with higher means for slaughter weight, empty body weight, hot carcass weight, feed intake weight and carcass length, in the age group 2 (540-584 days) than those of age group 1 (165-277days). Being highly significantly different at $P<0.001$, $P<0.001$, $P<0.001$, $P<0.01$ and $P<0.001$, respectively. However these two age groups had very similar and non-significantly different values for carcass dressing relative to the slaughter weight.

Table 3 represents the results of the effect of slaughter weight, SW (3A) and hot carcass weight, HCW; (3B), on some carcass parameters of the goats studied. The greater SW in group (2) of table 3A had highly significantly ($P<0.001$) more half carcass weight and carcass length in comparison with their counterpart group (1), with 4.17 vs 2.61Kg and 46.41 vs 41.27cm, respectively, as mean values. The dressing percent values were similar in the two SW groups when measured in terms of the SW, but these dressing values (Table 3A) were significantly ($P<0.05$) higher in SW group 2 (54.09 vs 50.54) when they were measured out of the empty body weight (EBW). Half carcass tissue (table 3A) weights and percent values were greater for total lean (2.73 vs 1.73, $P<0.001$ and 64.99 vs 63.80, $P>0.05$), and for total fat (0.20 vs 0.09, $P<0.001$ and 4.76 vs 2.96, $P<0.001$) but while the total bone was heavier (1.15 vs. 0.85 $P<0.01$) it had a lesser percent value (27.79 vs. . 34.05, $P<0.001$), in the SW group 2 in contrast to that of the SW group 1. There were more ratio values for half carcass weight: carcass length (0.06 vs. 0.04, $P<0.001$), total lean: total bone (2.39 vs. 1.92, $P<0.001$), total fat: total bone (0.18 vs. 0.10, $P<0.01$), in the SW group 2 as compared with group 1.

On the other hand testing the effect of HCW, in lieu of the SW, Table 3B, on these same

parameters, the results expressed were very similar to those shown in Table 3A. For example the half carcass weight, carcass length and the dressing percentage increased due to the heavier HCW and compared as follows: 4.26 vs 2.56, 46.32 vs. 41.83 and 55.19 vs. 48.79 (P<0.001) respectively, for the three parameters, the latter being measured in terms of empty body weight. Similarly there were greater tissue weights and percent values except for a lower total bone percent in the half carcass of the heavier HCW group compared with the same parameters in the lighter HCW group (Table 3B). The mean values for these were as follows: 2.82 vs. 1.65, P<0.001 and 65.95 vs. 62.13, P<0.05 for total lean; 1.16 vs. 0.85, P<0.001 and 27.37 vs. 34.34, P<0.001 for total bone and 0.20 vs. 0.09, P<0.001 and 4.68 vs. 3.25, P< 0.05 for total fat, respectively.

The heavier HCW also resulted in greater half carcass weight: carcass length, and other between different individual carcass tissues ratio values which are exceptionally smaller for total lean: total fat (table 3B). These values were: 0.06 vs. 0.04, P<0.001; 2.44 vs. 1.87, P<0.001 15.56 vs. 23.67, P< 0.05 and 0.17 vs. 0.11, P<0.0 for half carcass weight: carcass length, total lean: total bone, total lean: total fat and total fat: total bone, respectively.

Table 4 depicts the results of the effect of body maturity, measured in terms of SW and birth weight (BW); 4A, or measured in terms of the EBW and BW; 4B, on some carcass parameters of the male goats. 4A illustrates that goats with higher body maturity contained greater half carcass weight (4.23 vs. 3.07; P<0.001), greater carcass length (46.58 vs. 42.81; P<0.001), and higher dressing percent, in terms of EBW (54.43 vs. 51.37; P<0.05) but non-significantly lower dressing percent (40.72 vs. 41.20; P<0.05) on the SW.

On the other hand half carcass tissue weights and percent varied in the following manner between the greater and lesser body maturity groups as is depicted in Table (4 A): 2.82 vs. 1.97; P< 0.001 and 66.55 vs. 62.55; P< 0.01 for total lean, 1.17 vs. 0.93; P<0.001 and 27.89 vs. 31.86; P>0.05 for total bone and 0.21 vs. 0.11; P<0.001 and 5.00 vs. 3.31; P<0.01 for total fat.

The expression of half carcass weight to carcass length, total lean to total bone, total lean to total fat and total fat to total bone was encompassed in the following, in regard to the higher and lesser body maturity groups (2 and 1), respectively: 0.06 vs. 0.04; P<0.01, 2.44 vs. 2.02; P< 0.01, 15.05 vs. 21.96; P<0.05 and 0.18 vs. 0.12; P<0.01 (Table 4A).

It can be disclosed from (Table 4B) that goats with the greater body maturity (group 2) had greater half carcass weight (4.18 vs. 3.06; P<0.001, greater carcass length (46.50 vs. 42.68; P<0.001 and higher dressing percent on EBW (54.33 vs. 51.31; P<0.05) than those of the lesser body maturity group 1. As for half carcass tissue weights and percent values, these goats (group 2) performed in the following manner, respectively: 2.83 vs. 1.91; P< 0.001 and 66.35 vs. 62.66; P<0.05 for total lean, 1.61 vs. 0.92; P<0.001 and 28.05 vs. 31.90; P>0.05 for total bone and 0.20 vs 0.11; P<0.001 and 5.00 vs. 3.21; P<0.01 for total fat.

There were greater ratio values Table 4B for half carcass weight to carcass length (0.06 vs. 0.04; P<0.001), total lean to total bone (2.42 vs. 2.02; P<0.01) and total fat to total bone (0.18 vs. 0.11; P<0.01) but lesser ratio value for total lean to total fat (14.92 vs. 22.52; P<0.05) in the higher body maturity group (2) in contrast to those of the lower body maturity group (1).

Table (1):

Gross and calculated chemical composition of the ration in offer

Feed ingredients	Percent inclusion
Gross composition:-	
Sorghum vulgare (caudatum) grains	22.0
Decorticated groundnut cakes	32.0
Groundnut hulls	46.0
Chemical composition *:-	
Dry matter (DM)	95.97
Oil	40.65
Crude protein	19.28
Crude fiber	33.19
Ash	6.23
Metabolizable energy Mj/Kg DM	9.89

* According to Ellis, N. (1981).

Table (2) : Some Slaughter parameters of male Sudanese goats

	(A)			(B)		
Treatments / Parameters	White N=(30) x±se	Black N=(7) x±se	Level of significance	Age (1) N= (13) x±se	Age (2) N= (24) x±se	Level of significance
Slaughter weight, Kg	15.95±0.61	17.81±1.36	NS	14.61±1.25	19.15±0.81	***
Empty body weight, Kg	13.34±0.61	14.50±1.00	NS	10.91±0.91	14.99±0.44	***
Hot carcass weight, Kg	6.86±0.31	7.20±0.68	NS	6.04±0.62	8.02±0.41	***
Killing out% (on slaughter weight)	41.20±1.54	40.59±3.40	NS	41.05±3.12	40.56±2.04	NS
Feed intake, Kg	51.61±0.97	54.30±2.15	NS	51.46±1.94	54.46±1.29	**
Carcass length (CL), Cm	43.79±0.64	45.88±1.41	NS	43.19±1.30	46.47±0.85	***
Gastro-intestinal (GI) contents % of slaughter weight	19.66±0.82	21.26±1.82	NS	20.38±1.67	20.54±1.09	NS

N= number of animals

x±se= Mean± standard error

NS= Not significant; **=P<0.01; ***=P<0.001

Age (1): 165- 277 days, Age (2): 540- 584 days

Table (3): Effect of Slaughter-(A) and Hot carcass-Weight (B) on some carcass and other traits in male Sudanese goats

(A) (B)

treatments / traits	Slaughter weight (SW) ranges (Kg) 7.0--- 15.4 (1) N=12 x±se	x±se(%)	16.0-----24.4 (2) N=25 x±se	x±se(%)	P_1	P_2	Hot carcass weight (HCW) ranges (Kg) 2.6-----6.4 (1) N=13 x±se	x±se(%)	6.6-------10.4 (2) N=24 x±se	x±se(%)	P_1	P_2
Half carcass (HC),Kg	2.61± 0.23	-------	4.17± 0.12	-------	***	----	2.56 ±0.19	-------	4.26 ± 0.10	-------	***	-----
Carcass length (CL),Cm	41.27±1.13	-------	46.41±0.50	-------	***	----	41.83±1.17	-------	46.32±0.32	------	***	-----
Carcass dressing:-												
Percent/SW	--------	40.57±1.05	--------	41.14±1,85	------	NS	---------	39.20±0.86	---------	41.90±1.91	------	NS
Percent/EBW	--------	50.54±1.53	--------	54.09±0.77	------	*	---------	48.79±1.17	---------	55.19±0.62	------	** *
Carcass tissue weight and proportions in HC:-												
Total lean (TL), Kg	1.73±0.19	63.80±1.12	2.73±0.11	64.99±1.10	***	NS	1.65±0.17	62.13±1.72	2.82±0.08	65.95±0.75	***	*
Total bone (TB), Kg	0.85±0.06	34.05±2.32	1.15±0.40	27.79±0.84	**	***	0.85±0.05	34.34±2.34	1.16±0.03	27.37±0.59	***	***
Total fat (TF), Kg	0.09±0.02	2.96±0.52	0.20±0.01	4.76±0.32	***	**	0.09±0.02	3.25±0.62	0.20± 0.01	4.68±0.24	***	*
HC:CL Kg/Cm	0.04±0.003	----------	0.06±0.002	----------	***	----	0.04± 0.002	----------	0.06±0.002	----------	***	----
TL:TB Kg/Kg	1.92±0.13	----------	2.39±0.08	----------	**	----	1.87±0.13	----------	2.44±0.06	----------	** *	-----
TL:TF Kg/Kg	24.76±4.02	----------	15.36±1.13	----------	***	-----	23.67±3.93	----------	15.56±1.09	----------	*	-----
TF:TB Kg/Kg	0.10±0.02	----------	0.18±0.01	----------	**	----	0.11±0.02	----------	0.17±0.01	----------	**	----

N= number of animals, x±se= mean ± standard error ,P_1P_2 = statistical significance for means of traits within SW ranges (1) and (2) and within HCW ranges (1) and (2), where P_1 for weight and ratio and P_2 for percentage value, NS = not significant, *,**,***, different levels of statistical significance between relevant means,

Table (4): Effect of body maturity measured in terms of the relation of: Slaughter weight (SW) (A) or empty bodyweight (EBW) (B),with Birth weight (BW) on some carcass and other traits in male Sudanese goats.

(A) (B)

Treatments / traits	Body maturity (SW/BW) indicator ranges 4.0----10.00 (1) N=18 x±se	x±se(%)	10.10-----17.50 (2) N=19 x±se	x±se(%)	P_1	P_2	Body maturity (EBW/BW) indicator ranges 3.38---7.63 (1) N=17 x±se	x±se(%)	7.81-------14.67 (2) N=20 x±se	x±se(%)	P_1	P_2
Half carcass (HC),Kg	3.07± 0.23	-------	4.23± 0.14	-------	***	----	3.06 ±0.24	--- --------	4.18 ± 0.15	-------	***	-----
Carcass length (CL),Cm	42.81±0.94	-------	46.58±0.63	-------	***	----	42.68±0.99	----------	46.50±0.06	--------	***	-----
Carcass dressing:-												
Percent/SW	--------	41.20±0.88	--------	40.72±2.39	------	NS	---------	41.20±0.94	---------	40.75±2.27	------	NS
Percent/EBW	--------	51.37±1.25	--------	54.43±0.78	------	*	---------	51.31±1.32	---------	54.33±0.74	------	*
Carcass tissue weights and proportions in HC:-												
Total lean (TL), Kg	1.97±0.17	62.55±1.34	2.82±0.11	66.55±0.77	***	**	1.91±0.16	62.56±1.42	2.83±0.11	66.35±0.76	***	*
Total bone (TB), Kg	0.93±0.04	31.86±1.73	1.17±0.05	27.89±1.06	***	NS	0.92±0.05	31.90±1.84	1.16±0.05	28.05±1.02	***	NS
Total fat (TF), Kg	o.11±0.02	3.31±0.40	0.21±0.01	5.00±0.37	***	**	0.11±0.02	3.21±0.42	0.20± 0.01	5.00±0.35	***	**
HC/CL, Kg/cm	0.04±0.003	----------	0.06±0.002	----------	**	----	0.04± 0.003	----------	0.06±0.002	----------	***	----
TL:TB, Kg/Kg	2.02±0.11	----------	2.44±0.08	----------	**	----	2.02±0.11	----------	2.42±0.08	----------	**	-----
TL:TF, Kg/Kg	21.96±2.87	----------	15.05±1.38	----------	*	-----	22.52±2.99	----------	14.92±1.32	----------	*	-----
TF:TB, Kg/Kg	0.12±0.02	----------	0.18±0.02	----------	**	----	0.11±0.02	----------	0.18±0.02	----------	**	-----

N= number of animals, x±se= mean ± standard error,P_1P_2 = statistical significance for means of traits within body maturity indicator ranges in (1) and (2) for (SW/BW) and (EBW/BW), where P_1 for weight and ratio and P_2 for percentage value, NS = not significant, *,**,***, different levels of statistical significance between relevant means,

Discussion

The goat is the most livestock that is related to the economy and the livelihood of the poor family because it is there in the table and it can provide cash income in many smallholders (Kasowajete *et al*,, 1987). The parameters considered in this study are mostly concerned with factors effecting meat production. Breed of goat, here, was found not to be influencing these concerns. This was most likely because of the small size of goat groups under study since it is known that goats of different genetic origins tend to have different production potentials for growth and meat qualities and are more likely to

be improved on that basis. Similarly Wood *et al.* (1980) reported no effect of sheep breed type on the group of sheep they studied.

Santos *et al.* (2008) stated that weight or age at slaughter or both are the most usual comparing basis on carcass composition and meat quality studies. Our findings on the effect of age on those parameters shown on Table (2B) sorted out the older goats with the best effects as compared with the younger goats as for the slaughter, empty body, hot carcass and feed intake, weights. But the unit weight mass of these parameters required a lesser calculated feed intake in the older goats in contrast to that required by the younger ones, even though it is known that the latter are normally more efficient users of feed and convert lesser feed for more growth than goats which are already older. Older age in our goats was also associated with more carcass profile as is indicated by a greater carcass length in these goats in contrast to the counter parts. Previous studies, for example by Mohammed (2006), showed that slaughter, empty body and hot carcass, weights increased significantly with the increase in goat age. Similar effects of age, including body length as well, were obtained by Elbushra (2013) on Sudani Desert male goats.

The effects of the slaughter and hot carcass weights, shown in Table 3(A and B) and their subgroups 1 and 2, resulted in bigger weight and percentage values in the subgroups 2 except for the percent total fat which is smaller in the subgroups 2 than in the subgroups 1. The dressing values, as is expected, are greater, in general, when measured in terms of empty body weight rather than when taken out of the slaughter weight, being around 54% and 42% for the subgroups 2 and 1, respectively. Likewise the greater weight effects are associated with higher dressing values of about the same degree as is indicated above for the effect of the empty body weight (EBW) and the slaughter weight but with greater difference at the EBW level. Dressing percentage was described by Devendra and Burns (1983) as an important parameter for assessing meat production potential in animals and is influenced by the degree of body development, but variations in gutfill can offset its soundness when only the slaughter weight of the killed animal is taken into consideration. The dressing values obtained on slaughter weightier, Table 3(A and B) tended to be similar to those reported by Melaku and Betsha (2008) at least at the bottom level of the range (41.7 – 49.7%) which they showed for younger but heavier Somali goats. A similar performance (40.4 – 43.0%) together with another but dissimilar (49.0 – 54.1%) one, in this respect, was respectively reported by Gaili *et al.* (1972) for unfattened and fattened Sudanese goats. Such dissimilarity was also reported by Wilson (1976) who refereed to carcass dressing of 49 % of slaughter weight in some local goats in this region. Furthermore Pena *et al.* (2007) noted that Florida suckling kids slaughtered at 7 – 8 Kg and 14 – 15 Kg attained non-significantly variable carcass dressing values, taken on SW or EBW. On the other hand Adam *et al.* (2010) concluded that Nilotic male kids possess good potential for small carcasses of high dressing (for about 44 % to about 57 % of about 7.0 Kg carcass weight measured as hot or cold).

The effect of the weight groups in Table 3 (A and B) and their subgroups 1 and 2 on tissue weights and their proportional valves in the half carcass weight indicates that these were affected in a similar manner as is described above. The only exception is the smaller proportion of bone weight in the heavier half carcass in the subgroups 2; . The values obtained here are reasonable when compared with other findings except that the fat proportion (about 3—5%) is very poor. It is understood that between and within tissue obtainable values reflect, generally variations in growth and development between breeds, and levels of management and age as well. In this respect Pena *et al.* (2007) inferred that increasing carcass

weight influenced an excessive fatness while percentage muscle remained the same and that of bone was reduced. Their observation included 57 – 58 % for muscle 22 – 25 % for bone and 14 – 18% for fat. Similarly Pieniak–Lendzion *et at.* (2009) noted a drop in percentage muscle from 60.13 % to 50.60 % while bone and fat remained at 25.48 % and 25.37 % and 14.39 % and 14.13 %, respectively, in the case of white Improved Goats breed, killed at 90 and 180 days of age, respectively. In comparison Mohammed (2006) obtained non-significantly more percentage muscle tissue (71.28 %) for Sudanese Desert goats killed at 18.2 Kg of slaughter weight and 8.33 Kg hot carcass weight, while he obtained 68.5 % for muscle in another group killed at 13.5 Kg and 5.33 Kg SW and HCW. The present results are compatible with the general trends but varied in magnitude which is especially increasingly smaller for fat (about 3 – 5%). As for between tissue ratios the expression of the two effects is similar to that described above with a general trend towards a more carcass compaction, more lean/bone and fat/bone ratios but a reduced lean/fat in the heavier carcass of subgroups 2 of Table 3A and 3B.

The mean values being 2.44 and 2.39, for lean/bone, 0.17 and 0.18 for fat/bone in the subgroups 2 of the two effects, whereas the corresponding values of these ratios were 1.87 and 1.92 for lean/bone and 0.11 and 0.10 for fat/bone, the lean/fat values are 15.56 and 15.36 and 23.67 and 24.76 in the two effects subgroups for the heavier and the lighter weight effect 2 and 1 subgroups. Earlier, Osman (1985) using rations of different protein: energy levels obtained muscle bone ratios of 1.63, 1.83 and 2.05. But Elfadil (1996) in his three energy levels ration showed muscle: bone ratio of 1.9, 2.6 and 2.7. On the other hand Bello and Babiker (1988) reported a muscle: bone ratio of 2.8 for Desert goats and 3.0 for their temperate carcass. Also Elkhidir (1989) has obtained a muscle: bone ratio of 3.0 for the same characteristic in Sudanese goats. For two different ages at slaughter, less than one year and one year, Mohammed (2006) stated that Desert goats had different muscle: bone ratios, which were 2.53 and 3.12, respectively. He also showed that the two age groups contained a muscle: fat ratio of 39.45 and 17.88 each, respectively. Likewise Pena et al (2007) using kids of different weight groups obtained muscle: bone ratio values in the following succession; 2.23, 2.41, 2.61 being highest for biggest weight group. The succession of muscle: fat ratio values were reversed as to indicate the highest ratio value at the smallest weight (4.05, 3.48, 3.28).

In Table 4(A and B) the intention was to study the effect of the degree of body maturity on the parameters listed. It can be seen that the derivation of body maturity (development) by weighting, using the birth weight, did not change the effects of the SW and hot carcass weights on the parameters studied but it rather more likely confirmed them. Carles (1983) stated that the changes in the patterns of development are more closely related to body weight than age and that the distribution of meat within the carcass reflects the development of meat in the different joints and is also related to the stage of maturity of the body. Also Pralomkam *et al.* (1995) observed an increase in meat/bone ratio with increasing carcass weight and advance in maturity within a group of Thai native and a cross of Thai native with Anglo-Nubian male weaner goats.

It can be concluded from this study that breed or breed type effects need further investigation to verify their role on the parameters studied and this is because of small size of animal groups used in this study. Whereas age and slaughter weights and hot carcass weights are obvious causes of variations in the carcass parameters of the local goats studied. Body maturity or development can reflect on these causes.

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