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SHORT NOTE

Carcass characteristics of Garag sheep in the White vile State, Sudan

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Sheep production is very important in the Sudan as it is widely distributed and has socio-economic impacts (Ministry of Animal Resources and Fisheries, 2004). Sheep exports are increasing due to premium quality and are fed natural pastures with no feed additives, especially of animal origin, or growth promoters which threaten human and livestock health.

Sudanese sheep are classified according to the type of the tail (Mason. and Maule, 1960), ratio of tail length to height at withers and ecotypes (Devendra and McLeroy, 1982). Ecotypes are associated with tribes and their boundaries and are used since Sudanese sheep were not considered breeds according to western standards. There are 5 main ecotypes and 3 fused ones. Desert sheep is the main ecotype and export sheep with different subtypes. Garag sheep is listed among Desert sheep although it is likely a cross between the Desert and Nilotic ecotypes in contact areas (Khalifa, 2002). It was not preferred in the past, but its numbers are increasing in local markets and is considered hardy and disease resistant.

Information on Garag sheep is scarce and it is only studied in the White Nile State, Sudan (Khalifa, 2002). Information on Garag subtype husbandry in traditional areas is not available and that for carcass characteristics is scarce. Furthermore, it is required for other areas in Sudan including the White Nile State.

Consequently, this study was launched to furnish information on Garag sheep carcass characteristics in the White Nile State, Sudan.

Carcass characteristics were studied in Garag sheep from Kosti area in the White Nile State in March and April 2006. Kosti Municipality lies between latitudes 13˚.00' — 13˚ 15' N and longitudes 32˚ 30' — 32˚ 45' E. It is almost a flat plain in the rich savanna zone. Mean temperature is 24 - 44C˚ and annual rainfall is 200 - 500 mm with 25% perspiration. Animal production is important in the area with 0.5 million sheep depending mainly on natural pastures and crop residues. The main pasture plants are Deffra *(Echinochloa colonum*), Hamra (*Aristida adscensionis*), Adar (*Sorghum Sudanense*), Rabaa (*Zaleya pentandra*) and Ancouj (*Ischaemum aristatum*).

Six Garag male lambs were bought from Kosti livestock market including three at less than one year old and three at one year old. Their ages were estimated using the incisors (Devendra and McLeroy, 1982). They were transported to Wad Medani by car and housed in corrugated iron shaded individual pens in the Goat Research Centre premises in

Elneshasheba farm, Gezira University, Wad Medani, Sudan. They were ear tagged and treated against internal and external parasites. The animals were fed groundnut haulms *ad libitum* and drinking water was available all day for one week. They were fasted overnight and slaughtered in the morning according to Islamic rituals. They were weighed before slaughter and blood was collected in plastic containers and weighed. The head, legs and kin were removed and weighed. The carcass was opened and eviscerated and the lungs, heart, spleen, liver, and alimentary tract were removed and weighed. The alimentary tract was evacuated, washed and reweighed. The hot carcass was weighed with the kidneys and renal fats intact. The empty body weight (EBW) was calculated by subtracting the gut fill from body weight.

The means and standard errors were calculated for each body component in each group and the percentages were calculated on

EBW bases. Dressing percentages were calculated on live body weight and EBW basis(Khalifa, 2002).

The hot carcasses were divided along the vertebral column into left and right halves using a saw. The left side was subdivided into six wholesale cuts including neck, single short forequarter, best end of neck and breast, loin and leg and chump. Each cut was weighed and expressed as a percentage of EBW. Each cut was dissected into bones, muscles and fat
and were weighed and expressed on EBW basis. The carcass composition was calculated by summing all the cuts.

Data was statistically analyzed using the unpaired t-test with equal number of replicates per treatment.

Table l shows Garag sheep mean body components weights and percentages on EBW. All body components were higher at I year old than at < l year old and the differences were significant ($P \leq 0.05$) for blood, head, liver, spleen, kidneys and fat, intestines, mesenteric fat and tail. The increased body components with increased slaughter age were similar to that in Garag in Kenana Sugar Company (KSC) in the White Nile State Sudan (Khalifa, 2002) and Shorani sheep in Nuba Mountains (Gibreel, 2003). The percentages of all body components on EBW were higher at 1 year, except the skin, legs, lungs, heart and rumen. Garag body components percentages on EBW were higher in KSC than Kosti area and
this was mainly due to the former higher slaughter weights (Khalifa, 2002). Blood, skin, liver, kidneys and intestines were lighter in Kosti Garag than Shorani and the head and legs were heavier in Garag at < I year old. At 1 year old, all body components were heavier in Shorani than Garag and it could be attributed to Shorani heavier slaughter weights (3833 kg)

compared to Garag (25.67 kg). The variations between Garag and Shorani in body components on EBW may be genetic, environmental, nutritional or due to management differences.

Table1. Mean (± S.E) body components weight (kg) and percentages on empty body weight (EBW) of Garag males in Kosti area, White Nile State, Sudan.

Parameters	Weight			
	Age (years)			
	Kg		%	
	* < 1	1	< 1	1
Blood	0.83±0.05 [b]	1.09±0.03 [a]	5.21±0.21 [a]	5.27±0.18 [a]
Head	1.41±0.08 [b]	1.85±0.03 [a]	8.84±0.44 [a]	8.91±0.33 [a]
Skin	1.37±0.19 [a]	1.61±0.08 [a]	8.49±0.42 [a]	7.79±0.53 [a]
Legs	0.70±0.05 [a]	0.76±0.04 [a]	4.37±0.11 [a]	3.67±0.05 [b]
Lungs	0.32±0.02 [a]	0.38±0.03 [a]	1.98±0.11 [a]	1.83±0.09 [a]
Heart	0.12±0.02 [a]	0.14±0.02 [a]	0.73±0.11 [a]	0.65±0.06 [a]
Liver	0.29±0.04 [b]	0.43±0.03 [a]	1.80±0.26 [b]	2.08±0.09 [a]
Spleen	0.07±0.01 [b]	0.13±0.02 [a]	0.44±0.12 [b]	0.63±0.07 [a]
Kidneys and fat	0.09±0.01 [b]	0.15±0.02 [a]	0.61±0.02 [b]	0.71±0.09 [a]
Rumen	0.66±0.08 [a]	0.82±0.11 [a]	4.09±0.31 [a]	3.98±0.25 [a]
Intestines	0.58±0.05 [b]	0.89±0.02 [a]	3.59±0.09 [b]	4.29±0.59 [a]
Mesenteric fat	0.04±0.01 [b]	0.13±0.05 [a]	0.24±0.05 [b]	0.62± 0.06 [a]
Testicles	0.16±0.08 [a]	0.24±0.05 [a]	0.98±.46 [a]	1.14±0.21 [a]
Tail	0.11±0.03 [b]	0.22±0.03 [a]	0.68±0.11 [b]	1.06±0.23 [a]

Means in rows having the same letters are not significantly different at P >0.05.
SE = Standard error * N = number of observations =3.

Table 2 shows Garag slaughter weight and carcass characteristics. Slaughter weight, EBW and hot carcass weights were significantly higher at I year old. Mean slaughter weight, hot carcass weight and EBW (kg) up to I year old were 22.83, 10.75 and 18.44, respectively. The increased slaughter weight, EBW and hot carcass weight with increased slaughter weight were also reported in Shorani (Gibreel, 2003) and Desert sheep (Mansour *et al*., 1988). Slaughter weight, EBW and hot carcass weight were higher in Shorani than Garag and this could be genetic and/ or

environmental. Body and carcass weights were heavier in traditionally weaned Garag lambs compared to the early weaned (Khalifa, 2002).

Garag dressing percentages were significantly (P≤ 0.05) higher EBW than LBW basis. Similar results were also found in Garag in KSC (Khalifa, (2002) Shorani sheep (Gibreel, 2003) and Shugor in Rahad Sheme (Babikir, 2007). These variations were mainly because gut contents were deducted from body weight to calculate EBW. Garag dressing percentages on LBW and EBW were higher at < I year, but not significantly different. This finding disagreed with that reported for Shorani sheep (Gibreel, 2003). Garag dressing percentages in KSC were not affected by weaning age (Khalifa, 2002). Garag dressing percentages were higher than those in KSC and Desert sheep (Mansour, et al., 1988) and these differences may be genetic, nutritional, environmental or due to management.

Table 2. Mean S.E) slaughter weight (kg) and carcass characteristics Garag males in Kosti area, White Nile State, Sudan

Parameters	Age (years)	
	< 1	1
Slaughter weight (kg)	20.00 ± 2.00 [b]	25.67 ± 0.67 [a]
Empty body weight (kg)	16.12 ± 1.66 [b]	20.77 ± 0.89 [a]
Hot carcass weight (kg)	9.67 ± 1.33 [b]	11.83 ± 0.83 [a]
Dressing percentages:		
On LBW	47.92 ± 2.08 [a]	46.00 ± 2.00 [a]
On EBW	59.47 ± 2.41 [a]	56.88 ± 2.03 [a]
Total carcass muscle (%)	72.04 ± 2.16 [a]	71.75 ± 2.00 [a]
Total carcass bone (%)	24.22 ± 2.34 [a]	21.13 ± 1.66 [a]
Total carcass fat (%)	3.73 ± 0.52 [b]	7.02 ± 0.92 [a]
Muscle : bone	3.11 ± 0.54 [a]	3.40 ± 0.19 [a]
Muscle : fat	20.00 ± 2.24 [a]	12.05 ± 3.62 [b]

LBW = Live body weight. EBW = Empty body weight.

Means with the same letter(s) in rows are not significantly different (P > 0.05).

Total carcass muscles and bones percentages were higher at <1 year than at I year old and total fat percentages were higher at 1 year old, but not significantly different. The decreased carcass muscles with increased slaughter age were opposite to that in Shorani (Gibreel, 2003). Garag muscles percentages were higher than Desert sheep (Mansour, *et al.*, 1988) and Shorani at < I year old and were close to Shorani at < I year old. The decreased bone and increased fat percentages with the increased slaughter age were similar to that for Shorani (Gibreel, 2003). Garag bones and fat percentages were generally higher than Shorani and it had less fat (3.73%) at < l year old than Shorani (5.61%). This reflected variations in carcass composition between Garag and Shorani and were probably genetic‹ environmental or nutritional. The increased fat with increasing the slaughter age suggested that the animals should be slaughtered before reaching the age of one year when fat is not demanded.

Garag muscle: bone ratio was increased and muscle fat ratio was decreased with increasing the slaughter age, but not significantly different. Overall weights (kg) were 5.38, 3.87, 1.16 and 0.035 for hot carcasses‹ muscles, bones and fat, respectively. The increased Garag muscle: bone ratio with the increased slaughter weight was similar to that for Shorani (Gibreel, 2003). Muscle: fat ratio was less than Desert sheep and their crosses in the Gezira (Elhassan, 1994).

Table 3 shows Garag wholesale cuts weights as percentages of EBW. The heaviest cuts were single short forequarter, leg and chump and best end of the neck and the lighter cut was the breast followed by the loin. The percentages of neck, breast and loin were increased and that of the others decreased with increasing age at slaughter. The variations in the effects of age at slaughter on cuts percentages could be attributed to the proportional growth of animals. The increased percentages of some cuts with increasing slaughter age could be associated with increased body weight with increasing slaughter age. It is difficult to compare the

present results with those for other workers due to variations in cutting techniques.

Table 3. Mean (f S.E) wholesale cuts as percentages of empty body weight of Garag males in Kosti area, White Nile State, Sudan.

Parameters	Age (years)	
	<1	1
Neck	7.45 ± 0.21^{b}	8.87 ± 0.87^{a}
Single short forequarter	34.33 ± 0.70^{a}	34.17 ± 0.65^{a}
Best end of neck	16.04 ± 0.76^{a}	14.73 ± 1.28^{a}
Breast	4.55 ± 0.42^{a}	4.83 ± 0.24^{a}
Loin	5.96 ± 0.14^{b}	7.48 ± 0.93^{a}
Leg and chump	31.66 ± 0.63^{a}	29.91 ± 1.18^{b}

Means with the same letter(s) in a row are not significantly different ($P > 0.05$).

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صفات ذبيحة أغنام القرج في ولاية النيل الأبيض بالسودان

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الخلاصة

درست صفات الذبيحة في 6 من ذكور أغنام القرج من منطقة كوستي في ولاية النيل الأبيض بالسودان بعمر أقل من عام وعمر عام (ثلاثة لكل عمر). كانت كل مكونات الجسم الثانوية أعلى بعمر عام مقارنة بالعمر الأصغر وكانت الاختلافات معنوية ($P \leq 0.05$) للدم والرأس والكبد والطوحال والكلى والشحم و الأمعاء وشحم المساريقا والذيل، كانت نسب كل مكونات الجسم الثانوية على أساس الوزن الفارغ أعلى بعمر عام باستثناء الجلد والأرجل والرئتين والقلب والكرش، كان متوسط وزن الذبح والذبيحة ساخنة والوزن الفارغ (كجم) لعمر 22.83، 10.75 18.44 على التوالي، كانت أوزان الذبح والوزن الفارغ والساخن أعلى بعمر عام بشكل معنوي ($P> 0.05$) . كما كانت نسب التصافي على أساس الوزن الحى والفارغ أعلى للحيوانات الصغيرة بأقل من عمر عام ومعنويا أعلى على الوزن الفار غ ($P\leq,0\ 05$) كانت نسب العضلات والعظام في الذبيحة أعلى للعمر الأصغر والشحم أعلى بعمر عام بشكل غير معنوي، ازدادت نسبة العضلات؛ للعظام وانخفضت نسبة العضلات؛ للشحم بزيادة عمر الذبح بشكل غير معنوي، كانت الأوزان الكلية (كجم) 5.38 ,3.87 ,1.6و 0.035 للذبيحة الساخنة، العضلات، العظام و الشحم على التوالي، أثقل القطع الإجمالية الربع الأمامي القصير، الرجل والجمب وأفضل طرف العنق واخفها الصدر ثم القطن، كانت النسب المئوية للعنق والربع الأمامي القصير والصدر والقطن أعلى بعمر عام وتلك للرجل والجب أثقل بعمر يقل عن عام.