

The Effect of Carcass Weight on Different Traditional Sudanese Beef Cuts of Western Sudan Baggara Bulls

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Abstract

The effect of live body weight on different traditional Sudanese beef cuts was investigated. Thirty fattened western Sudan Baggara bulls were slaughtered, dressed, divided into two sides and then partitioned into traditional Sudanese cuts as forequarter cuts (12 cuts) which include Neck, Grebatalzened, Alargoobalamammi, Albahal, Alshooka, Aldoosh, Lawhatelkatif, Smallribs, Ribs, Dolatalmoia and Alsinkar, and hind quarter cuts (11 cut) also include Baitalkalway, Alargoobalkhalfi, Algreeba, Ashakila, Alfalijalahmar, Alsenia, Almakhrooga, Alfalijalasfar, Bianco, Alsarra, Fielto, and then deboned. The data collected were stratified according to live body weights into 3 groups A, B and C. Group A (200-250) kg, B (255-300) kg, C (305-400) kg. The results revealed that different slaughter weights had did not followed a common trend as expected which could be attributed to different growth waves and different cuts composition. However, carcass tissues increased with the increase in live weighs. We concluded that the Sudan traditional cut system resulted in 23 cuts which may be considered as retail cuts according to consumer preferences. The results obtained in this study recommend slaughtering Baggara bulls at heavier weights (305-400 kg live body weight) to get maximum lean carcasses.

Keywords: Baggara Bulls; Traditional Sudanese Beef cuts.

1. Introduction

The reference [8] estimated livestock population of different species at 105,235 million head of which the total cattle population is estimated is 29,840,000 heads. The consumer preference to beef commodity is not only attributed to its high nutritive value but might also be ascribed to its particular enjoyable taste.

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Red meat is a rich source of high quality protein, iron, B vitamins and vitamin A (e.g. liver). Animal protein is of a high biological value containing essential amino acids; so it's necessary for physical wellbeing and proper mental and intellectual human development. Rising of per capita meat consumption to the recognized world standards is influenced by possession of a sizable national livestock herd and/or availability of financial resources to cover purchase of meat [2]. Sudan western Baggara cattle are the major beef animal in the country that provides the bulk of meat consumed in Northern Sudan and contribute considerably to export of beef cattle [1, 5]. The problems of beef production in the Sudan are numerous including market problems. In Sudan feeding of livestock depend mainly on pasture; the transportation of livestock on hoof from far production area in western Sudan to the National capital is another factor affecting productivity and quality of meat produced from these cattle.

The present systems of meat marketing in the Sudan dose not appreciate difference in quality between carcasses meats. Meat carcasses of different grades fetch the same price per kilograms. For instance Sudanese people prefer some parts or joints. Therefore, there is great need to develop a system of carcass grading in beef marketing suitable for use in the Sudan. The aim of this study was to compare between meat yields of different weight of Sudanese cattle from different meat cuts. Also to study the components of traditional meat cuts in Sudan.

2. Materials and Methods

Source of Data:

The data used in this study were taken from thirty western Sudan Baggara bulls grouped according to live weight range of 200-250 kg (A), 255-300 kg (B), and 305-350 kg (C). Those experimental animals were arranged in a complete randomized design into three weight groups.

The animals were kept indoors and fed on molasses concentrate based feed (Table 1) and sorghum Stover as roughage source and were provided with shade, feeding and watering facilities throughout the experiment.

Table1: Ingredients proportion and chemical composition of the experimental concentrate diet (on fresh Basis)

Ingredients	%
Molasses	52
Wheat bran	39
Groundnut cake	5
Urea	3
Common salt	1
Total	100
Crude protein (%)	19.60
Metabolizable energy (MJ/kg)	11.09

Table 2: The local name (Arabic) of traditional Sudanese beef cuts

No.	Traditional Sudanese beef cuts	Arabic name
1.	Neck (figra)	الرقبة(الفقره)
2.	Alsinkeet (hump)	السنكيت(السنام)
3.	Graibatalzened (part of clod)	قريبة الزند(لوحة الكتف)
4.	Albahal (part of clod)	البهال
5.	Baitelklaway (loin)	بيت الكلاوي
6.	Alargoob ALamami (shin)	العرقوب الامامي
7.	Almakhrooga (rump)	المخروقة
8.	Alshakila (part of thin flank)	الشاكله
9.	Alfalij alahmar (adductor muscle)	الفالج الاحمر
10.	Alargoob Al khalfi (leg)	العرقوب الخلفي
11.	Algereba (topside and silver)	القريبة
12.	Alsainia (eye round)	الصينية
13.	Alshooka (part of brisket)	الشوكه
14.	Aldoosh (brisket)	الدوش
15.	Lohatakatif (part of clod)	لوحة الكتف
16.	Small ribs (part of rib)	الضلع الصغيرة
17.	Ribs	الضلوع
18.	Dolatalmoia (part of rib)	ضلعة الموية
19.	Alsinkar (chuck and blad)	السنكار
20.	Alfalijalasar (biceps femories muscle)	الفالق الاصفر
21.	Bianco (semitendonouses muscle)	البيانكو
22.	Alsrra (part of sirloin)	السرا
23.	Fileto (semimembernouses muscle)	الفلتو

Slaughter procedure:

The animals were slaughtered at the slaughterhouse at Animal Production Research Center according to Muslim practice by severing the carotid arteries and veins. The trachea and esophagus were cut by a single slash of a sharp knife. After slaughter and complete bleeding, the head was removed at the atlanto-occipital joint and the fore and hind feet were removed at carpal and tarsal joints, respectively. The animals were skinned and all abdominal and thoracic organs were removed. The carcass weight was recorded and kept on 4°C overnight for chilling. The carcass was then split along the vertebral column into left and right sides and left side was cut into twenty three traditional Sudanese cuts (Table 2).

A. *Forequarter parts:*

1. Neck (figra): is removed from the forequarter by a straight cut parallel and cranial to the 1st rib and through the junction of the 7th cervical and 1st thoracic vertebra.
2. Alsinkeet (hump): were derived from the forequarter and where the predominant portion of the M. rhomboideus which is located on the dorsal edge of the Chuck and Neck.
3. Graibet Alzenid (part of Clod): was prepared from the forequarter and removed from clod containing part of humerus.
4. Albahal (part of Clod): it results from graibet alzenid from the head of humerus.
5. Alargoup Alamami (shin): was prepared from Forequarter legs (extensor group of muscles). The fore leg is removed by a cut following the Brisket removal line from the Forequarter through the M. triceps and M. biceps brachii and distal end to the humerus to include the radius and associated muscles.
6. Alshooka (part of brisket): prepared from the Brisket by a cut following the ventral contour of the costal cartilage from the 7th rib to the 13th rib of the Forequarter removing the boneless ventral portion of the navel end.
7. Aldoosh (brisket): was prepared by a cut commencing at the 1st sternal segment cutting through and along the costal cartilage to and including the cartilage at the 7th rib.
8. Lawhatakatif (part of cold): prepared from cold with including scapula.
9. Smallribs (part of rib): prepared from rib consist of rib bones and intercostal muscles.
10. Ribs: are prepared from a Forequarter and consist of rib bones and intercostal muscles.
11. Dolatalmoia (part of rib): prepared from the last part of rib including 11, 12 and 13th rib consist of rib bones and intercostal muscles.
12. Alsinkar (chuck and blad): is prepared from Chuck and Blade and from a Forequarter by the removal of the caudal portion of ribs. The Brisket is removed along the cropping line. The Shin is removing.

B. *Hind quarter parts:*

1. Almakhroga (Rump): was prepared from the hindquarter with the removal of the tenderloin in one piece from the ventral surface of the lumbar vertebrae and the lateral surface of ilium.
2. Alshakila (Thin flank): is prepared from the Thin Flank.
3. Alfalij alahmar (adductor muscle): was prepared from hind quarter, this fleshy, prismatic muscle lies

behind the Pectineus and Vastus medialis. It extends downward and forward from the ventral surface of the pelvis to the medial epicondyle of the femur. Origin; the ventral surface of the pubis and ischium, and the tendon of origin of gracillis. Insertion; the posterior surface of the femur from the level of the third trochanter to the groove for the femoral vessels and the medial ligament of the stifle joint.

4. Alargoup Alkhalfi: was prepared from Hindquarter legs (flexor group of muscles). The Hindquarter leg is removed by a cut through the stifle joint removing the tibia/tarsal bones including the surrounding flexor/extensor muscle groups.
5. Algereaba alkhalfia (Topside and silver): was prepared from the hindquarter by a straight cut through the stifle joint, parallel to the base, removing the tibia, tarsal bones and surrounding meat.
6. Alsainia (Eye Round): was prepared from an outside by the removal of the Outside Flat along the natural seam between the Eye Round and the Outside Flat.
7. Alfalij alasar (biceps femoris): This large muscle lies behind and in part upon the superficial and middle glutei. It extends in a curved direction from the sacral and coccygeal spines to the lateral surface of the stifle and leg.
8. Bianco (semitendonous muscle): This is a long muscle which extends from the first two coccygeal vertebrae to the proximal third of the medial surface of the tibia. It lies at first behind the biceps, passes downward to the back of the thigh, between that muscle and semimembranosus.
9. Alsarra (part of sirloin): The tubera, crest and the adjacent part of the ventral surface of the ilium.
10. Fileto (psoas major muscle): This is much larger than the Psoas minor muscle, by which it is partly covered. It is triangular, with the base anterior. The muscle is fleshy being in general flattened, thick in the middle, thin at its edges.
11. Baitelkalway (loin): was prepared from a back by a straight cut at the junction of the lumbar and sacral vertebrae to a point cranial to the tuber coxae to the ventral portion of the Flank.

The weights of cuts were recorded and the data of each weight group was kept separately.

Deboning:

Each cut was physically separated into muscle, bone, fat, and connective tissues. The weight of muscle, bone, fat, and connective tissues of each cut were recorded.

Statistical analysis:

The collected data was statistically analyzed using ANOVA one way analysis of variance at ($p < 0.05$) level to test the significant level using Stat soft (2001) computer program. In case of significance Duncan multiple range tests was used to test the difference between means.

3. Results and Discussion

Table (3) shows the average mean values of forequarter Sudan traditional meat cuts as a percentage of chilled carcass weight. Cuts as Figra (Neck), Aldoosh (brisket), Lawhatakatif (part of clod), Small ribs, Ribs, Dolatamoia (part of ribs) and Alsinkar (chuck and blade) were not affected ($P > 0.05$) by the change in slaughter

weight. While Gerebatalzened (part of clod), Alsinket (hump), Argoobamami (shin) and Abahal cuts were highly influenced ($P < 0.001$) by the slaughter weight. The same is true for Alshooka ($P < 0.01$). Our findings are in line with other authors [9] raising baggara cattle to two slaughter weights of 134.5 ± 7.5 kg and 249.0 ± 9.6 kg. The forequarter cuts that were not affected by the slaughter weight or positively increased with the increase in slaughter weight attributed to that tissue are early maturing or still growing respectively [9].

Table 3: Effect of carcass weight on forequarter Sudanese traditional cuts % of western Sudan Baggara bulls

Item	Group			SEM	P-level
	A	B	C		
Slaughter weight (kg)	222.50 ^a	266.50 ^b	330.50 ^c	6.828	***
Left side weight (kg)	52.73 ^a	69.77 ^b	84.48 ^c	2.230	***
Forequarter					
Cuts					
Neck	8.90		8.95		NS
		8.94		0.350	
Gerebatalzened	3.60 ^b				***
		3.26 ^a	3.17 ^a	0.085	
Alsinket					***
	0.96 ^a	1.65 ^b	1.40 ^b	0.123	
Alargoobalamammi					***
	^c 3.91	3.32 ^b	3.02 ^a	0.073	
Albahal					**
	3.48 ^b	3.33 ^b	2.92 ^a	0.126	

Alshooka	3.19 ^a	3.43 ^{ab}	3.84 ^b	0.148	*
Aldoosh					NS
	4.59	4.92	4.93	0.255	
Lawhatakatif					NS
	9.43	9.59	9.67	0.242	
Small ribs					NS
	1.52	1.59	1.67	0.093	
Ribs					NS
	3.52	3.48	3.59	0.149	
Dolatalmoia					NS
	1.11	1.31	1.27	0.076	
Alsinkar					NS
	6.97	8.04	8.58	0.740	

Notes: in this table and subsequent tables:

A: (200-250) kg live body weight group, B: (255-300) kg live body weight group and C: (305-400) kg live body weight group.

SEM=standard error of the means, P-level=significant level, NS=No significant, *= significant ($p < 0.05$), **= ($p < 0.01$), ***= ($p < 0.0001$).

Table (4) illustrated the effect of carcass weight on hind quarter Sudanese traditional meat cuts as percentage out of chilled carcass. There is no significant difference on Baitalkalway, Asenia, Alfalijalasar, Bianco, Alsrar and Fileto cuts. Meanwhile there are significant differences on Alargoobalkhalfi, Algereba, Alshakila and Alfalijalahmar ($p < 0.001$), and ($p < 0.01$) significant difference on Almakhrooga. The above mentioned discrepancy may be attributed the different growth rate of cuts component of traditional Sudanese cuts, and that is agree with reference [6] who stated that the most variation in the wholesale cuts percentage and composition were found to be associated with differences in the total lean and fat content.

Table 4: Effect of carcass weight on Hindquarter Sudanese traditional cuts % of western Sudan Baggara bull carcass

Item	Group			SEM	P-level
	A	B	C		
Hindquarter					
Cuts					
Baitalkalawi					NS
	4.45	4.17	4.32	0.167	
Alargoobalkhalfi					***
	5.21 ^a	4.17 ^a	3.81 ^b	0.143	
Algreeba					***
	10.89 ^a	9.18 ^a	8.44 ^b	0.228	
Alshakila					***
	3.35 ^b	3.69 ^b	3.76 ^a	0.087	
Alfalijalahmar					***
	5.72 ^a	5.16 ^a	4.89 ^b	0.132	

Alsenia					NS
	3.21	3.28	3.46	0.113	
Almakhrooga	4.05 ^{ab}	3.77 ^a	4.26 ^b	0.130	*
Alfalijalafar					
	4.74	4.79	4.66	0.153	NS
Binaco					NS
	1.98	2.08	1.91	0.079	
Alsarra					NS
	3.37	3.85	3.45	0.168	
Fielto					NS
	1.80	1.86	2.01	0.141	

Table (5) shows the effect of carcass weight on mean carcass tissues as (kg) and percentage. There is no significant difference on muscle percentage, but total muscle as (kg) show highly significant difference ($p < 0.001$). Total bone weight and percentage viewed highly significant difference ($p < 0.001$), as same as total fat weight and percentage. Also total carcass weight, muscle+connective tissues increased as carcass weight increased ($p < 0.001$).

Muscle: bone ratio increased significantly as carcass weight increased ($p < 0.001$), muscle: fat ratio showed significant difference ($p < 0.001$) with increasing weight. Muscle+fat: bone ratio increased significantly ($p < 0.01$) with increasing weight. However, researchers have observed and documented that meat animal growth and development may be altered through the diet [12].

The trend of traditional cut muscle content increased as slaughter weight increased. Muscle growth trend was in the line with reference [9]. Variations in bone tissues among different slaughtered weights were evident. Bones percentage of carcass weight decreased significantly as slaughter weight increased. The bone is expected to grow at different rates according to genetic constitution of the animal. Therefore small size animals attain their mature size at higher rates than large size animals [3]. The weight of bone for assessing carcass composition was widely used by reference [14]. The results reported here are expected to furnish information that could be used in assessing local zebu cattle in terms of slaughter weight, growth of structural tissues and consequently the yield of the muscles as an important edible tissue of the carcass. For all cuts fat weights in depots increased significantly as slaughter weight increase this was in the line with the finding of reference [3]. At the lighter weight (200kg) the fat deposition was generally less marked but with the increased of slaughter weight (400kg) the proportion of fat increased. The reference [11] found that fat in loin and leg cuts was representative of carcass fat. This contradicts the finding of the reference [7] who found the rib was good indicator of carcass fatness. As observed in current results subcutaneous fat and connectives tissues showed significance variation. However, the reference [4] reported that for Kenana cattle subcutaneous fat was deposited at 120% of the rate of total fat. Visual assessment of subcutaneous fat in cattle gave high correlation with the measured subcutaneous fat. By the addition of side weight, weight of kidney knob and channel fat and measurements on the eye muscle a satisfactory prediction of total fat was achieved in cattle [10]. Consumers appreciate white fat as yellow fat, such as that of meat from dairy cows or grass fed animals, may be less appealing [13].

Table5: Effect of carcass weight on mean carcass tissues weight (kg) and percentage in western Sudan Baggar bulls (left carcass side)

Item	Group			SEM	P-Level
	A	B	C		
Total muscle weight (kg)	33.70 ^a	43.91 ^b	53.56 ^c	1.62	***
Muscle %	69.10	68.57	69.46	0.65	NS
Total Bone weight (kg)	12.59 ^a	14.76 ^b	16.59 ^c	0.31	***
Bone %	24.24 ^b	21.52 ^a	20.22 ^a	0.50	***
Total fat weight (kg)	3.55 ^a	6.82 ^b	8.48 ^c	0.50	***
Fat %	6.66 ^a	9.91 ^b	10.32 ^b	0.65	***
Total carcass	52.33 ^a	68.62 ^b	82.37 ^c	2.12	***
Muscle+ Connective tissue %	36.19 ^a	47.05 ^b	57.30 ^c	1.68	***
Muscle: Bone	2.89 ^a	3.19 ^b	3.45 ^c	0.08	***
Muscle: Fat	12.07 ^b	7.10 ^a	7.03 ^a	1.11	***
(Muscle+Fat):Bone	2.96 ^a	3.44 ^b	3.74 ^c	0.10	**

4. Conclusion and Recommendations

The Sudan traditional cut system resulted in 23 cuts which may be considered as a retail cuts according to consumer preferences. Although Sudanese researchers adopted M. L. C. procedure for cutting carcasses. The results obtained in this study recommend slaughtering Baggara bulls at heavier weights (305-400 kg live body weight) to get maximum lean carcasses.

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