



Effect of Nutrition and Castration on carcass Measurements, Wholesale Cuts and Carcass Composition of Male Desert Goats

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ABSTRACT

The experiment was conducted in desert goats to evaluate the effect of nutrition and castration on carcass measurements, wholesale cuts and carcass composition of male desert goats. Seventy two male desert goats aged 4-5 months and weighing 12.1Kg (11.7-12.4 kg) were used in this experiment. The goats were divided randomly into three groups; each group (24 goats) was subdivided into two sub groups (12 goats) in Factorial experimental randomized design. The results revealed that nutrition and castration had no significant effect ($p>0.05$) on carcass length. Internal chest length, external chest length, distal foreleg length, proximal foreleg length, proximal hind leg length, foreleg circumference, hind leg circumference and eye muscle area were significantly affected ($p<0.05$) by nutrition, On the other hand, castration had no significant effects ($p>0.05$) on these measurements. Forequarter, rack, breast percentages were significantly affected ($p<0.01$) by nutrition, on the other hand, castration had no significant effect ($p>0.05$) on these cuts except loin cut percentage. Carcass dissected revealed that nutrition had greater muscle, bone and fat compared with grazing group. On the other hand, castration had no significant effect ($p>0.05$) on carcass composition except muscle to fat ratio which was significantly affected ($p<0.05$) by castration and interaction of nutrition and castration.

Keywords: Desert goats, nutrition, castration, carcass, meat.

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INTRODUCTION

Sudan desert goats are found in arid and semi arid areas of Sudan, especially in Kordofan and Darfur regions and are adapted to survive under adverse conditions of feed limitations and water scarcity (Mason and Mule, 1960). Total annual red meat production in Sudan is estimated at 8830 tones, with goats contributing about 310 tones and annual live goat exports to the Arab world exceed 16.500 head (MAR, 2003). Goats have been a common source of meat in many tropical and developing countries and they are more important meat producing

animals compared to sheep (Mahgoub and Lodge, 1998). Hango *et al.* (2007) reported that carcass weight and dressing percentage increased significantly ($p < 0.05$) with increasing amount of concentrate. Castration of animals is a common management practice that imposes unnecessary pain and stress and may reduce performance (Hopkins-Shoemaker *et al.*, 2004). The presence of testicular hormones is related to greater muscle growth capacity in intact males (Arnold *et al.*, 1997). Castration in goats has an advantage of eliminating the strong male odor present in bucks. Un-castrated and sexually mature goats are difficult to sell or they may have low market price because of their strong male taint. Castrations also affect growth and carcass composition (Solomon *et al.*, 1991). Generally Castration reduced slaughter weight and carcass weight and improved the juiciness. The objective of this research is to study the effect of nutrition and castration on carcass measurements, wholesale cuts and carcass composition of male desert goats.

MATERIALS AND METHODS

Experimental animal's management

This work was conducted at El-Obeid Agricultural Research Station, North Kordofan State, Sudan. Seventy two male desert goats aged 4-5 months and weighing 12.1Kg ranged between (11.7-12.4 kg) were used in this study. The goats were divided randomly into three groups, each group (24 goats) was subdivided into two sub groups (12 goats); one sub group was castrated while the other was left intact. Group one was kept on grazing only which consist of dry grasses (Bano, *Eragrotis turmula*, Sheeleni, *Zornia glochidiata*, Haskaneeet, *Cenphrus spp*) and browse (Sedeer leaves, *Ziziphus spina chritis*, Hegleeg leaves, *Balanite aegyptiaca* and Ushar dried leaves and flower, *Calotropis purocera*). Group two was kept on grazing plus concentrate supplement with experimental diet which consist of (wheat bran 38%, Dura grain fetareta 30%, ground nut cake 20%, ground nut hay 10%, sodium chloride 1%, and limestone 1%) given at a rate of 324g/head/day. Group three was *ad libitum* fed the experimental diet (zero grazing). The chemical composition of range plants and experimental diet were shown in Table (1). Live weight of each animal was recorded at the start of experiment, then weekly until the end of trial (90 days), using spring balance. The animals were weighed in the morning (before grazing), following over night fast except for water.

Table 1. Chemical composition of range plants and experimental diet

Chemical composition	Range of plant	Experimental diet
Dry matter (DM %)	95.9	98.6
Organic matter (OM%)	84.2	87.7
Crude protein (CP%)	10.0	22.0
Crude fiber (CF%)	32.0	25.0
Ether extract (EE%)	7.0	12.0
Nitrogen free extract (NFE%)	36.0	31.0
Ash (%)	10.0	08.0
Energy density(MJME/Kg DM)	9.0	12.0

*Calculate as in MAFF (1972)

Slaughter procedure and data collection

At the end of the experiment which extended for 90 days twelve animals from each treatment group were slaughtered at the end of the experiment. Slaughter was performed according to Muslim practice by severing jugular vessels, esophagus and trachea without stunning. Following skinning and evisceration the external and internal offals including gut content were weighed. The hot carcass weight was recorded; the carcass was split along midline.

The weights of the carcass halves were recorded. On the left half carcass measurements were done according to procedure of Owen (1975) then the left half was cut into wholesale cuts, each cut was dissected into lean, fat and bone and then tissues separately were weighed, dissection was carried out according to procedure outlined by Cuthberton *et al.* (1972).

Statistical analysis

The data were statistically analyzed according to factorial experimental randomized design as a 3×2 (management Vs sex). Multiple range tests were used to compare the means.

RESULTS AND DISCUSSION

Effect of nutrition and castration on carcass measurements (cm) of male desert goat:

The effect of nutrition and castration on carcass measurements is displayed in (Table 2). The results showed that the internal and external chest length and Eye muscle area were significantly higher ($P<0.001$) where Distal foreleg length, Proximal foreleg length, Distal hind leg length, Proximal hind leg length, Foreleg circumference and Hind circumference were significantly high ($P<0.05$). Effect of castration on carcass measurement did not show any significant effect. Most of the carcass measurements increased with supplementation of grazing and with *ad libitum* feeding of concentrates which might be due to the improvement of the nutrition status of the animal resulting in increased tissue growth. Castration had no significant effect on some carcass measurements because castration spared energy which was utilized for tissue growth.

Table: 2.Effect of nutrition and castration on carcass measurements (cm) of male desert goat

Parameters	Nutrition(N)					Castration (C)							
	Grazing	Grazing + supple	Zero grazing	SE	LS	Grazing		Grazing+ supple		Zero grazing		SE	LS
						Entire	Castrate	Entire	Castrate	Entire	Castrate		
No. of Animal	24	24	24	-	-	12	12	12	12	12	12	-	-
Exp. period (days)	90	90	90	-	-	90	90	90	90	90	90	-	-
Carcass length	38.3	40.9	42.5	1.3	NS	37.5	39.0	41.4	40.4	43.7	41.2	1.1	NS
Internal chest length	19.0 ^a	19.7 ^b	21.3 ^b	0.4	* **	18.2	19.8	19.4	19.9	21.3	21.3	0.3	NS
External chest length	21.5 ^a	23.6 ^b	24.8 ^b	0.5	* **	20.4	22.5	23.5	23.7	25.1	24.5	0.4	NS
Distal foreleg length	17.8 ^a	18.6 ^b	19.9 ^b	0.3	* *	17.2	18.4	18.3	18.9	20.4	19.3	0.3	NS
Proximal foreleg length	14.1 ^a	14.4 ^b	15.0 ^b	0.2	*	13.6	14.6	14.4	14.3	15.3	14.6	0.2	NS
Distal hind leg length	25.4	25.7	26.5	NS	* *	25.0	25.7	24.4	26.8	26.1	26.8	0.4	*
Proximal hind leg length	14.4 ^a	16.4 ^b	16.1 ^b	0.6	*	13.9	14.8	17.4	15.3	15.4	16.8	0.8	NS
Foreleg circumference	16.7 ^a	18.6 ^b	18.7 ^b	0.5	**	17.0	16.3	18.8	18.3	19.0	18.3	0.4	NS
Hind circumference	32.2 ^a	36.0 ^b	36.3 ^b	1.1	**	34.2	30.1	38.3	34.2	37.5	35.1	0.9	NS
Eye muscle area	3.2 ^a	4.5 ^b	5.8 ^b	0.4	***	2.9	3.6	4.7	2.9	2.9	2.9	0.3	NS

^{ab} Values in same rows with different superscripts differ at $P<0.001$, $P<0.01$ and $P<0.05$ respectively, NS= non significant

Effect of nutrition and castration on primal cuts (%) of male desert goat

Wholesale cuts proportions of goat increased with concentrate supplementation and in the *ad libitum* feeding of concentrates and that of forequarter rack and breast cuts increased significantly (Table 3). This result was in contrast with Srivastva and Sharma (1997) who observed that none of the cuts (leg, loin, rack, shoulder, breast and shank) were significantly affected by dietary treatment in Jumunapari goats. Castration had no significant effect on percentages of forequarter, rack, breast and leg cuts, but the forequarter and breast were heavier in entire than in castrates (Table 3). These findings agreed with the findings of Simela *et al.* (2011) who reported no significant differences between entire and castrated male desert

goats in the percentage of carcass wholesale cuts. This trend was also similar to the findings of Robles *et al.* (1985) which revealed that the major carcass cuts of goat as the forequarter and the breast were heavier for entire than for castrates. Male sex hormones in entire individuals might be responsible for the increased weight of forequarter and breast. Growth is differential and carcass tissues have different growth rates that are mainly regulated by sex hormones (Devendra and Burns, 1983).

Table 3. Effect of nutrition and castration on primal cuts (%) of male desert goat

Parameters	Nutrition(N)					Castration (C)							
	Grazing	Grazing+ supple	Zero grazing	SE	LS	Grazing		Grazing+ supple		Zero grazing		SE	LS
						Entire	Castrate	Entire	Castrate	Entire	Castrate		
No. of Anim	24	24	24	-	-	12	12	12	12	12	12	-	-
Exp. period (days)	90	90	90	-	-	90	90	90	90	90	90	-	-
Forequarter	42.8 ^a	49.7 ^b	48.2 ^b	1.5	**	49.0	47.4	50.6	48.7	42.8	42.7	1.2	NS
Leg	32.8 ^a	37.4 ^b	37.2 ^b	1.9	NS	37.3	37.0	37.5	37.3	31.9	33.6	1.5	NS
Rack	8.1 ^a	11.4 ^b	11.9 ^b	0.8	* *	13.7	10.1	11.8	11.0	7.8	4.8	0.7	NS
Breast	5.4 ^a	9.5 ^b	9.7 ^b	0.6	* **	10.3	9.0	9.6	9.3	6.1	4.6	0.5	NS
Loin	9.3	9.5	9.6	0.7	NS	11.1 ^a	8.1 ^b	10.2 ^a	8.8 ^b	9.1 ^a	9.5 ^b	0.5	*

^{ab} Values in same rows with different superscripts differ at P<0.001, P<0.01 and P<0.05 respectively, NS= non significant

Effect of nutrition and castration on carcass composition of male desert goat

The data in Table (4) revealed that total muscle of zero grazing goats group and grazing + supplementary group had recorded greater percentage compared with grazing group, and this agreed with the finding of Elkhidir (1989) and Hassaballa (1996) who reported that the total muscle percentage was 64. On the other hand castration had no significant effect on total muscle percentage (Table 4), but entire goats had relatively more muscles compared with castrates, which was in line with findings of Smith (1982) and Devendra and Burns (1983) who reported that intact goat males had less fat and more muscle and bone than castrates and females. Wilson (1958) and Koyuncu *et al.* (2003) reported that castration did not affect tissue distribution in the carcass except intramuscular fat which is known to be a more variable tissue in quantity and distribution.

Table 4. Effect of nutrition and castration on carcass composition of male desert goat

Parameters	Nutrition(N)					Castration (C)							
	Grazing	Grazing + supple	Zero grazing	SE	LS	Grazing		Grazing+ supple		Zero grazing		SE	LS
						Entire	Castrate	Entire	Castrate	Entire	Castrate		
No. of Anim	24	24	24	-	-	12	12	12	12	12	12	-	-
Exp. period (days)	90	90	90	-	-	90	90	90	90	90	90	-	-
Total muscle (g)	1238.8 ^a	1901.0 ^b	2249.0 ^b	0.5	***	1323.0	1154.0	1944.5	1858.0	2194.0	2304.1	102.5	NS
Muscle (%)	58.5 ^a	66.7 ^b	66.0 ^b	2.2	*	59.9	58.1	77.0	62.3	63.2	68.8	1.8	NS
Total bone weight (g)	625.0 ^a	779.3 ^b	853.6 ^b	29.8	* **	676.0	573.9	800.5	758.0	900.0	806.8	24.4	NS
Bone (%)	30.3 ^a	28.4 ^b	26.1 ^b	0.9	* **	31.4	29.2	31.1	25.7	25.5	26.7	0.7	NS
Total fat weight (g)	53.2 ^a	123.1 ^b	338.0 ^b	38.8	* **	38.0	70.0	97.0	149.1	310.0	365.9	31.7	NS
Fat (%)	2.8 ^a	4.0 ^b	4.6 ^b	0.9	* **	1.6	3.4	3.2	4.8	4.0	5.1	0.7	NS
Muscle: fat	23.3 ^a	15.4 ^b	14.3 ^b	14.0	*	21.5 ^a	24.5 ^b	13.0 ^a	17.0 ^b	14.1 ^a	13.5 ^b	11.7	*
Muscle: bone	2.0 ^a	2.5 ^b	2.6 ^b	0.1	***	2.0	2.0	2.4	2.0	2.4	2.8	0.1	NS
(Muscle+ fat): bone	2.0 ^a	2.6 ^b	3.0 ^b	0.2	***	2.0	2.0	2.6	2.6	3.0	3.0	0.1	NS

^{ab} Values in same rows with different superscripts differ at P<0.001, P<0.01 and P<0.05 respectively, NS= non significant

CONCLUSIONS

It could be concluded that during management practices of goat that involved grazing, concentrate supplementation of grazing, zero grazing and castration. Zero grazing group recorded highest carcass measurements on the other hands, grazing plus supplementation

group registered the highest values in forequarter and leg cuts, muscles percentages and muscles: fat.

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