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Influence of Body Weight and Methods of Castration on the Growth Performance and Nutrient Digestibility of Savanna Brown Goats

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Abstract
This study was designed to investigate the influence of castration methods on the growth performance and nutrient digestibility of Savanna Brown goats. 24 animals were allocated to six treatment groups on weight bases. Each treatment contained four animals with two replicates and two animals per replicate. Treatment 1(T_1) contained goats weighing 4-8 kg, non-castrates; Treatment 2(T_2) contained goats weighing 0-4 kg castrates (open castration–surgical); Treatment 3(T_3) were goats weighing 4-8 kg castrates (close castration-burdizzo); Treatment 4(T_4) were goats weighing 8-12 kg castrates (open castration-surgical); Treatment 5(T_5) were goats weighing 8-12 kg castrates (close castration-burdizzo) and Treatment 6(T_6) were goats weighing 8-12 kg non-castrates. Digestibility trial was conducted at the end of the feeding trial that lasted for 14 weeks. During digestibility determination, 12 goats were transferred to metabolism cages. After three days of adaptation in the metabolism cages, faeces were collected for a period of seven days and analyzed to determine nutrient digestibility. Results obtained revealed that there were significant ($p<0.05$) differences in the initial and final body weights due to the different weight ranges; the total weight gain, average daily weight gain and feed conversion ratio were not significant among the treatments. Significant ($p<0.05$) differences were observed in total feed intake and average daily feed intake. Results also show that there was a significant ($p<0.05$) difference between open, close and the non castrates in dry matter, crude protein, crude fibre, ash, fat and nitrogen free extract digestibility It can be inferred that castration had no significant effect on the growth performance of Savanna Brown goats, while the nutrient digestibility was significantly affected by the castration methods.

Keywords: Savanna Brown goat, castration, growth performance and nutrient digestibility

Introduction

Goat is an important animal serving man in numerous ways by producing milk, meat, fibre and different byproducts. Nsoso *et al.* (2004) reported that goats play a significant role by providing milk and meat as a source of protein and are a major source of income, especially for rural people. They proved useful to man throughout the ages due to their productivity, small size, and non-competiveness with man for food (Mahmoud, 2010). It is believed that goats are clever, independent, agile, and tolerant to numerous diseases and parasites and can take care of themselves to a large extent better than other domestic animals However, the strong taint of male goat is always considered to be one of the problems militating against goat farming especially in Sub-Saharan Africa and castration is the proven way of either reducing or eliminating this problem (Tesfaye *et al.,* 2008). Castration isoneofthemajormanagement strategies usedto produce carcasseswith higher percentages of fat tissues than intact kids (Kebede *et al.,* 2008). Tesfaye *et al.* (2008) found that un-castrated and sexually mature goats are difficult to sell or they may have low market prices because of their strong male taints.

There are various types of castration methods; however, they can be classified into three major groups: physical, chemical, and hormonal. Nsoso *et al.* (2004) reported that castration is achieved by cutting blood supply to the testis both by crushing the blood vessels, cutting and elevating the temperature of the testis. Among the castration methods reported in the literature, the commonly used method of castration is the physical castration which involves the surgical elimination of the testicles of the goat through the application of a contracting elastic band (rubber ring) at the bottom of the scrotum. There is also a bloodless castration method that involves the use of external clamping with a suitable device such as burdizzo clamp (Johann *et al.,* 2010). Despite the wide acceptance of physical castration as a means of controlling taint in goat, there is controversy on the best weight and method of castration that will produce the highest weight gain in goats.

Hence the objective of this research study was to determine the influence of body weight and method of castration on body weight gain in Savanna Brown goats.

Materials and Methods

Twenty for Savanna Brown goats, obtained from goat markets within Minna, were allocated to six treatment groups on weight bases. Each treatment contained four animals with two replicates and two animals

per replicates. Treatment 1(T_1) were goats weighing 0-4 kg non-castrates, Treatment 2(T_2) were goats weighing 0-4 kg castrates (open castration –surgical), Treatment 3(T_3) were goats weighing 0-4 kg castrates (close castration-burdizzo), Treatment 4(T_4) were goats weighing 4-8 kg castrates (open castration-surgical), Treatment 5(T_5) were goats weighing 4-8 kg castrates (close castration-burdizzo) and Treatment 6(T_6) were goats weighing 4-8 kg non-castrates. Animals were castrated using the close castration method (Burdizzo) following the procedure of Olaifa and Opara (2011); while open castration (surgical) was accomplished using the procedure of Tibary and Van Metre (2004).

The animals were managed under semi-intensive system in a cross-ventilated pens within the animal house. Before the arrival of the animals, the pen was washed and disinfected with izal and allowed to dry. On arrival, the animals were vaccinated against Peste des Petits Ruminante (PPR). The animals were provided with feed and mineral salt lick. Routine health care practices such as vaccination, ecto-parasites control and de-worming were carried out. Fresh drinking water was provided *ad libitum*. Goats were fed at 3 % of their body weights, with concentrate diet in the morning (08:0 am – 09:00 am) before they were allowed to graze from 10:00 am- 04:00 pm. The experiment lasted for fourteen (14) weeks during which time data were collected on feed intake and weight gain. Digestibility trial was conducted at the end of the feeding trial.

Collected data were analyzed using SAS Statistical Package (2002, Version 10.0) based on a Completely Randomized Design using a 2 x 3 factorial arrangement. Where treatment means were significant ($p<0.05$), they were separated using Duncan multiple range test as contained in the Package.

Results and Discussion

Table 1 shows the main and interaction effects of body weight and methods of castration on growth performance of Savanna Brown goats. There were no significant (P>.0.05) differences between open castration, close castration and non-castration in the initial body weight, final body weight, body weight gain, average daily body weight gain and feed conversion ratio. These results are similar to those of Phad *et al.* (1995), where methods of castration had no significant (p>.0.05) effect on the live weight of goats. El- Waziri *et al.* (2011) found that castration by elastrator had no significant effect on slaughter weight, feed intake, body weight gain, feed to gain ratio, carcass weight and dressing percentage. However, there were significant ($p<0.05$) differences in between open, close and non castration methods in total feed intake and average daily feed intake. Interaction effects between castration and weight show that there was a significant ($p<0.05$) difference in initial body weight and final body weight due to the different weight ranges of the experimental animals used.

Table 1: Main and interaction effects of body weight and methods of castration on growth performance of Savanna Brown goats

Factor	Initial body weight (kg)	Final body weight (kg)	Body weight gain (kg)	Average daily body weight gain (kg)	Total feed intake (kg)	Average daily feed intake (kg)	Feed conversion ratio
Castration							
Non Castrate	8.50	10.75	2.25	0.02	11.67^{b}	0.13^{b}	5.44
Close Castrate	8.81	10.94	2.13	0.02	13.49^{a}	0.15^{a}	5.82
Open Castrate	8.56	10.63	2.06	0.02	12.69^{ab}	0.14^{ab}	6.54
SEM	0.245	0.333	0.197	0.002	0.349	0.004	0.676
L.S	NS	NS	NS	NS	*	*	NS
Weight							
4-8(W_1)	7.71^{b}	9.88^{b}	2.17	0.02	12.60	0.14	6.07
8-12(W_2)	9.54^{a}	11.67^{a}	2.13	0.02	12.64	0.14	5.79
SEM	0.199	0.271	0.160	0.002	0.286	0.003	0.552
L.S	*	*	NS	NS	NS	NS	NS
Interaction							
NC X W_1	7.25^{b}	9.88^{b}	2.63	0.03	11.44^{b}	0.13^{b}	4.50
NC X W_2	9.75^{a}	11.63^{a}	1.88	0.02	11.90^{ab}	0.13^{ab}	6.39
CC X W_1	7.88^{b}	9.88^{b}	2.00	0.02	13.51^{a}	0.15^{a}	6.75
CC X W_2	9.75^{a}	12.00^{a}	2.25	0.02	13.49^{a}	0.15^{a}	4.88
OC X W_1	8.00^{b}	9.88^{b}	1.88	0.02	12.86^{ab}	0.14^{ab}	6.97
OC X W_2	9.13^{a}	11.38^{ab}	2.25	0.02	12.52^{ab}	0.14^{ab}	6.11
SEM	0.346	0.470	0.278	0.003	0.495	0.005	0.957
L.S	*	*	NS	NS	*	*	NS

[ab]Means in the same row with different superscripts were significantly different (P< 0.05) *=Significant level (P<0.05), N S = Not significant

Goats of 4-8 kg differed significantly (p<0.05) from those of 8-12 kg, however, there was a statistical similarity between the goats of both groups, this is in agreement with result of Nsoso *et al.* (2004) who reported that there was no significant difference (p>0.05) in live weight between the groups of goats at the same age and stage of development. There was a significant difference (p<0.05) in the total feed intake and average daily feed intake between open castration, close castration and non-castration. Total feed intake and average daily feed intake was high in castrates than non-castrated goats. In collaboration with the findings in this study, Bello and Adama (2012) in their research with Savanna Brown goats reported that castrates consumed significantly more (p<0.05) dry matter (DM) than non castrates.

Table 2 shows the main and interaction effects of body weight and methods of castration on nutrient digestibility of Savanna Brown goats. There were no significant (p<0.05) difference between open, close and the non castrates in dry matter (DM) digestibility; however, for crude protein, crude fibre, ash, fat and nitrogen free extract digestibility, there were significant (p<0.05) differences between open castration, close castration and the non-castration.

Table 2: Main and interaction effects of body weight and method of castration on nutrient digestibility of Savanna Brown goats

Factor	Dry Matter	Crude Protein	Crude Fibre	Ash	Fat	Nitrogen Free Extract
Castration						
Non Castrate	76.10	60.66[b]	84.15[b]	53.79[b]	51.69[c]	79.65[c]
Close Castrate	75.55	64.95[a]	82.54[c]	54.98[a]	55.62[b]	84.69[a]
Open Castrate	76.80	64.29[b]	87.69[a]	55.20[a]	57.12[a]	81.16[b]
SEM	0.179	0.954	0.121	0.234	0.094	0.042
L.S	NS	*	*	*	*	*
Weight						
4-8(W_1)	74.70[b]	61.77[b]	85.07[a]	54.30[b]	55.08[a]	80.46[b]
8-12(W_2)	76.93[a]	64.83[a]	84.52[b]	55.01[a]	54.54[b]	83.22[a]
SEM	0.147	0.779	0.098	0.191	0.077	0.034
L.S	*	*	*	*	*	*
Interaction						
NC X W_1	74.30[d]	60.09[b]	84.25[d]	54.36[bc]	53.08[d]	80.11[d]
NC X W_2	76.30[b]	61.23[b]	84.05[d]	53.22[c]	50.29[e]	79.20[e]
CC X W_1	74.50[cd]	62.80[ab]	84.85[c]	54.05[bc]	56.30[b]	81.21[c]
CC X W_2	76.60[b]	67.10[a]	80.24[e]	55.90[a]	54.94[c]	88.19[a]
OC X W_1	75.30[c]	62.42[ab]	86.10[b]	54.50[b]	55.85[b]	80.07[d]
OC X W_2	77.90[a]	66.15[a]	89.28[a]	55.90[a]	58.39[a]	82.26[b]
SEM	0.254	1.349	0.171	0.331	0.134	0.059
L.S	*	*	*	*	*	*

[abcd]Means in the same row with different superscrips were significantly different (P< 0.05)*=Significant level (p<0.05), N S = Not significant,

This is in contrast to the report of Adeloye (1992) who found no significant (p<0.05) difference between castrates and intact males except for thedry matter (DM). Goats of 8-12 kg had significantly (P<0.05) higher values in dry matter, crude protein, ash and nitrogen free extract than goats of 4-8 kg castrates, except for crude fibre and fat where, goats of 4-8 kg had significantly higher value than those of 8-12 kg.

Conclusion and Recommendation

From the results obtained in this study, it can be concluded that castrations methods had no significant effects on the body weight of Savanna Brown goats.However, castrates gained more body weights compared to the non castrates. Also, castrates had higher digestibility coefficient than non castrates. It is therefore

recommended that castration of male Savanna Brown goats that is not required for breeding programmes should be carried out, although it may take longer than fourteen weeks to get the full effects of castration.

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