EFFECTS OF CASTRATION ON LINEAR BODY MEARSUREMENTS IN RED SOKOTO GOATS IN KASHERE , GOMBE STATE, NIGERIA .

[1]Bukola, O.A, [1]Sadiq, M.S,' [2]Eboh, S ,[2]Aliyu, A.K, [3]Damba, D.B, [4]Adejoh, C.O, and [1]Usman, B
[1]Department of Animal Science, Federal University ,,Kahere, Nigeria
Department of Animal Production, Kogi State University , Anyigba, Nigeria
[2]Department of Animal Health and Production Technology, Federal College of Horticulture, Dadin Kowa, Gombe ,State, Nigeria
[3]Department of Animal Health and Production Technology ,Kogi State Polytechnic,Lokoja, Itakpe Campus , Nigeria
[4]Department of Animal Production, Kogi State University , Anyigba, Nigeria
(Bukola, O.A ojoadewale052@gmail.com)

ABSTRACT
The research work was carried out in federal university of kashere, Gombe state, from march to July 2021. The study was conducted on 20 male red Sokoto goat kids of 8.12± 0.19 kg initial body weight for 5 months to investigate the effect of age of castration on live weight gain and linear body measurement of castrated animals. The treatments were intact bucks ,uncastrated at 2 months.(control) T0, Treatment (1) T1, castrated at 2months. Treatment (2) T2, castrated at 3 months, treatment (3) T3 castrated at 4 months treatment (4) T4, castrated at 5 months. all castrated and intact goats were allowed to graze at the federal university of Kashere Teaching and Research Farm during the day and supplemented with concentrate. Age at castration had significant (P<0.05) effect on body weight in treatment 4 in the month of July, linear body measurement of red sokoto goats on body length BL, height at wither (HW) neck circumference (NC) loin circumference (LC) heart at girth (HG), body weight (BW) were significant (P<0.05) in treatment 4 as compared to other treatments. Castration is important for better weight gain and linear body measurement at 5 months of age. castration at 5 months of age had better rib eye area and fat thickness than other castrated groups and intact goats.

KeyWords: Castration, Linear Body Measurements, Red Sokoto Goats, Morphometric

1.0 INTRODUCTION

Nigeria human population is continuously on the increase annually. This increase has led to more demand for animal and animal products to meet up with the minimum animal protein requirement per individual per day.

The protein intake of an average Nigeria is estimated at 45.5g per head per day, this is lower compared with the Food and Agricultural Organization's recommended minimum intake of 70g per head per day, of which 50% (35g) should be of animal source (FAOSTAT, 2008). The inadequate supply of animal protein in Nigeria can be attributed to inadequate production potentials of the most common sources of meat which include poultry, goat, cattle, pig, sheep, rabbit etc. Thus, there is therefore, the need to increase the supply of animal protein through meat consumption and this could be accomplished through efficient use of promising indigenous animals such as goat. Gambo *et al.* (2004) reported that among the cheapest and most affordable protein source for this ever increasing population is mainly the poultry products and chevon (goat meat).

Okpeku *et al.* (2011) also reported that rearing of small ruminants (sheep and goats) would have lasting effects in bringing about social change by improving the incomes and standard of living.

Goat (*Capra hircus*) is the earliest domestic animal and probably the first ruminant livestock, after the wolf was domesticated (Zeder and Hasse, 2000). They are one of the smallest domesticated ruminants which are managed for the production of milk, meat, wool and leather particularly in arid and semi-tropical or mountainous countries (Morand-Fehr, 2004). Goat is the most prolific ruminant among all domesticated ruminant under tropical and subtropical conditions. It is a resourceful and efficient ruminant producing meat, milk, skin and hair (Morand-Fehr, 2004).

Goats constitute the largest group of small ruminant livestock in Nigeria totalling about 53.8 million and also constituting 6.2 percent of the World's goat population (FAOSTAT, 2011). Surveys have shown that up to 85 percent of rural households, poor farmers and small-time business people of all age groups and sexes keep goat (FDLPCS, 2007). The ability of goats to tolerate harsh climates, the presence of trypanotolerance in some breeds (Salako, 2004), suitability to traditional systems on account of small size, short generation interval (Abdul-Aziz, 2010) and ability to thrive on poor quality diets provided by scarce grazing on marginal lands (Adedeji *et al*., 2011) all combine to make small ruminants strategic to increasing livestock productivity in rural agricultural systems (Adedeji*et al.*, 2011).

Castration is one of the husbandry techniques practiced in a livestock production enterprise. Castration of male kids not required for breeding purposes improves meat quality [Devendra, 1990; kaberia*et al* 2003;Jansen and Burg, 2004] and increases the carcass weight; hence it has proved

advantageous in the production of goat meat [chevon] [Akinyosoye, 1976; Kyomo, 1978]. The ability of the producers and buyers to relate the live animal's measurement to growth characteristics is essential for optimum production and value-based trading system. This ability will also adequately reward livestock farmers rather than the middlemen that tend to gain more profit in Livestock production business, especially in developing countries (Afolayan*et al.*, 2006). A study of linear body measurements on most farms in the tropics is important because most farmers lack weighing scales and the education to understand their manipulations (Gerald, 1994). Linear body measurements can be used as a way of estimating weight and market value in terms of cost of the animals (Gerald, 1994).Body condition scoring is an important management practice used by producers as a tools to help optimize production, evaluate health, and assess nutritional status. This practice helps evaluate their herd or flock as to the amount of body reserves, particularly fat and muscle, an animal possesses. If body condition scoring is conducted at planned intervals throughout the production cycle, nutritional and management can be altered needed. The most critical time to body condition score animals during the production cycle include pre-breeding, mid- gestation, parturition, and weaning. The practice of body condition scoring is used mainly to increases economic returns through increase reproductive performance and realize more efficient feed costs.

The fundamental knowledge of obtain direct body weight measurement at the field level has practical limitation due to the time and energy expended and the non-availability and unaffordability of weighting scales especially in the small scale farming sector. Hence farms are relying on questionable estimation of the body weight of their animals leading to in accuracy in decision making, husbandry and marketing practice. Indirect estimation of body weight to an acceptable degree of accuracy using a linear body measurement of considerable practical use.

Linear body measurement has been used to predict body weight by several authors in many breeds. Different methods and body models might be needed to predict body weight in different environmental conditions and breeds. Information on linear body measurements of red sokoto goat in kashere, Gombe state and indeed North East Nigeria as affected by castration is not adequate in literature, therefore making this research work expedient. Therefore the present study was designed to determine the variability in linear body measurement of castrated red sokoto goat in using different methods and also to determine the live weight, gain of castrated red sokoto goats under grazing condition.

2.0 MATERIAL AND METHOD

The study was conducted at the Small Ruminant Unit ,Livestock Teaching and Research Farm, Department of Animal Science, Federal University of Kashere, Gombe State. Kashere is located at an elevation of 431meter above the sea level. Its coordinates lies between latitude 9°46"O"N and longitude 100°57'0" E, Altitude 349m (NPC Census, 2006)).

The annual rainfall of Kashere ranges between 800mm-900mm per annum and is characterized by distinct dry season from (October - May) and rainy season (June - September). The annual temperature ranges from 30-32° C, and it experiences a relative humidity of 17-90%.

The experimental animals used were purchased from kashere market 20 male red Sokoto goats which were within the age of 2-5months. The experimental animals were introduced into the university farm, and were allowed to acclimatize for two weeks before the experiment commenced

The experimental animals were castrated by the use of burdizzor plier by a Veterinarian on the farm. Animals were castrated in the morning by pressing the burdizzor plier through the spermatic curd of the bucks. Crushing on the spermatic cord twice, on the right of left scrotum by the burdizzor plier, after the castraion the animals were allowed to rest for 40_50 minutes before beign allowed to graze on the University grazing land.

Experimental animals were managed on the University of Kashere Teaching and Research farm. Animals were allowed grazing in the morning from (8:00am to 12:00pm), and evening grazing from (4:00pm to 6:00pm).water was provided to the animals' *adlibitum* on the farm

3.5 linear body measurement of experimental animals

Linear Body measurement were recorded using tape measures in cm, parameters measured were

1 Body length (BL)
2 ches girth (CG)
3 height at wither (HW)
4 pelvic width (PW)
5 Body weight (BW)
6 neck circumference (NC

Body condition score of the experimental animals were assessed through visual appraisal and physical palpation of the animals.

Statistical analysis:

One-way nalysis of variance (ANOVA) procedures for a completely randomized design experiment using the General Linear Model (GLM) procedures of SAS (1999 - 2000) was implemented on body weight, body measurements, body condition score, carcass and non-carcass components data and Duncan's Multiple Range Test (DMRT) was used to compare treatment means.

3.0 RESUILS AND DISCUSION

Morphometric and Linear Measurements of Different Age Group of Red Sokoto Goat Male Kid's Castrated at Different Months in [cm]

Morphometric and linear measurements of different age group of red sokoto goat male kid's castrated at

different months in [cm] is summarized in Table 1. Result showed that red sokoto goat castrated at the age of five months performed better (p>0.05) than other treatments in the experimental animal. Treatment four showed better performance in body length (BL), height at wither (HW), heart girth (HG), Leon circumference (LC), Body weight (BW) and neck circumference. The result obtained in these work does not agree with that of Tesfaye*et al* (2008). The reasons for differences in the result obtained could be attributed to differences in the breeds and types of animals used as well as differences in experimental location**.**

Table 1:**Morphometric and linear measurements of different age group of red Sokoto goat male kid's castrated at different months in [cm]**

TREATMENTS	BL	HW	NC	LC	HG	BW
0	16.69^{c}	16.67^{c}	11.79^{b}	16.46^{c}	5.00^{b}	7.43^{e}
1	17.00^{bc}	$17.52b^{b}$	12.02^{b}	16.53^{c}	5.02^{b}	7.97^{d}
2	17.20^{b}	17.23^{b}	12.11^{b}	17.05^{b}	5.55^{b}	9.00^{c}
3	17.23^{b}	17.23^{b}	12.36^{b}	16.96^{b}	5.54^{b}	9.69^{b}
4	18.33^{a}	18.85^{a}	13.11^{a}	18.37^{a}	7.12^{a}	11.92^{a}
SIG	**	**	**	**	**	**
LSD	0.38	0.44	0.49	0.29	0.69	0.38

Means on the same row with Different Superscripts are Significantly (P>0.05) Different
Body length (BL)
Height at wither (HW)
Heart girth (HG)
Body weight (BW)
Neck circumference (NC)
Loin circumference (LC)

.

Body weight of red sokoto goat male kids castrated at different month in (Kg)

Showed the body weight of red sokoto goats male kids castrated at different months. Treatment four which were male red sokoto goat castrated at five months of age performance better (p>0.05) in the month of June and July as compared to any of the treatments. The performance could have been due to the ability of the animal to have better recovery from affect castration ability of the animal in treatment four to graze and browse forages better than any other animals in other treatments. Nsoso*et al* (2004^{b}) reporedt that there were significantly higher height at wither in castrates than the entire male. They also stated that diagonal body length was significantly higher in castrate. The same authors reported that castrates develop longer and deeper bodies and body length differed significantly among burdizzor castrated and entire goats. The result obtained in these research work agree with that of Nsoso*et al* (2004^{b})

Table 2: Body weight of red sokoto goat male kids castrated at different months in (Kg)

	TREATMENTS				
MONTH	O	1	2	3	4
March	6.75^{ij}	6.27^{j}	7.7^{fgh}	8.977^{cbe}	10.95^{bc}
April	7.62^{fgh}	6.95^{hij}	8.5^{def}	9.12cde	11.00^{b}
May	7.57^{fgh}	7.00^{hij}	8.32^{efg}	9.6^{bcd}	10.95^{b}
June	7.4^{ghi}	9.52^{bcd}	10.17^{bc}	10.3^{bc}	13.17^{a}
July	7.75^{gh}	10.1^{bcd}	10.3^{bc}	10.45^{bc}	14.00^{a}

Means on the same row with Different Superscipts are Significantly (P>0.05) Different

Morphometric Linear Body Measurement of Body Length (BL) of Castrated Red Sokoto Goat (cm).

The result showed that castrated red sokoto goast in treatment four in the month of may showed better performance (P<0.05) as compared to any of the treatment. The result obtained in this research work does not agree with that of Nsoso*et al* (2004^{a}) which indicated that body length measurement showed no significant effect on linear body measurement among castrates and entire male goast at different months.

Table3 :Morphometric linear body measurement of body length (BL) of castrated red sokoto goat (cm).

	TREATMENT				
MONTH	0	1	2	3	4
March	17.22^{bcd}	16.2^{fgh}	16.45^{efg}	16.37^{efg}	17.72^{bcd}
April	16.67^{efg}	16.42^{efg}	17.22^{bcd}	17.62^{bc}	18.45^{abc}
May	17.8^{bc}	17.42^{bcd}	17.75^{bcd}	17.00^{bcd}	19.45^{a}
June	15.75^{h}	17.75^{bcd}	16.75^{def}	16.92^{def}	17.5^{bcd}

July	16.00^{gh}	17.87^{abc}	18.5^{abc}	18.25^{abc}	18.62^{ab}

Means on the same row with Different Superscripts are Significantly (P>0.05) Different

.**Morphometric Linear Body Measurement of Heart Girth (HG) of Castrated Red SokotoGoat (cm).**

The result showed that castrated red sokoto goats in treatment four in the month of July, performanced better (p<0.05) as compared to any of the treatments the result agreed with that of Nsoso *et al* (2004[b]) who reported that these were significant difference in the heart girth measurement in Arsi-bale goats castrated at different ages.

Table 4: **Morphometric Linear Body Measurement of Heart Girth (HG) of Castrated Red Sokoto Goat (cm).**

	TREATMENTS				
MONTH	0	1	2	3	4
March	4.5^{d}	4.37^{d}	5.1^{bcd}	4.97^{cd}	5.07^{cd}
April	4.97^{cd}	4.72^{cd}	5.12^{bcd}	5.15^{cd}	8.75^{ab}
May	5.5^{bcd}	5.87^{bcd}	5.92^{abc}	6.8^{abc}	7.67^{abc}
June	4.57^{d}	5.02^{cd}	6.25^{abc}	5.42^{bcd}	8.55^{a}
July	5.5^{bcd}	5.12^{bcd}	5.5^{bcd}	5.37^{bcd}	6.1^{abc}

Means on the same row with Different Superscipts are Significantly (P>0.05) Different

Morphometric Linear Body Measurement of Neck Circumference (NC) of Castrated Red Sokoto Goat (cm).

Morphometric linear body measurement of neck circumference (cm) of red sokoto goat showed that castrated male red sokoto goat in treatment four in the month of April performed than any of the other treatments. (P<0.05). The result indicated in these report showed similarity with that of Thiruvenkadan (2005) that showed significant differences in neck circumference of Arsi-bale goat castrated at different ages.

Table 5: **Morphometric Linear Body Measurement of Neck Circumference (NC) of Castrated Red Sokoto Goat (cm).**

NC	TREATMENT				
MONTH	O	1	2	3	4
March	12.35^{abc}	10.85^{e}	12.72^{abc}	13.25^{abc}	13.25^{abc}
April	12.15^{abc}	12.3^{abc}	12.^{75abc}	13.37^{abc}	14.10^{a}
May	11.75^{abc}	11.12^{e}	11.17^{de}	10.87^{e}	12.25^{abc}
June	11.85^{abc}	12.57^{abc}	11.42^{cd}	12.07^{abc}	13.25^{abc}
July	11.75^{bcd}	13.25^{abc}	12.5^{abc}	12.25^{abc}	12.25^{abc}

Means on the same row with Different Superscipts are Significantly (P>0.05) Different.

MorphometricLlinear Body Measurement of Loin Circumference (LC) Castrated red Sokoto Goat in (cm).

Loin circumference (LC) 0f castrated male red sokoto goats in treatment four in the month of July was significantly higher (P<0.05) as compared to the other treatmenst. This might have been due to accuracy or ability in taking linear body measurement, breed types amongst other factors.

Table 6: Morphometric Llinear Body Measurement of Loin Circumference (LC) of Castrated red Sokoto Goat in (cm).

	TREATMENT				
MONTH	0	1	2	3	4
March	15.57^{jkl}	15.02^{l}	17.67^{bcde}	17.02^{cde}	17.9^{bcd}
April	16.17^{ghi}	15.27^{kl}	17.42^{bcd}	16.85^{def}	18.52^{ab}
May	16.37^{fgh}	16.15^{hij}	15.47^{jkl}	15.62^{ijk}	17.67^{bcd}
June	18.57^{efg}	18.07^{bcd}	16.55^{efg}	17.57^{bcd}	18.6^{ab}
July	17.62^{bcd}	18.12^{abc}	18.12^{abc}	17.75^{bcd}	19.37^{a}

Means on the same row with Different Superscipts are Significantly (P>0.05) Different

Morphometric linear body measurement of height at wither (HW) of castrated red sokoto goats in (cm).

Height at wither of castrated and entire male red sokoto goat in treatment four in the month of April performed better (P<0.05) as compared to any of the treatments the result obtained did not agree with the report of Nsoso *et al.,* (2004[a]) which indicate absence of significance in linear body measurement at height at wither of castrated and entire male goats Arsi-bale.

Table 7 **:Morphometric linear body measurement of height at wither (HW) of castrated red sokoto goats in (cm).**

HW	TREATMENT				
MONTH	0	1	2	3	4
March	16.8^{def}	17.07^{bcd}	16.82^{def}	16.92^{cde}	18.72^{abc}
April	16.75^{def}	17.55^{abc}	17.85^{abc}	17.75^{abc}	18.6^{abc}
May	16.75^{def}	17.00^{cde}	15.75^{g}	17.17^{bcd}	18.62^{abc}
June	15.92^{fg}	18.12^{abc}	17.00^{cde}	16.05^{efg}	18.92^{ab}
July	17.12^{bcd}	17.87^{abc}	18.75^{abc}	18.12^{abc}	19.37^{a}

Means on the same row with Different Superscripts are Significantly (P>0.05) Different

Mean body weight measurement of castrated red sokoto goat in (kg).

Mean body weight at different age of castration is shown in Table 4.8 castrated red sokoto goat in treatment four in the month of July gained more body weight (P<0.05) as compared to other treatments. These finding was not in line with Solomon *et al.*, (1991) who reported that castration had no significant effect on body weight. The difference in the result might have been due to the types of breed used in the research work and area where research work was carried out.

Table 8 : Mean body weight measurement of castrated red sokoto goat in (kg).

	TREATMENT				
MONTH	0	1	2	3	4
March	6.75^{ij}	6.27^{j}	7.7^{fgh}	8.977^{cbe}	10.95^{bc}
April	7.62^{fgh}	6.95^{hij}	8.5^{def}	9.12cde	11.00^{b}
May	7.57^{fgh}	7.00^{hij}	8.32^{efg}	9.6^{bcd}	10.95^{b}
June	7.4^{ghi}	9.52^{bcd}	10.17^{bc}	10.3^{bc}	13.17^{a}
July	7.75^{gh}	10.1^{bcd}	10.3^{bc}	10.45^{bc}	14.00^{a}

Means on the same row with Different Superscipts are Significantly (P>0.05) Different.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

Age at castration has significant effect on linear measurement, and body weight. Castration at five months of age showed best performance (P<0.05) and linear body measurements of red sokoto goats than earlier age of castration. Morphometric linear body measurement on body length, height girth, neck circumference, height at wither, were significantly higher in treatment four in different months compared to the other treatments.

4.2 RECOMMENDATIONS

Castration is important for better fat deposition, improved body weight gain. Castration at five month of age in red sokoto goat is recommended as goat castrated at five months of age had better rib eyes area and fat thickness than other castration groups and intact group.

REFERENCES.

Adeyinka, I. A., Mohammed, I.D.,(2006). Accuracy of body weight prediction in Nigerian Red Sokoto goats raised in north eastern Nigeria using linear body measurement. *Pakistan J Biological Sci,* 9: 2828-2830.

Afolayan, R.A., Adeyinka, I. A., Lakpini, C. A.M., 2006. The estimation of live weight from body measurements in Yankasa sheep. *Czech J AnimSci*, 51: 343–348 .. .

Adedeji, T. A., Ozoje, M. O., Peters, S. O., Sanusi, A. O., Ojedapo, L. O. and Ige, A. O. (2011). Coat pigmentation and Wattle genes effect on some haematological characteristics of heat stressed and extensively reared West African Dwarf goats. *World J. Life Sci. Med*. Res. 3: 48-55.

FAOSTAT. (2008). Number of animals: cattle and buffalo and sheep and goat; Statistics division. FAO statistical yearbook..

FDLPCS. (2007). Federal Department of Livestock and Pest Control Services. FLDPCS Nigerian. Livestock Resources. National Synthesis, 440 pp.

Gambo, M., Igwebuike, J. U. and Kwari, I. D. (2005). Performance of growing rabbit and feed graded levels of goat rumen content, *Global Journal of Pure and Applied Sciences l.* 11(1): 39-43.

Morand-Fehr, P. (2004). Proposals for improving the research efficiency in goats. *Small Ruminant Res.* 51: 145-153.

Okpeku, M., Yakubu, A., Peters, S., Ozoje, M., Ikeobi, C., Adebambo, O and Imumorin, I. (2011). Application of Multivariate Principal Component Analysis to Morphological Characterization of Indigenous Goats in Southern Nigeria. ActaargiculturaeSlovenica, 98 (2): 101-109.

Salako, A. E. (2004). Maturity rate of some morphometric traits in the West African

Dwarf sheep of Nigeria. *Trop. J. Anim. Sci.*, 7 (1): 51-55.

SAS, 1999-2000. Statistical Analysis System. SAS Institute Inc., Cary, NC, USA.

Tesfaye K, Tesfaye L, Estifanos T, Mieso G (2008). Effect of level of substitution of sweet potato (Ipomoea Batatas. L) Vines for concentrate on body weight gain and carcass characteristics of browsing Arsi-Bale goats. J. Cell Anim. Biol. 2(2): 036-042.

Zeder, M. A. and Hasse, B. (2000). The initial domestication of goats (Capra hircus) in the Zagros Mountains 10,000 years ago.