Global Journal of Animal Scientific Research

Journal homepage: www.gjasr.com

Print ISSN: 2345-4377 *Online ISSN: 2345-4385*

Original Article

Effect of Feed Restriction on Linear Body Measurements and Weight Changes of Pregnant Rabbit Does

A.A. Adeyemo[1,*], O.A. Adeyemi[1], A.A. Ayoola[1], O.M. Sogunle[1], A.J. Ademokoya[1] and A.M. Bamgbose[2]

[1]Department of Animal Production and Health, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria
[2]Department of Animal Nutrition, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria

ARTICLE INFO

Corresponding Author:
A.A. Adeyemo
arkeens25@gmail.com

How to cite this article:
Adeyemo, A.A., O.A. Adeyemi, A.A. Ayoola, O.M. Sogunle, A.J. Ademokoya and A.M. Bamgbose. 2014. Effect of Feed Restriction on Linear Body Measurements and Weight Changes of Pregnant Rabbit Does. *Global Journal of Animal Scientific Research. 2*(3): 304-309.

Article History:
Received: 25 June 2014
Revised: 6 July 2014
Accepted: 9 July 2014

ABSTRACT

Restricted feeding of growing rabbits has two advantages such that using an adequate feed restriction could help decrease feed intake without reduction of the body weight and also prevent the occurrence of enteritis after weaning. A four- week study was conducted to determine the effect of varying levels and periods of feed restriction during pregnancy on linear body measurements and weight changes of rabbit does. A total of thirty six rabbit does (36) were grouped into three consisting of 12 rabbits does each. These rabbit does were exposed to three levels of quantitative feed restriction (0.15 and 30%) at three different periods of gestation (15-19, 20-24 and 25-29 days). Data collected on performance and linear body measurements were arranged in a 3×3 factorial experimental layout and then subjected to completely randomised design using SAS. The result showed significant differences ($p<0.05$) in final weight and weight gain. While, all other parameters measured for linear body measurement were not significantly ($p>0.05$) affected. In this study, it was revealed that the levels and periods of feed restriction do not have any negative effect on linear body measurement of pregnant rabbit does.

Keywords: Feed restriction, linear body measurement, Pregnant, rabbit does.

INTRODUCTION

Rabbit production is gradually becoming an important source of income and employment generation in Nigeria. It can serve as alternative source of cheap animal protein to mitigate the negative impacts of malnutrition in infants and adults which is prevalent in developing countries. The only limiting factor reported to be affecting growth and productivity of rabbits in tropical and arid climates according to McNitt *et al.,* (2000) is calorie stress associated with high ambient temperature. Rabbit meat provides a cheap source of meat which is

characterized by a high protein and low fat cholesterol content (Aduku and Olukosi, 1990), and it is considered a delicacy and a healthy food product (Dalle Zotte, 2000). One of the pre-requisites for genetic improvement is the knowledge of genetic parameters for important economic traits (Akanno and Ibe, 2006). Rabbit producers are interested in the relationship that exists between bodyweight and physical characteristics, since this information would reflect in their feed efficiency and performance of the rabbits. According to Margherita (2008), because of the size and oral anatomy of rabbits, it is intrinsically difficult to perform a thorough oral examination and measurement on rabbits and rodents. Breeders need to establish the relationship that exists between these parameters and to organize the breeding programmes so as to achieve an optimum combination of bodyweight and good conformation for maximum economic returns (Khalil *et al*., 1987). In livestock production the objective of live body measurement has appealed to many researchers as a means of describing the size and shape of farm animals (Brown *et al* 1956). In line with this, linear body measurements have been used to characterize breeds, evaluate breed performance and predict live body weight of animals (Ibe 1989; 1994, Ozoje and Herbert, 1997). This later report is attributed to high genetic correlations between body weight and linear traits. For instance Adeleke *et al.,* (2004) observed that chickens live weight is positively correlated with other linear body traits and gave breast girth as the best predictor of live weight. In domestic rabbit, Oke *et al.,* (2003) found height at withers as the best prediction of body weight at 20 weeks of age and body length at 16weeks of age.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Rabbitry Unit, Directorate of University Farms, Federal University of Agriculture, Abeokuta (FUNAAB), Ogun State. The site is located in the rain forest vegetation zone of South-Western Nigeria on latitude 7^{o} 13' 49.46'' N, longitude 3^{o} 26 11.98E and altitude 76m above the sea level. The climate is humid with a mean annual rainfall of 1037mm and mean temperature and humidity of 34.7^{0}C and 83%, respectively (Google Earth, 2013).

Experimental Animals and Management

Thirty six (36) rabbits do of 20 weeks old of mixed breeds (Chinchilla, Dutch and New Zealand white) with initial live weight of 1.7-2.0 kg were used for the study. The does were divided into three groups of twelve rabbits each after balancing for weight and housed individually in cells of dimension 0.8×0.5×0.6 m. The hutches were washed and disinfected prior to the commencement of the experiment.

Experimental Design

Animals (36) were grouped into three and allotted to three feed restriction levels (0.15, 30%). Each group was further subdivided into three and three and then randomly divided assigned to three periods of feed restriction (15-19, 20-24, 25-29 days). Thus arranged in a 3×3 factorial experimental layout in a completely randomized design. The table below shows the composition of concentrate mash diet fed to the rabbit does.

DATA COLLECTION

The experiment lasted for 28days (4 weeks) during which data were collected on weight gain and linear body measurement (Head to shoulder, ear length, heart girth, body length and tail length) of the rabbit does.

Weight gain

This was measured on weekly basis for four weeks by subtracting the initial weight from the final weight.

Table 1. Composition of concentrate diet fed to rabbit does

Ingredients	%
Maize	47.50
Fish meal	2.00
Soybean meal	3.00
Wheat offal	23.00
Groundnut cake	12.00
Rice husk	7.00
Bone meal	3.00
Oyster shell	2.00
Salt	0.25
Vitamin and Mineral premix	0.25
Total	100
Determined Analysis	
ME (Kcal/kg)	2578.8
Ash (%)	2.74
Crude fibre %	10.65
Crude protein	16.20
Nitrogen free extract	42.50

Linear body measurement

Linear body measurements that were taken on the rabbit does include: Head to shoulder (HTS), ear length (EL), heart girth (HG), body length (BL)and tail length (TL).This was taken at an interval of 7days for a period of four weeks. All the linear body measurements were taken in centimeter with the aid of tape rule according to the procedures of Akanno and Ibe (2006).

The descriptions of the measurements were as described below:

i) **Head to shoulder**-This was measured from the tip of the nose to the end of the cervical vertebra.
ii) **Ear length –**This was measured from the tip of the ear to the junction of the ear at the level of the skull.
iii) **Heart girth-** This was determined by measuring the circumference of the chest region directly below the fore arms.
iv) **Body Length** – This was the length from the tip of the shoulder to the tip of the pelvic.
v) **Tail length** –This was taken from the junction of the hip to the tip of the tail.

Statistical Analysis

Data collected were arranged in a 3×3 factorial experimental layout and then subjected to one way analysis of variance using (SAS, 1999). Significantly ($p<0.05$) different means were separated using Duncan's Multiple Range Test of SAS (1999) statistical package.

The experimental model:

$Y_{ijk} = \mu + R_i + P_{j+} RP_{ij} + \varepsilon_i j_k$

Where Y_{iJk} = Observed value

μ = Overall mean value

R_i = Effect of ith Restriction

P_j= Effect of jth Periods
RP_{ij}= Effect of interaction between ith Restriction and jth periods
ε_{iJk}= Residual error

RESULTS

Main effect of levels and periods of feed restriction on linear body measurement of pregnant rabbit does

Table 2 shows the main effect of level of feed restriction and period of feed restriction on final weight, weight gain and linear body measurements of rabbit does. The result showed that significant differences ($p<0.05$) were obtained on final weight and weight gain of the rabbit does on different levels and periods of feed restriction. Rabbit does on 15% restriction have the highest final weight (2,414.16 g, and weight gain 530.00g respectively) while rabbit does on 0% restriction have the least values (2,221.33g and 397.67g respectively). Levels of feed restriction significantly ($p<0.05$) influenced head to shoulder length, ear length and tail length. However, heart girth and body length were not significantly affected ($p>0.05$). The means for head to shoulder ranges from 12.67cm to 13.48cm for the levels of feed restriction. Ear length values ranged from 11.27cm (does on 0% restriction) to 11.89cm (does on 15% restriction level) while that of the tail ranges from 7.63 cm for does on 30% restriction and 10.56cm for does on 0% restriction level. Periods of feed restriction had no effect on body weight gain and linear body measurement except for ($p<0.05$) the tail length with rabbit does restricted between 25-29 days recording the longest (9.44cm).

Table 2. Main effect of levels and periods of feed restriction on linear body measurement of pregnant rabbit does

	Levels of feed restriction				Periods of feed restriction(days)			
Parameters	0%	15%	30%	SEM	15-19	20-2 4	25-29	SEM
Initial weight (g)	1823.66	1884.16	1848.33	26.53	1815.83	1912.41	1827.91	27.17
Final weight (g)	2221.33^{c}	2414.16^{a}	2258.33^{b}	54.46	2263.33	2367.41	2263.08	54.94
Weight gain(g)	397.67^{c}	530.00^{a}	410.00^{b}	23.06	447.50	455.00	435.16	42.31
Head to shoulder(cm)	13.48^{a}	13.45^{a}	12.67^{b}	0.15	13.38	13.24	12.97	0.15
Ear length (cm)	11.27^{b}	11.89^{a}	11.51^{ab}	0.18	11.56	11.56	11.55	0.19
Heart girth (cm)	27.39	26.31	26.39	0.37	26.73	26.73	26.62	0.43
Body length (cm)	33.23	34.38	32.50	1.10	32.72	33.44	33.95	1.15
Tail length (cm)	10.56^{a}	8.69^{b}	7.63^{c}	0.30	8.50^{b}	8.93^{ab}	9.44^{a}	0.10

$^{a, b, c}$:Means in the same row with different superscripts differ significantly ($p<0.05$)
SEM: Standard error of mean

Interaction between levels and periods of feed restriction linear body measurement of pregnant rabbit does

Table 3 shows the interaction between levels of feed restriction and period of restriction on weight gain and linear body measurement of gestating does. Significant ($p<0.05$) differences were obtained on the final weight and weight gain. Gestating does on 15% level of feed restriction at 20-24days recorded the highest value (2,567.50 g) for final weight compared to those on 0% level of feed restriction at the different periods which recorded similar statistical values with other treatment group. Similar ($p>0.05$) mean weight gain values (395.00, 400.00 and 398.00 g) were obtained for gestating does on 0% feed restriction across the different restriction periods which differed ($p<0.05$) significantly with similar values (545.00, 555.00 and 490.00 g) observed for those on 15% restriction at various periods of restriction.

The interaction between levels of feed restriction and period of feed restriction had no significant ($p>0.05$) effect on all the parameters measured for linear body measurements.

Table 3. Interaction between levels and periods of feed restriction linear body measurement of pregnant rabbit does

Levels of feed restriction	0%			15%			30%			
Period of feed restriction(days)	15-19	20-24	25-29	15-19	20-24	25-29	15-19	20-24	25-29	SEM
Parameters										
Initial weight (g)	1825.00	1822.25	1823.75	1792.50	2012.50	1847.50	1830.00	1902.50	1812.50	46.06
Final weight (g)	2220.00^{b}	2222.25^{b}	2221.75^{b}	2337.50^{b}	2567.50^{a}	2337.50^{b}	2232.50^{b}	2312.50^{b}	2230.00^{b}	73.63
Weight gain(g)	395.00^{ab}	400.00^{ab}	398.00^{ab}	545.00^{a}	555.00^{a}	490.00^{a}	402.50^{ab}	410.00^{ab}	417.50^{ab}	55.21
Head to shoulder(cm)	13.57	13.40	13.47	13.53	13.46	13.37	13.06	12.86	12.09	0.26
Ear length (cm)	11.37	11.22	11.22	11.56	11.93	12.18	11.77	11.53	11.25	0.31
Heart girth (cm)	27.47	27.34	27.36	26.54	26.51	25.88	26.19	26.35	26.64	0.65
Body length (cm)	33.31	33.20	33.18	32.50	34.78	35.86	32.35	32.36	32.80	1.91
Tail length (cm)	10.65	10.46	10.58	7.54	8.18	10.35	7.33	8.15	7.40	0.52

$^{a, b, c}$:Means in the same row with different superscripts differ significantly ($p<0.05$)
SEM: Standard error of mean

DISCUSSION

In this study, feed restriction had significant effect on the performance (final weight and weight gain) of the gestating does and this is in accordance with the work of Perrier and Ouhayoun (1996) and Tumova *et al*., (2002; 2003) who reported a form of compensatory growth and typical weight gain in restricted group during realimentation period. The mean values obtained for main effect on head to shoulder in this study for the levels and periods of feed restriction is higher than what was reported by Ogbuewu *et al.*, (2010) in mature rabbit bucks. The significant effect ($p<0.05$) obtained on ear length for levels and periods of feed restriction is in agreement with the range of values reported by Olawumi (2014) in rabbit at 16 and 18 weeks of age. The means obtained for heart girth were similar across the levels and periods of feed restriction. The result obtained for heart girth is within the ranges of what was reported by Ajayi and Oseni (2012) in adult female rabbits. Values obtained for body length in this study corroborate with the work of Olawumi (2014) who also reported values that are within the ranges of what was obtained in this study. The significant difference obtained on tail length in this study is higher than what was reported by Ajayi and Oseni (2012) in adult female rabbit.

Interaction between level of feed restriction and period of feed restriction showed significant effect on the final weight and weight gain of gestating does. The result obtained in this study is also in harmony with the work of Tumova *et al*., (2003) that also reported a form of compensatory growth and typical weight gain in the restricted groups. Consequently, when feed was provided *ad libitum* to the previously restricted does, weight gain was significantly higher than that in the *ad libitum* group and this also coincides with what was obtained in this study as reported by Petrere *et al.*, (1993) and Bispham *et al*., (2003).

The result obtained for interaction shows that all linear body measurement parameters measured were not significantly ($p>0.05$) affected. The result obtained on ear length for the level and period of feed restriction in this study is higher than the values reported by Ajayi and Oseni (2012) in female rabbits the higher values obtained cannot be attributed to the treatment effect. Result obtained for heart girth and body length in this study is within the ranges of values reported by Ajayi and Oseni (2012) in female rabbits.

CONCLUSIONS

From this study it can be concluded that feed restriction does not have any adverse effect on linear body measurement of pregnant rabbit does. There were no skeletal malformation and abortions recorded during the period of feed restriction. All pregnant does carried their neonates to term and there were no mortality of kits after kindling. Feed restriction can be applied on pregnant does at 15 % between 20-24 days because it was at this level optimum performance of does was recorded.

REFERENCE

Adeleke, M.A., M.O. Ozoje, O.A. Adebambo, S.O. Peters and A.M. Bamgbose. 2004. Estimation of body weight from linear body measurement among crossbred egg type chickens. *Proceedings of 2004 Annual conference of Genetics society of Nigeria. pp: 88-91.*

Aduku, A.O., and J.O. Olukosi. 1990. Rabbit management in the tropics production, processing, utilization, marketing, economic practical training, research and future prospects. Living Book Series, G. U. Publications, Abuja.

Ajayi B.A., and S.O. Oseni. 2012. Morphological characterisation and principal component analysis of body dimensions in Nigerian population of adult rabbits. *Proceedings 10th World Rabbit Congress – September 3-6, 2012- Sharm El-Sheikh- Egypt .pp: 229-233.*

Akanno, E.C., S.N. Ibe. 2006. Prediction of body weight of the domestic rabbit at different stages of growth using linear body measurements. *Nigerian Journal of Animal Production.* 33(1):3-8.

Bispham, J., G.S. Gopalakrishnan, J. Dandrea. 2003. Maternal endocrine adaptation throughout pregnancy to nutritional manipulation: consequences for maternal plasma leptin and cortisol and the programming of fetal adipose tissue development. *Endocrinology*. 144 (8): 3575–3585.

Brown, C.J., Warwick, E.J., Smith H.J., Green W.W. and Stewart H.A. 1956. Relationship between conformation scores and live animal body measurements of beef cattle. *Journal of Animal Science. 5(3): 911-921.*

Dalle Zotte, A. 2000. Main factors influencing the rabbit carcass and meat quality. *Proc. Of the 7th World Rabbit Congress.* Valencia, Spain. pp:1-32.

Harris D.J., P.R. Cheeke and N.M. Patton. 1984. Effect of full versus restricted feeding diets with and without added copper on fryer rabbit performance. *Journal of Applied Rabbit Research. 7(1): 22-24.*

Ibe, S.N. 1989. Measurement of size and conformation in commercial broilers. *Journal Animal Breeding and Genetics. 106: 461-469.*

Ibe, S.N. and A.G. Ezekwe. 1994 Quantifying size and shape difference between Muturu and N`dama breed of cattle. *Nigerian Journal of Animal Production. 21: 51-58.*

Jerome N., J.L. Mousset, B. Messager, I. Deglaire, P. Marie. 1998. Influence de différentes méthods de rationnement sur les performances de croissance et d'abattage du lapin. *In: Proc.* 7émes *Journ. Rech. Cunicole, Lyon, France.pp: 175-178.*

Khalil, M.H, J.B. Owen, and E.A. Afifi. 1987. A genetic analysis of litter traits of bauscat and Giza white rabbits. *Animal Production. 45(1): 123–124.*

Margherita, G. 2008. Clinical Technique: Normal Dental Radiography of Rabbits, Guinea Pigs, and Chinchillas. *J. Exotic Pet. Med. 17(2): 78- 86.*

McNitt J. I., Moody G.L. 1991. Effect of length of feeding time on performance of fryer rabbits. *Journal of Applied Rabbit Research. 14(1): 9-10.*

McNitt, J.I., N.M.Patton, S.D. Lukefahr, and P.R. Cheeke. 2000. Rabbit Production. Interstate Publishers (7thedition) Danville, IL .p:493.

Oke, U.K., S.N. Ibe, O.M. Onyiro and C. Nwichi. 2003. Influence of age and sex on productive traits of rabbits in humid tropics. *Proceedings of 2003 Annual conference of Nigerian Society for Animal Production. pp:122-124.*

Olawumi, S.O. 2014. Comparative study on rabbit breeds for post weaning growth traits in the humid tropics of Nigeria. *Global Journal of Animal Scientific Research.* 2(1):45-51. Availableat:http://www.gjasr.com/index.php/GJASR/article/view/22/71.

Perrier, G. and J. Ouhayoun. 1996. Growth and carcass traits of the rabbit a, comparative study of three modes in feed rationing during fattening. *In: Proceedings 6th World Rabbit Congress, July 9–12, Toulouse, France. 102.*

Petrere, A.J., W.R. Rohn, and L.E. Grantham. 1993. Food restriction during organogenesis in rabbits: effects on reproduction and the offspring, *Fundamental and Applied Toxicology.* 21(4) 517–522.

SAS .1999. SAS Users Guide*:* Statistics released version 8.0. Statistical Analysis System Institute. Inc., Cary, NC.

Szendrő, Z.S., M. Gyovai, E. Biróné Németh, I. Radnai, I. Nagy and Z.S. Matics. 2001. Effect of nutritional status of foetus, suckling and growing rabbits on their production between 3 and 13 weeks of age. *Állattenyészt és és Takarmányozás*. 50 (6) 549-554.

Szendro, Z., S. Szabo, I. Hullar 1989. Effect of reduction of eating time on production of growing rabbits. *Journal of Applied Rabbit Research. 12: 22–26.*

Tůmová, E., M. Skřivan, V. Skřivanová and L. Kacerovská. 2002. Effect of early feed restriction on growth in broiler chickens, turkeys and rabbits. *Czech Journal Animal Science. 47: 418–428.*

Tůmová, E., V. Skřivanová and M. Skřivan. 2003. Effect of restricted feeding time and quantitative restriction in growing rabbits. *Arch. Geflőgelkde. 67: 182–190*.