



Annual Research & Review in Biology

26(3): 1-5, 2018; Article no.ARRB.41218
ISSN: 2347-565X, NLM ID: 101632869

Genotype Variation In Semen, Libido and Testicular Traits of Adult Rabbits (*Oryctolagus cuniculus*)

C. E. Isidahomen^{1*} and D. O. Oguntade¹

¹Department of Animal Science, Ambrose Alli University, Ekpoma, Edo State, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ARRB/2018/41218

Editor(s):

(1) George Perry, Dean and Professor of Biology, University of Texas at San Antonio, USA.

Reviewers:

- (1) Lyda Yuliana Parra Forero, National Polytechnic Institute, Universidad Autónoma Metropolitana, México.
(2) Oluwole Olufunke, Institute of Agricultural Research and Training, Obafemi Awolowo University, Nigeria.

Complete Peer review History: <http://www.sciencedomain.org/review-history/24539>

Original Research Article

Received 9th February 2018
Accepted 19th April 2018
Published 10th May 2018

ABSTRACT

Semen and Testicular traits were measured on 54 matured rabbits aged 10 - 12 months and weighed between 2.20 – 2.26 kg and data were used to determine the influence of genotypes on g semen, libido and testicular evaluation. The genotypes used are Chinchilla (CHIN), New Zealand White (NZW) and New Zealand Red (NZR). The experiment was randomized complete design with genotype as the factor of interest. Traits measured were Volume, motility, concentration, pH and colour. Feed and water were served *ad libitum* throughout the 16 weeks experimental period. At the end of the trial, 8 rabbits per genotype were slaughtered and their reproductive organs were carefully dissected out and separated into different components. The testicular morphometry and sperm characteristics were evaluated. There were significant differences ($P < 0.05$) among the genotypes for semen evaluation Volume values were 0.59, 0.72 and 0.52, motility 85.08, 87.27 and 86.24 respectively for Libido value are , 4.25, 4.45 and 4.31 respectively and Testicular trait studied. New Zealand White (NZW) was significantly superior ($P < 0.05$) to other genotypes for most of the parameters studied, followed by New Zealand Red (NZR). The study is aimed at breeds effect on testicular morphometry and sperm characteristics. This result shows that breeds can be of effect on testicular morphometry and sperm quality of male rabbits.

*Corresponding author: E-mail: ebicley2k@yahoo.com;

Keywords: New Zealand white; New Zealand red; chinchilla; rabbit; sperm, testicular morphometry; genotype/breed.

1. INTRODUCTION

The intensive rabbit production requires the increasing use of high performance reproduction stock. Several efforts have taken place, since the late eighties, to optimize the reproductive Function of male and female rabbits, such as adapted management techniques (cyclization) combined with the use of artificial insemination [1]. Semen quality improvement has become an important part of these efforts, since artificial insemination has spread worldwide. Semen quality is influenced by a lot of factors such as buck management, breed, nutrition etc. However the literature concerning the breeds on semen traits is scarce. The present work was conducted to determine the effects of breed on libido and semen characteristics of bucks. Since rabbits are usually used as indicators to detect the differences in reference parameters, the present study was undertaken to investigate the influence of breed or genotype and Libido semen parameters in domestic rabbits.

2. MATERIALS AND METHODS

2.1 Experimental Site/Location of Study

The research was carried out at the Rabbitry Unit of the Livestock Teaching and Research Farm of Ambrose Alli University Ekpoma, Edo State. The mean ambient temperature ranges from 26°C in December to 34°C in February, relative humidity ranges from 61% in January to 92% in August with yearly average of about 82%. The vegetation represents an interface between the tropical rainforest and the derived savanna.

2.2 Duration of Experiment, Management and Feeds of the Rabbits

A total of 54 male rabbits were used for this study. These consisted of 18 rabbits each of the genotypes were Chinchilla (CHIN), New Zealand White (NZW) and New Zealand Red (NZR). All rabbits were tagged for proper identification and subjected to the same management practice throughout the experimental period. Medication and vaccinations were carried out accordingly against stress and disease. The Rabbits were given *ad libitum* access to commercial Growers marsh containing 15.86% crude protein, 2716 Kcal/kg Metabolizable Energy and clean water

was given regularly. The experiment was carried out for a period of Sixteen (16) weeks.

2.3 Reaction Time (libido)

A matured cyclic doe (teaser) was introduced to the buck every 2 weeks interval to monitor their sex drive. In this study, reaction time was considered as an indication of libido. The time in seconds it took for the rabbit bucks to sniff, groom and mount the female was recorded with a stop watch, and libido scored using the scoring pattern of 1-5 (no libido - high libido) described by Chibundu [2] (8).

2.4 Testicular Morphometry

The animals were weighed and slaughtered at the end of the experiment. At slaughter, the pairs of testes were quickly milked-out, weighed and recorded in grams after the epididymis has been trimmed off. These testicular measurements were taken at the Animal Science Laboratory of Department of Animal Science, Faculty of Agriculture, Ambrose Alli University, Ekpoma, Edo State

2.5 Experimental Design and Statistical Analysis

The experiment was carried out in a completely randomized design (CRD). All data collected were subjected to one way analysis of variance (ANOVA) using the complete randomized design according Statistical Analysis System Institute [3]. Significant differences were computed and Duncan's Multiple Range Test [4] was used to separate the means.

2.6 Semen Quality

The artificial vagina (AV) for semen collection was built based on a model described by Herbert and Adejumo [5]. Its mucosa was filled with glycerin, and it was used when the inner temperature was between 45° and 50°C. A collector tube was attached onto one of the edges, and the free edge was positioned to penis intromission. Before semen collection, bucks were allowed one false mount and, at the subsequent mounting, the AV was adequately positioned on the dorsum of the stimulus female allowing penis intromission.

2.7 Reaction Time

Sexual activity (libido) was estimated as time between introduction of the teaser female into the male's hutch and ejaculation. Sperm concentration was assessed by Neubauer haemocytometer (Improved Neubauer chamber, Germany) after dilution (1:100 v/v). Semen colour and motility was estimated according to Zemjams [6] and percentages of live spermatozoa were determined for each sample using the procedure of Oyeyemi et al. [2008]. Ejaculate volume was read using graduated collection tube and recorded in milliliters.

2.8 Statistical Analysis

All data collected were subjected to one way analysis of variance (ANOVA) using the complete randomized design according Statistical Analysis System Institute [3]. Significant differences were computed and Duncan's Multiple Range Test [4] was used to separate the means.

3. RESULTS AND DISCUSSION

The effect of genotype on three breeds of Rabbit on semen characteristic and Testicular Morphometry, Epididymal are presented in Table 1.

Averages for semen volume, concentration, sperm motility and pH varied significantly ($P < 0.05$). Semen volume was highest for New Zealand white, followed by Chinchilla and New Zealand Red (0.72 ± 0.00 , 0.59 ± 0.02 and $0.52 \pm$

0.00) respectively. Motility and concentration were also significant ($P < 0.05$) and higher in New Zealand white (87.27% and $249.23 \times 10^9/\text{ml}$) than other genotypes. Semen pH also varied significantly ($p < 0.05$) between the three genotype of Rabbits. Semen analysis includes the measurement of a particular aspect of spermatozoa. According to Rumbullaku and Agostini [7], this includes morphology, motility, volume, concentration and pH. Normal values of semen parameters generally used as reference by the WHO [8] includes semen volume (0.5 or more), sperm concentration (200×10^6 mL or more), semen motility (50%) or more with rapid forward progression) and semen pH (7.2-8). The assessment of the seminal characteristics of the rabbits gives an excellent indication of the reproductive capacity of the animal. The mean semen concentration, semen pH, motility and ejaculate volume obtained in this study agrees with the mean volume set as reference by the WHO [8] and also with the study of Agostini and Lucas [9]. New Zealand White bucks had higher ejaculate volume, sperm motility, semen concentration and semen pH. Significant effect of breed on ejaculate volume had been reported by Ezekwe and Machebe [10].

The data on sexual libido, testis weights of rabbit breed bucks are presented in Table 1. Maturation of mammalian testes is dependent on the normal proliferation and differentiation of germinal epithelium and sertoli cells and the number of sertoli cell which established during the pre pubertal period which determines the final testicular size and the number of sperm produced in sexually mature animals.

Table 1. Semen Characteristics, Libido and Testicular Morphometry, Epididymal of male rabbits

Genotype	Chinchilla	New Zealand white	New Zealand red
Volume (ml)	0.59 ± 0.02^b	0.72 ± 0.00^a	0.52 ± 0.00^c
Motility (%)	85.08 ± 0.12^c	87.27 ± 0.15^a	86.24 ± 0.08^b
Concentration ($\times 10^6/\text{ml}$)	202.83 ± 0.59^b	249.23 ± 0.71^a	249.52 ± 2.09^a
pH	7.13 ± 0.03^b	7.49 ± 0.03^a	7.47 ± 0.02^a
Colour	Creamy white	Creamy white	Creamy white
Libido Reaction time (Sec)	4.25 ± 0.12^c	4.45 ± 0.01^a	4.31 ± 0.01^b
Testicular circumference (cm)	6.62 ± 0.00^b	6.71 ± 0.01^a	6.46 ± 0.01^c
Testicular weight(g)	2.29 ± 0.05^b	2.43 ± 0.05^a	2.31 ± 0.03^{ab}
Testicular length (cm)	5.58 ± 0.06^a	5.63 ± 0.07^a	5.25 ± 0.03^b
Testicular diameter(cm)	3.27 ± 0.01^c	3.78 ± 0.01^a	3.38 ± 0.01^b
Testicular width right(cm)	1.52 ± 0.02^c	1.82 ± 0.00^a	1.63 ± 0.01^b
Testicular width left(cm)	1.74 ± 0.01^b	1.96 ± 0.00^a	1.75 ± 0.01^b

Means \pm along the same row with different superscript are significantly different ($P < 0.05$)

Testicular weights have been reported to have a high correlation with sperm reserve in the testis or epididymis and therefore a reflection of sperm production [11]. The increase in testicular weights of rabbit bucks in New Zealand white group is a pointer that breed or genotype can affect testicular growth. Ejaculate colour of the animals semen were creamy white. Concerning the reaction time, the rabbit bucks in New Zealand white, New Zealand Red and Chinchilla had significant effect ($p < 0.05$) sexual libido which fell within the range reported by Ogbuewu et al. [11] in mature rabbit bucks.

The results of testicular morphometry of rabbits breed are presented above. The knowledge of basic morphometric characteristics of the reproductive tract have been found to provide valuable information in the evaluation of breeding and fertility potential of the animals [11]. Gage and Freckleton [12] described the mammalian testes as infallible predictors of spermatozoa production. The authors further asserted that knowledge of the basic morphometric characteristics of the reproductive organs is mandatory for assessment and prediction not only of sperm production but also of the storage potential and fertilizing ability of the breeder male. The paired testes weight in this study were not significantly ($p > 0.05$) influenced by breeds. The finding also agrees with the report of Ogunlade et al. [13] who observed non significant differences in testis weight among rabbits fed fumonisin contaminated diets. The finding, however, contrasts with the reports of Bitto et al. [14] who observed a significant decrease in paired testes weight of cockerels fed cassava peel meal up to 30% in diet. Egbunike and Oluoyemi [15] observed testicular degeneration and impaired spermatogenesis in rats treated with sub lethal doses of aflatoxin. The mean testicular length values ranged from 5.25 ± 0.03 to 5.63 ± 0.07 cm. The values of testicular length and width obtained in this study are not similar to ranges of 2.26 to 4.40 cm and 0.94 to 1.10 cm for testicular length and width respectively as reported by Ajayi et al. [16] in rabbits. According to Ezekwe [17] and Perry and Petterson [18], testes size, length and width are good indicators of present and future sperm production.

4. CONCLUSION AND RECOMMENDATIONS

The semen characteristic of three Rabbits observed in the study to have compared

favorably to other Rabbits breed especially with regards to the semen volume, concentration, motility and pH. The higher semen volume and total sperm count is an indication of the superior genetic tendencies of Rabbits for reproductive ability and higher fertility. These New Zealand white Rabbits should be further evaluated for genetic merit for including them as valuable gene pool for genetic conservation for immediate and future use in the genetic improvement of other medium and smaller breeds of Rabbits and genetic breeding and conservation policies.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Luzi F, Maertens I, Mijten P, Pizzi F. Effect of feeding level and dietary protein content on libido and semen characteristics of bucks. 6th World Rabbit Congress Toulouse France. 1996;2:87-92.
2. Chibundu UC. Response of pre-pubertal bucks to administration of estradiol β . Project Report, Federal University of Technology, Owerri. 2005;30.
3. SAS/STAT. SAS user's guide; statistic released version 8.0. Statistical analysis system institute Inc. Cary. NC; 1999..
4. Gomez AK, Gomez AA. Statistical procedures for Agricultural Research 2nd Edition, John Wiley and Sons New York U.S.A. 1984;680.
5. Herbert U, Adejunmo DO. Construction and evaluation of artificial vaginal for collecting rabbit semen. Delta Agric. 2001; 2:99-108.
6. Zemjanis R. Collection and evaluation of semen. In: Diagnostic and Therapeutic techniques in Animal Reproduction. The Williams and Wilkins Co. Baltimore. 1977; 242.
7. Rumbullaku L, Agostini. Semen analysis. 8th Post-Graduate course for training in Reproductive Medicine and Reproductive Biology. Department of Obstetrics and Gynaecology. Geneva University Hospital; 2007.

8. WHO. Laboratory manual for the examination of human semen and semen cervical mucus. 3rd Edn., Cambridge University Press, Cambridge; 1992.
9. Agostini A, Lucas H. Semen analysis. 9th Post Graduate Course for Training on Reproductive Medicine and Reproductive Biology; 2005.
10. Ezekwe AG, Machebe NS. Ejaculate characteristics of two strains of local cocks (nakedneck and frizzle) in Nigeria. Proceeding of 29th Annual Conference of the Nig. Soc. For Anim. Prod. 2004;29:92-95.
11. Ogbuewu IP, Okoli IC, Iloeje M. Semen quality characteristics, reaction time, testis weight and seminiferous tubule diameter of buck rabbits fed neem (*Azadiractita indica* A juss) leaf meal based diet. Iranian Journal of Reproductive Medicine. 2009; 7(1):23-28.
12. Gage MJG, Freckleton RP. Relative testis size and sperm morphometry across mammals: No evidence for an association between sperm competition and sperm length. Proceedings of Biological Science. 2003;22:625-632.
13. Ogunlade JT, Ewuola EO, Gbore FA. Testicular and epididymal sperm reserves of rabbits fed fumonisin contaminated diets. Int. Digital Organisation for Scientific Information. 2006;1(1):35-38.
14. Bitto II, Sende CT, Eze PU. Preliminary investigations on to the effect of cassava peel meal on testicular morphometry and some biochemical characteristics of serum in cockerels. Global J. Pure and Appl. Sci. 2000; 6(2):161-165.
15. Egbunike GN, Oluyemi JA. Comparative studies of the reproductive capacity of Nigeria and exotic poultry breeds. Nig. J. Anim. Prod. 1979;6:47-57.
16. Ajayi AF, Raji Y, Togun V. Caudal epididymal sperm characteristics and testicular morphometrics of rabbits fed graded levels of a blood-wild sunflower leaf meal (BWSLM) mixture diet. J. Compl. Integr. Med. 2009;(6)1:26.
17. Ezekwe AG. Gonadal and extragonadal sperm reserve and testicular histometry of post pubertal Muturu bulls. Nig. J. Anim. Prod. 1998;25:106-110.
18. Perry G, Petterson D. Determining reproductive fertility in herd bulls. University of Missouri Agriculture Publication. 2001;2011:1-8.

© 2018 Isidahomen and Oguntade; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history/24539>