SEMEN CHARACTERISTICS AND SPERM ABNORMALITIES OF EXOTIC AND INDIGENOUS RABBITS IN THE SUB-HUMID TROPICS OF NORTHERN NIGERIA

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ABSTRACT

This study was designed to evaluate the semen characteristics and incidence of sperm abnormalities in exotic (ER) and indigenous (IR) rabbits in the sub-humid tropics of northern Nigeria. Rabbits comprising ER (n=5) and IR, n=5) were subjected to once weekly semen collection regiment for five weeks. Semen samples were evaluated for volume, colour, pH, spermatozoa concentration, percent live and motility. Spermatozoa abnormalities (detached head, free tail, bent tail, coiled tail) were evaluated. Semen volume was significantly higher ($P<0.05$) in the ER than IR being 0.6 ml ± 0.16 and 0.32 ml ± 0.08, respectively. Semen colour, spermatozoa motility, percent live cells and normal cells did not differ between ER and IR. Spermatozoa concentration was significantly higher ($P<0.05$) in the ER (211 x 10^6 ± 27.15) than in IR (67 x10^6 ± 27.64). Overall, higher incidence of sperm abnormities were observed in ER than in IR, although not significantly. It was concluded that semen of ER and IR in the sub-humid tropics of northern Nigeria show similarities except for semen volume and spermatozoa concentration which was higher in the ER.

INTRODUCTION

The rabbit has been described as a micro-livestock species and has been associated with man for many centuries as a source of food, fur, and an experimental subject in research (El-Azim and El-Kamash, 2011). The meat has high protein and less fat and calorie per gram than beef (Segun, 2014). Its consumption is bereft of cultural and religious biases (Biobaku and Oguntona, 1997). The increasing demand for food to feed the world's growing population is relentless (FAO, 2014). In Nigeria, the New Zealand White and California White are the most commonly seen exotic breed of rabbits. They are often challenged with stressful environmental conditions and diseases endemic to Nigeria. Information on the semen characteristics of rabbits in Nigeria is scarce and comparative studies on semen characteristic of both local and exotic rabbit in Nigeria is limited. Assessment of the seminal characteristics of rabbits gives an excellent indication of the reproductive capacity of the animals and is important in order to select bucks of high fertility for the purpose of artificial insemination (Akpa, 2012). Therefore, the aim of this study was to evaluate the semen characteristics and the incidence of spermatozoa abnormalities in the semen of indigenous and exotic rabbits in the sub-humid zone of Northern Nigeria.

MATERIALS AND METHODS

The study was carried out at the Department of Pharmacology and Therapeutics, Ahmadu Bello University, Zaria, Nigeria, and the Swine and Rabbit Research Programme, National Animal Production Research Institute (NAPRI), Shika-Zaria. Ten (n=10), apparently healthy adult rabbit bucks, five (n=5) of which were indigenous rabbits sourced from local markets in Zaria and the five (n=5) exotic rabbits (New Zealand White) imported, aged between 8-12 months with an average body weight of 2.5-3.5 kg (Exotic) and 1.2-2.0 kg (indigenous) were used for the study. Bucks were screened and treated with broad spectrum medication against haemoparasites and helminthes before the commencement of the experiment where indicated. Water and feed was provided *ad libitum*. The bucks were housed in standard rabbit cages, one buck per cage. The bucks were placed in two groups of five bucks each, group I (Exotic Rabbits) and II (Indigenous Rabbits). After two months acclimatization, semen samples were collected using a specially designed artificial vagina once weekly for evaluation. Semen samples were maintained in a water bath at 37^{0}C until evaluation was completed (Rekwot *et al.*, 1987). The ejaculates were examined as described by Zemjanis (1970) with modifications as follows: volume was assessed directly from the calibrated collection tube. pH was determined using a pH paper, sperm motility was determined using a microscope at x10 magnification, spermatozoa

concentration was determined using a Neubauer haemocytometer as described by Azawi and Ismael (2012), percentage live cells was determined by making a thin smear of semen on a clean grease free glass slide and stained with eosin nigrosin stain, sperm abnormalities were examined and counted using light microscopy at ×40 magnification. Data collected was expressed as mean ± SD and subjected to statistical analysis using Graphpad prism version 5.0. Values of $P<0.05$ was considered significant.

RESULTS AND DISCUSSION

The mean volume of semen of ER in this study was about twice the volume obtained from IR (Table 1). This could be attributed to the larger body and testes size of the ER as compared to the IR. In this study, although ages were similar, ER weighed 2.5-3.5 kg while IR weighed 1.2-2.5 kg and this may have been responsible for the marked difference in semen volume. Similar association between body size and semen output have been reported in bulls, rabbits and rams (Rekwot *et al.*, 1987; Akpa *et al.*, 2012). El-AZim and El-Kamash (2011) reported mean semen volume of 0.80 ± 0.02 in NZW rabbits in Egypt. This is higher than that observed in NZW (ER) in Nigeria. This may be attributed to environmental influences such as heat stress, management and diseases prevalent in the humid tropics. It was reported that larger testes correlated with increased sperm production (Rekwot *et al.*, 1987). There was no significant difference in semen colour observed for ER and IR (Table 1).The mean sperm motility of the ER rabbits (72.2 %)was comparable with that of IR (69.8 %). Sperm motility of ER (NZW) observed in this study is higher than that reported by El-Azim and El-Kamash (2011) in NZW in Egypt. The significantly higher sperm concentration in ER than IR may be attributed to optimum nutrition and management keeping conditions of the ER as nutrition plays a key role in reproductive performance of bucks (Nwagwu and Nzekwe, 2006). The slightly alkaline pH of semen of ER may be attributed to the nature of diet fed to the ER rabbit bucks. The percentage live cells were higher for IR breed than for ER although not significantly. These were similar to that reported by El-Azim and El-Kamash (2011).The results of this study revealed higher sperm abnormalities in ER compared with IR (Table 2). This could be the result of a chronic or subclinical infection, heat stress or poor adaptation to the climatic conditions of the sub-humid tropics of the country.

CONCLUSION

It was concluded that semen of ER and IR in the sub-humid tropics of northern Nigeria showed similarities except for semen volume and spermatozoa concentration which were higher in the ER. Also, the higher incidence of sperm abnormalities may be due to subclinical infection, heat stress or poor adaptation to the climatic conditions of the sub-humid tropics of the Northern Nigeria.

Table 3: Overall semen characteristics and sperm abnormalities of indigenous and exotic rabbits in the sub-humid tropics of northern Nigeria.

Semen Characteristics	Absolute Mean ± SD	
	IR	ER
Volume	0.32 ± 0.08^a	0.6 ± 0.16^b
Colour	2.3 ± 0.33	2.2 ± 0.26
Motility	69.8 ± 5.26	72.2 ± 7.19
pH	7.0 ± 0.0	6.4± 0.14
Concentration	67 ± 27.64^a	211 ± 27.15^b
Percent live Cell	84.6 ± 5.4	80.8± 6.7
Normal Sperm	82.3 ±3.6	78.8± 2.4
Detached Head	6.7 ± 0.8	7.0± 1.9
Free Tail	4.5 ± 2.1	7.4± 1.8
Coiled Tail	3.3 ± 0.6^a	0.8 ± 0.6^b
Bent Tail	2.9 ± 1.8	4.5± 0.6

a, b: Letters with different superscripts in a row differ significantly ($P<0.5$)

REFERENCES

Akpa, G.N. (2012). The effects of age, breed, sire body weight and the ejaculate characteristics of rabbit bucks International Journal of Animal and Veterinary Advances, 4(3): 191-194, 2012

Awonorin, S.O., Ayoade, J.A., Carew, S.W., Ingbian, E.K. and. Girgih, A.T. (1994). Quality characteristics of fresh and frozen meat from rabbits fed different levels of Gliricidia sepium. Nigerian Journal of Animal Production, 21(1-2): 170-176

Biobaku, W.O. and Oguntona, E.B. (1997): The effects of feeding multi-nutrient mini blocks and pelleted diet on the growth of rabbits. Nigerian Journal of Animal Production, 24(2): 147-149.

El-Azim, A.A. and El- Kamash, E.M. (2011). Evaluation of semen quality and its relation to mating system for some breeds of rabbits under environmental conditions in the middle of Egypt. Egyptian Poultry Science, 31(2): 467-480.

Food and Agriculture Organization, (2014). The rabbit- Husbandry, health and production. Retrieved September 6, 2014, from http:/www.fao.org/docrep/t1690e03.ht

Nwagwu, A.C. and Nzekwe, A.G. (2006). Effect of feeding concentrate and forage on the Reproductive performance of rabbits and their kids. .Proceedings 31st Annual Conference, Nigerian Society for Animal Production. Bayero University Kano, Nigeria. Pg. 123-125.

Rekwot, P.I., Voh, Jr., A.A., Oyedipe, E.O., Opaluwa, G.I., Sekoni, V.O. and Dawuda, P.M. (1987). Influence of season on characteristics of the ejaculate from bulls in an artificial insemination center in Nigeria. Animal Reproductive science, 14: 187-194.

Segun, A. (2014). Rabbit breeding: A profitable business Agrainnovate Nigeria, Jan 04 2014.

Zemjanis, R. (1970). Collection and Evaluation of Semen. In: Diagnostic and Therapeutic Techniques in Animal Reproduction 2nd Edition, Williams and Wilkins co. Baltimore MD pp. 139-156.

Table 1: Semen characteristics of indigenous and exotic rabbits in the sub-humid tropics

Week		Semen characteristics				
		Volume (ml)	Colour	Motility (%)	pH	Concentration ($x10^6$)
1	IR	0.4±0.2	2.0	67±9.4	7.0	66±8.0
	ER	0.3±0.1	2.0	72±5.7	6.2±0.2	222.41±122.99
2	IR	0.4±0.2	2.8±0.8	76±8.2	7.0	94.2±62.5
	ER	0.7±0.7	2.6±0.5	61±16.4	6.5±0.5	241±184.6
3	IR	0.34±0.1	2.2±0.4	74±8.2	7.0	66±32.8
	ER	0.7±0.5	2.4±0.5	79±7.4	6.5±0.3	178±121.4
4	IR	0.2±0.1	2.0	69±8.9	7.0	22.8±17.4
	ER	0.5±0.4	2.0	71±17	6.5±0.5	187.6±81.4
5	IR	0.3±0.2	2.4±0.5	63±24.4	7.0	86±30.4
	ER	0.6±0.4	2.2±0.4	78±22.5	6.3±0.3	226.6±85.9

Key: IR=Indigenous rabbits; ER=Exotic rabbits; Semen colour: watery=1, milky=2, creamy=3

Table 2: Sperm abnormalities of indigenous and exotic rabbits in the sub-humid tropics

Week		Sperm Abnormality					
		LC	NS	DH	FT	CT	BT
1	IR	89 ± 5.5	81.2 ± 5.6	8 ± 4.1	3.6±1.5	2.6±1.9	4.8±0.8
	ER	70±18.7	77.6±18.2	5.4±1.9 6	10.2±1.8	0.2±0.4 3	4.6±2.1 0
2	IR	84±8.2	88.4±5.2	6±2.7	1.4±1.3	4±2.1	8±1.1
	ER	87±4.5	78.6±4.8	9.2±3.5	6.5±0.5	0.6±0.5	4.0±4.0
3	IR	78±13	81.8±6.4	6.6±3	6.8±3.6	3.6±3.4	1.2±1.8
	ER	85.2±10.3	78.8±2.9	8.8±5	6.4±2.8	1.2±1.1	3.8±2.2
4	IR	91±2.2	79±10	6.2±3.5	6±3.4	4±1.6	4.4±2.9
	ER	79±8.2	83.8±6	5.2±3.7	5.8±2.3	0.6±1.3	4.6±2.2
5	IR	80.8	81.2±10.6	6±3.4	4.8±3.6	2.8±1.3	3.2±3.4
	ER	83±5.7	78.6±6.8	6.4±2.3	8±3.2	1.6±1.1	5.4±3.4

Key: IR=Indigenous rabbits; ER=Exotic rabbits; NS=Normal sperm; DH=Detached head; FT=Free tail; CT=Coiled tail; BT=Bent tail; LC=Percent live cell