



GONADAL AND EXTRAGONADAL SPERM RESERVES OF CAMEL (*Camelus dromedarius*) IN THE SEMI-ARID REGION OF NIGERIA

Ibrahim A. A.^{1*}, Aliyu J.², Hassan A. M.¹ and Salisu N.¹

¹Department of Animal Science, Kano University of Science and Technology, Wudil, Nigeria

²Department of Animal Science, University of Maiduguri, Nigeria

*E-mail: talk2aai@yahoo.com

ABSTRACT

The current study was conducted to evaluate the sperm production rate, gonadal and extragonadal sperm reserves from tissue homogenates collected from 12 reproductive tracts of matured camel (*Camelus dromedarius*). The paired testes sperm reserves were $85.83 \pm 8.96 \times 10^6$ and the left and right testes sperm reserves were $46.17 \pm 6.77 \times 10^6$ and $39.67 \pm 6.65 \times 10^6$, respectively. The epididymal sperm reserves were $31.75 \pm 4.73 \times 10^6$ for caput, $24.80 \pm 2.72 \times 10^6$ for corpus and $128.67 \pm 17.71 \times 10^6$ for cauda. The relative contribution of the epididymal segments to the total extragonadal sperm reserves were caput 20.29%, corpus 17.64% and cauda epididymides 62.13%. The paired testes weight and gonadal sperm reserves showed a high significant positive correlations ($r = 0.038$, $p < 0.01$) with each other. Gonadal sperm reserves further showed positive correlations with all the epididymal sperm reserves. The study reveals the sperm producing capacity of camels in the semi - arid environment of northern Nigeria and also provided baseline information for breeding purposes.

Keywords: camel's gonadal, epididymal, sperm reserves, semi-arid.

INTRODUCTION

With the increasing population in the developing countries and the world at large, the demand for animal protein also increases. Ruminant animals such as camel have been servicing millions of people living in the arid, semi-arid and desert areas of the world. It provides meat, milk, Fiber, transport and social status to the farmers. [1] Reported that camel possesses certain physiological features that enable them to thrive in extremely arid environment. They use water economically in almost all metabolic functions, they don't over heat, has the ability to withstand water loss and store fats in the hump for use in times of food and water deprivation.

The fundamental difference between other domestic animals and camelids are the letters low sperm production, extended mating length and unusual ejaculate characteristics [2]. The reproductive efficiency of camel under natural pastoral condition is low, [3] reported that a better understanding of the reproductive physiology of the camel in the arid and semi-arid environment is essentials for profitable production and imperative to efficiency of selection and rapid growth.

Genetic improvement of farm animals relies on the intensive use of a few superior males either for natural mating or artificial insemination programme. [4] Asserted that the importance of the breeding male for fertilizing eggs is rivaled only by his genetic influence on the progeny performance. However, sperm production and other sexual characteristics may limit the extent to which camel can be used for breeding. Direct counts of maturing spermatids in the testes have been carried out in various domestic animals and the results expressed as gonadal sperm reserves (GSR). [5] Reported that the knowledge about gonadal and extragonadal sperm reserves seems to

be essential for a careful assessment of male fertility. Extragonadal sperm reserves (ESR) represent sperm stored in the caput, corpus and cauda epididymis, and the number of spermatozoa stored in the epididymis has been said to be related to sperm production by the testes [6].

Gonadal and extragonadal sperm reserves have been estimated in Nigeria for bull [7], bucks [8, 9], rabbits [10] and domestics fowl [11, 4], but these information is little or lacking in camels. The present study was therefore designed to determine the gonadal and extragonadal sperm reserves of camels in the semi-arid environment because the information is of great importance in providing baseline for rating the fertility of male camel.

MATERIALS AND METHODS

Sample collection

Reproductive tracts of 12 matured camels were obtained *intoto* after slaughter from the Kano central abattoir. Collections were done between 0500 and 0700 hours on 3 separate days. The reproductive tract were immediately brought to the laboratory covered in ice and were processed on the same day. The testes and epididymis were dissected out and trimmed free of adhering fat and connective tissues.

Gonadal and extragonadal sperm reserves

The testes and epididymis were carefully separated and weight individually. The epididymis was divided into caput, corpus and cauda segments. Sperm reserves were determined by homogenization techniques as already reported by [12, 13 and 14].



Daily sperm production/g testes

Daily sperm production was obtained from the testicular homogenates by dividing the Gonadal sperm reserves by a time divisor of 3.56 proposed by [15, 16] for cattle.

Statistical analysis

Data obtained were subjected to the student "t" test to test the significance of differences between means, and correlation analysis [17].

RESULTS AND DISCUSSIONS

The results of gonadal and epididymal sperm reserves are presented in Table-1 and Figure-1. The left and right testicular sperm reserves were $46.17 \pm 6.77 \times 10^6$ and $39.67 \pm 6.65 \times 10^6$, respectively. These values were consistent with the results obtained for camel in Egypt and Sudan by [5]. The mean epididymal sperm reserves for

caput, corpus and cauda were $31.75 \pm 4.73 \times 10^6$, $24.80 \pm 2.72 \times 10^6$ and $128.67 \pm 17.71 \times 10^6$, respectively. The distributions of spermatozoa in the three segment of the epididymis in the present study disagree with the reports of the above workers. Gonadal and epididymal sperm reserves were much lower in camels than other species of animals. This is similar with the reports of [18] that testes in camels are much smaller and has less sperm reserves than those of the stallion, bull ram and boar. [5, 2] had also reported that the camel testes contain much lower number of spermatozoa per gram of tissue than those of bulls, buffalo, ram and boar. They further compared the sperm reserves and concluded that the reproductive capacity of the camels studied were remarkably low. Therefore, the gap existing between camels and other animals in gonadal and extragonadal sperm reserves is an indication of genetic and species differences.

Table-1. Gonadal and epididymal sperm reserves of the camels (mean \pm sem).

Parameters	Testicular and epididymal weight (g)	Sperm reserves ($\times 10^6$)	Level of significance
Testis : Left	69.66 ± 12.53	46.17 ± 6.77	ns
Right	79.46 ± 12.96	39.67 ± 6.65	
Paired	147.69 ± 25.39	85.83 ± 8.96	
Caput : Left	8.80 ± 0.96	3.33 ± 2.50	ns
Right	8.28 ± 1.06	18.42 ± 2.14	
Paired	17.08 ± 1.00	31.75 ± 4.73	
% of caput contribution		20.29 ± 3.01	
Corpus : Left	3.03 ± 0.37	14.33 ± 1.68	ns
Right	3.87 ± 0.55	10.47 ± 1.08	
Paired	6.90 ± 0.49	24.80 ± 2.72	
% of corpus contribution		17.64 ± 2.95	
Cauda : Left	5.14 ± 0.47	58.84 ± 6.43	ns
Right	4.46 ± 0.50	69.83 ± 11.25	
Paired	9.70 ± 0.39	128.67 ± 17.71	
% of cauda contribution		62.13 ± 5.42	

sem = standard error of means, ns = not significant.

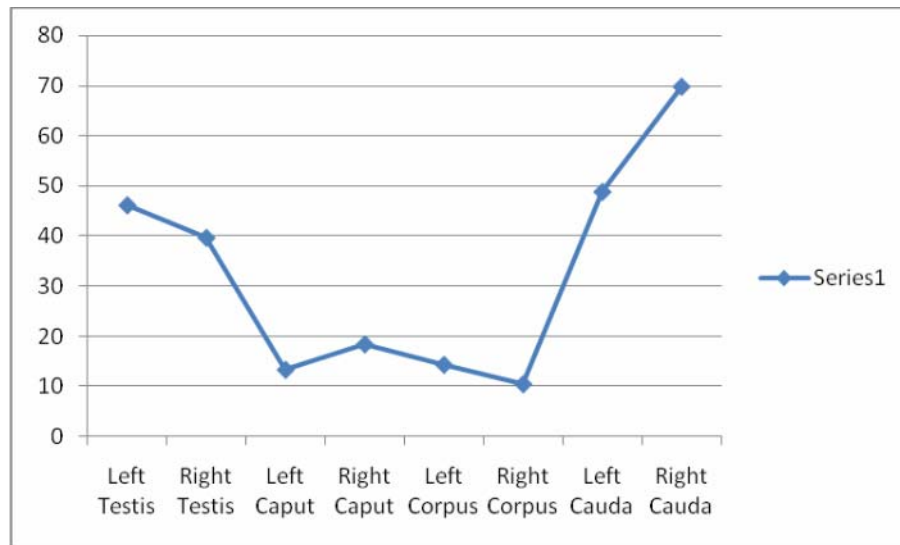


Figure-1. Distribution of gonadal and extragonadal sperm reserves.

The sperm reserves of the carput epididymis represent 20.29% of the total epididymal reserves while the corpus and the cauda accounted for 17.64% and 62.13% respectively (Figure-2). The distribution of the sperm reserves in the three segment of epididymis is comparable with the report of [19, 20, 21], in other species of animals. Although [5] reported that the corpus epididymis is the largest in size and was the sperm

depot, the result of the present study shown that the carput is larger in size but the cauda epididymis is the sperm depot. This is strong agreement with the report of [19, 22, 20, 21]. More so, research has shown that the cauda epididymal reserves when used with AI can produce offspring in a multitude of species, eland antelope [23], goats [24,] dog [25].

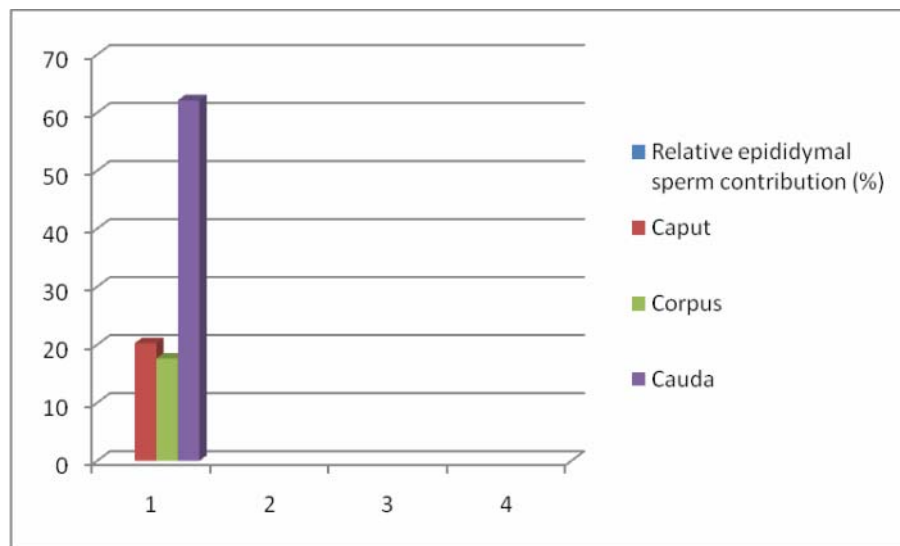


Figure-2. Distribution (%) of sperm reserves in the epididymal segments.

The daily sperm production (DSP) and daily sperm production per gram testes (DSPG) values were presented in Table-2. There were no statistical ($p > 0.05$) difference between the overall mean. Left and right sperm productions were $12.97 \pm 0.12 \times 10^6$ and $11.14 \pm 0.67 \times 10^6$, respectively. The values of sperm production

recorded in the study were lower than the values obtained by [26]. This may be due to environmental peculiarities, age of the animal, testicular size, season or even nutrition as the animals used were purely reared on pastoral condition.

**Table-2.** Daily sperm production (DSP) and daily sperm production/gram testis (DSPG) in the camel (mean \pm sem).

Parameters		Values	Level of significant
Daily sperm production ($\times 10^6$)	Left	12.97 \pm 0.12	ns
	Right	11.14 \pm 0.67	
	Paired	24.11 \pm 0.64	
Daily sperm production/gram testes ($\times 10^7$)	Left	0.22 \pm 0.02	ns
	Right	0.16 \pm 0.11	
	Paired	0.39 \pm 0.32	

sem = standard error of means.

Table-3 shows the correlation between testes weight, testicular and epididymal sperm reserves. A significant high correlation was found between testes weight and gonadal reserves ($r = 0.038$, $p < 0.01$), caput sperm reserve and cauda sperm reserve ($r = 0.594$, $p < 0.05$). The significant correlation observed here between the testes weight and testicular reserves, and

between caput and cauda epididymal reserves is in agreement with the correlation by [20] in other species of ruminants. Therefore, the study reveals the sperm producing capacity of camels and provided base line information which would be of a major importance for maximum breeding result when properly improved.

Table-3. Correlations between gonadal and epididymal sperm reserves in camels (mean \pm sem).

	Paired testis weight	Gonadal sperm reserves	Caput sperm reserves	Corpus sperm reserves	Cauda sperm reserves
Paired testis weight	—	0.038**	0.182	0.012	0.359
Gonadal sperm reserves		—	0.355	0.281	0.054
Caput sperm reserves			—	0.276	0.594*
Corpus sperm reserves				—	0.053
Cauda sperm reserves					—

sem = standard error of means, * = $p < 0.05$, ** = $p < 0.01$

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