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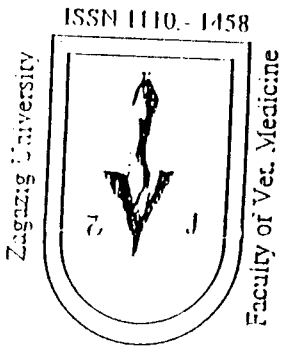

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Some Aspects of Semen Characteristics Collected by Two Different Ways Of Arabian Camels *(Camelus Dromedarius)*

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ABSTRACT

This study was conducted to evaluate the semen characteristics of dromedary camel using two different methods of semen collection. During September to December, semen samples were collected either by using artificial vagina or electro-ejaculation (6 Arabian camels in each). Following collection, semen characteristics were examined using inverted microscope. The results show that camel semen characteristics (reaction time, ejaculate volume, sperm motility, the percentage of live spermatozoa, the abnormality and concentration of spermatozoa) collected either by artificial vagina or by electro-ejaculation were 4.4 min., 3.9 ml, 32.9%, 45.6 %, 16.0, 5.0 x 10^6 sperms/ml^3; and 12.0 min., 8.5 ml, 38.3 %, 46.4 %, 9.4%, 4.9 X10^6 sperms/ml^3, respectively. There was an increase in the testosterone levels throughout the breeding season (from 2.3 to 2.6 nmol/l). Testosterone concentrations were higher significantly ($P<0.001$) in peripheral blood than seminal plasma. In conclusion, to enhance productivity in camel by using artificial insemination, semen must be collected by electro-ejaculation.

INTRODUCTION

The Arabian camel *(Camelus dromedarius)* is an indispensable animal which contributes effectively both as a source of food and welfare to people living under harsh desert condition. It is frugal in habits yet highly productive of milk, meat, wool and work. Opportunities to improve reproductive efficiency of the dromedary camel are limited by inherent characteristics, which include long gestation, a restricted breeding season, and induced ovulation. The continued use of traditional management adds to the practical difficulties in improving reproductive performance as it is often difficult to be certain that females are pregnant at the end of the breeding season. A further factor in the poor reproductive rate is the level of inbreeding in traditional herds. The study of spermatozoal morphology has received great emphasis in present day research. It is regarded as an essential factor to be taken into account in analysis of spermatozoa, the morphology of spermatozoa is the spermatozoal parameter such as the sperm motility, sperm morphology, and the number of spermatozoa in ejaculate ***(1, 2).*** Measurement of testosterone concentrations in peripheral blood have been helpful in evaluating testis activity in animal. Spermatogenesis has become maximal by six years of age in the camel and, because the Leydig cells are mainly responsible for androgen production, the male camel can breed when mature Leydig cells are abundant ***(3).*** ***Fat-Halla and Ismail (4)*** reported that FSH concentration was highest during the rutting season in camel, and FSH acts synergistically with LH to increase testosterone production in males ***(5).***

The objective of this study was to evaluate the semen characteristics of dromedary camels using two different ways of semen collection (artificial vagina or electro-ejaculation) and to measure testosterone levels during study period.

MATERIALS AND METHODS

Twelve dromedary camels (Majaheem, 5-10 years old) of good health and maturity were used. The animals were kept separately in an open shaded barns (each barn about 8 x 10 m) at the farm of the Animal Production Department, College of Agriculture, King Saud University in Riyadh, Saudi Arabia. Camels were fed on concentrates and roughage according to their actual requirements. The concentrate mixture was containing

13.4% digestible protein and 72% total digestible nutrients while the roughage was alfalfa. Water is available at all times in drinking basin and salt licks are provided *ad libitum*. Blood samples from all animals were collected weekly from jugular vein into 10 ml evacuated tubes. Then, samples were centrifuged at 3000 g for 20 min. and plasma was stored at -20°C for later analysis. Concentrations of testosterone in the serum and in the seminal plasma were determined using a direct solid phase 125I radioimmunoassay method (Coat-a-Count, Diagnostic Products Corporation, Los Angeles, CA, USA).

During September to December, weekly semen samples were collected from camels either by using an artificial vagina (AV) or by electro-ejaculation.

Artificial vagina: six camels were used to collect semen using AV (Figure 1) that was designed specially for camel (IMV, Cassou, France) constructed in such a way that the semen is ejaculated directly into the graduated collection vessel because most rubber liners have a deleterious effect on camel spermatozoa ***(6)***. The AV was filled with water at 55-60°C so that temperature inside the inner liner stabilises at 41-43°C a few drops of Vaseline were smeared on the inner liner at the entrance to the AV to provide lubrication. A female in oestrus was secured in the sitting position, preferably with its forelegs tied. The bull was teased by allowing him to smell the female before leading him to her rear. Then, the operator was ready to knell at the right side of the female once the bull had sat upon her. When the bull began to thrust, the operator should grasp the sheath with his left hand and direct the extended penis into the AV, which he was holding in his right hand. The ejaculate usually came in fractions and bull made several thrusts, interrupted by period of rest, until ejaculation was complete.

Electro-ejaculation: six camels were used to collect semen using electro-ejaculation (Figure 2). A bull electro-ejaculator (Standard Precision Electronics, Colorado, USA) was used with the camel secured in sternal recumbancy and then turned onto its side as described by ***Tingari et al. (7)***. Electro-ejaculation was achieved by using the rectal probe lubricated with copious amounts of jelly to ensure good electrical contact with the mucous and giving two sets of stimulation, each of 10 to 15 pulses of 3 to 4 seconds duration at 12 volts and 180 mA, with a rest of 2 to 3 minutes between the two sets. The collection was made into a flask held at the preputial orifice, with occasional milking of the prepuce to expel all the semen.

Following collection, flask containing the semen samples was placed in a water bath at 30°C for 15 minutes to liquefied the jelly-like semen and allow the spermatozoa to attain motility. Then, semen was examined for volume, percentage of mass motility, percentage of morphologic sperm abnormalities and concentration of sperm and according to standard procedure ***(8)***. Sperm motility was assessed by placing a drop of semen on warm slide and examining it under inverted microscope (Nikon TMS-F, Japan). The total number of spermatozoa ml was determined in a hemocytometer,. Eosin vital stain ***(9)*** was used to study the ratio of live : dead and abnormal spermatozoa. One hundred spermatozoa per slide were counted for each determination. Concentrations of testosterone in the blood serum and in the seminal plasma were determined using a direct solid phase I125 radioimmunoassay method (Coat-a-Count, Diagnostic Products Corporation, Los Angeles, CA, USA). The cross-reactivity for androstenedione, cortisol, 5α-dihydrotestosterone and estrone were 0.5, 0.005, 3.3 and 0.01 %, respectively. The inter-assay and the intra-assay coefficient of variation were 0.17 and 0.11, respectively.

All data were statistically analyzed using General Linear Model (GLM) procedure *(10).*

RESULTS AND DISCUSSION

The results show that semen can be collected from male camels by two ways either using artificial vagina, or by electro-ejaculation. However, electro-ejaculation is an effective and more voluminous, safe and clean method compared to the AV method.. Characteristics of camel semen collected by artificial vagina or electro-ejaculation are presented in Table 1. The volume of ejaculate was higher when electro -ejaculation was used compared to the AV method (8.5 vs 3.9 ml). Similarly, ***Foote (11)*** found that semen samples collected from bull by electro-ejaculation were of larger volume than samples obtained with the AV. Furthermore, ***Tingari et al. (7)*** claimed maximum volume of 9 ml from camel semen collected by electro-ejaculation. However, there is some studies found high volume of camel semen using the AV ***(6, 12).*** Therefore, for the development of artificial insemination techniques in camel, semen must be collected by electro-ejaculation to get higher volume since camel is considered to be an induced ovulator, with ovulation induced by semen that contains an ovulation inducing factor ***(13, 14).***

Figure 3 shows the mean percentage of mass motility, live sperm and abnormal sperm in semen of camel collected either by artificial vagina or electro-ejaculation. From this Figure its appeared that semen characteristics are better in semen collected by electro-ejaculation compared those ones collected by artificial vagina.(38.3, 46.4 and 9.4 vs 32.9, 45.6 and 16.0%, for mass motility, live sperm and abnormal sperm, respectively). Similar results were obtained by ***Muas et al. (13)*** who conducted a study comparing semen characteristics in camel ejaculates recovered by two methods. They found that the percentage of sperm showing morphological abnormalities were higher in semen collected by AV compared to the electro -ejaculation.

Figure 4 shows the means of reaction time, ejaculate volume and sperms concentration in semen of camel collected by two ways. The time for ejaculation to occur was longer with electro-ejaculation compared to the AV method (12.0 vs 4.4 minute, respectively). Therefore, the AV method stimulate the nerve that responsible of ejaculation faster than the electro method.

Testosterone concentrations in blood serum of camel during the study period are illustrated in Figure 5. The level of testosterone was increased from September through December (from 2.3 to 2.6 nmol/I). Similar concentrations were reported by ***Yagil and Etzion (15) and Azouz et al. (16).*** This mean testosterone concentration increased toward December when the male is sexually active ***(17).*** Furthermore, testosterone concentration in blood was higher than in the seminal plasma (2.3 vs 1.2 nmol/I, respectively; (Figure 6).

In conclusion, to enhance breeding programmes and improve productivity in camel by using artificial insemination, semen must be collected by electro -ejaculation.

Table (1) : Semen characteristics in male camels collected by electro-ejaculation (EJ) or artificial vagina (AV).

Semen characteristics	EJ	AV
Reaction tim,e (min)	12.03±0.29	4.41±0.57
Ejàculate volume (ml)	8.47±0.54	3.92±0.46
Mass motility (%)	38.33±2.49	32.89±1.77
Live sperm (%)	46.40±2.11	45.62±1.56
Abnormal sperm (%)	9.37±1.29	16.01±0.71
sperm concentration (x 10^6 /ml)	4.90±1.02	4.99±0.92

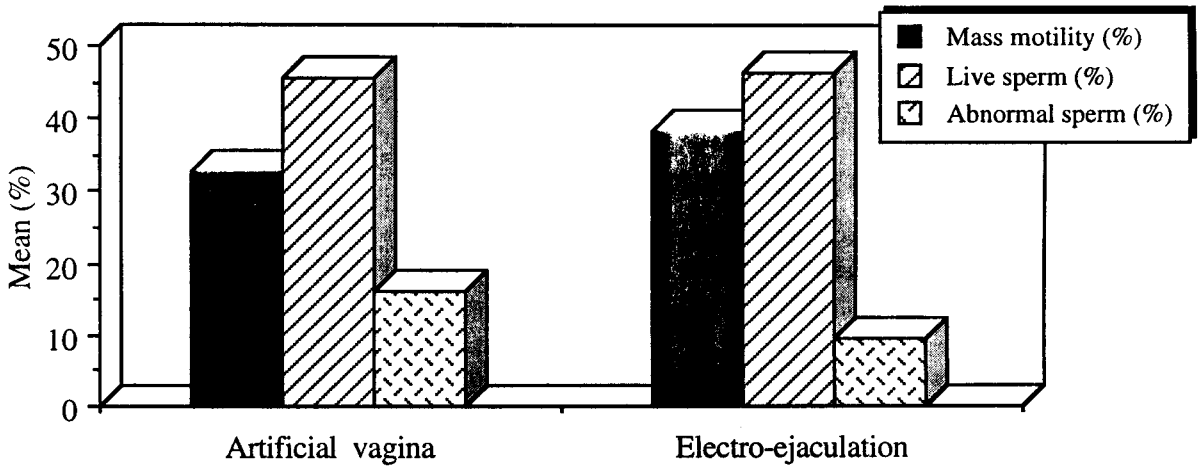

Fig. (3) : The mean percentage of mass motility , live sperm and abnormal sperm in semen of camel collected either by artificial vagina or electro-ejaculation.

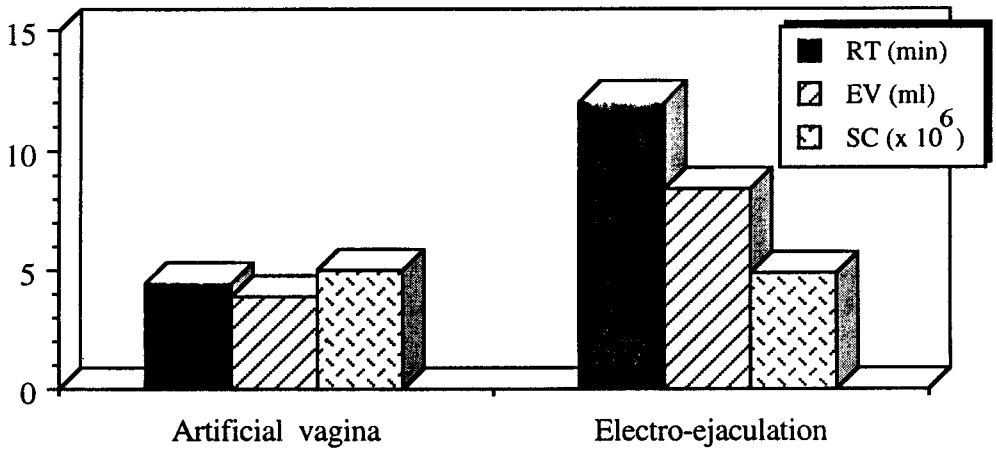

Fig. (4) : The means of reaction time (RT) , ejaculate volume (EV) and sperm concentration (SC) in semen of camel collected either by artificial vagina or electro - ejaculation.

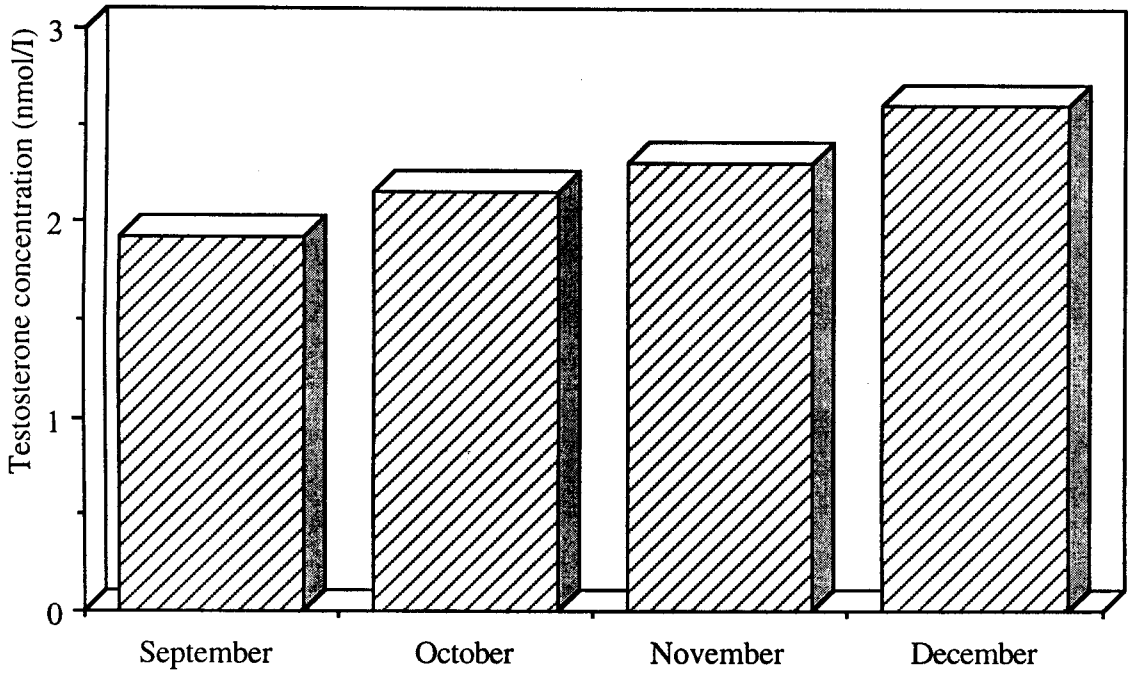

Fig. (5) : Testosterone concentration (nmol/l) in blood serum of camel during the study period.

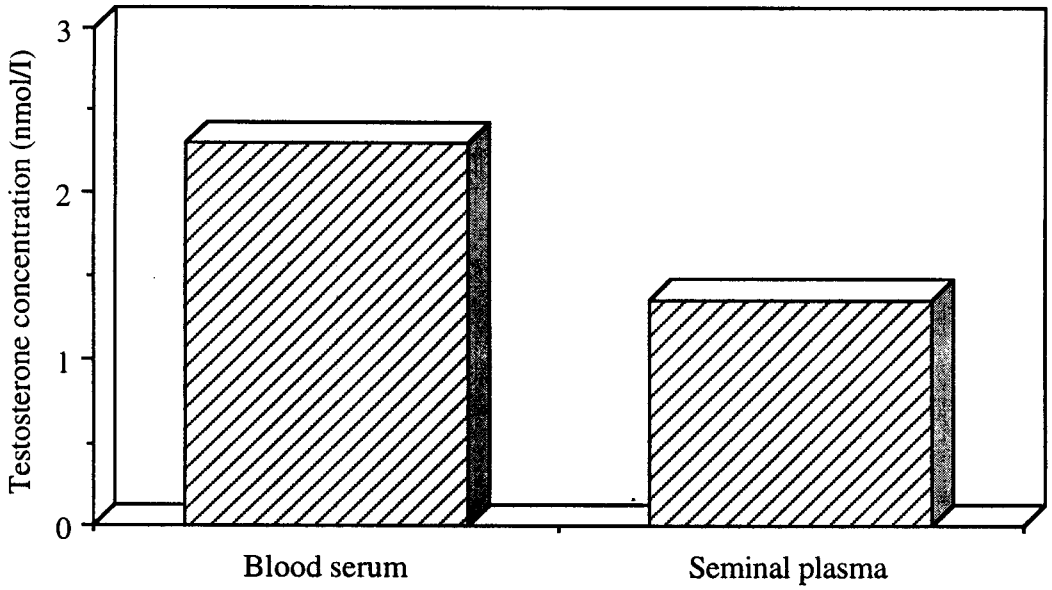

Fig. (6) : Testosterone concentration (nmol/l) in blood serum and seminal plasma of camels.

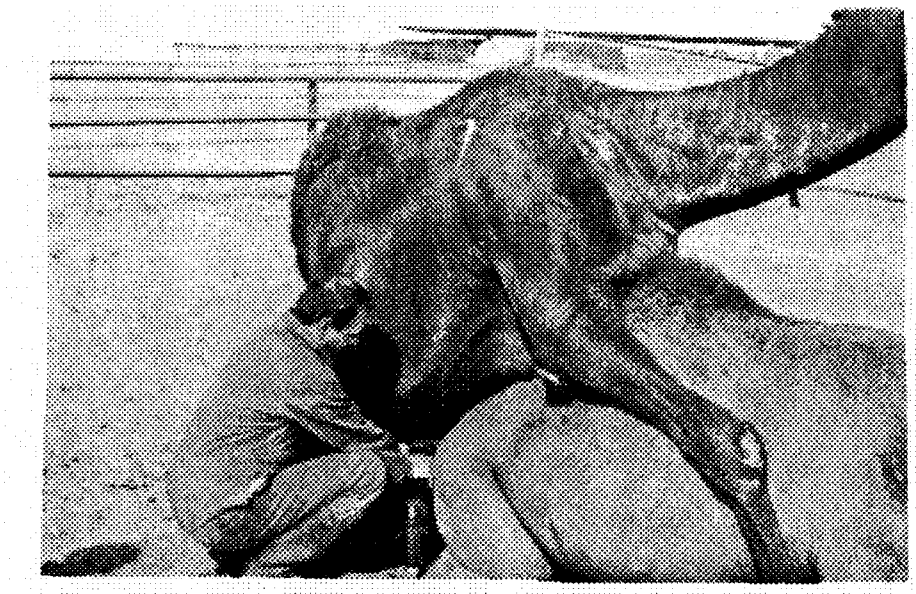

Fig. (1): Method of collection of semen in camel using artificial vagina

Fig. (2): Method of collection of semen in camel using electro-ejaculation

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الملخص العربي

دراسة على بعض صفات السائل المنوي المتحصل عليه بطريقتين مختلفتين في الإبل العربية

منصور بن محمد الفريجي

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أجريت هذه الدراسة لتقييم السائل المنوي المتحصل عليه بطريقتين مختلفتين (باستخدام المهبل الصنعي أو التنبيه الكهربائي) للإبل العربية . تم اختيار ١٢ فحلاً من إبل المجاهيم (أعمارها من ٥-١٠ سنوات) قسمت عشوائيا بالتساوي إلى مجموعتين (٦ حيوانات في كل مجموعة) ، وخلال فترة التجربة (من سبتمبر إلى ديسمبر) تم جمع السائل المنوي مرة كل أسبوع من المجموعة الأولى باستخدام المهبل الصنعي ومن المجموعة الثانية بواسطة التنبيه الكهربائي وأيضا تم أخذ عينات دم أسبوعيا من جميع الفحول لتقدير مستوى هرمون التستستيرون . قدر تركيز هرمون التستستيرون في عينات سيرم الدم والبلازمة المنوية باستخدام طريقة التحليل المناعي الإشعاعي (RIA) . وتم تحليل البيانات إحصائيا بالمعادلة الخطية العامة (GLM) باستخدام برنامج SAS الإحصائي . كانت نتائج خواص السائل المنوي المتحصل عليها بواسطة المهبل الصنعي هي كالتالي: الوقت اللازم للقذف ٤,٤ دقائق وحجم السائل المنوي ٣,٩/مل^{٣} ونسبة كل من الحيوية ٣٢,٩ % والنطف الحية ٤٥,٦% والنطف الشاذة ١٦,٠% وتركيز النطف ٥,٠ X ١٠^{٦}/مل^{٣} بينما خواص السائل المنوي المتحصل عليه بواسطة التنبيه الكهربائي كانت كالتالي: الوقت اللازم للقذف ١٢,٠ دقائق وحجم السائل المنوي ٨,٥/مل^{٣} ونسبة كل من الحيوية ٣٨,٣ % والنطف الحية ٤٦,٤% والنطف الشاذة ٩,٤% وتركيز النطف ٤,٩ X ١٠^{٦}/مل^{٣} . ومن نتائج تحليل التستستيرون لوحظ أن مستواه مرتفع معنويا في عينات سيرم الدم عن عينات البلازما المنوية وان تركيزه في سيرم الدم يتزايد تدريجيا خلال الفترة من سبتمبر إلى ديسمبر (من ٢,٣ إلي ٢,٦ نانومول) مما يدل على أن نشاط الخصية يتزايد بتقدم الفترة من سبتمبر إلى ديسمبر . هذه الزيادة من التستستيرون تتوافق مع زيادة النشاط الجنسي للفحول. نستخلص من هذه الدراسة إن جمع السائل المنوي باستخدام التنبيه الكهربائي حسن من بعض خواص السائل المنوي مثل زيادة حجم القذفة وارتفاع نسبة حيوية النطف مما يساهم في إنجاح عملية التلقيح الصنعي في الإبل حيث البلازما المنوية في الإبل تحتوي على بعض الهرمونات التي لها دور في حدوث عملية الإباضة حيث إنها تعتبر مهمة نظرا لان الإباضة في الإبل إحداثية .