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Reproductive Characteristics of Native Bucks at Different Ages

S.M. Abd-Allah[*], A.S. Mostafa,[**] and I.Z. El-Nemr[***]
[*]Departments of Theriogenology, [**]Animal Hygiene, Management and Zoonosis, Faculty of Veterinary Medicine, Beni Suef University and[***] Dept. Anim. Reprod. and A.I., National Research Centre, Cairo, Egypt.

THIS STUDY was devoted to evaluate reproductive parameters in native Egyptian bucks. Attention was also directed to evaluate variation of plasma testosterone levels and semen quality as well as correlate between the influence of age and physical body status (body weight, height, crown rump "CR" length and girth) as well as testis length and width in addition to scrotum circumference "SC" of bucks and their reproductive performance. Semen was collected twice a week for 12 successive weeks during the spring season 2006. Semen volume, sperm concentration, mass and progressive forward motility, percentage of live sperm in addition to percent of abnormal sperm as well as total number of live-normal sperm were also evaluated. The obtained data showed that semen volume, sperm motility, percent of live sperm and abnormal sperm, testicular size, scrotum circumferences, libido and testosterone hormone differed significantly ($P < 0.002$) in bucks according to changes in physical conditions. Therefore, it was concluded from the present study that the optimal native bucks expected to be used for either natural service or artificial insemination should be of age ≥ 2 years, body weight ≥ 35.83 kg, CR ≥ 63.16 cm, testis length ≥ 12.40 cm, testis width ≥ 5.30 cm, SC ≥ 22.50 cm, body height ≥ 70.83 cm, girth ≥ 75.33 cm, libido index (MPD) ≥ 2.66 concomitant with serum testosterone level ≥ 2.30 ng / ml.

Keywords: Egyptian bucks; Semen characteristics; Testosterone; Libido, Age; Physical body conditions.

Sexual behavior and semen quality are the main factors that influence male reproductive efficiency. Factors affecting semen characteristics are important in management practices, especially for the artificial insemination "AI" in any breeding program. Scrotal circumference and semen characteristics have been confirmed to vary with age among different breeds of bucks and also among individual bucks of the same breed (Pandey *et al.*, 1985 and Noran *et al.*, 1998). Although information is available on the semen characteristics of several goat breeds (Pandey *et al.*, 1985 and Ali & Mustafa, 1986) yet knowledge about the semen characteristics of the native Egyptian bucks is scarce. It was previously found that age was one of the major contributing factors associated with differences in scrotal circumference and semen characteristics (Toe *et al.*, 1994), with testicular size being closely related to total sperm output (Oldham *et al.*, 1978; Dufour *et al.*, 1984 and Ahmed &Noakes, 1995). Season of the year seems

also to be one of the main factors affecting semen quality in goats (Aboul-Ela and Chemineau, 1988). Furthermore, it was detected that the male with large symmetrical testes and free from defects, was likely to produce semen of good quality (Gordon, 1997).

The most important semen characteristics for evaluation of the reproductive performance in bucks are criteria such as ejaculate volume, mass sperm motility, progressive motility, sperm concentration, total sperm per ejaculate, viable sperm concentration and percentage of abnormal sperm (Zamiri and Heidari, 2006).

In this respect, the estimation of the plasma testosterone levels was found to be of applied clinical significance (Degen *et al.*, 1981).

Therefore, the present study was devoted to clarify the semen characteristics of native bucks in Egypt as well as study the effect of different physical factors on reproductive characteristics of bucks in order to select optimal reproductive efficiency for breeding programs.

Material and Methods

This study was devoted to evaluate reproductive parameters in native Egyptian bucks. Attention was also directed to evaluate variation of plasma testosterone levels and semen quality as well as correlate between the influence of age and physical body status (body weight, height, crown rump "CR" length and girth) as well as testis length and width in addition to scrotum circumference "SC" of bucks and their reproductive performance.

This study was conducted at Farm of Faculty of Veterinary Medicine, Beni Suef University, Egypt. Twenty native breed bucks (Zarabii breed) of different ages (1, 2 and 3 years-old), body weight and height as well as CR were used to study the effect of physical body conditions on semen quality during the period of spring season (from March to June, 2006). The 3 age groups involved 6, 6 and 8 bucks, respectively. Bucks were fed fresh Egyptian clover, rice straw and concentrate feed mixture according to requirements necessary for the buck's age. Animals had free access to water throughout the day.

Every month, each buck was subjected to record the body conditions score "BCS" which included body weight (kg) and height (cm), CR length (cm) and girth in cm (Hossamo, 1984). In addition, scrotal circumference, testis width and testis length in the scrotum were measured by using a tape-measure at the broadest part of the scrotum, with the animal being restrained in a lateral recumbent position (Nishimura *et al.*, 2000 and Ahmed *et al.*, 2004).

Ejaculates were collected twice weekly with 3 days interval using an artificial vagina. During semen collection, the 1st ejaculates were collected from each buck, separately. Semen characteristics (semen volume, mass activity,

progressive forward motility, total sperm per ejaculate, percentage of live sperm, count of total live-normal sperm and percentage of abnormal sperm were estimated. In this respect, estrous does were introduced to the bucks for sexual stimulation prior to semen collection. The number of successive mounts which ended by ejaculation and the time interval between the first mount and ejaculation (libido index) were also recorded (Nishimura *et al.*, 2000 and Ahmed *et al.*, 2004).

The ejaculate volume was recorded immediately after collection and mass motility was assessed according to the wave motion, by viewing a drop of semen under low magnification (100x) with scores between 0 and 4 (Sorensen, 1979). Progressive motility was assessed by viewing a drop of semen on a glass slide with cover slip under high magnification (400x) (as a percentage), being allocated, depending on the individual motility of the sperm as adopted by Sorensen (1979). Sperm concentration was determined using a hemocytometer (Chemineau *et al.*, 1991). Further semen was diluted in a 0.85 % saline solution containing 0.01 % mercury chloride at concentration of 1 : 400 (semen ; diluent) as described by Chemineau *et al.* (1991) for determining the percentage of abnormal sperm.

The percentage of live & dead sperms ware estimated by the examination of the stained films according to Chemineau *et al.* (1991).

Directly after semen collection, the corresponding individual blood samples were also obtained. Samples were collected from the jugular vein into 10 ml heparinized vacutainer tubes (Prand, France). Samples were centrifuged at 3000 rpm for 15 minutes for plasma separation. Plasma was then stored at -20°C until assaying for testosterone by using direct RIA technique (Abraham *et al.*, 1972). Under such circumstances, the standard curve ranged between 0 and 25 ng/ml. Sensitivity of the curve was < 0.08 ng/ml. Intra- and inter-coefficients of variation for plasma testosterone was 4.1 and 7.8 %, respectively.

Data were subjected to statistical analysis using general linear model (GLM) procedure (SAS, 1990).

Results

It appears from Table 1 that the best libido index for the native bucks was detected in two and three years-old bucks having a large number of mounts ($P < 0.002$), while the lowest libido was observed in one years aged bucks. The mean scrotal circumference was greatest ($P < 0.002$) in two and three years aged bucks when compared to the recorded value of one year aged bucks which coincided with libido peak.

The mean plasma testosterone concentration was lowest ($P < 0.002$) in one year aged bucks compared with the corresponding values recorded in 2 and 3

years-old bucks. Meanwhile the highest plasma testosterone level was assayed in three years aged bucks (Table 1).

TABLE 1. Semen characteristics of native bucks at various ages (Mean±SE).

Parameters	One year bucks	Two years bucks	Three years bucks
Body weight (kg)	30.16 ± 0.47 A	35.83 ± 1.05 A	44.33 ± 1.38 A
Body height (cm)	62.33 ± 2.77 AB	70.83 ± 1.73 A	72.50 ± 2.01 B
CR length (cm)	62.83 ± 1.40 A	63.17 ± 0.47 A	68.87 ± 1.17 A
Girth (cm)	69.50 ± 0.61 A	75.33 ± 0.88 A	79.50 ± 1.21 A
Testis length (cm)	11.00 ± 0.31 AB	12.40 ± 0.27 A	12.60 ± 0.47 B
Testis width (cm)	4.50 ± 0.15 A	5.30 ± 0.12 A	5.93 ± 0.11 A
Scrotum circum-ference (cm)	20.33 ± 1.08 a	22.50 ± 0.80 a	26.00 ± 0.53 a
Libido index (MPD)	1.16 ± 0.15 A	2.67 ± 0.21 A	3.88 ± 0.12 A
Testosterone (ng/ml)	1.17 ± 0.12 AB	2.30 ± 0.19 A	2.80 ± 0.22 B
Semen volume (ml)	0.86 ± 0.15 AB	1.55 ± 0.10 A	1.71 ± 0.11 B
Mass motility (score system 0-4)	2.16 ± 0.16 AB	3.33 ± 0.30 A	3.62 ± 0.18 B
Progressive forward motility	53.66 ± 1.28 AB	67.50 ± 2.97 A	71.12 ± 2.53 B
Sperm con-contrition (10^9/ml)	2.98 ± 0.29 AB	4.50 ± 0.46 A	5.47 ± 0.25 B
Total sperm (10^9/ejaculate)	2.56 ± 0.22 AB	6.97 ± 0.98 A	9.29 ± 1.38 B
Live sperm %	66.81 ± 1.59 AB	84.76 ± 2.23 A	86.52 ± 1.84 B
Abnormal sperm%	16.31 ± 0.49 AB	10.32 ± 0.59 A	9.38 ± 0.54 B

SE : Standard error.
In the same row, values having identical letters differ significantly from each others at P<0.002 upon using capital letters and 0.05 using small ones

Semen characteristics (volume, mass and progressive forward motility, total sperm count, percent of live sperm were greatest (P <0.002) in two and three years aged bucks when compared to the other corresponding one year aged bucks values (Table 1). However, the abnormal sperm percent was greatest (P <0.001) among one year aged bucks. It was also obvious that semen characteristics vary significantly in native Egyptian bucks according to body conditions score as well as scrotum circumferences, libido and plasma testosterone concentration.

Discussion

Reproductive performance and physiology of reproduction in male goats compared with other farm animals have withdrawn less attention (Gordon, 1997). Moreover, information about the semen characteristics of the native Egyptian bucks is scarce (El-Sisy, 2005). Therefore, the present study is an endeavour to study these characteristics in native bucks during different ages of maturity.

Attention was also directed to correlate among plasma testosterone level, body condition score as well as scrotum circumference and the semen quality of the bucks.

The results of this study show that mature bucks of 2 or 3 years have the best semen characteristics as compared with the corresponding values determined in one year-old bucks (Table 1). These results are in agreement with the findings of Oldham *et al.* (1978); Toe *et al.* (1994); Ahmed & Noakes (1995) and Gordon (1997). In this respect, the authors explained that age is one of the major contributing factors influencing scrotal circumference and semen characteristics with testicular size being closely related to total sperm output.

It is also apparent from the current results that advancement of age leads to increase significantly the body conditions score (body weight and height, CR length and girth) as well as scrotum circumference, testis length and width which reflected on improvement of semen quality. In this respect, these observations come in accordance with the reports of Osinowo *et al.* (1988) and Zamiri & Heidari (2006) on mature bucks who found that when the bucks were heavier with larger scrotal circumference, the total sperm per ejaculate and sperm concentration were better when compared to the yearling bucks. In addition, the viable sperm concentration was higher in mature bucks as mature bucks normally have higher sperm concentration and fewer abnormalities and it is expected that they will have more viable sperms.

The low libido with low semen quality in bucks of one year could possibly be attributed to the low level of circulating plasma testosterone (Table 1). This hormone was detected to play an indispensable role for regulating testis function and semen quality (Rees, 1993; Knobil *et al.*, 1994 and Perez & Mateos, 1995).

In conclusion, it could be said that semen characteristics in one year aged bucks may be a critical obstacle when implementing intensive goat breeding systems (three kidding in 2 years). Moreover, bucks have a distinct improved sexual activity starting from two years. The bucks expected to have high semen quality should be of age ≥ 2 years and possess particular body score, testis length and width as well as scrotum circumferences match with the required application for optimal breeding.

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الخصائص التناسلية لذكور المعز المحلية فى الأعمار المختلفة

صابر محمد عبد الله *، أحمد سعد مصطفى ** و إبراهيم زكى النمر ***
*قسم التوليد والتناسل والتلقيح الإصطناعى – كلية الطب البيطرى – بنى سويف
**قسم الصحه والأمراض المشتركة – كلية الطب البيطرى - بنى سويف–
و***قسم التكاثر فى الحيوان والتلقيح الإصطناعى – المركزالقومى للبحوث – القاهرة – مصر .

أجريت هذه الدراسة على عشرون من ذكور المعز الزرايبى البالغة الموجودة بكلية الطب البيطرى - بنى سويف - ذات الأعمار المختلفة (عمر سنه ، سنتان ، ثلاث سنوات) لبيان تأثير العمر والخصائص الجسدية على التناسل فى ذكور المعز المحلية طوال مدة الدراسة ، تم وضع الذكور تحت الإشراف البيطرى المستمر وتقدم العليقة الملائمة طبقا للأعمار.

تم تجميع السائل المنوى وبلازما الدم من الذكور (مرتين إسبوعيا) طوال اثنى عشرة اسبوعا متتالية ربيع عام ٢٠٠٦(مارس – يونيو) . تم أيضا قياس معامل الرغبة الجنسية لدى كل مجموعة من الذكور .

تم اجراء الدراسات التى تبين خصائص السائل المنوى لذكور المعز أثناء الأعمار المختلفة طبقا للطرق المعملية الخاصة بكل قياس كما تم إستخدام بلازما الدم لقياس مستوى الهرمون الذكرى بطريقة المناعة الإشعاعية .

تم قياس وتسجيل بعض الخصائص الجسدية لذكور المعز أثناء الأعمار المختلفة شهريا - كل على‌حدة - وذلك لبيان تأثير وعلاقة هذه الخصائص الجسدية مع خصائص السائل المنوى والهرمون الذكرى .

أوضحت الدراسات وجود علاقة وثيقة بين العمر والصفات الجسدية للجسم وكذا قياسات الخصية ومحيط الصفن إلى جانب مستوى هرمون الذكورة ومعامل الرغبة الجنسية مع خصائص السائل المنوى .

أوضحت الدراسة بأن ذكور المعز الزرايبى المستخدمة فى أغراض التناسل كتيوس تربية يجب ألا يقل عمرها عن سنتين أو ثلاثة حيث تتميز تلك المرحلة بصفات جسدية وهرمونية عالية تؤدى لتحسين خصائص السائل المنوى مما يجعل تلك الذكور أكثر صلاحية لأغراض التناسل .