ULTRASONOGRAPHIC VS VERNIER CALIPERIC EVALUATION OF TESTES AND ACCESSORY GLANDS IN ONGOLE (*BOS INDICUS*) BULLS

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ABSTRACT

Breeding soundness evaluation was performed on 8 Ongole bulls aged between 3 to 5 years. The testicular biometry was compared between ultrasonography verses vernier measurements and trans-rectal ultrasonography was performed to evaluate the accessory sex glands. The mean body condition score was 6.63 ± 0.18. The overall mean scrotal circumference was 34.63 ± 0.21 cm and, it had a significant positive correlation with biometry of scrotum and testes, testicular volume, testicular weight and ejaculate volume (P<0.05). The testicular dimensions varied significantly between bulls (P<0.01). The overall mean testicular length, breadth and thickness measured by vernier calipers were recorded as 10.87 ± 0.08, 5.63 ± 0.05 and 5.28 ± 0.03 cm, respectively. The predicted volume of each testis was 159.15 ± 2.70 cm^3 and the predicted testicular weight was 168.18 ± 2.86 gm. The overall mean testicular length, breadth and thickness measured by ultrasonography were 10.66 ± 0.07, 5.42 ± 0.05 and 5.05 ± 0.03 cm respectively. The predicted volume of each testis of a pair was 143.06 ± 2.47 cm^3 and the predicted testicular weight was 151.18 ± 2.61 gm. The overall means of the ultrasonographic dimensions of seminal vesicle, ampullae, prostrate body and cauda epididymis were recorded as 1.58 ± 0.05, 0.61 ± 0.02, 1.19 ± 0.03 and 2.59 ± 0.03 cm respectively with highly significant difference between the bulls (P<0.01).

Key words: Ongole bulls, Breeding soundness, Ultrasonography, Testicular biometry, Accessory sex glands.

INTRODUCTION

Andrological investigation of breeding bulls is important to evaluate their fertility and elimination of sub-fertile sires through study of scrotal and testicular biometry; ultrasonography of male reproductive tract and testes and laboratory evaluation of semen quality (Abdel-Razek and Ali, 2005). Scrotal circumference and testicular volume have direct influence on sperm production and semen quality. Trans-scrotal ultrasonography allows assessment of palpable and non-palpable testicular lesions and is a useful, non-invasive and non-harmful method in selecting good breeding bulls (Chapwanya *et al.*, 2008). Perusal of literature revealed scanty information on comparative studies on ultrasonography verses vernier measurements to evaluate breeding soundness of Ongole bulls.

MATERIAL AND METHODS

In the present study 8 bulls aged between 3 and 5 years which were housed in individual pens and maintained under scientific and uniform conditions of feeding and management were utilized. Body condition scores were recorded as per the method described by Nicholson and Butterworth, (1986). The scrotal

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circumference was measured in centimeters (cm) by using a measuring tape. The testicular length, width and depth were measured by caliper to nearest 0.1 cm as described by Abdel-Razek and Ali (2005). Great care was taken to exclude the epididymis while measuring the length. All the tape and caliper measurements *in-vivo* were repeated for 6 occasions at 15 day intervals. After recording the actual testicular length and width their averages are calculated and the predicted volume (cm^3) of each testis of a pair was calculated by the formula for a prolate spheroid volume=$0.5236(L)(W)^2$ while the predicted testicular weight (gm) was calculated by the formula weight=$0.5533(L)(W)^2$ as per the method of Bailey *et al.,* (1998).

The testes were scanned transcutaneously in transverse and longitudinal planes. While the thickness of tunica albugenia and mediastinum testis were examined from a longitudinal plane. The tail of epididymis was visualized from a diagonal plane near the distal end of testis. A 5/7 MHz linear array transducer connected to B-mode ultrasound scanner (SA-600V; Medison Co Ltd, Seoul, Korea) was used for all the procedures with a 4 cm standoff and gridline. The testicle was measured from the proximal pole to the gridline at the approximate midline of the testicle and then from this midline to the distal end, the summation of the 2 values yielded the testicular length. All the measurements are read to the nearest 0.1 cm as per the procedure described by Bailey *et al.,* (1998). Transrectal ultrasonography was conducted to record echogenic pictures of the pelvic genitalia including ampullae, bulbourethral gland, pelvic urethra, pars disseminate and body of prostate as well as the seminal vesicles as per the procedure described by Abdel-Razek and Ali (2005). After freezing the image all the ultrasound assisted measurements *in-vivo* were repeated on 6 occasions at 15 day intervals. The observations were recorded and analyzed by one-way analysis of variance and correlation as per the methods described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The results are presented in Table 1. The overall mean body condition score (BCS) was 6.63 ± 0.18 which was positively correlated, albeit non significantly, with the biometry of testes, dimensions of accessory sex glands, ejaculate characteristics and fertility of bulls. The mean body condition score recorded in this study was in agreement with the findings of Wildeus and Hammond (1993) in Holstein and Senepol bulls but much higher than the reports of Shelke and Dhami (2002) in Gir bulls. Factors like age, breed and nutritional status might have contributed to the recorded variation in body condition score (Chacon *et al.,* 2002). The overall mean scrotal circumference (SC) was 34.63 ± 0.21 cm and, it differed significantly between the bulls ($P<0.01$). Scrotal circumference had a significant positive correlation with biometry of scrotum and testes, testicular volume, testicular weight and ejaculate volume ($P<0.05$). The scrotal circumference recorded in the present study was in agreement with that of Dhami *et al.,* (2001) in Gir breeding bulls; Thirumala Rao (2005) in Ongole bulls and Mathur *et al.,* (2006) in Frieswal bulls.

The overall mean testicular length (L), breadth (B) and thickness (T) measured by vernier calipers were recorded as 10.87 ± 0.08, 5.63 ± 0.05 and 5.28 ± 0.03 cm, respectively. The predicted volume of each testis was 159.15 ± 2.70 cm^3 and the predicted testicular weight was 168.18 ± 2.86 gm. The testicular dimensions varied significantly between bulls ($P<0.01$). The testicular biometry measured by vernier calipers exhibited significant positive correlation with ultrasonographic measurements of the testes, accessory sex glands, ejaculate volume and live sperm per cent ($P<0.05$). The mean testicular length, breadth and thickness values measured by vernier calipers and the predicted testicular volume of each testis and testicular weight were in agreement with the observations of Tandle *et al.,* (1998) in Deoni bulls and Sundararaman *et al.,* (2002) in Jersey bulls. On the contrary, Dhami *et al.,* (2001) in Gir bulls; Shelke and Dhami (2002) in Gir bulls and Thirumala Rao (2005) in Ongole bulls recorded higher testicular biometry values which might be due to age, breed, season and locational differences.

The overall mean testicular length (L), breadth (B) and thickness (T) measured by ultrasonography were

recorded as 10.66 ± 0.07, 5.42 ± 0.05 and 5.05 ± 0.03 cm respectively. The predicted volume (T Vol) of each testis of a pair was 143.06 ± 2.47 cm^3 and the predicted testicular weight (T Wt) was 151.18 ± 2.61 gm. Testicular biometry was significantly positively correlated with ultrasonographic measurements of seminal vesicles (P<0.01), ejaculate volume (P<0.05) and live sperm percent (P<0.05). Testicular biometry was significantly positively correlated with ultrasonographic measurements of the testes, accessory sex glands, ejaculate volume and live sperm per cent (P<0.05) which is an indicator for sperm producing capacity of the bull. At times scrotal circumference may not be a true representation of testicular mass as season or ambient temperature and fat deposits influence the size and shape of the scrotum. Hence the use of a specialized non-invasive diagnostic technique like trans-scrotal ultrasonography which gives the precise measurement of the testes can be recommended (Barth *et al.,* 2008).

The overall means of the ultrasonographic dimensions of seminal vesicle (SV), ampullae (Amp), prostrate body (Prost) and cauda epididymis (Cauda Epi) were recorded as 1.58 ± 0.05, 0.61 ± 0.02, 1.19 ± 0.03 and 2.59 ± 0.03 cm respectively with highly significant difference between the bulls (P<0.01). Seminal vesicle dimensions revealed significant positive correlation with ejaculate volume (P<0.01) and live sperm per cent (P<0.05). Ampulla showed a significant positive correlation with dimensions of prostate body where as prostate body had a highly significant positive correlation with individual motility (P<0.01) and non significant positive correlation with ejaculate volume and live sperm percent. Cauda epididymis had a significant positive correlation with both ejaculate volume and individual motility (P<0.05) but a non-significant positive correlation with live sperm per cent. Testicular biometry was significantly positively correlated with ultrasonographic measurements of seminal vesicles (P<0.01), ejaculate volume (P<0.05) and live sperm per cent (P<0.05) which are in accordance with the findings of Cartee *et al.*(1989) in Hereford bulls who observed that ultrasonographic and physical measurements of testicular diameter in Hereford bulls had correlation with testicular circumference, weight and volume and Abdel – Razek and Ali (2005) in Friesian bulls reported that all the three dimensions of the testes showed significant increase with advancement of age and had a positive correlation with scrotal circumference, bulbourethral gland and seminal vesicles. The testicular parameters measured by ultrasonography had a non-significant positive correlation with fertility. Seminal vesicle had a positive and highly significant correlation with ejaculate volume (P<0.01) and significant correlation with live sperm per cent (P<0.05) and a non-significant positive correlation with fertility. Ampulla had a significant positive correlation with dimensions of prostate body and non-significant positive correlations with ejaculate volume, live sperm per cent and fertility. Prostate body had a highly significant positive correlation with individual motility (P<0.01) and non-significant positive correlation with ejaculate volume, live sperm per cent and fertility. Cauda epididymis had a significant positive correlation with ejaculate volume, individual motility (P<0.05) and a non-significant positive correlation with live sperm per cent and fertility.

Collectively all the above findings revealed that the dimensions of the testis, accessory sex glands and cauda epididymis reflect on ejaculate volume, individual motility, live sperm per cent and fertility suggesting that better quality semen could be obtained from bulls with larger accessory sex glands as their secretions primarily act as carriers of spermatozoa and also stimulate sperm motility.

The results of the present study suggest that testicular volume could be considered for selection of young breeding bulls as it had shown a significant positive correlation with ultrasonographic dimensions of accessory sex glands, ejaculate volume and live sperm percent that indicates the superior quality of semen ejaculated. Instead of age and body weight, scrotal circumference alone or in combination with testicular volume could be used practically for selection of young bulls to predict the semen production ability of the breeding bulls (Chaudhari *et al.,* 2007) and ultrasonography a specialized non-invasive diagnostic technique could be used to diagnose deep seated fibrotic or necrotic lesions, or to visualize the seminiferous

tubule area and pathology of the accessory sex glands (Barth *et al.,* 2008).

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