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Scrotal Circumference and its Relationship with Testicular Growth, Age, and Body Weight in Murrah Buffalo Bulls

V.H. Shende*, S.H. Sontakke, V.V. Potdar, Tejsjree V. Shirsath and J.R. Khadse

BAIF Development Research Foundation, Central Research Station, Urulikanchan, Pune – 412 202, Maharashtra, India

**Corresponding author*

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A B S T R A C T

The present study was undertaken to assess the relationship between the scrotal circumference and testicular parameters with body weight and age in Murrah bulls which were maintained at Central Research Centre of BAIF Development Research Foundation, Urulikanchan, Pune, Maharashtra, India. A total of 47 bulls of Murrah of different age group were selected and divided into four groups according to their age namely, Group I: 18–24 months (n = 7), Group II: 25–36 months (n = 26), Group III: 37–48 months (n = 14) months. The scrotal circumference and testicular parameters were measured with caliper and tape and age of animals was calculated with dental formula. The body weight of bulls was estimated with Shaeffer's formula. Result revealed that the scrotal circumference was highly correlated with testicular parameters age and body weight. The results of the present study in revealed that scrotal circumference is a useful indicator and is an important selection criterion to determine the testicular development and breeding soundness in young bulls as it is highly correlated with testicular parameters. The body weight was significantly ($P<0.01$) and positively correlated with scrotal circumference ($r=0.82$) .The overall mean (±SE) scrotal circumference of Murrah bulls were ranges between 24.68 ± 1.03 to 24.84 ± 1.47 cm. A significant ($P<0.01$) variation in scrotal circumstance was reported among the bulls.

Introduction

Bull is considered as half of the herd, as it contributes 50% of the genetic potential of the entire calf (Bhosrekar, 2005). For years producers and researchers have emphasized the role of bulls in cattle breeding operations. The reproductive function of the bulls depends upon sexual desire, mating ability, production and deposition of semen. The bull is half of the herd in animal husbandry, which indicates that the sire is one of the parents of all the calves in the herd. Methods to predict sperm production potential and particularly to identify the bulls with high sperm output potential at an early age are important, which is related with testicular parameters and scrotal circumference. Scrotal circumference

is one of the parameters assessed during clinical examination, which is part of a reproductive evaluation of a bull. Bulls play a key role in calf production and represent an important source of bioeconomic capital in this activity. However, 15 to 25% of bulls can have fertility problems due to various causes (physical condition, testicles, foreskin, musculoskeletal system, penis, etc) (Vale Filho, 1997; Moraes *et al.,* 1998; Menegassi *et al.,* 2006; 2008).Lunstra *et al.,* (1988) selected bulls with larger testicles and found a heritability of 41% for age at puberty in their daughters and for scrotal circumference in half-brothers, while Van Melis (2010) found 53% and 42% for these characteristics. Therefore, increased precocity based on the selection of bulls for larger scrotal circumference may enhance the precocity of their progeny (Gressler *et al.,* 2000).

Materials and Methods

Measurement of scrotal circumference is important because it assesses testicular volume and is highly correlated with sperm output. Considering that this measurement is easy to perform and accurate, it can be used for the selection of young bulls. The aims of this study were to quantify the variability of scrotal circumference in Murrahbulls. Scrotal circumference (SC) is frequently used in breeding programs because of its easy measurement, high repeatability and moderate to high heritability. It is also favorably associated with physical semen characteristics, age at puberty, sexual precocity and weight gain (Brinks, 1994). One way to describe testicular growth is using nonlinear regression models. The advantage of nonlinear models is that they can accommodate a large number of measurements in some parameters and, thus, permit appropriate biological interpretation (Loaiza-Echeverri *et al.,* 2013). The information available on age-related changes in testicular size, in water buffalo is limited and almost exclusively based on cross-sectional studies (Ahmad *et al.,* 2010). This information could assist in estimating the age at puberty and maturity at buffalo bulls and to establish some norms for breeding soundness evaluation of different breeds of buffalo raised in Brazil. The aim of the present study was to compare the scrotal circumference growth curve of three buffalo breeds using a nonlinear model.

The present study was undertaken in 47 Murrah buffalo bulls of different ages maintained at bull station, BAIF Development Research Foundation, Central Research Station, Uruli Kanchan. All the bulls were screened for testicular abnormality and then recorded testicular length, scrotal circumference Age. A flexible centimeter tape was used to measure the length and SC of testis and body weight is measured by weighing balance. The fully descended testes were cradled rather than grasping and length was measured from head of testis to the cauda for left and right separately by using flexible centimeter tape. Scrotal circumference was measured by using flexible centimeter tape.

The testicles were pushed to the bottom of the scrotum by holding the neck of scrotum and then measured SC at greatest diameter of the scrotal sac with the testes fully descended (Pant *et al.,* 2003). Healthy Murrah buffalo breeding bulls (n=47) in different age group were selected which were maintained at bull station, BAIF Development Research Foundation, Central Research Station, Uruli Kanchan. Bulls were housed in individual pens with the orientation of east-west direction through its long axis.

The bulls had free access to fresh drinking water throughout the day. All the Bulls were fed according to standard feeding schedule. The bulls were made to exercise, the day prior to semen collection in the rotator bull

exerciser. Vaccination, deworming and other herd health programme were followed as per the standard schedule

Scrotal circumference

The scrotal circumference measured by pulling the testicles firmly into the bottom of scrotum by placing the thumb and fingers laterally on the side of neck of the scrotum and pushing ventrally down. A scrotal circumference measuring tape was slipped over the widest portion of scrotum and scrotal circumference was measured in centimetres (Pant *et al.*, 2003).

Statistical analysis

The data were embedded into an Excel spreadsheet and for descriptive statistics. Statistical significance was set at 99%.The relationship among testicular, physical and semen quality parameters was calculated by using standard statistical method.

Results and Discussion

The results of different testicular parameters, scrotal circumference, and body weight at different age of Murrah bulls were presented in Table 1, which indicated that these parameters were significantly ($P< 0.05$) different between the age groups. It has been reported that the average scrotal circumference was 18.78 ± 3.47 in 18-24 age group, 24.84 ± 1.47 in 25 to 36 age group and 27.32 ± 0.55 in 37 to 48 age group it show as age increase there is increase in scrotal circumstance.

In the body weight wise study average body weight in 18-24 age group was 369.71 ± 7.54 kg average body weight in 25 to 36 age group was 420.46 ± 10.64 kg while average body weight in 37 to 48 age group was 428.29 ± 14.90 kg it show as age increases there is increase in body weight of animal. In the age wise study average age in 18-24 age group was 22.43 ± 0.94 month average age in 25 to 36 age group was 30.85 ± 0.75 month while average age in 37 to 48 age group was 40.14 ± 0.66 month. Patrícia Aparecida Cardoso da LUZ (2013) reported similar finding of scrotal circumstance in Murrah Breeding bulls in Brazil. Same findings were reported by Perumal (2014).

Measurements of the testis were correlated with each other ($P< 0.01$) as in exotic cattle reported by Hahn *et al.,* (1969) and Pant *et al.,* (2003) reported same in buffalo (Table 2). Bodyweight, Scrotal circumference were highly correlated with the various testicular measurements than age. Scrotal circumference was a simple measurement to obtain; maximum circumference is reached at 37 to 48 months age and remains relatively constant thereafter.

These results indicate that scrotal circumference is a useful indicator and is an important selection criterion to determine the testicular development in young bulls. In the present study, the results revealed that scrotal circumference of Murrah bulls have been highly correlated with testicular parameters. Thus, measurement of scrotal circumference in Murrah bulls can be useful to predict the testicular parameters and can be used in breeding centre to select suitable breeding male for artificial breeding purpose.

In the present study, the mean value of scrotal circumference in 25–36months age group was significantly ($P< 0.01$) higher than in 18–24 months age group. It has been observed in the present study that SC was increased rapidly in young bulls and gradually in mature bulls. In conclusion, present results indicate scrotal circumference in Murrah bulls is a useful indicator of breeding soundness and should be used as an important criterion for selection of young bulls for breeding purpose.

Table.1 Mean, standard error and standard deviation of scrotal circumference for Murrah Buffalo bulls at the different ages

AGE group (Month)	Particular	Scrotal circumference (cm)	left testicle (cm)	Right Testicle(cm)	AGE(month)	Body Weight (KG)
18 to 24	Mean	18.78 ± 3.47	10.07 ± 1.71	10.00 ± 1.98	22.43 ± 0.94	369.71 ± 7.54
	N	7	7	7	7	7
	Std. Deviation	9.18	4.55	5.25	2.50	19.95
25 to 36	Mean	24.84 ± 1.47	11.25 ± 0.53	11.25 ± 0.67	30.85 ± 0.75	420.46 ± 10.64
	N	26	26	26	26	26
	Std. Deviation	7.52	3.22	3.45	2.37	54.25
37 to 48	Mean	27.32 ± 0.55	12.96 ± 0.61	12.39 ± 0.46	40.14 ± 0.66	428.29 ± 14.90
	N	14	14	14	14	14
	Std. Deviation	2.09	2.29	1.73	2.44	55.77
Total	Mean	24.68 ± 1.03	11.58 ± 0.48	11.40 ± 0.49	32.36 ± 0.98	415.23 ± 7.87
	N	47	47	47	47	47
	Std. Deviation	7.10	3.29	3.39	6.73	53.97

Table.2 Correlation coefficients between scrotal circumferences, age, body weight, and various testicular measurements in bulls

Correlations	Scrotal circumference	left testicle (cm)	Right Testicle(cm)	Age	Body Weight
Scrotal Circumference	1	0.847**	0.838**	0.763**	0.825**
Left testicle (cm)	0.847**	1	0.917**	0.700**	0.851**
Right Testicle(cm)	0.838**	0.917**	1	0.729**	0.773**
Age	0.763*	0.700**	0.729**	1	0.307**
Body Weight	0.825**	0.851**	0.773**	0.307**	1
** Correlation is significant at the 0.01 level					

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