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CORRELATION OF AGE WITH BODY WEIGHT AND TESTICULAR BIOMETRY IN DEVELOPING BUFFALO MALES OF MURRAH BREED

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ABSTRACT

The current investigation was conducted on one hundred and eighty Murrah buffalo male calves from the age of one to thirty months, to investigate the correlation of age with body weight and testicular biometry. Six animals were included in each month. The body weight (b. wt) of the male calves was recorded on the weight bridge balance and the circumference of scrotum was measured by inch tape. The testicular dimensions were measured ultasonographically. Mean body weight from one to thirty month ranged between 57.0±1.99 and 433.0±9.81 kg. It increased 12.52 kg per month. The mean testicular circumference at 1, 12, 18 and 30 months was 9.00±00, 20.25±0.64, 21.42±0.64 and 26.67±0.42 cm, respectively. The overall increase in testicular circumference from one to thirty months was 0.59 cm per month. The mean length of right testes at one month was 2.89±0.15 cm and at eighteenth month was 6.87±0.27 cm. It increased in parallel pattern with b.wt and age. The width of right testes ranged between 1.01±0.05 to 4.53±0.211 cm. The length of left testes from one to eighteen month ranged between 2.73±0.19 to 6.49±0.10 cm with an increase of 0.21 cm per month. Similarly, the mean width of left testes ranged between 1.12±0.02 to 4.61±0.17 cm and significantly increased 0.12 cm/month. The data obtained in the current extensive study may serve as reference values for Murrah buffalo bulls.

Keywords: *Bubalus bubalis*, buffaloes, body weight, biometry, scrotal circumference, testicular length, width

INTRODUCTION

Buffalo through their inherent potential for milk production, meat and draftability, devote indispensably to the agrarian economy of India and one of the main limiting factors in augmenting the productivity of buffalo is seasonality of reproduction and inherent reproductive issues. The total bubaline population in the nation is 109.85 million revealing a hike of about 1.0% over last Livestock Census and approximately 20.5% of the total livestock is attributed by buffaloes (Basic Animal Husbandry Statistics, 2019). Identification

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and rearing of young males at an early age is imperative for profit-making semen production units. Selection needs detailed assessment of male calves from an early age and breeding bulls are usually chosen for their physical attributes and testicular parameters. Therefore, selecting breeding bulls at earlier age reduces managerial expenses and improves reproductive potential of bulls. Breeding soundness evaluation of bull is attempted to select the future sires which ultimately aims the genetic gain in the herd. Methodologies to assess spermatozoal output potential and specially to recognize the bulls with better quality semen output at an early age are requisite, which is related with testicular dimensions and circumference of scrotum (Perumal, 2014). Assessment of weight of testis (and a proxy for it; circumference of testis) should be included as a component of breeding soundness evaluation (Barth, 2007) and is globally recognised as an indicator of spermatozoal output (Gipsona *et al*., 1985). Morphological studies of testes of bulls are essential in relating not only spermatozoal production but also the fertilizing capability of breeding bulls. Likewise, the testicular circumference is an estimate of current and future spermatozoal production potential in breeding males in domestic animals (Togun and Egbunike, 2006). Hence, proper action plan for identifying future breeding bulls is very necessary in breeding programmes (Crudeli *et al*., 2007). As per the the Society for Theriogenology (SFT), bull breeding soundness evaluation includes examination of general health and external and internal genitalia, scrotal circumference correlated with age, sperm morphological and kinematic studies (Alexander, 2008).

Assessment of circumference of scrotum is an indirect but a good parameter for assessing the age, seminal quality, total semen output, testicular affections, weight of testis and fertility of sires (Ahmad *et al*., 2005); while testicular dimensional studies reveal sperm producing capacity in post-pubertal age of young males (Siddiqui *et al*., 2008). Likewise, scrotal circumference (SC), body weight and age are correlated in males in domestic animals (Raji *et al*., 2008). The Murrah buffalo bull is different than cow bull in many characteristics e.g. low daily sperm production rate, comparatively low epididymal sperm reserve and low semen volume (Sharma, 1987). The data on body and testicular dimensions have been well documented in young/growing cattle bulls. Further, the literature on young/growing buffalo bulls is scanty and particularly with Murrah breed of buffalo. The methods should be devised for forecasting future semen production in early age for profitable management provision. For this, there could be establishment of reference physical or ultrasonographic data on various testicular parameters and interrelationship with age and body weight. Therefore, the aim of the present study was to investigate the correlation of age with scrotal circumference, body weight and testiculo-morphometric analysis in Murrah buffalo males.

MATERIALS AND METHODS

Selection of animals

The present investigation was executed on one hundred and eighty Murrah buffalo males. The age of the calves was from one to thirty months. Six calves were included in each month. These calves were maintained at Sector 2, Government Livestock Farm (G.L.F.) Hisar, Haryana. The calves were at the foot of the elite Murrah buffalo bull mothers and were kept under standard managerial conditions.

Feeding and management

The calves of lactating mothers were allowed to suckle milk in the morning and evening at the time of milking. The calves of non-lactating buffaloes were stall fed. The calves above 1 to 2.5 year of age were let loose in their own herd for open grazing as well on a large open field. They were also offered concentrates prepared at sector, G.L.F, Hisar as well as purchased from Haryana State Co-operative Supply and Marketing Federation Ltd. The green fodder was provided round the year and the wheat straw was provided in their manger *ad-lib*. The fresh drinking water was also supplied *ad-lib* to their access throughout the day.

Measurement of SC

The body weight of the bull calves was recorded on weigh bridge balance before ultrasonographic measurements. The scrotal circumference was recorded following as per the method described by SFT (Chenoweth *et al*., 2010). At the point of widest circumference, the tape was tightened manually with mild pressure on the scrotum and the measurement was noted down, whereas other testicular dimensions were measured ultrasonographical.

Ultrasonographic scanning

An ultrasound machine (Scanner-200 Vet, Philips Pie Medical, The Netherlands), conjuncted with a rectal probe with dual frequency of 5.0 and 7.5 MHZ was used for recording testicular dimensions. The linear probe's contact surface was lubricated with a coupling gel at the time of ultrasonographic measurement of testicular dimension in the dark room.

Statistical analysis

Data of all the measurements of body weight, scrotal circumference as well as ultrasonographic measurements of testes were subjected for SPSS test method for analysis of mean, standard deviation, and Correlation coefficient for all parameters.

RESULTS AND DISCUSSIONS

Body weight

The average body weight at one month of age was 57.5±1.99 kg, whereas at thirty month of age it was 433.0±9.81 kg (Table 1). The overall per month increase in the body weight from one to thirty month was 12.52 kg per month. The mean body weight (b.wt) among all five blocks 1, 2, 3, 4 and 5 of six month each was 85.89±4.68, 191.64±6.38, 82.69±4.34, 300.86±5.05 and 369.89±7.07 kg, respectively and it was significantly ($P<0.05$) different among each other. The b.wt of 4^{th} month was significantly higher than the first three months. The mean b.wt of 5^{th} and 6^{th} month was significant from first four months. The mean b.wt of 12^{th} month was significant ($P<0.05$) from the mean b.wt of all 7^{th} to 11^{th} month. In 3^{rd} block the mean b.wt between 13^{th} and 14^{th} month was non-significant, whereas it was significantly ($P<0.05$) different from mean b.wt of 15^{th}, 16^{th}, 17^{th} and 18^{th} month. The mean b.wt among 15^{th}, 16^{th} and 17^{th} month was also non-significant, but it was different ($P<0.05$) from others within the block. The mean b.wt of 18^{th} month was significantly ($P<0.05$) higher from all within the block. In 4^{th} block the mean b.wt of 19^{th}, 20^{th}, 21^{th} and 22^{th} month was not significant ($P<0.05$), similarly the mean b.wt between 23^{rd} and 24^{th} month was not significantly different, but different ($P<0.05$) from others in the block. The b.wt of 28^{th}, 29^{th} and 30^{th} month was significantly ($P<0.05$) higher among each other and with others

in the block. The mean increase in b.wt from 1 to 14 month was 14.88 kg per month and the rate of increase in b.wt during the tenure was significantly (P<0.05) more than overall rate i.e. 12.52 kg per month. The mean increase in b.wt from 15th month to 25th month was only 4.91 kg per month, indicating a lower significant (P<0.05) change as compared to the first fourteen month. The mean growth in the b.wt observed from 26th to 30th month was 17.4 kg per month which was highly significant (P<0.05) within the block of six months.

The correlation coefficient in the current investigation between age and b.wt was r^2=0.92. The results in the current investigation are in agreement with Perumal (2014) in Tho-Tho (*Bos indicus*), Viu *et al.* (2015) in Nellore bulls and Shende *et al.* (2019) in Murrah buffalo males. Chandolia *et al.* (1997) observed a b.wt growth 13.5 kg per two weeks in calves, which is higher than the present study (12.52 kg per month) and the reason may be the species difference. Similarly, Pant *et al.* (2003) reported correlation of age with body as r^2=0.72 whereas, in present correlation it was r^2=0.92 i.e. higher than Pant *et al.* (2003). The reason of this difference might be a better feeding and management practices. Further, the b.wt has a direct correlation with testicular development (Cardoso da Luz *et al*., 2013). Body and testicular growth in buffalo males increase linearly with age, similar to cattle males (Montes *et al*., 2007).

Testicular Circumference

The mean testicular circumference at one month of age was 9.00±00 cm. It was 26.67±0.42 cm at thirty month of age (Table 1). The overall increase in testicular circumference from 1 to 30 month was 0.59 cm/month. It was significant (P<0.05) among age groups of 1 to 30 month. In 4th block the mean testicular circumference of 19th, 20th and 21st month was not significant among each other, whereas the mean testicular circumference of 22nd, 23rd and 24th month was significantly different (P<0.05) among each other. From 1 to 7 month, the mean testicular circumference increased from 9.00±00 to 13.67±0.57 cm i.e. 0.67 cm per month. At eighth month, the mean testicular circumference was 15.33±0.84 cm, a sudden increase in mean testicular circumference of 1.66 cm in a month. At eleven months, it was 17.00±0.45 cm, but at twelfth month again a sudden increase of 3.25 cm observed. From twelve (20.25±0.64 cm) to twenty-fifth (22.83±0.40 cm) month of age a lower significant (P<0.05) increase in the mean testicular circumference 0.18 cm per month was observed. From twenty-sixth (23.92±0.40 cm) to thirty months (26.67±0.42 cm) of age, the increase of mean testicular circumference 0.55 cm/month was observed.

The correlation coefficient between age and circumference of testis in the present study was r^2=0.88 and between b.wt and testicular circumference was r^2=0.94 i.e. highly significant. The finding of the current investigation is in accordance with earlier reports by Devkota *et al.* (2008) in Holstein bulls, Perumal (2014) in Tho-Tho bulls (*Bos indicus*) and Varghese *et al.* (2019) in Deoni bulls. The present study directly indicates that reproductive development is very fast up to first eighteen months, and then it increased little bit slow in Murrah buffalo bull calves. This is in agreement with Pant *et al.* (2003); Sudheer (2000). Scrotum circumferences increase linearly from birth to 25 to 30 months of age and then plateau afterwards (Ahmad *et al*., 2011). The mean values recorded for scrotal circumference in this study were higher than reported by Henry *et al.* (2013) in Jaffarabadi (11.57 cm), Murrah (14 cm) and Mediterranean male calves (16.2 cm) up to

12 months of age. Cardoso da Luz *et al.* (2013) obtained 25.30 cm average SC at 24 months with a sample of three specimens which is higher than the current investigation. Among the listed causes of variation in testicular dimensions include age of male animal, breed, managerial conditions, year and season of recording (Brito *et al*., 2002). SC is a simple repeatable method of recording of testicular size which is positively correlated with testicular weight, seminal quality, and with sperm robustness (Waldner *et al*., 2010). As SC has been documented to be heritable trait (Sylla *et al*., 2007), therefore, it is being advocated for incorporation into managerial and breeding soundness evaluation.

Length of right testis

The mean length of right testes ranged 2.89±0.15 cm to 6.87±0.27 cm from one month to eighteen months of the study (Table 1). The measurement of length of right testes above 18th month onwards was not possible because of the limitation of probe length of the ultrasound machine. The change in the mean length of right testes at 1st, 2nd and 3rd blocks of six month each was significantly (P<0.05) varying among each other. The length of right testes at 6th month was significantly higher than all others in the block of study. The length of right testes between 5th and 6th month was significantly (P<0.05) varied. The average length of right testes of 11th and 12th month was significantly (P<0.05) different between each other and with others in the block. The overall length of right testes from one to eighteen month increased significantly(P<0.05) 0.22 cm/month. The mean change in length of right testes from 1 (2.89±0.15 cm) to 4 month (3.43±0.26 cm) was 0.14 cm/month. The mean length of right testes from five (3.81±0.16 cm) to eighteen month was 6.87±0.27 cm. It increased (P<0.05) 0.23 cm/month.

The coefficient of correlation between age and length of right testes in the present study was r^2=0.85 and between body weight and length of right testes was r^2=0.87 i.e. highly significant with age and b.wt. Jain (2004) in Sahiwal and Karan Fries bulls, Mahmood *et al.* (2014) in Cholistani bulls and Varghese *et al.* (2019) in Deoni bulls also documented a positive correlation between b.wt and testicular length. Further, Siqueira *et al.* (2012) recorded length of right testicles as 11.40±0.59 cm in young Nellore males with average age of 21.29 months. But, in the current study the testicular length could not be measured after 18 months of age due to limitation of length of probe of the ultrasound machine.

Width of right testis

The mean width of right testes ranged from 1.01±0.05 cm to 4.53±0.21 cm in this study. It increased significantly (P<0.05) 0.12 cm per month (Table 1). The change in the width of right testes among all five blocks of six month was significantly (P<0.05) higher. In 2nd block the width of right testes between 7th and 8th month was non-significantly different, but significantly (P<0.05) different with others in the block. It was also non-significant among 9th, 10th, 11th and 12th month, but significantly (P<0.05) different with others in the block. In 3rd block the width of right testes between 13th and 14th and among 15th, 16th, 17th and 18th month was non-significant (P>0.05), but significantly different (P<0.05) with others in the block. The pattern of change in the width of right testes from 1 month (1.01±0.05 cm) to 8th month (1.74±0.11 cm) was 0.09 cm/month. The change in the width of right testes from 9th month (2.12±0.11 cm) to 24 month (3.21±0.21 cm) was 0.07 cm per month, still lower than overall mean. The mean width of right

testes from 25th month (3.66±0.16 cm) to 30th month (4.53±0.21 cm) increased significantly (P<0.05) 0.15 cm/month.

The coefficient of correlation between age and width of right testes in the present study was r^2=0.89 and between body weight and width of right testes was r^2=0.89 i.e. highly significant with age and b.wt. The findings obtained in the present study are corroborated by Galmessa (2002) in Sahiwal and Karan Friesian bulls, Abdel-Razek and Ali (2005) in Friesian bulls and Varghese *et al.* (2019) in Deoni bulls. Siqueira *et al.* (2012) recorded width of right testicles as 6.14±0.27 cm in young Nellore males with average age of 21.29 months which is higher than our findings. The difference is due to breed difference as the testicular measurement of Murrah buffalo bulls are lower than the of cattle bulls (Pant *et al.*, 2003).

Length of left testis

The mean length of left testes ranged from 2.73±0.19 cm to 6.49±0.10 cm in the present investigation (Table 1). It increased 0.21 cm per month. The change in the mean length of left testes in 1st, 2nd and 3rd blocks of six month each was significant (P<0.05) among each other. The measurement of length of left testes above 18th month onwards was not possible because of the limitation of probe length of the ultrasound machine. At 9th month the length of left testes was significantly (P<0.05) different with others in the block. Among 10th, 11th and 12th month the length of left testes was not significantly (P>0.05) different, but it was also significantly (P<0.05) different with others in the block (P<0.05). The length of left testes from 1st (2.73±0.19 cm) to 4th month (3.67±0.13 cm) increased 0.24 cm/month and from 5th month (3.85±0.21 cm) to 18th month (6.49±0.10 cm), it increased significantly (P<0.05) 0.19 cm/month.

The coefficient of correlation between age and length of left testes in the present study was r^2=0.88 and between body weight and length of left testes was r^2=0.90 i.e. highly significant with age and b. wt. The findings of the current investigation agree with the findings of Suri (1993) in Karan Swiss bulls and Murrah buffalo male calves, Torres-Junior and Henry (2005) in Guzerat breed (*Bos taurus indicus*), Mathur *et al.* (2006) in Frieswal bulls and Varghese *et al.* (2019) in Deoni bulls. Siqueira *et al.* (2012) reported length of left testicles as 11.37±0.60 cm in young Nellore males with average age of 21.29 months. But, in the current study the testicular length could not be measured after 18 months of age due to limitation of probe length of the ultrasound machine.

Width of left testis

The mean width of left testes ranged from 1.12±0.02 cm to 4.61±0.17 cm in the current study and increased significantly (P<0.05) 0.12 cm per month (Table 1). The change in the width of left testes among all five blocks (1, 2, 3, 4, 5) of six month each was significantly (P<0.05) varied among each other. The mean width of left testes at 6th month of age was not significantly (P<0.05) different with 2nd, 3rd, 4th and 5th month in the block (P<0.05). The width of the left testes increased from 1st month (1.12±0.02 cm) to 8th month (1.86±0.07 cm) i.e. 0.09 cm/month. The change in the width of left testes from ninth month (2.00±0.14 cm) to twenty-four months (3.22±0.07 cm) was 0.08 cm per month. The mean width of left testes from twenty-fifth months (3.67±0.11cm) to thirty month (4.61±0.17 cm) increased significantly (P<0.05) 0.16 cm per month. It was significantly (P<0.05) higher than the overall change from 1st to 30th month (P<0.05).

The coefficient of correlation between age

Table 1. Relationship of testicular biometry with age and body weight in Murrah buffalo males.

Block**	Age (Months)	Body weight* (Kg)	Circumference* (cm)	Right testes length* (cm)	Right testes width* (cm)	Left testis length* (cm)	Left testis width* (cm)
1^{A}	1	57.5±1.99^{a}	9.00±0.00^{a}	2.89±0.15^{a}	1.01±0.05^{a}	2.73±0.19^{a}	1.12±0.02^{a}
	2	62.0±2.65^{ab}	9.42±0.42^{a}	3.15±0.18^{ab}	1.67±0.02^{ab}	3.13±0.07^{ab}	1.20±0.05^{ab}
	3	76.0±4.59^{ab}	11.20±0.64^{b}	3.30±0.10^{ab}	1.26±0.07^{abc}	3.44±0.13^{bc}	1.35±0.13^{ab}
	4	82.5±6.36^{b}	11.33±0.33^{b}	3.43±0.26^{bc}	1.27±0.05^{abc}	3.67±0.13^{c}	1.38±0.08^{ab}
	5	108.8±8.72^{c}	12.92±0.33^{c}	3.81±0.16^{c}	1.44±0.07^{bc}	3.85±0.21^{c}	1.40±0.04^{ab}
	6	128.5±2.15^{c}	13.50±0.50^{c}	4.39±0.20^{d}	1.58±0.08^{c}	4.34±0.12^{d}	1.54±0.06^{b}
2^{B}	7	141.5±3.76^{a}	13.67±0.57^{a}	4.50±0.26^{ab}	1.59±0.05^{a}	4.43±0.18^{ab}	1.66±0.12^{ab}
	8	162.3±7.14^{a}	15.33±0.84^{b}	4.81±0.27^{abc}	1.74±0.11^{a}	4.76±0.08^{ab}	1.86±0.07^{abc}
	9	196.7±6.56^{b}	16.83±0.71^{c}	4.98±0.24^{bc}	2.12±0.11^{b}	4.86±0.17^{b}	2.00±0.14^{bc}
	10	201.8±5.04^{b}	16.92±0.69^{c}	5.30±0.26^{cd}	2.20±0.09^{b}	5.41±0.23^{c}	2.19±0.15^{cd}
	11	207.5±6.67^{b}	17.00±0.45^{c}	5.32±0.21^{cd}	2.25±0.11^{b}	5.48±0.12^{c}	2.25±0.09^{cd}
	12	230.5±9.21^{c}	20.25±0.64^{d}	5.61±0.20^{d}	2.49±0.08^{b}	5.71±0.20^{c}	2.54±0.12^{d}
3^{C}	13	249.3±10.66^{a}	20.50±0.55^{a}	5.87±0.11^{a}	2.53±0.07^{ab}	6.15±0.12^{a}	2.66±0.14^{a}
	14	265.8±5.63^{ab}	20.83±0.79^{a}	6.15±0.30^{ab}	2.59±0.05^{ab}	6.26±0.21^{a}	2.86±0.13^{a}
	15	280.2±2.28^{bc}	20.83±0.40^{a}	6.37±0.09^{bc}	2.68±0.09^{b}	6.33±0.09^{a}	2.83±0.08^{a}
	16	286.5±7.86^{bc}	21.00±0.52^{a}	6.44±0.15^{bc}	2.69±0.10^{b}	6.36±0.21^{a}	2.86±0.09^{a}
	17	289.7±6.98^{bc}	21.17±0.48^{a}	6.68±0.18^{c}	2.77±0.16^{b}	6.43±0.08^{a}	2.88±0.05^{a}
	18	298.7±3.05^{c}	21.42±0.64^{a}	6.87±0.27^{c}	2.82±0.10^{b}	6.49±0.10^{a}	2.90±0.19^{a}

Note: The measurement of the testicular length after 18 months of age was not possible due to limitation of probe length of the ultrasound machine

*Superscript small alphabets denote significant difference within all groups of six months ($P<0.05$) in a column.

**Superscript capital alphabets denote significant difference among all five blocks ($P<0.05$) in a column.

Table 1. Relationship of testicular biometry with age and body weight in Murrah buffalo males. (Continue)

Block**	Age (Months)	Body weight* (Kg)	Circumference* (cm)	Right testes length* (cm)	Right testes width*(cm)	Left testis length* (cm)	Left testis width* (cm)
4^{D}	19	301.8 ± 11.86^{ab}	21.50 ± 0.50^{abcd}	-	2.90 ± 0.12^{abcd}	-	2.92 ± 0.11^{ab}
	20	305.3 ± 9.44^{ab}	21.67 ± 0.67^{abcd}	-	2.97 ± 0.18^{abcd}	-	2.99 ± 0.26^{ab}
	21	307.3 ± 1.54^{ab}	21.83 ± 0.40^{abcd}	-	3.02 ± 0.14^{bcd}	-	3.11 ± 0.17^{b}
	22	311.7 ± 13.04^{ab}	22.17 ± 0.60^{bcd}	-	3.11 ± 0.09^{cd}	-	3.13 ± 0.15^{b}
	23	318.7 ± 12.63^{b}	22.33 ± 0.49^{cd}	-	3.14 ± 0.17^{cd}	-	3.21 ± 0.09^{b}
	24	321.7 ± 8.66^{b}	22.67 ± 0.33^{d}	-	3.21 ± 0.21^{d}	-	3.22 ± 0.07^{b}
5^{E}	25	329.3 ± 9.80^{a}	22.83 ± 0.40^{a}	-	3.66 ± 0.16^{a}	-	3.67 ± 0.11^{a}
	26	346.0 ± 11.64^{ab}	23.92 ± 0.20^{ab}	-	3.87 ± 0.22^{ab}	-	3.68 ± 0.05^{a}
	27	350.8 ± 5.40^{ab}	$24.080.27^{ab}$	-	4.04 ± 0.15^{bc}	-	4.00 ± 0.16^{a}
	28	358.3 ± 7.40^{b}	25.17 ± 0.30^{bc}	-	4.27 ± 0.09^{cd}	-	4.39 ± 0.21^{b}
	29	401.8 ± 12.03^{c}	26.00 ± 0.36^{c}	-	4.39 ± 0.19^{cd}	-	4.43 ± 0.19^{b}
	30	433.0 ± 9.81^{d}	26.67 ± 0.42^{c}	-	4.53 ± 0.21^{d}	-	4.61 ± 0.17^{b}

Note: The measurement of the testicular length after 18 months of age was not possible due to limitation of probe length of the ultrasound machine

*Superscript small alphabets denote significant difference within all groups of six months ($P<0.05$) in a column.

**Superscript capital alphabets denote significant difference among all five blocks ($P<0.05$) in a column.

and width of left testes in the present study was r^2=0.91 and between body weight and width of left testes was r^2=0.92 i.e. highly significant with age and b.wt. The finding of the present study agrees with the reports of Jain (2004) in Sahiwal and Karan Friesian bulls, Torres-Junior and Henry (2005) in the Guzerat bulls and Varghese *et al.* (2019) in Deoni bulls. Siqueira *et al.* (2012) recorded width of left testicles as 6.09±0.29 cm in young Nellore bulls with average age of 21.29 months which is higher than our findings. The difference is due to breed difference as the testicular measurement of Murrah buffalo bulls are lower than the of cattle bulls (Pant *et al*., 2003).

Kumar (2014) documented a significant variation in length between left and right testicle in buffalo males. The right testicular length, width and left testicular length and width are lower at 18 to 24 months of age than *Bos indicus* bulls as reported by Perumal (2014). This may be due to species variation. In the current investigation, the correlation among the various testicular parameters was in accordance with the findings in Sahiwal bulls (Ahmad *et al*., 2011) and buffalo (Bedi, 1980). High correlation was observed between testis size and SC and based on these collective evidence, testicular diameter along with SC are excellent markers of spermatogenic functionality (Almquist *et al*., 1976) and this can be used for breeding soundness examination in growing males/bulls of buffalo breed.

CONCLUSION

The Murrah buffalo bull is different than cow bull in many characteristics and the literature on body and testicular development has been well reported in cattle bulls. But, the data on buffalo males is scanty in literature, therefore, the current investigation was carried out on buffalo males from the age of one to 30 months. The overall increase in body weight and testicular circumference was 12.52 kg /month and 0.59 cm per/month, respectively. The length of right tests up to 18th month becomes almost two and a half time compared to one month. Similarly, the mean length of left testes from 1st month to 18th month increases 0.21 cm/month. Further, the width of right testes increases parallelly with age and b. wt. Further studies on relationship of age, b. wt and testicular biometry with seminal attributes in buffalo bulls are warranted.

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