

Original Research Article

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Studies on Linear Body Measurements of Red Kandhari Bullocks in their Breeding Tract of Maharashtra

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ABSTRACT

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Red Kandhari is one of the important breed of Marathwada region of Maharashtra State. The body measurements and body weight of Red Kandhari bullocks at more than 36 month of age were studied at different locations in the breeding tract. The body measurements play an important role in judging bullocks and often help in predicting probable value of the animals. The chest girth, body length and height are indicative of development of various body cavities, thus giving sufficient idea about development of vital organs. The body measurements indicate the skeletal growth of the animals. Body length and height at withers are the measures of bone growth while chest girth is a measure of development of muscles, bones and fat and it has close relationship with the live weight.

Introduction

Indian cattle population is an integral part of the agriculture. Thus the cattle occupy central position and are basis of the Indian rural livelihood security. The cattle biodiversity in India constitutes 40 well defined breeds of cattle, 13 breeds of buffaloes, 26 breeds of goat and 42 breeds of sheep (NBAGR, 2017). Red Kandhari is one of the important breed of Marathwada region of Maharashtra State. The Red Kandhari germplasm has very old and rich historical background. It is said that the breeding of cattle was taken up by the Royal

dynasty of king Somadeorai as far back as fourth century A. D. The cattle breed having red colour naturally acquires the name as Red Kandhari as it is sure that the breed would have been named by Raja Somadeorai in memory of his father as Raja Kanhar now misnomered as Red Kandhari (Chauhan *et al.*, 2008). The overall performance of animals depends on morphometric, productive and reproductive characteristics, which play an important role for evaluation of animal. The Red Kandhari breed is reared mainly for draught purpose. Animals are medium in size, strong, compact and good looking. Body

colour is dull red to almost dark brown. Cows are low milk producers and bullocks of the breed are preferred over the Deoni breed for better draught ability and smaller size (Pundir and Singh, 2008). Therefore, the present study has been conducted to study body measurements, body weight at different age groups and the block effect on various characteristics.

Materials and Methods

Selection of animals

The data on body measurements of 851 Red Kandhari bullocks respective of sex was collected by taking actual measurements of each individual in different villages as mentioned in Table 1. From each tehsils on an average 94 bullocks / individuals at more than 36 months of age of Red Kandhari bullocks were chosen randomly for present study.

Tools and Techniques of data collection

The basic instrument for the present study was measuring tape and visual examination. The data was collected by measuring different body part and also by the visual examination. Efforts were made to avoid mechanical error, while recording the measurements. Arrangement was made to stand the animal on even surface and in normal position at the time of recording body measurement. The body measurements were measured with the help of standard metallic tape. The body measurement was recorded in centimetre. The data on morphometric characteristics of Red Kandhari bullocks were collected by actual measurements and interview with the livestock owners with the help of questionnaire.

The collected data of 851 Red Kandhari bullocks on body measurements and body weights were subjected to the Least Squares Analysis Technique as outlined by Harvey

(1990). The body weights at various age groups in Red Kandhari bullocks were estimated by using Agarwal's formula as outlined below.

$$\text{Live body weight (in pound)} = \frac{\text{Length} \times \text{Chest Girth}}{Y}$$

Where,

Y= 9.0 if girth is less than 1.62 meters

Y= 8.5 if girth is between 1.62-2.00 meters

Y= 8.0 if girth is more than 2 meters

Results and Discussion

Body measurements and body weights of Red Kandhari bullocks at more than 36 months of age

Body weight

It is observed from Table 2 that the overall least squares mean for body weight of Red Kandhari bullocks at more than 36 months of age group was 302.92 ± 1.73 kg. The least squares means of body weight for D₁, D₂, D₃, D₄, and D₅ districts were 289.81 ± 4.00 , 297.16 ± 3.45 , 300.40 ± 3.07 , 305.20 ± 3.68 and 322.03 ± 4.94 kg, respectively. The least squares analysis of variance has revealed that highly significant (P<0.01) effect of districts on body weight of Red Kandhari bullocks at more than 36 months of age. Higher body weight was reported by Kakade (2013) as 436.64 ± 1.91 kg, Magar (2013) as 382.77 ± 3.15 kg, Nikam (2013) as 451.08 ± 3.46 kg, Shinde (2013) as 454.14 ± 3.37 kg and Das (2016) as 375.27 ± 5.29 kg in Red Kandhari bullocks, respectively. Lower body weight was reported by Shikalgar (2011) as 255.55 ± 3.79 kg in Khillar bullocks. The overall picture of body weight and body measurements of Red Kandhari bullocks at more than 36 months of

age may be attributed to the fact that these bullocks are reared in field condition in the breeding tract with almost all unfavourable feeding conditions during the present study as the Marathwada region was reeling under draught conditions resulting into the comparably lower morphometric performance. Hence it is concluded that geo-ecological situations of surveyed area and management practices followed there plays an important role on physical measurements parameters of Red Kandhari bullocks.

Chest girth

It is observed from Table 2 that the overall least squares mean for chest girth of Red Kandhari bullocks at more than 36 months of age group was 178.27 ± 0.46 cm. The least squares means of chest girth for D₁, D₂, D₃, D₄, and D₅ districts were 175.14 ± 1.07 , 181.81 ± 0.92 , 176.10 ± 0.82 , 175.48 ± 0.98 and 182.80 ± 1.32 cm, respectively. The least squares analysis of variance has revealed significant ($P < 0.05$) effect of districts on chest girth of Red Kandhari bullocks at more than 36 of age. Similar findings for chest girth were reported by Nikam (2013) as 179.86 ± 0.37 cm in Red Kandhari bullocks. Higher chest girth was reported by Shikalgar (2011) as 185.98 ± 1.15 cm in Khillar bullocks and lower chest girth was reported by Pundir and Singh (2008) as 169.70 ± 1.00 cm and Das (2016) as 171.73 ± 0.77 cm in Red Kandhari bullocks, respectively.

Body length

It is observed from Table 2 that the overall least squares mean for body length of Red Kandhari bullocks at more than 36 months of age group was 143.94 ± 0.51 cm. The least squares means of body length for D₁, D₂, D₃, D₄, and D₅ districts were 141.60 ± 1.18 , 138.89 ± 1.02 , 144.86 ± 0.91 , 146.30 ± 1.09 and 148.06 ± 1.46 cm, respectively. The least

squares analysis of variance has revealed significant effect of district on body length of Red Kandhari bullocks at more than 36 months of age. Similar findings for body length were reported by Gaikwad *et al.*, (1990) as 141.50 cm in adult age group of Red Kandhari bullocks. Higher body length was reported by Nikam (2013) as 151.39 ± 0.96 cm and lower body length was reported by Pundir and Singh (2008) as 118.20 ± 1.30 cm and Das (2016) as 137.44 ± 1.00 cm in Red Kandhari bullocks, respectively.

The lower value for body length than the present investigation, reported by various authors in Red Kandhari bullocks may be based on the study from different areas and management condition pattern followed in that particular area rather than farmers of present study.

Height at wither

It is observed from Table 2 that the overall least squares mean for height at wither of Red Kandhari bullocks at more than 36 months of age group was 141.24 ± 0.39 cm. The least squares means of height at wither for D₁, D₂, D₃, D₄, and D₅ districts were 137.88 ± 0.89 , 144.09 ± 0.77 , 141.90 ± 0.69 , 140.40 ± 0.82 and 141.94 ± 1.11 cm, respectively. The least squares analysis of variance has revealed that non-significant effect of districts on height at wither of Red Kandhari bullocks at more than 36 months of age. Similar findings for height at wither were reported by Das (2016) as 141.03 ± 1.11 cm in Red Kandhari bullocks. Higher height at wither was reported by Nikam (2013) as 152.65 ± 0.49 cm and lower height at wither was reported than present study by Pundir and Singh (2008) as 131.1 ± 1.00 cm and Magar (2013) as 134.18 ± 0.37 cm in Red Kandhari bullocks, respectively.

Belly girth

It is observed from Table 2 that the overall least squares mean for belly girth of Red Kandhari bullocks at more than 36 months of age group was 194.07 ± 0.54 cm. The least squares means of belly girth for D₁, D₂, D₃, D₄, and D₅ districts were 187.92 ± 1.24 , 195.86 ± 1.07 , 195.50 ± 0.95 , 190.98 ± 1.14 and 200.10 ± 1.53 cm, respectively. The least squares analysis of variance has revealed that highly significant ($P < 0.01$) effect of district on the belly girth of Red Kandhari bullocks at more than 36 months of age. Lower belly girth was reported by Singh *et al.*, (2008) as 174.14 ± 1.92 cm in Hallikar cattle and Das (2016) as 182.11 ± 0.83 cm in Red Kandhari bullocks, respectively. Lower belly girth reported by various authors in indigenous cattle breeds might be due to difference in their genetic makeup coupled with differences in their management and environment to which they are exposed. The present data being the field observations of Red Kandhari cattle bullocks from breeding tract hence the higher belly girth might have been recorded.

Height at hip bone

It is observed from Table 2 that the overall least squares mean for height at hip bone of Red Kandhari bullocks at more than 36 months of age group was 144.97 ± 0.39 cm. The least squares means of height at hip bone for D₁, D₂, D₃, D₄, and D₅ districts were 142.30 ± 0.90 , 147.42 ± 0.77 , 145.01 ± 0.69 , 145.17 ± 0.83 and 144.94 ± 1.11 cm, respectively.

The least squares analysis of variance (Table 3) has revealed that non-significant effect of districts on height at hip bone of Red Kandhari bullocks at more than 36 months of age. Similar finding for height at hip bone was reported by Das (2016) as 142.79 ± 1.08 cm in Red Kandhari bullocks.

Length of body at trunk

It is observed from Table 2 that the overall least squares mean for length of body at trunk of Red Kandhari bullocks at more than 36 months of age group was 111.45 ± 0.29 cm. The least squares means of Length of body at trunk for D₁, D₂, D₃, D₄, and D₅ districts were 114.47 ± 0.67 , 113.62 ± 0.57 , 109.55 ± 0.51 , 108.76 ± 0.61 and 110.87 ± 0.82 cm, respectively. The least squares analysis of variance has revealed that non-significant effect of districts on length of body at trunk of Red Kandhari bullocks at more than 36 months of age.

Body measurements of Red Kandhari bullocks at more than 36 months age

Face measurement

It is observed from Table 3 that the overall least squares mean for face measurement of Red Kandhari bullocks at more than 36 months of age group was 56.36 ± 0.16 cm. The least squares means of face measurement for D₁, D₂, D₃, D₄, and D₅ districts were 58.58 ± 0.38 , 55.16 ± 0.33 , 55.71 ± 0.29 , 55.94 ± 0.35 and 56.42 ± 0.47 cm, respectively. The least squares analysis of variance has revealed non-significant effect of district on the face measurement of Red Kandhari bullocks at more than 36 months of age. Similar findings for face measurement were reported by Das (2016) as 53.82 ± 0.36 cm in Red Kandhari cattle. Higher value was reported by Magar (2013) as 59.32 ± 0.16 and lower value was reported by Pundir and Singh (2008) as 48.6 ± 0.30 cm in Red Kandhari cattle, respectively.

Tail length

It is observed from Table 3 that the overall least squares mean for tail length of Red Kandhari bullocks at more than 36 months of

age group was 99.06 ± 0.20 cm. The least squares means of tail length for D₁, D₂, D₃, D₄, and D₅ districts were 100.99 ± 0.47 , 102.65 ± 0.40 , 96.97 ± 0.36 , 97.55 ± 0.43 and 97.15 ± 0.58 cm, respectively. The least squares analysis of variance has revealed non-significant effect of district on tail length of Red Kandhari bullocks at more than 36 months of age. Higher value was reported by Singh *et al.*, (2008) as 108.78 ± 1.21 cm in Hallikar cattle and lower was reported by Magar (2013) as 95.27 ± 0.21 cm, Pundir and Singh (2008) as 85.3 ± 0.90 cm in Red Kandhari Bullocks, respectively.

Ear length

It is observed from Table 3 that the overall least squares mean for ear length of Red Kandhari bullocks at more than 36 months of age group was 26.09 ± 0.10 cm. The least squares means of ear length for D₁, D₂, D₃, D₄, and D₅ districts were 25.79 ± 0.23 , 26.58 ± 0.19 , 25.92 ± 0.17 , 26.11 ± 0.21 and 26.05 ± 0.28 cm, respectively. The least squares analysis of variance has revealed non-significant effect of district on ear length of

Red Kandhari bullocks at more than 36 months of age. The similar findings for face measurement were reported by Magar (2013) as 25.82 ± 0.09 cm and Das (2016) as 27.11 ± 0.24 cm in Red Kandhari bullocks, respectively. Lower value was reported by Pundir and Singh (2008) as 23.9 ± 0.4 cm in Red Kandhari bullocks.

Horn length

It is observed from Table 3 that the overall Least Squares mean for horn length of Red Kandhari bullocks at more than 36 months of age group was 16.02 ± 0.24 cm. The Least Squares means of horn length for D₁, D₂, D₃, D₄, and D₅ districts were 13.56 ± 0.55 , 13.70 ± 0.47 , 14.59 ± 0.42 , 19.50 ± 0.50 and 18.76 ± 0.68 cm, respectively. The least squares analysis of variance has revealed non-significant effect of district on horn length of Red Kandhari bullocks at more than 36 months of age. Higher value was reported by Pundir and Singh (2008) as 21.0 ± 0.50 cm, Magar (2013) as 21.24 ± 0.31 cm and Das (2016) as 18.75 ± 0.62 cm in Red Kandhari bullocks, respectively.

Table.1 List of villages randomly selected for collection of data

Sr. No.	Name of the District	Name of the Tehsils	Name of the Villages
1.	Nanded (D ₁)	Kandhar	Bori (Khu.), Umaraj, Jambhulwadi, Dagadsangavi, Ghodaj
		Loha	Dhanora (Makta), Subhashnagar, Chitali, Malakoli, Malegaon
2.	Latur (D ₂)	Ahmedpur	Sangavi (Su.), Sunegaon (Sa.), Babaldara, Hippalgaon, Sawargaon (Thot)
		Jalkot	Kunki, Wanjarwada, Hawarga, Jirga, Jagalpur
3.	Parbhani (D ₃)	Palam	Kerwadi, Shirpur, Sayal, Kapsi, Pethshivani
		Gangakhed	Dhavalkewadi, Kaudgaon, Malewadi, Maradasgaon, Naralad
4.	Hingoli (D ₄)	Vasmat	Aaral, Darephal, Bori, Aadgaon, Kalamba
		Aundha	Barashiv, Ranjala, Purjal, Sirla, Aajarsonda
5.	Beed (D ₅)	Parli	Tokwadi, Sangam, Waghbet, Belamba, Injegaon

Table.2 LSM and SE for body measurements (cm) and body weights (kg) of Red Kandhari bullocks at more than 36 months age

Sources	Code	N	LSM \pm SE						
			Body weight (kg)	Chest girth (cm)	Body length (cm)	Height at wither (cm)	Belly girth (cm)	Height at hip bone (cm)	Length of body at trunk (cm)
Population mean	μ	851	302.92 \pm 1.73	178.27 \pm 0.46	143.94 \pm 0.51	141.24 \pm 0.39	194.07 \pm 0.54	144.97 \pm 0.39	111.45 \pm 0.29
District									
Nanded	D ₁	145	289.81 ^a \pm 4.00	175.14 ^a \pm 1.07	141.60 ^a \pm 1.18	137.88 \pm 0.89	187.92 ^a \pm 1.24	142.30 \pm 0.90	114.47 \pm 0.67
Latur	D ₂	195	297.16 ^a \pm 3.45	181.81 ^b \pm 0.92	138.89 ^a \pm 1.02	144.09 \pm 0.77	195.86 ^b \pm 1.07	147.42 \pm 0.77	113.62 \pm 0.57
Parbhani	D ₃	245	300.40 ^b \pm 3.07	176.10 ^a \pm 0.82	144.86 ^b \pm 0.91	141.90 \pm 0.69	195.50 ^b \pm 0.95	145.01 \pm 0.69	109.55 \pm 0.51
Hingoli	D ₄	171	305.20 ^b \pm 3.68	175.48 ^a \pm 0.98	146.30 ^b \pm 1.09	140.40 \pm 0.82	190.98 ^a \pm 1.14	145.17 \pm 0.83	108.76 \pm 0.61
Beed	D ₅	95	322.03 ^{bc} \pm 4.94	182.80 ^b \pm 1.32	148.06 ^b \pm 1.46	141.94 \pm 1.11	200.10 ^{bc} \pm 1.53	144.94 \pm 1.11	110.87 \pm 0.82

Note: Means connected by same superscripts do not differ significantly

Table.3 LSM and SE for body measurements (cm) of Red Kandhari bullocks at more than 36 months age

Sources	Code	N	LSM \pm SE					
			Face measurement (cm)	Tail length (cm)	Ear length (cm)	Horn length (cm)	Fore legs length (cm)	Hind legs length (cm)
Population mean	μ	851	56.36 \pm 0.16	99.06 \pm 0.20	26.09 \pm 0.10	16.02 \pm 0.24	97.18 \pm 0.16	55.72 \pm 0.10
District								
Nanded	D ₁	145	58.58 \pm 0.38	100.99 \pm 0.47	25.79 \pm 0.23	13.56 \pm 0.55	95.89 \pm 0.37	57.00 \pm 0.24
Latur	D ₂	195	55.16 \pm 0.33	102.65 \pm 0.40	26.58 \pm 0.19	13.70 \pm 0.47	99.29 \pm 0.32	56.66 \pm 0.20
Parbhani	D ₃	245	55.71 \pm 0.29	96.97 \pm 0.36	25.92 \pm 0.17	14.59 \pm 0.42	97.06 \pm 0.28	54.74 \pm 0.18
Hingoli	D ₄	171	55.94 \pm 0.35	97.55 \pm 0.43	26.11 \pm 0.21	19.50 \pm 0.50	96.15 \pm 0.34	55.12 \pm 0.22
Beed	D ₅	95	56.42 \pm 0.47	97.15 \pm 0.58	26.05 \pm 0.28	18.76 \pm 0.68	97.49 \pm 0.45	55.10 \pm 0.29

Fore legs length

It is observed from Table 3 that the overall least squares mean for fore legs length of Red Kandhari bullocks at more than 36 months of age group was 97.18 ± 0.16 cm. The least squares means of fore legs length for D₁, D₂, D₃, D₄, and D₅ districts were 95.89 ± 0.37 , 99.29 ± 0.32 , 97.06 ± 0.28 , 96.15 ± 0.34 and 97.49 ± 0.45 cm, respectively. The least squares analysis of variance has revealed non-significant effect of district on fore legs length of Red Kandhari bullocks at more than 36 months of age.

Hind legs length

It is observed from Table 3 that the overall least squares mean for hind legs length of Red Kandhari bullocks at more than 36 months of age group was 55.72 ± 0.10 cm. The least squares means of hind legs length for D₁, D₂, D₃, D₄, and D₅ districts were 57.00 ± 0.24 , 56.66 ± 0.20 , 54.74 ± 0.18 , 55.12 ± 0.22 and 55.10 ± 0.29 cm, respectively. The least squares analysis of variance has revealed non-significant effect of district on hind legs length of Red Kandhari bullocks at more than 36 months of age.

In conclusion the effect of block was found significant to highly significant on body weight of Red Kandhari bullocks at more than 36 months of age group. The effect of block was found significant to highly significant on chest girth, body length and belly girth in > 36 month male group of animals. Hence it is concluded that geo-ecological situations of surveyed area and management practices followed there plays an important role on physical measurements parameters of Red Kandhari bullocks.

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