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Morphometric Characteristics of Rathi Calf of 4-6 Months of Age in Arid Region of Rajasthan

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ABSTRACT

The present study was conducted with an aim to determine the morphometric, characteristics of Rathi calves of 4-6 months in its breeding tract i.e. Bikaner, Sri Ganganagar and Hanumangarh district. A total number of 180 Rathi calves were taken for observations in 6 tehsils of 3 districts belonging to the breeding tract irrespective of sex. Upon comparison of means, highly significant effect of sex on body weight and ear length was observed whereas remaining parameters did not vary significantly. Among districts, only body weight, body length and height at hip bone differ significantly. The body weight of Rathi calves at 4-6 months of age in Sri Ganganagar district were observed to be significantly higher as compared to Bikaner and Hanumangarh district. Rathi calves did not reveal significant variation among each other. Similarly, body length and height at hip bone of Rathi calves at 4-6 months of age also varied significant in which Sri Ganganagar district had higher values as compared to other two districts exhibited comparable values. The results of this survey study determined better characterization of Rathi breed in its home tract which might be useful to establish its current status in arid zone of Rajasthan to plan strategy for conservation of Rathi cattle for supporting dairy husbandry activity in its breeding tract.

HIGHLIGHTS

- Rathi cattle had better characterization in its home tract.
- The height at wither, chest girth and body length of Rathi calves were positive and significantly correlated with body weight.

Keywords: Arid region, Morphometric, Rathi calf

India has once again reaffirmed its global leadership in livestock numbers, as evidenced by the 21st Livestock Census. This extensive enumeration, covering 16 species, including cattle, buffalo, sheep, goats, and poultry reveals a 4.8% increase in the nation's livestock population since 2012. Notably, rural areas house 95.78% of this population, underscoring the sector's profound integration into India's agrarian economy. India, boasting the world's largest livestock population, is home to a myriad of indigenous cattle breeds meticulously adapted to its diverse agro-climatic conditions. Among these, the Rathi cattle, often referred to as the "Desert Rani" or "Queen of Rajasthan" epitomize resilience and utility in the arid expanses of the

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Thar Desert. Originating from the Loonkaransar tehsil of Bikaner district in Rajasthan, this indigenous breed is integral to the pastoral economy of northwestern India. Adapted to the extreme climatic conditions of the Thar Desert, Rathi cattle thrive in temperatures ranging from 2°C in winter to 50°C in summer. They are resilient to dust storms and possess a robust immune system, making them less susceptible to diseases prevalent in arid regions. The Rathi breed plays a pivotal role in the livelihoods of farmers in Rajasthan, providing milk, draught power, and contributing to the local economy. Recognizing its significance, conservation efforts have been initiated by the National Dairy Development Board (NDDB) and the Department of Animal Husbandry, Government of Rajasthan, focusing on breed improvement, veterinary healthcare, and disease control programs.

MATERIALS AND METHODS

The present study was conducted in the breeding tract of Rathi cattle i.e. Bikaner (Tehsil- Bikaner and Lunkaransar) Sri Ganganagar (Tehsil - Anupgarh and Gharsana) and Hanumangarh (Nohar and Rawatsar) districts of Rajasthan state. The Rathi breed of cattle is found in purest form in these districts of Rajasthan. The breeding tract of Rathi breed lies between 72° Min to 75° Max longitude and between 27° to 30° latitude. These districts were selected for study on morphometric characteristics of Rathi calves. The data on physical characteristics of Rathi calves i.e. body weight, chest girth, body length, height at wither, belly girth, height at hip bone, face measurement, tail length, ear length, horn length were collected from the major breeding tract. A total of 180 Rathi calves were selected from the two tehsils from each district of breeding tract. The data on body measurements of 180 Rathi animals irrespective of sex were collected by taking actual measurements of each calf in different tehsils in Bikaner, Sri Ganganagar and Hanumangarh districts of Arid region of Rajasthan. From each tehsil 30 animals with age group 4-6 months were chosen randomly for present study. In this study morphometric characters, were taken into consideration. The basic instruments used for the present study were measuring tape and visual examination. The data were collected by measuring different body parts and by the visual examination. Efforts were made to avoid obvious 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 measured with the help of standard metallic tape. The body measurements were recorded in centimeter. In present study the following characteristics were taken into consideration as:—

- Age: Months/Years - By actual interview with the livestock owners / visual examination /dentition method.
- Sex: Male / Female- By actual visual examination.
- Height at withers: It was measured immediately behind the hump to the ground.
- Height at hip bone: Height at hip bone was measured from vertical distance between the fetlock and the point of the hip bone.
- Chest girth: It was measured as circumference around the chest behind the elbow joint.
- Belly girth: It was measured as circumference around the abdomen just in front of hind legs.
- Body length: It was measured from point of shoulder to the point of pin bone.
- Ear length: It was measured as length of ear at the ventral surface.
- Horn length: It was measured as distance between base and the tip of horn.
- Face measurement: It was measured from centre of horn poll to point of muzzle.
- Tail length: It was measured as the distance between base and tip of the tail.
- Body weight: The body weights at various age groups in Rathi calves 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

Statistical analysis

The data collected during the present investigation were subjected to statistical analysis by adopting appropriate methods of analysis of variance as described by Snedecor and Cochran (2005), where ever, the variance ratio (F value) was found significant at 5 per cent and 1 per cent level of probability. The significance of the mean difference was tested by Duncan's New multiple range test as modified by Kramer (1957).

RESULTS AND DISCUSSION

The overall mean values for body measurements and body weight of Rathi cattle at 4-6 months of age have been presented in Table 1. Average value for body measurements such as chest girth, body length, body girth, ear girth, face measurements, height at wither, height at wither, height at hip bone and tail length were found to be 107.27±3.67, 92.87±3.52, 113.29±4.88,16.96±1.19, 33.0±1.30, 95.93±2.46, 99.22±3.48 and 60.25±2.68 cm, respectively. Also, the mean body weight of Rathi calves at 4-6 months of age was observed to be 80.65±1.72 kg. Upon comparison of means, highly significant effect ($P<0.01$) of sex on body weight and ear length was observed whereas remaining parameters didn't vary significantly. Among districts, only body weight, body length and height at hip bone differ significantly ($P<0.05$). The body weight of Rathi calves at 4-6 months of age in Sri Ganganagar district were observed to be significantly ($P<0.05$) higher (82.81±1.30 kg) as compared to Bikaner (80.39±1.36 kg) and Hanumangarh district (78.72±1.02 kg). Rathi calves did not reveal significant variation among each other. Similarly, body length and height at hip bone of Rathi calves at 4-6 months of age also varied significantly ($P<0.05$) in which Sri Ganganagar district had higher values as compared to other two districts exhibited comparable values.

The cause of correlation between two or more characters is largely due to plieotropic effect of genes. The results of correlation among body measurements and body weight are presented in the Table 2. The height at wither, chest girth and body length of Rathi calves were positive and significantly correlated with body weight. Similarly, the different body measurements also indicated significant and positive correlations between each other. The study of correlation of Rathi calves revealed that body measurements and body weights were positive and significantly correlated with each other. The similar positive and significant correlations of body measurements with body weight were reported by and Patel *et al.* (1990)

Table 1: Body measurements (cm) and body weights (kg) of Rathi calves at 4-6 months of age

Source of variation	Code	Body measurements (cm) and body weights (kg)								
		Body weight	**Chest girth**	**Body length**	**Belly girth**	**Ear length**	**Face measurement**	**Height at wither**	**Height at hip bone**	**Tail Length**
Population Mean	μ	80.65 ± 1.72	107.27 ± 3.67	92.87 ± 3.52	113.29 ± 4.88	16.96 ± 1.19	33.00 ± 1.30	95.93 ± 2.46	99.22 ± 3.48	60.25 ± 2.68
Effect of sex										
Male	S1	83.45^{a} ± 1.02	107.95 ± 1.14	93.67 ± 0.81	114.86 ± 1.00	17.74^{a} ± 0.57	33.35 ± 0.43	96.35 ± 0.72	99.95 ± 0.70	61.45 ± 1.04
Female	S2	77.37^{b} ± 1.89	106.47 ± 0.61	91.94 ± 0.62	111.46 ± 1.50	16.04^{b} ± 0.55	32.59 ± 0.41	95.43 ± 0.54	98.36 ± 0.62	58.84 ± 0.82
Effect of district										
Bikaner	D1	80.39^{b} ± 1.36	106.55 ± 1.58	91.04^{b} ± 1.05	113.04 ± 2.08	16.73 ± 0.38	32.43 ± 0.73	94.62 ± 1.01	96.41^{b} ± 1.06	60.87 ± 1.71
Sri Ganga Nagar	D2	82.81^{a} ± 1.30	108.05 ± 1.04	93.68^{a} ± 0.88	113.86 ± 1.55	17.53 ± 0.32	33.92 ± 0.39	96.23 ± 0.72	103.82^{a} ± 2.73	60.04 ± 0.88
Hanumangarh	D3	78.72^{c} ± 1.02	107.19 ± 0.65	93.87^{a} ± 0.74	112.97 ± 0.69	16.60 ± 0.30	32.64 ± 0.35	96.92 ± 0.59	96.39^{b} ± 1.60	59.87 ± 0.75

Note: Means bearing different superscript differ significantly.

Table 2: Correlations among body measurements and body weights in Rathi cattle at different age groups

4-6 months (Male)			
	Chest girth	**Body length**	**Body weight**
Height at wither	0.375**	0.518**	0.571**
Chest girth		0.344**	0.467**
Body length			0.567**
4-6 months (Female)			
	Chest girth	**Body length**	**Body weight**
Height at wither	0.426**	0.649**	0.672**
Chest girth		0.486**	0.788**
Body length			0.864**

in height at wither and chest girth, Blackmore *et al.* (1958) and Patel *et al.* (1990) in height at wither and body length, Deshpande and Singh (1977) and Patel *et al.* (1990) in chest girth and body length, in all the age groups.

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