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Studies on linear body measurements of gaolao calves in the breeding tract of Maharashtra

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ABSTRACT

The body measurement and body weight of Gaolao calves at various stages of growth were studied for both male and female at different location in the breeding tract. The idea is to obtain the real picture of the breed in the breeding tract. The body measurements play an important role in judging calves and often help in predicting probable value of the calves. Body length and height at wither are the measures of bone growth while chest girth is measures of development of muscles, bone and fat and it has close relationship with the live body weight.

Key words: Body length, Body measurement, Body weight, Judging calves.

INTRODUCTION

Indian cattle population is an integral part of the agriculture. The cattle biodiversity in India constitutes 41 well define breeds of cattle, 13 breeds of buffaloes, 26 breeds of goat and 42 breeds of sheep (NBAGR, 2017). India has 190.90 million cattle, 108.70 million buffaloes, 135.20 million goats and 65.06 million sheep population. The total Bovine population is 299.90 million in 2012 which shows a decline of 1.57 per cent over previous census (Livestock Census, 2012). The Gaolao is famous cattle breed of the Vidarbha region of Maharashtra state. Gaolao is average milking breed and a very popular breed for draught among farmers (Patil *et al.,* 2005). According to 19th Livestock Census (2012), the total Gaolao cattle population in India is 3, 22,683, among these 1, 21, 538 pure and 2, 01,145 graded. The Gaolao breed eyes are almond shaped and ears are medium sized, carried high giving an alert appearance to the head and forehead is slightly convex appearance. In the breeding tract, among the Gaolao population, colour varies from light to milky white. Therefore, the present study has been following objective:

1) To study the body measurements and body weights at different age group
2) To study the block effect on various characteristics

MATERIALS AND METHODS

Selection of calves: The on body measurements of 129 Gaolao calves irrespective of sex were collected by actual measurements of each individual in different villages as mention below. From each block on an average 25 calves/ individual with 0-3 month's age group and different sex were chosen randomly for present study.

Tools and techniques of data collection: The basic instruments used for the present study were measuring tape and visual examination. The data were collected by measuring different body parts and also 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 measurement was recorded in centimetre. The data on morphometric, productive, reproductive, colour pattern and off type characteristics of Gaolao individual were collected by actual measurements and personal interview with the Gaolao owners with the help of model questionnaire.

The collected data of 129 Gaolao calves 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 Gaolao cattle were estimated by using Shaeffer's formula as outlined below.

$$\text{Live body weight (in pound)} = \frac{\text{Length x (Girth)}^2}{300}$$

Where,

Length and girth is measured in Inches.

RESULTS AND DISCUSSION

Body weights and body measurements of Gaolao calves at 0-3 months of age

Body weights: It was observed from Table 2 that the overall least squares mean for body weight of Gaolao calves at 0-3 months of age group was 31.24 $\pm$ 0.62 kg. The least squares mean of body weight for Gaolao calves for male (S_1) and

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

Name of District	Name of Block	Name of Villages
Wardha	Arvi (B_1)	Chincholi, Danapur, Kharangna, Kinhala(Bothali), Pachod, Talegaon (Raghugi)
	Karanja (B_2)	Bhiwapur Heti, Dharti, Heti Kundi, Jaurwada, Kannamwar Gram, Selgaon
	Selu (B_3)	Akoli, Antargaon, Jamni, Madani, Masala, Zadsi
	Wardha (B_4)	Ashtaa, Bhankheda, Bhugaon, Jaulgaon, Selukate, Zanzapur
Nagpur	Katol (B_5)	Chandanpardi, Khandala, Murti, Parsoda,Sawanga, Walni

Table 2: The body weights (kg) and body measurements (cm) of Gaolao calves at 0-3 month's age.

Sources of variation	Code	N	Body weights and body measurements					
			Body weight (kg)	Chest girth (cm)	Body length (cm)	Height at wither (cm)	Belly girth (cm)	Height at hip bone (cm)
			LSM ± SE					
Population mean	M	129	31.24 ± 0.62	72.41 ± 0.64	63.89 ± 0.44	68.82 ± 0.55	75.45 ± 0.67	70.36 ± 0.56
Effect of sex								
Male	S_1	67	32.19 ± 0.85	73.68 ± 0.89	64.14 ± 0.61	69.04 ± 0.76	76.02 ± 0.92	70.41 ± 0.78
Female	S_2	62	30.30 ± 0.89	71.15 ± 0.93	63.65 ± 0.64	68.60 ± 0.79	74.88 ± 0.96	70.32 ± 0.81
Effect of Block								
Arvi	B_1	33	29.23 ± 1.21	71.00 ± 1.26	62.59 ± 0.87	67.10 ± 1.08	74.05 ± 1.30	68.57 ± 1.10
Karanja	B_2	25	32.10 ± 1.39	72.45 ± 1.45	65.87 ± 1.00	70.84 ± 1.24	75.49 ± 1.50	72.80 ± 1.27
Selu	B_3	26	32.72 ± 1.36	73.59 ± 1.42	65.28 ± 0.98	70.06 ± 1.24	76.37 ± 1.47	72.07 ± 1.24
Wardha	B_4	25	33.07 ± 1.39	74.41 ± 1.45	63.31 ± 1.00	67.88 ± 1.24	76.29 ± 1.50	68.92 ± 1.27
Katol	B_5	20	29.09 ± 1.55	70.65 ± 1.62	62.45 ± 1.11	68.25 ± 1.38	72.55 ± 1.68	69.45 ± 1.42

female (S_2) sex were 32.19 ± 0.85 and 30.30 ± 0.89 kg, respectively. The least squares mean of body weight of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 29.23 ± 1.21, 32.10 ± 1.39, 32.72 ± 1.36, 33.07 ± 1.39 and 29.09 ± 1.55 kg, respectively. The least squares analysis of variance revealed non-significant effect of sex and block on body weight of Gaolao calves at 0-3 months of age. The higher body weight than the present results were reported by Magar (2013) as 44.23 ± 1.63 kg and Bainwad *et al.* (2017) as 51.65 ± 0.62 kg in Red Kandhari calves, respectively.

Chest girth: It was observed from Table 2 that the overall least squares mean for chest girth of Gaolao calves at 0-3 months of age group was 72.41 ± 0.64 cm. The least squares mean of chest girth for Gaolao calves for S_1 and S_2 sex were 73.68 ± 0.89 and 71.15 ± 0.93 cm, respectively. The least squares mean of chest girth of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 71.00 ± 1.26, 72.45 ± 1.45, 73.59 ± 1.42, 74.41 ± 1.45 and 70.65 ± 1.62 cm, respectively. The least squares analysis of variance revealed non-significant effect of sex and block on chest girth of Gaolao calves at 0-3 months of age. Similar finding for the chest girth were reported by Nikam (2013) as 72.57 ± 0.50 cm, Kakade (2013) as 72.69 ± 0.45 cm and Bainwad *et al.* (2017) as 73.44 ± 0.51 cm in Red Kandhari calves, respectively.

Body length: It was observed from Table 2 that the overall least squares mean for body length of Gaolao calves at 0-3 months of age group was 63.89 ± 0.44 cm. The least squares mean of body length for Gaolao cattle for S_1 and S_2 sex were 64.14 ± 0.61 and 63.65 ± 0.64 cm, respectively. The least squares mean of body length of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 62.59 ± 0.87, 65.87 ± 1.00, 65.28 ± 0.98, 63.31 ± 1.00 and 62.45 ± 1.11 cm, respectively. The high body length was observed in male (S_1) and lower in (S_2). The high body length was observed in B_2 block (65.87 ± 1.00 cm) followed by B_3, B_4, B_1 and B_5, respectively. The least squares analysis of variance revealed non-significant effect of sex and significant ($P<0.05$) effect of block on body length of Gaolao calves at 0-3 months of age. Similar finding for the body length were reported by Munde (2012) as 62.72 ± 0.52 cm in Gaolao calves, Das (2016) as 64.06 ± 0.69 cm and Bainwad *et al.* (2017) as 63.13 ± 0.44 cm in Red Kandhari calves, respectively.

Height at wither: It was observed from Table 2 that the overall least squares mean for height at wither of Gaolao calves at 0-3 months of age group was 68.82 ± 0.55 cm. The least squares mean of height at wither for Gaolao calves for S_1 and S_2 sex were 69.04 ± 0.76 and 68.60 ± 0.79 cm, respectively. The least squares mean of height at wither of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 67.10 ± 1.08, 70.84 ± 1.24, 70.06 ± 1.24, 67.88 ± 1.24 and 68.25 ± 1.38 cm, respectively. The least squares analysis of variance revealed non-significant effect of sex and block on height at wither of Gaolao calves at 0-3 months of age. Similar finding for the height at wither were reported by Das (2016) as 69.00 ± 0.63 cm in Red Kandhari calves and the higher result for height at wither was reported by Bainwad *et al.* (2017) as 71.56 ± 0.58 cm in Red Kandhari calves, respectively.

Table 3: The body measurements (cm) of Gaolao calves at 0-3 month's age.

Sourcesof variation	Code	N	Body measurements				
			Face measurement (cm)	Tail length (cm)	Ear length (cm)	Fore legs length (cm)	Height at hock (cm)
			LSM ± SE				
Population mean	Ì	129	27.34 ± 0.28	54.04 ± 0.37	13.57 ± 0.13	55.26 ± 0.30	29.04 ± 0.13
Effect of Sex							
Male	S_1	67	27.48 ± 0.38	54.18 ± 0.52	13.82 ± 0.18	55.67 ± 0.41	29.17 ± 0.18
Female	S_2	62	27.20 ± 0.40	53.89 ± 0.54	13.32 ± 0.19	54.85 ± 0.43	28.91 ± 0.19
Effect of Block							
Arvi	B_1	33	28.10 ± 0.55	55.83 ± 0.74	14.28 ± 0.26	55.40 ± 0.59	28.83 ± 0.26
Karanja	B_2	25	26.46 ± 0.63	53.21 ± 0.85	13.49 ± 0.30	54.39 ± 0.68	29.30 ± 0.30
Selu	B_3	26	27.60 ± 0.62	55.54 ± 0.83	13.36 ± 0.29	55.45 ± 0.66	29.02 ± 0.29
Wardha	B_4	25	27.78 ± 0.63	53.81 ± 0.85	13.49 ± 0.30	54.63 ± 0.68	28.90 ± 0.30
Katol	B_5	20	26.75 ± 0.70	51.80 ± 0.95	13.25 ± 0.33	56.45 ± 0.76	29.15 ± 0.34

Belly girth: It was observed from Table 2 that the overall least squares mean for belly girth of Gaolao calves at 0-3 months of age group was 75.45 ± 0.67 cm. The least squares mean of belly girth for Gaolao calves for S_1 and S_2 sex were 76.02 ± 0.92 and 74.88 ± 0.96 cm, respectively. The least squares mean of belly girth for B_1, B_2, B_3, B_4 and B_5 blocks were 74.05 ± 1.30, 75.49 ± 1.50, 76.37 ± 1.47, 76.29 ± 1.50 and 72.55 ± 1.68 cm, respectively. The least squares analysis of variance revealed non-significant effect of sex and block on belly girth of Gaolao calves at 0-3 months of age. Similar finding for the belly girth were reported by Bainwad *et al.* (2017) as 76.45 ± 0.50 cm in Red Kandhari calves and lower belly girth than the present results were reported by Pundir *et al.* (2015) as 71.25 ± 3.35 and 72.62 ± 2.42 cm in male and female indigenous calves of Manipur and Das (2016) as 72.27 ± 0.78 cm in Red Kandhari calves, respectively.

Height at hip bone: It was observed from Table 2 that the overall least squares mean for height at hip bone of Gaolao calves at 0-3 months of age group was 70.36 ± 0.56 cm. The least squares mean of height at hip bone for Gaolao calves for S_1 and S_2 sex were 70.41 ± 0.78 and 70.32 ± 0.81 cm, respectively. The least squares mean of height at hip bone of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 68.57 ± 1.10, 72.80 ± 1.27, 72.07 ± 1.24, 68.92 ± 1.27 and 69.45 ± 1.42 cm, respectively. The high height at hip bone was observed in male (S_1) and lower in female (S_2). The least squares analysis of variance revealed non-significant effect of sex and significant ($P<0.05$) effect of block on height at hip bone of Gaolao calves at 0-3 months of age. Similar finding for the height at hip bone was reported by Das (2016) as 69.44 ± 0.66 cm in Red Kandhari calves. The higher height at hip bone than the present result was reported by Bainwad *et al.* (2017) as 72.19 ± 0.56 cm in Red Kandhari calves.

Body measurements of Gaolao calves at 0-3 month's age

Face measurement: It was observed from Table 3 that the overall least squares mean for face measurement of Gaolao calves at 0-3 months of age group was 27.34 ± 0.28 cm. The least squares mean of face measurement for Gaolao calves for S_1 and S_2 sex were 27.48 ± 0.38 and 27.20 ± 0.40 cm, respectively. The least squares mean of face measurement of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 28.10 ± 0.55, 26.46 ± 0.63, 27.60 ± 0.62, 27.78 ± 0.63 and 26.75 ± 0.70 cm, respectively. The least squares analysis of variance revealed non-significant effect of sex and block on the face measurement of Gaolao calves at 0-3 months of age. The lower length of face than the present result were reported by Das (2016) as 23.21 ± 0.32 cm and Bainwad *et al.* (2017) as 23.70 ± 0.19 cm in Red Kandhari calves, respectively.

Tail length: It was observed from Table 3 that **t**he overall least squares mean for tail length of Gaolao calves at 0-3 months of age group was 54.04 ± 0.37 cm. The least squares mean of tail length of Gaolao calves for S_1 and S_2 sex were 54.18 ± 0.52 and 53.89 ± 0.54 cm, respectively. The least squares mean of tail length of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 55.83 ± 0.74, 53.21 ± 0.85, 55.54 ± 0.83, 53.81 ± 0.85 and 51.80 ± 0.95 cm, respectively. The high tail length was observed in male (S_1) and lower in female (S_2). The high tail length observed in B_1 block (55.83 ± 0.74 cm) followed by B_3, B_4, B_2 and B_5, respectively. The least squares analysis of variance revealed non-significant effect of sex and highly significant ($P<0.01$) effect of block on tail length of Gaolao calves at 0-3 months of age. The lower tail length than the present result was reported Das (2016) as 41.66 ± 0.44 cm and Bainwad *et al.* (2017) as 72.19 ± 0.56 cm in Red Kandhari calves, respectively.

Ear length: It was observed from Table 3 that the overall least squares mean for ear length of Gaolao calves at 0-3 months of age group was 13.57 ± 0.13 cm. The least squares mean of ear length for Gaolao calves for S_1 and S_2 sex were 13.82 ± 0.18 and 13.32 ± 0.19 cm, respectively. The least squares mean of ear length of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 14.28 ± 0.26, 13.49 ± 0.30, 13.36 ± 0.29, 13.49 ± 0.30 and 13.25 ± 0.33 cm, respectively. The least squares analysis of variance revealed non-significant effect

of sex and block on ear length of Gaolao calves at 0-3 months of age. The higher ear length than the present results were reported by Magar (2013) 16.36 ± 0.25 cm and Bainwad *et al.* (2017) as 18.66 ± 0.22 cm in Red Kandhari calves, respectively.

Fore legs length: It was observed from Table 3 that the overall least squares mean for fore legs length of Gaolao calves at 0-3 months of age group was 55.26 ± 0.30 cm. The least squares mean of fore legs length for Gaolao calves for S_1 and S_2 sex were 55.67 ± 0.41 and 54.85 ± 0.43 cm, respectively. The least squares mean of fore legs length of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 55.40 ± 0.59, 54.39 ± 0.68, 55.45 ± 0.66, 54.63 ± 0.68 and 56.45 ± 0.76 cm, respectively. The least squares analysis of variance revealed non-significant effect of sex and block on fore legs length of Gaolao calves at 0-3 months of age. The higher value than the present result was reported by Bainwad *et al.* (2017) as 58.90 ± 0.31 cm in Red Kandhari calves.

Height at hock: It was observed from Table 3 that the overall least squares mean for height at hock of Gaolao calves at 0-3 months of age group was 29.04 ± 0.13 cm. The least squares mean of height at hock for Gaolao calves for S_1 and S_2 sex were 29.17 ± 0.18 and 28.91 ± 0.19 cm, respectively. The least squares mean of height at hock of calves for B_1, B_2, B_3, B_4 and B_5 blocks were 28.83 ± 0.26, 29.30 ± 0.30, 29.02 ± 0.29, 28.90 ± 0.34 and 29.15 ± 0.34 cm, respectively. The least squares analysis of variance revealed non-significant effect of sex and block on height at hock of Gaolao calves at 0-3 months of age. The higher value than the present result was reported by Bainwad *et al.* (2017) as 38.05 ± 0.17 cm in Red Kandhari calves.

CONCLUSION

The effect of sex was found non-significant on all body traits on Gaolao calves whereas effect of block was found highly significant effect on tail length, significant effect on body length, height at hip bone and non- significant effect found on rest of the traits in both of sexes. Hence it is concluded that geo-ecological situation of surveyed area and management practices followed there played an important role on physical measurement parameter of Gaolao calves.

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