

## Relationship of Body Weight with Linear Body Measurements in Goats

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**Abstract:** The present research work was conducted at livestock Research and Development station surezai Peshawar, Pakistan. Data was collected on 86 goats of different age groups. 44 were male and 42 were female. The mean bodyweight of male in four age groups (04-12, 13-18, 19-24, 24-36 month and above) were observed as 18.60±1.81, 25.25±2.76, 29.86±1.28 and 41.47±1.63 kg, respectively while that of female in same age groups were noted as 14.50±1.19, 21.0±3.47, 24.00±1.25, 33.95±4.97kg, respectively. The body length of male recorded in these age groups were found to be 59.60±0.74, 64.38±1.39, 69.42±0.29, 78.15±0.60cm while that of female in these age groups were investigated to be 58.70±0.84, 60.14±0.50, 62.16±0.60, 69.31±1.85cm, respectively. The mean height at withers in male in four age groups were noted to be 60.30±1.16, 68.25±1.42, 72.14±0.67, 82.11±1.02 cm while that of female in these age groups were recorded to be 56.50±1.28, 63.14±0.55, 66.50±1.18 and 71.42±2.31cm, respectively. The mean heart girth in male in these age groups were recorded to be 59.10±0.86, 66.0±3.19, 70.29±1.19, 79.63±0.96cm. In case of female mean heart girth was noted to be 57.60±0.95, 61.29±1.27, 64.00±0.68 and 70.15±1.80cm, respectively. Bodyweight was correlated with body length (0.49, 0.12, 0.70 and 0.78), height at withers (0.75, 0.54, 0.62 and 0.72) and heart girth (0.64, 0.55, 0.53 and 0.71), respectively. During present investigation Male were found heavier ( $p<0.05$ ) and longer ( $p<0.05$ ) than female in all age groups. Similarly the heart girth ( $p<0.05$ ) as well as height ( $p<0.05$ ) at withers were also bigger in male than those of the female.

**Key words:** goat, male, female, body length, height at withers, heart girth and body weight

### INTRODUCTION

Goat is a multi functional animal and plays a significant role in the economy and nutrition of landless, small and marginal farmers in the country. Goat rearing is an enterprise which has been practiced by a large section of population in rural areas. Goats can efficiently survive on available shrubs and trees in adverse harsh environment in low fertility lands where no other crop can be grown. They contribute to livestock industry in terms of milk, meat skin and hair. In comparison with other domestic animals, goats are the victims of prejudice and neglect, but they have nevertheless fulfilled a most useful task in supplying a part of humane population with milk, meat, hair, leather and other products<sup>[1]</sup>. In spite of their importance, goat has received little scientific attention.

Therefore the present research project was designed to observe body weight measurement relationship in beetal goat at Livestock research and Development station Surezai, Peshawar, Pakistan. The Beetal is a breed used for meat and milk production. The males have long twisting horns. The breed is similar to the Jamnapari but is superior to it in that it is more prolific and more easily adaptable to different agro ecological condition. Males are raised especially as sacrificial animals for slaughter on

Eid-Ul-Azha. To increase meat yield from this breed require genetic improvement of its live weight. Proper measurement of this trait, which is often hard in villages due to lack of weighing scale, is requisite for achieving this goal. The need for estimation of the trait from simple and more easily measurable variable such as linear body measurements therefore arises.

Studies regarding the linear body measurements of goat have been carried in other region of the world and their possible use for estimating the animals live weights<sup>[2-10]</sup>.

This study was carried out to establish the relationship between live weight and some body measurements in beetal goat as a step towards employing such in body weight estimation for selection and other purpose. Present study would also helpful to animal scientists who are involved in small ruminant's research projects.

### MATERIALS AND METHODS

Eighty-six goat forty-four male and forty-two female were used for the present study.

The animals were divided in four age groups. Group A (04-12 month) consist of 10 male and 10 female, Group

b (13-18 month) consist of 08 male and 07 female, Group C (19-24 month) consist of 07 male and 06 female, Group D (25-36 and above) consist of 19 male and 19 female. Among these animals forty-two were managed in Livestock Research and Development station Surezai, Peshawar, while rest of animals were selected from the surrounding area of the station for collection of the data. The animals were released daily for grazing at 8.00am and they remained outside until 2.00 pm. Drinking water was provided ad lib. Animals received routine inspection and dipping; drenching and vaccination were done for herd health maintenance.

In all 86 sets of measurements were obtained for the four variables considered. Body weight was taken using weighbridge and the following linear body measurements were made using the tailor's tape measure as previously used for linear body measurements in Nigerian Red Sokoto goats<sup>[11]</sup>

- Body Length (BL) was measured as the distance from the external occipital protuberance to the base of the tail.
- Height-At-Withers (HAW) was measured as the distance from the surface of a platform to the withers and
- Heart Girth (HG) represented the circumference of the chest.

Data collected were classified on the basis of sex and age. Four Age groups (04-12, 13-18, 19-24, 25-36 month and above) were used. Means  $\pm$  SE for the body weight and linear body measurements (BL, HAW and HG) were calculated using Minitab Statistical software programme. The relationship of bodyweight and linear body measurements were estimated by Pearson correlation. This was done separately for the two sexes in cases of significant sex effect.

## RESULTS AND DISCUSSION

Table 1 summarises the average measurements obtained for the four traits studied. All the values obtained for linear body measurements were higher in the male than in the females. The mean bodyweight of male in four age groups (04-12, 13-18, 19-24, 24-36 month and above) were recorded to be 18.60 $\pm$ 1.81, 25.25 $\pm$ 2.76, 29.86 $\pm$ 1.28 and 41.47 $\pm$ 1.63 kg, respectively while that of female in these age groups were observed to be 14.50 $\pm$ 1.19, 21.0 $\pm$ 3.47, 24.00 $\pm$ 1.25, 33.95 $\pm$ 4.97 kg, respectively. The body length of male in these age groups were recorded to be 59.60 $\pm$ 0.74, 64.38 $\pm$ 1.39, 69.42 $\pm$ 0.29, 78.15 $\pm$ 0.60 cm while that of female in these age groups were found to be 58.70 $\pm$ 0.84, 60.14 $\pm$ 0.50, 62.16 $\pm$ 0.60, 69.31 $\pm$ 1.85 cm, respectively. The mean height at withers in

male in four age groups were noted to be 60.30 $\pm$ 1.16, 68.25 $\pm$ 1.42, 72.14 $\pm$ 0.67, 82.11 $\pm$ 1.02 cm, while that of female in these age groups were recorded to be 56.50 $\pm$ 1.28, 63.14 $\pm$ 0.55, 66.50 $\pm$ 1.18 and 71.42 $\pm$ 2.31 cm, respectively. The mean heart girth in male of four age groups were found to be 59.10 $\pm$ 0.86, 66.0 $\pm$ 3.19, 70.29 $\pm$ 1.19, 79.63 $\pm$ 0.96 cm while that of female in the same age groups were investigated to be 57.60 $\pm$ 0.95, 61.29 $\pm$ 1.27, 64.00 $\pm$ 0.68 and 70.15 $\pm$ 1.80 cm, respectively. During present investigation Male were found heavier ( $p < 0.05$ ) and longer ( $p < 0.05$ ) than female in all age groups. Similarly the heart girth ( $p < 0.05$ ) as well as height ( $p < 0.05$ ) at withers were also bigger than those of the female.

The Table 2 describes the correlation of Bodyweight with other body measurements. Bodyweight was correlated with body length (0.49, 0.12, 0.70 and 0.78), height at withers (0.75, 0.54, 0.62 and 0.72) and heart girth (0.64, 0.55, 0.53 and 0.71). Results of correlation analysis of sex on the variables are given in Table 3. The Higher correlation coefficient for male goats in most of the cases indicate that on the basis of the dimension of various body lengths the body weight could be predicated more accurately in male as compared to their female counterpart as the age advances ( $r = 0.824$  for male in 25-36 month of age).

## DISCUSSION

The finding regarding linear body measurements in the present study are in line with previous finding obtain in those reported by Moruppa and Ngere<sup>[5]</sup> for Red Sokoto goats in similar age groups. The present finding regarding the body weight and body length of goat are lower than previous report on Indian beetal goat. The body weight in adult male Indian beetal was reported to be in the range of 50-62 kg while in the adult female of the same breed was recorded to be in the range of 35-40 kg, respectively. The body length in adult male and female Indian beetal goat was found to be 86 and 70.5 cm, respectively. Similarly the chest girth was reported in adult male and female of the same breed to be 86 and 73.5 cm, respectively<sup>[12]</sup>. These may be due to the better nutritional and environmental condition. The present finding regarding the body weight are in close vicinity with previous report about the body weight in same indigenous breed. The body weight in adult male and female beetal goat was reported to be 46 and 37 kg, respectively<sup>[13]</sup>.

These values are with no respect to affect the sex of goat on the variable. The high and significant correlation coefficient between height at withers and heart girth and bodyweight at 04 to 18 month of age suggests that either of this variable or their combination would provide a good estimate for predicating live body weight in beetal goats at an early age. The higher coefficient of correlation

**Table 1: Mean ( $\pm$ SE) for bodyweight and linear body measurement (cm)**

Age (Month)	Sex	No of observation	Body weight (Kg)	Body length	Height at withers	Hearth girth
04-12	M	10	18.60 $\pm$ 1.81	59.60 $\pm$ 0.74	60.30 $\pm$ 1.16	59.10 $\pm$ 0.86
	F	10	14.50 $\pm$ 1.19	58.70 $\pm$ 0.84	56.50 $\pm$ 1.28	57.60 $\pm$ 0.95
	M&F	20	16.55 $\pm$ 1.15	59.15 $\pm$ 0.55	58.40 $\pm$ 0.94	58.35 $\pm$ 0.65
13-18	M	8	25.25 $\pm$ 2.76	64.38 $\pm$ 1.39	68.25 $\pm$ 1.42	66.0 $\pm$ 3.19
	F	7	21.0 $\pm$ 3.47	60.14 $\pm$ 0.50	63.14 $\pm$ 0.55	61.29 $\pm$ 1.27
	M&F	15	23.27 $\pm$ 2.18	62.40 $\pm$ 0.94	65.87 $\pm$ 1.03	63.80 $\pm$ 1.85
19-24	M	07	29.86 $\pm$ 1.28	69.42 $\pm$ 0.29	72.14 $\pm$ 0.67	70.29 $\pm$ 1.19
	F	06	24.00 $\pm$ 1.25	62.16 $\pm$ 0.60	66.50 $\pm$ 1.18	64.00 $\pm$ 0.68
	M&F	13	27.15 $\pm$ 1.21	66.08 $\pm$ 1.09	69.54 $\pm$ 1.02	67.38 $\pm$ 1.14
25-36 and above	M	19	41.47 $\pm$ 1.63	78.15 $\pm$ 0.60	82.11 $\pm$ 1.02	79.63 $\pm$ 0.96
	F	19	33.95 $\pm$ 4.97	69.31 $\pm$ 1.85	71.42 $\pm$ 2.31	70.15 $\pm$ 1.80
	M&F	38	37.71 $\pm$ 1.16	73.73 $\pm$ 0.81	76.76 $\pm$ 1.05	74.89 $\pm$ 0.93

Values within each age group with different superscripts differ significantly ( $p < 0.05$ )

**Table 2: Coefficient of correlation between the variable**

Age (month)	Variable 1	BW	BL	HAW
04-12	BL	0.485		
	HAW	0.746	0.477	
	HG	0.623	0.551	0.638
13-18	BL	0.115		
	HAW	0.541	0.603	
	HG	0.713	-0.098	0.552
19-24	BL	0.701		
	HAW	0.617	0.813	
	HG	0.525	0.740	0.813
25-36 and above	BL	0.779		
	HAW	0.722	0.893	
	HG	0.708	0.857	0.870

1 BL= Body length; BW=bodyweight; HG= Hearth Girth; HAW= Height at withers

**Table 3: Coefficient of correlation between bodyweight (kg) and linear body measurement**

Age (month)	SEX	BL	HAW	HG
04-12	M	0.570	0.671	0.516
	F	0.342	0.769	0.725
	M&F	0.485	0.746	0.638
13-18	M	0.034	0.776	0.759
	F	-0.337	0.050	0.845
	M&F	0.115	0.541	0.552
19-24	M	0.599	0.503	0.130
	F	0.702	0.134	-0.579
	M&F	0.701	0.617	0.525
25-36 and above	M	0.824	0.575	0.524
	F	0.742	0.677	0.751
	M&F	0.779	0.722	0.708

BL= Body length; HG= Hearth Girth; HAW= Height at withers

( $r = 0.638$  and  $r=0.552$ ) obtained between the two variables attests to this. Similar trend was also reported in Red Sokoto goats<sup>[5,7]</sup>.

Mukherjee *et al.*<sup>[14,15]</sup> and Singh *et al.*<sup>[16]</sup> reported the highest and significant correlation value of bodyweight with chest circumference in Brown Bengal does and Grey Bengal Goats, respectively. At later stages (from 19-24 month and onward) the body length assumes more importance as an indicator of live weight( $r=0.701$ ,  $r=0.779$ ).

In conclusion, since the body measurements had high correlation with the body weight, this may be used as selection criteria. Earlier reports also indicated that selection based upon the body measurements should improve the meat production<sup>[17,18]</sup>. However, further research is needed to investigate the relationship between the body weight with linear body measurements in same

and other breeds of goat in different region of the country at different age with maximum number of observation.

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