Prediction of Carcass Weight from the Body Characteristics of Black Bengal Goats

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ABSTRACT

A total of 122 wethers were taken to predict carcass weight from body measurements specially to assume meat yield from body measurements in goats. Goats taken in this experiment were divided into three groups (A, B & C) on the basis of source of collection. In group A at 12 months of age, highly significant correlations ($p < 0.01$) were found between live-weight with body length (0.92) and wither height (0.98). Correlation between live-weight with heart girth (0.76) was also significant ($p < 0.01$). In group B at different ages highly positive significant correlations (0.73 to 0.86) were found between live weight and body measurements. The partial correlation between live weight and body measurements for constant age was 0.56 to 0.75. Body measurement expressed significant positive relationship with live weight for constant age. In group C at slaughter ages correlations between hot carcass weight and live weight (0.85) and rib-saddle joint length (0.91) were found highly significant.

Key Words: Body measurement; Carcass weight; Wether

INTRODUCTION

The economy of Bangladesh largely depends on agriculture. Livestock plays an important role in national economy, contributing about 9% of gross domestic products (GDP) and 13% of total foreign exchange earning (DLS, 1994). In Bangladesh, Black Bengal Goat occupies a very significant position in livestock sector. It has greater importance, particularly in subsistence agricultural situations. The annual national requirement of meat is 5.77 million metric ton but meat supply is 0.51 million metric ton (Amin *et al.,* 2000). Chevon (goat meat) is accepted to the people of all community irrespective of caste, creed and religious taboo. Black Bengal Goats are dwarf goats and are known to be famous for its adaptability, fertility, fecundity, delicacy of meat and superior skin quality (Devendra, 1985; Acharya, 1987; Saadullah, 1991). Carcass weight of animals depends on its rate of gain, weight at slaughter and dressing percentage. Carcass weight of Black Bengal Goat may depend on its body measurements. It is, therefore, necessary to study the relationship of body measurements and carcass weight. For many years investigator have attempted to predict carcass weight from indirect measurements on live animals. With this end in view some correlation studies on carcass traits and body measurements in Black Bengal Goats of different ages were undertaken with the objectives to establish relationship between pre-slaughter traits and carcass weight, predict carcass weight and study the correlation between body weight and body measurement.

MATERIALS AND METHODS

The study was conducted at Bangladesh Agricultural University Artificial Insemination Center as a base. The animals used in this experiment were maintained by the goat owners in the village goataries at the vicinity of BAU campus. Data were collected from three groups (A, B & C) of animals in this experiment. The basis of grouping was the source of collection. Information about carcass weight and body measurements of Black Bengal Goats in group A were collected from records maintained in the goat breeding project at the Department of Animal Breeding and Genetics, BAU, Mymensingh and the number of goats were 16. A total of 6 traits were considered in group A to predict the relationship between body measurements and carcass characteristics. In group B some data were collected from neighboring areas of BAU, Mymensingh. As many as 53 wethers were chosen randomly and 6 traits were taken under consideration to assume relationship within the body measurements. In group C the data were collected from a goat market. A number of 53 wethers were chosen randomly and were studied for 3 traits to find out the relationship of rib-saddle joint length with live-weight as well as hot carcass-weight.

In table I the following parameters were considered for analysis: (i) live weight (in kg) recorded early morning; (ii) empty live weight (in kg) recorded early morning on empty stomach; (iii) wither height (in cm), vertical distance between ground to point of wither; (iv) body length, distance between points of shoulder to point of hip; (v) heart girth, smallest circumference of the body immediately behind the shoulder; (vi) rib-saddle joint length, distance between one side to another side at the junction between last rib and first lumber bone; (vii) hip width, distance between one hip joint to another hip joint; (viii) hot carcass weight, weight was taken within one hour of slaughter at warm

condition. Live weight was taken on using weighing balance and body measurements were measured by measuring tape.

The recorded data was compiled, tabulated and analyzed in accordance with the objectives of the study. Correlation co-efficient was calculated among the different measurements using the computer program Statgraf (1993).

RESULTS AND DISCUSSION

Average live weight, body measurements and carcass weight of different groups are shown in Table II. In group A, average live-weight. heart girth, body length and wither height at 12 months of age were 14.69 ± 0.62 kg, 55.63 ± 0.55 cm, 59.19 ± 1.46 cm and 45.49 ± 0.62 cm, respectively. In group B average age, live-weight, body measurements like heart girth, body length, wither height, rib-saddle joint length, hip width with standard error were 9.21 ± 0.30 months, 13.29 ± 0.35 kg, 51.70 ± 0.55 cm, 49.50 ± 0.49 cm, 47.60 ± 0.47 cm, 11.08 ± 0.16 cm, 10.37 ± 0.16 cm, respectively. These findings were alike Singh *et al*. (1981), Bhattacharya *et al*. (1984) and Hussain (1993). Singh found 14.25 kg live-weight. 56.92 cm heart girth, 49.69 cm wither height, whereas Bhattacharya got 46.53 ± 0.57 cm wither height, 46.15 ± 0.68 cm body length and Hussain (1993) observed 50.90 ± 0.20 cm heart girth and 46.70 ± 0.20 cm wither height and 46.40 ± 0.20 cm body length. In group A hot carcass weight was found to be 5.82 ± 0.27 kg. This result is in good agreement with Amin *et al.* (2000). Amin *et al.* (2000) found 4.9 ± 0.21 kg hot carcass weight.

In case of group C goats were six months of age and the average hot carcass weight, rib-saddle joint length, live weight were 6.75 ± 0.18 kg, 11.14 ± 0.14 cm, 11.17 ± 0.22 kg, respectively.

Correlation between body measurements and carcass weight are shown in Table III. In group A there was positive ($p < 0.1$) correlation between heart girth and live-weight. Correlation between live-weight and body length, live-weight and wither height were positive and highly significant ($p < 0.01$). The findings are similar with Singh *et al*. (1987), Prasad (1977), Koratkar and Patil (1982). Significant ($p < 0.01$) correlations were found between live-weight and hot carcass weight. It indicates that hot carcass weight is strongly correlated with live weight. Many authors like Stanley *et al*. (1963), Shelton *et al*. (1977), Chawla and Nath (1979) found that phenotypic correlation of empty live-weight. and hot carcass weight were positive and significant ($p < 0.01$). Therefore it is revealed that live-weight have a relation with carcass traits.

In group B all body measurements such as heart girth, body length, wither height, rib-saddle joint length, hip-width showed positive significant correlation ($p < 0.01$) with live weight. These results are in partial agreement with the findings of many investigators (Prasad, 1977; Singh *et al*., 1987; Pander *et al*., 1989; Koratkar & Patil, 1982; Khan *et al*., 1992). They found significant positive correlation (p <

Table I. Traits considered for different groups of goat

Traits	Group A	Group B	Group C
No. of goats	16	53	53
Live weight (LW)	√	√	√
Empty live weight (ELW)	√	-	-
Wither height (WH)	√	√	-
Body length (BL)	√	√	
Heart girth (HG)	√	√	–
Rib-saddle joint length (RSJL)	–	√	√
Hip width (HW)		√	
Hot carcass weight (HCW)	√	–	√

Table II. Average body measurements and carcass characteristics in different groups

Parameters	Group A	Group B	Group C
Live weight (kg)	14.69±0.62	13.29±0.35	11.17±0.22
Wither height (cm)	45.69±0.62	47.60±0.47	x
Body length (cm)	59.19±1.46	49.50±0.49	x
Heart girth (cm)	55.63±0.55	51.70±0.55	x
Rib-saddle joint length (cm)	x	11.08±0.16	11.14±0.14
Hip width (cm)	x	10.37±0.16	x
Hot carcass weight (kg)	5.82±0.27	x	6.75±0.18

Table III. Correlation co-efficient of live weight with body measurements and carcass weight in different groups

Characters	Group A	Group B	Group C
r_{WL}	0.92***	0.84***	–
r_{WH}	0.98***	0.79***	–
r_{WG}	0.76**	0.86***	–
r_{WR}		0.86***	–
r_{Wh}		0.73***	
r_{WC}	0.98***	–	0.85**
r_{RC}	-	-	0.91***

r , Correlation coefficient; W, Live weight; L, Body length; H, Wither height; G, Heart girth; R, Rib-saddle joint length; h, Hip width; C, Hot carcass weight; ***, Significant at 0.01%; **, Significant at 0.1%

Table IV. Simple linear regression equations and partial regression equations for estimation of live weight from body measurements and its % reliability in different groups

Groups	Y= a+bx	R^2
	$-33.50+0.87x_1$	58
	$-8.46+0.39x_2$	85
Group A	$-30.31+0.99x_3$	96
	$-32.64+0.09x_1+0.93x_3$	95
	$-31.02+0.02x_2+1.02x_3$	95
	$-32.40+0.10x_1+0.01x_2+0.90x_3$	95
	$-14.65+0.54x_1$	74
	$-16.06+0.59x_2$	71
	$-14.50+0.58x_3$	62
Group B	$-7.48+1.87x_4$	74
	$-3.13+1.58x_5$	53
	$-18.61+0.33x_1+0.30x_2$	80
	$-19.34+0.30x_1+0.25x_2+0.10x_3$	80
	$-17.02+0.18x_1+0.22x_2+0.04x_3+0.76x_4$	83
	$-16.89+0.17x_1+0.20x_2+0.05x_3+0.76x_4+0.06x_5$	83

Y, Live weight; x_1, Heart girth; x_2, Body length; x_3, Wither height; x_4, Rib-saddle joint length; x_5, Hip width.

Table V. Simple linear regression equations for estimation of hot carcass weight from live weight and their % reliability in group A

Estimation	Regression equation	R^2
HCW from LW	HCW=-0.37+0.43LW	96

HCW, Hot carcass weight; LW, Live weight

Table VI. Simple linear regression equation for estimation of hot carcass weight from rib-saddle joint length and partial regression equation for estimation of hot carcass weight from rib-saddle joint length, live weight and its % reliability

Estimation	Regression equation	R^2
HCW from RSJL	HCW=-6.13+1.16 RSJL	83
HCW from RSJL and LW	HCW=-5.35+0.85 RSJL+0.24 LW	83

HCW, Hot carcass weight; RSJL, Rib-saddle joint length; LW, Live weight

Table VII. Prediction chart for determining body weight and carcass weight from body measurements in Black Bengal goats

Heart girth (cm)	Body length (cm)	Wither height (cm)	Live Weight (kg)	ELW (kg)	HCW (kg)
50	50	40	9.00	8.67	3.36
51	51.5	41	10.00	9.75	3.75
52	53	42	11.00	10.75	4.25
53	54.5	43	12.00	11.75	4.75
54	56	44	13.00	12.75	5.00
55	57.5	45	14.00	13.75	5.50
56	59	46	15.00	14.75	6.00
57	60.5	47	16.00	15.50	6.25
58	62	48	17.00	16.50	6.75
59	63.5	49	18.00	17.50	7.25
60	65	50	19.00	18.50	7.50

ELW = Empty live weight, HCW = Hot carcass weight

0.01) between live-weight and body measurements.

In group C correlation between live-weight and rib-saddle joint length, weight and hot carcass weight, rib-saddle joint length and hot carcass weight were found highly significant (p < 0.01). Many investigators (Bradford, 1974; Arganosa *et al.*, 1977; Kanuajia *et al.*, 1985; Thahir *et al.*, 1994; Singh *et al.*, 1994) observed similar significant correlation between live-weight and hot carcass weight El-Shahat (1993) found significant correlation of hot carcass weight with rib-saddle joint length in goats.

Simple linear regression and partial regression equation for estimation of live weight from body measurements of different groups with their reliability percentage have been shown in Table IV. The existence of positive significant correlation of live weight with body measurements justified the use of linear regression for prediction of live weight. Body measurements can be separately or together used in estimating live weight in goats.

Simple linear regression equation for estimation of empty live weight from live weight, hot carcass weight from empty live weight, with there reliability percentage in group

A have been represented in Table V. Live weight can be used in estimating carcass weight in goats. In group C rib-saddle joint length and live weight have been used separately or together in estimating hot carcass weight in goats (Table VI).

CONCLUSION

Body measurements like live weight, wither height, heart girth, body length as selection criteria to select goats for meat production. Rib-saddle joint length is found quite reliable in predicting live weight than hip width. A prediction chart for determining body weight and carcass weight from body measurements have been prepared and shown in Table VII.

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