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Find out Phenotypic Descriptors for Prediction of Probable Kidding Size of Black Bengal Goat (*Capra hircus bengalensis*)

P.S. Chakrabortty[1]*, C.K. Biswas[1], D. Majumdar[2] and S.K. Sutradhar[1]

[1]*Department of Animal Science, BCKV, Mohanpur, Nadia, West Bengal, INDIA*
[2]*Department of Agricultural Statistics, BCKV, Mohanpur, Nadia, INDIA*

**Corresponding author: PS Chakrabortty; E-mail: partha3188@gmail.com*

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ABSTRACT

Data on some linear traits along with age, body weight (BW) at breeding, parity and previous litter size (LZ) of 240 pregnant Black Bengal goats were analysed using one-way Analysis of Variance, F-test, T-test, Chi-square test, DMRT & stepwise discriminant function analysis using SPSS. Based on stepwise discriminant function to find out month wise phenotypic descriptors, seven linear traits {Punch Girth (PG), Body Length (BL), Head-Rump Length (HRL), Curved Head-Rump Length (HRCL), Heart Girth (HG), Wither Height (WH) and BW} were identified to be significant in discriminating the foetal numbers between groups. Out of these, PG measurement might be considered as one of the best indicator for higher LZ during the first, third, fourth, fifth month of pregnancy and after kidding. BW emerged as the second-best indicator for higherLZ during third, fourth, fifth month of pregnancy and after kidding.

HIGHLIGHTS

- Higher litter sizes vary on their phenotypic appearance.
- Various morphometric traits may be considered as good predictor.

Keywords: Black Bengal Goat, Prolificacy, Reproductive Parameters, Phenotypic Traits

Black Bengal is an accredited (INDIA_GOAT_ 2100_ BLACKBENGAL_ 06004) goat breed of eastern region of India, which is mainly reared for meat purpose by the farmers of this region. This breed is distributed throughout West Bengal and adjoining parts of the neighbouring states, like Bihar, Jharkhand, Orissa, Assam, parts of Tripura and Bangladesh. Black Bengal goat is a dwarf breed and famous for high fertility, prolificacy, superior chevon quality, best quality skin, early sexual maturity, resistance against common diseases, low kidding interval and very good adaptability (Chakrabortty, 2022). Black Bengal goat is a prolific breed, with prolificacy percentage 187.49 and the percentage of multiple ovulations is 72.88 percent (Patra *et al.,* 2014).

MATERIALS AND METHODS

Three districts of West Bengal viz. Nadia, Hooghly and Purba-Bardhaman were selected for the present investigation. Two blocks under each district and two villages under each block were randomly selected. Twenty to twenty-five pregnant Black Bengal goats, preferably at the 1st month of pregnancy but not later than 2nd month, from each village were randomly selected; a total of 240 female pregnant animals of different age groups and parity were included in the present study. A group of animals were offered concentrate supplement while the other group thrived only on grazing. Some general information, qualitative traits and reproductive parameters

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were collected one time, while different morphometric traits including body weight were recorded at monthly interval during five months of pregnancy period and one set of observation after kidding. A complete time-series data on 240 pregnant goats were analysed using One-Way ANOVA, F-test, T-test, Chi-square test, DMRT & stepwise discriminant function analysis using SPSS.

RESULTS AND DISCUSSION

Body Length (BL)

The mean value of body length (BL) of Black Bengal goats measured in different months of pregnancy and once after kidding is presented in Table 1. The value were markedly influenced (P<0.01) by litter size throughout the pregnancy and even after kidding, the triplet bearing does showed the highest BL followed by twines and single bearing does. Multiple births were mostly recorded in does with larger body size which were expected to have higher BL and hence justifying the present finding. The result was supported by Paul (2008) reported that the body lengths of Black Bengal bucks and does were 46.50 ± ± 0.77 and 42.15 ± 0.55 cm, respectively.

Heart Girth (HG)

The month wise mean values of hearth girth corresponding to different litter size are presented in Table 1. It is clearly evident from the present finding that litter size of does had marked influence on hearth girth. Triplets showed significantly higher (P<0.01) HG values (59.50 ± 2.66 to 63.33 ± 0.74 cm) as compared to single and twin bearing does, the 1st group had the least value. The recorded variation might be due to their increased body size, which is agreed with the present findings. Pan *et al.* (2015) also observed that similar trend of increased HG values with increasing litter size of does. Does producing quadruplets had the highest value (67.00 ± 1.00) to 68.29 ± 1.77 cm) compared to other litter bearing does.

Punch Girth (PG)

The mean values of punch girth corresponding to different litter size of does are presented in Table 1. It is delusive from the present finding that litter size of does had marked influence (P<0.01) on punch girth over entire gestation period and even after kidding. The values rapidly increased over the months of gestation as compared to other physical parameters. The highest PG values were recorded in triplet bearing group (72.22 ± 1.15 to 80.61 ± 0.61 cm). This group of does had to make more room anatomically for accommodating multiple foetuses within their womb and provide more body strength to bear more foetuses resulted to increased pelvic cavity and higher PG values (Pan *et al.* 2015).

Head – Rump Length (HRL)

Mean Head-Rump length of Black Bengal does under the present investigation are presented in Table 1. The result focused that there was a positive association between HRL and litter size of does. Triplet bearing does were identified to have maximum HRL compared to single and twins bearing does. The triplet giving does have the larger body size at any given age which could be the cause of higher HRL value. Halder *et al*. (2014a) measured the HRL of Black Bengal does and found the mean value (57.15 ± 5.16 cm) which is near to the present finding.

Curved Head – Rump Length (HRCL)

It gives a brief overview of curved head-rump length belonging to different month of pregnancy with LZ (Table 1). A remarkable association (P<0.01) between HRCL and litter size was noted throughout the pregnancy and even after kidding. The values were significantly higher in triplet producing does (66.69 ± 3.06 to 69.18 ± 0.09 cm) compared to twins and singles producing does, the singles had the least value. The finding indicated that the triplet bearing does, owing to their larger body size had higher HRCL values compared to other two groups (Table 1). Pan *et al* (2015) recorded almost similar type of finding where such association was highly significant (P<0.01).

Rump Length (RL)

The present study emerges an important finding, inexplicably; this correlation is rump length in different month of pregnancy related to LZ and Feed. The result casts a new light on RL of Black Bengal goat belonging to single, twins and triplets in Table 1. The result indicates that in most of the months (2nd to 6th) highly significant

(P<0.01) variation of RL were noted with kidding size of doe while the 1st month of gestation showed less variation (P<0.05) for this physical parameter. The triplet bearing does showed the maximum RL (14.16 ± 0.69 to 15.41 ± 0.24 cm) which might be due to increased body size to accommodate multiple foetus and obviously the single bearing does had the least value (12.45 ± 0.27 to 12.73 ± 0.2 cm). Pan *et al.* (2015) recorded almost similar measurements of RL (12.89 ± 0.26 to 14.57 ± 0.65 cm) and opined that the does with multiple births had proportionately higher RL values.

Wither Height (WH)

This section summarizes the findings of the relationship between wither height and different LZ and Feed in every month of pregnancy (Table 1). From the result it appears that a definite trend was established between wither height and litter size of doe. Increased WH had more chance to give multiple births and in the present study the triplet bearing does had the maximum WH and the single bearing does, on the other hand had the least value. Such association was found to be highly significant (P<0.01). The results of present study are supported by various scientists like, Husain, (1993) who found that height at wither of adult Black Bengal Goat was 49.5 cm. Adhikary *et al.* (2009) also watched that the wither height of Black Bengal does in the days of 180th, 360th and 720th were 33.25 ± 2.11, 40 ± 1.98 and 48.74 ± 1.22 cm respectively.

Croup Height (CrH)

The results (Table 1) demonstrated that a cutting-edge solution in this point, to sum up the relationship between croup height and different LZ and Feed in every month of pregnancy. An increasing trend was clearly established among different litter size bearing does in respect to their croup height and this variation was statistically significant. The triplet bearing group consistently showed the highest value (47.88 ± 2.28 to 50.05 ± 0.63 cm) compared to other two groups. This might be due to their higher body size and resultant higher CrH. The present findings corroborated with Pan *et al.* (2015) who was inkling that the croup height of BBG belonging to single, twins, triplet and quadruplets varied significantly (P<0.05).

Clearance of Udder (CU)

Litter size wise clearance of udder over the entire gestation period and once after kidding are presented in Table 1. The result shows that udder height decreases with advancement of pregnancy due to enlargement of pelvic and abdominal areas, but such variation was not remarkable. Litter size wise variation were not consistent, these were significant during 3rd to 5th month, while the 1st two months variation were noted to be non-significant (P>0.05). This might be due to urge of fulfillment of nourishing multiple birth in triplet bearing does compared to other two groups. Little higher value of CU (22.77 ± 2.68 cm) than the present finding was reported by Halder *et al.* (2014a).

Chest Height (ChH)

This asserts the relationship between clearance of sternum and different LZ and Feed in every month of pregnancy (Table 1). The result indicates that during 1st month of pregnancy the clearance of sternum was unaffected by litter size of does. But during the later months of gestation and even after kidding the CS value varied significantly (P<0.01). Pan *et al.* (2015) also reported the similar finding, i.e. no effect in 1st month and significant variation in subsequent months.

Pelvic Triangle (PLVT-A)

Another promising finding is that the relationship between *PLVT-A* and different *LZ* and Feed in every month of pregnancy. Out of three different sides of pelvic triangle measured in Black Bengal does during their length of gestation; side 'A' is presented in Table 1. It is evident that PLVT-A was influenced by the litter size of does. Triplet bearing does measured significantly (P<0.05) or P<0.01) higher values compared to the others which might be due to their larger body size. Relevant literature on this parameter was not available to compare with the present finding.

Pelvic Triangle (PLVT-B)

The mean value of another side of the triangle (PLVT-B) was also found to vary significantly (P<0.05 or P<0.01) over the months of gestation and once after kidding (Table 1). The triplet bearing does consistently had the higher value compared to others. Accuracy of the result could not be compared due to lack of relevant literature. It could be assumed that triplet bearing does due to their larger body size and physiological and anatomical need of bearing multiple foetus, had higher PLVT-B values.

Pelvic Triangle (PLVT-C)

Among three sides of pelvic triangle rate of increment of side 'C' over the months of pregnancy had been found to be maximum (Table 1). A positive association (P<0.01) was established between PLVT-C and litter size of does all through the pregnancy, the triplet producing does had been measured the highest value than singles and twins bearing does. Previous studies or this parameter could also not be found. This significant variation would be due to enlargement of pelvic region and resultant side 'C' to accommodate the developing multiple foetus.

Pelvic Triangle Area (PLVT)

The pelvic triangle area of the pregnant does under the present investigation was markedly increased with advancement of pregnancy and of course with the increase in litter size of does. This variation was found to be highly significant (P<0.01). Rate of increase of PLVT (399.46 ± 20.31 to 458.80 ± 11.67) of triplet producing does, were much higher than compared to other two groups of does (Table 1). Haldar *et al.* (2014a and 2014b) and Pan *et al.* (2015) also worked out on this parameter and found the similar trend of increasing PLVT with increase in litter size.

Distance between Tuber Coxae (DTC)

Distance between Tuber Coxae (DTC), like most of the linear traits were also found to be positively associated with litter size of does, triplet bearing does had the highest DTC (P<0.01) compared to other two groups (Table 1). The reason of such variations suggested earlier. Overall these findings are in accordance with findings reported by Halder *et al.* (2014 a) was that the distance between Tuber Coxaebones of female Black Bengal goat was 11.38 ± 1.18 cm.

Table 1: Mean and correlation between month wise phenotypic descriptor and different LZ

Parameter	MOP	Litter Size						F-Value	Sig.(S_e)	Test of Sig.
		Single	SEM ±	Twin	SEM ±	Triplet	SEM ±			
Body Length (BL)	1	40.53[a]	0.73	45.15[ab]	1.07	46.69[b]	2.4	6.54	0.003	*
	2	40.73[a]	0.57	44.72[b]	0.7	49.81[c]	1.25	30.25	0.000	*
	3	41.36[a]	0.48	46.29[b]	0.54	51.73[c]	0.76	66.40	0.000	*
	4	41.46[a]	0.47	46.47[b]	0.54	51.78[c]	0.76	65.12	0.000	*
	5	41.53[a]	0.47	46.60[b]	0.54	51.96[c]	0.76	66.36	0.000	*
	6	41.52[a]	0.49	46.56[b]	0.54	51.96[c]	0.76	65.94	0.000	*
Heart Girth (HG)	1	50.05[a]	0.73	57.85[b]	1.09	59.50[b]	2.66	14.84	0.000	*
	2	51.33[a]	0.53	57.24[b]	0.75	61.42[c]	1.24	38.28	0.000	*
	3	52.10[a]	0.55	58.69[b]	0.52	36.13[c]	0.71	77.68	0.000	*
	4	52.42[a]	0.55	59.06[b]	0.50	63.31[c]	0.74	75.57	0.000	*
	5	52.46[a]	0.57	59.30[b]	0.52	63.49[c]	0.73	76.18	0.000	*
	6	52.40[a]	0.56	59.06[b]	0.52	63.33[c]	0.74	47.04	0.000	*
Punch Girth (PG)	1	60.63[a]	0.98	70.35[b]	1.26	72.22[b]	1.15	30.76	0.000	*
	2	63.83[a]	0.82	71.07[b]	0.88	73.97[b]	0.68	41.51	0.000	*
	3	64.69[a]	0.72	72.42[b]	0.62	76.97[c]	0.64	78.71	0.000	*
	4	66.16[a]	0.74	73.97[b]	0.61	78.76[c]	0.12	84.10	0.000	*
	5	67.76[a]	0.75	75.71[b]	0.61	80.61[c]	0.61	86.36	0.000	*
	6	64.38[a]	0.74	72.00[b]	0.6	75.91[c]	0.60	73.02	0.000	*

Head – Rump Length (HRL)	1	50.05^{a}	0.78	60.29^{b}	1.36	60.41^{b}	2.79	17.38	0.000	*
	2	49.62^{a}	0.71	57.73^{b}	1.02	61.49^{b}	1.40	37.04	0.000	*
	3	49.82^{a}	0.61	57.75^{b}	0.65	62.49^{c}	0.82	74.13	0.000	*
	4	50.04^{a}	0.61	57.92^{b}	0.64	62.60^{c}	0.82	73.23	0.000	*
	5	50.11^{a}	0.62	57.91^{b}	0.63	62.71^{c}	0.83	73.62	0.000	*
	6	50.04^{a}	0.62	57.88^{b}	0.65	62.71^{c}	0.84	72.82	0.000	*
Curved Head – Rump Length (HRCL)	1	54.48^{a}	0.80	64.19^{b}	1.35	66.69^{b}	3.06	17.21	0.000	*
	2	54.91^{a}	0.62	62.48^{b}	0.92	68.10^{c}	1.49	45.61	0.000	*
	3	54.91^{a}	0.66	62.79^{b}	0.66	69.12^{c}	0.89	82.38	0.000	*
	4	55.19^{a}	0.65	62.97^{b}	0.66	69.12^{c}	0.9	79.18	0.000	*
	5	55.13^{a}	0.65	62.96^{b}	0.66	69.17^{c}	0.9	80.62	0.000	*
	6	55.15^{a}	0.66	63.01^{b}	0.66	69.18^{c}	0.9	80.57	0.000	*
Rump Length (RL)	1	12.45^{x}	0.27	13.42^{xy}	0.23	14.16^{z}	0.69	5.50	0.006	**
	2	12.55^{a}	0.24	13.67^{b}	0.2	15.14^{c}	0.39	23.43	0.000	*
	3	12.61^{a}	0.2	13.95^{b}	0.16	15.15^{c}	0.24	39.59	0.000	*
	4	12.72^{a}	0.2	14.13^{b}	0.15	15.31^{c}	0.23	43.33	0.000	*
	5	12.73^{a}	0.2	14.17^{b}	0.16	15.41^{c}	0.24	43.56	0.000	*
	6	12.66^{a}	0.2	14.06^{b}	0.16	15.24^{c}	0.23	41.43	0.000	*
Wither Height (WH)	1	38.98^{a}	0.71	43.88^{b}	1.04	46.25^{b}	2.24	9.29	0.000	*
	2	39.51^{a}	0.47	43.30^{b}	0.67	47.21^{c}	1.13	26.61	0.000	*
	3	39.77^{a}	0.44	43.97^{b}	0.45	48.56^{c}	0.69	60.25	0.000	*
	4	39.90^{a}	0.43	44.02^{b}	0.47	48.70^{c}	0.70	58.58	0.000	*
	5	39.96^{a}	0.46	44.15^{b}	0.46	48.65^{c}	0.69	57.18	0.000	*
	6	39.94^{a}	0.44	44.14^{b}	0.46	48.59^{c}	0.69	57.25	0.000	*
Croup Height (CrH)	1	42.71^{x}	0.72	46.35^{y}	0.75	47.88^{y}	2.28	5.36	0.007	**
	2	43.51^{a}	0.61	46.19^{ab}	0.49	48.68^{b}	1.11	12.48	0.000	*
	3	43.55^{a}	0.45	46.53^{b}	0.53	49.78^{c}	0.4	34.57	0.000	*
	4	43.60^{a}	0.52	46.55^{b}	0.4	49.88^{c}	0.62	34.41	0.000	*
	5	43.72^{a}	0.54	46.63^{b}	0.4	50.05^{c}	0.63	33.81	0.000	*
	6	43.58^{a}	0.53	46.57^{b}	0.4	49.99^{c}	0.61	35.58	0.000	*
Clearance of Udder (CU)	1	19.85	0.32	20.33	0.61	20.64	1.28	0.36	0.698	NS
	2	20.28	0.28	20.96	0.41	21.36	0.66	1.63	0.201	NS
	3	19.94^{a}	0.27	21.02^{ab}	0.29	21.74^{b}	0.43	6.51	0.002	*
	4	19.45^{a}	0.25	20.35^{ab}	0.28	21.13^{b}	0.43	5.91	0.003	*
	5	18.93^{x}	0.25	19.53^{xy}	0.27	20.32^{y}	0.4	4.49	0.012	**
	6	19.00^{x}	0.25	19.73^{xy}	0.28	20.48^{y}	0.4	5.06	0.007	**
Chest Height (ChH)	1	20.74	0.32	21.96	0.52	22.84	1.1	3.07	0.053	NS
	2	20.79^{a}	0.26	21.82^{ab}	0.38	23.39^{b}	0.66	9.23	0.000	*
	3	20.77^{a}	0.23	21.53^{a}	0.25	23.30^{b}	0.39	17.57	0.000	*
	4	20.49^{a}	0.22	21.44^{a}	0.26	23.34^{b}	0.4	20.92	0.000	*
	5	20.63^{a}	0.23	21.45^{a}	0.26	23.29^{b}	0.4	19.13	0.000	*
	6	20.68^{a}	0.23	21.53^{a}	0.26	23.30^{b}	0.4	18.11	0.000	*

Pelvic Triangle (PLVT-A)	1	34.00^{x}	0.32	36.69^{y}	0.83	38.19^{y}	1.69	5.78	0.005	**
	2	33.83^{a}	0.36	35.59^{a}	0.62	39.01^{c}	0.92	16.99	0.000	*
	3	33.89^{a}	0.29	36.33^{b}	0.4	39.41^{c}	0.55	36.44	0.000	*
	4	34.02^{a}	0.28	36.47^{b}	0.41	39.44^{c}	0.52	37.59	0.000	*
	5	34.06^{a}	0.29	36.65^{b}	0.4	39.60^{c}	0.51	39.46	0.000	*
	6	33.96^{a}	0.29	36.69^{b}	0.4	39.51^{c}	0.52	39.14	0.000	*
Pelvic Triangle (PLVT-B)	1	17.74^{x}	0.57	19.69^{xy}	0.75	21.61^{y}	1.40	05.00	0.010	**
	2	18.95^{a}	0.43	20.22^{a}	0.5	22.69^{b}	0.73	11.97	0.000	*
	3	19.25^{a}	0.36	20.73^{b}	0.3	23.06^{c}	0.41	26.61	0.000	*
	4	19.40^{a}	0.37	20.80^{b}	0.3	23.15^{c}	0.41	26.06	0.000	*
	5	19.40^{a}	0.37	20.93^{b}	0.3	23.27^{c}	0.40	27.80	0.000	*
	6	19.33^{a}	0.36	20.87^{b}	0.31	23.22^{c}	0.39	28.40	0.000	*
Pelvic Triangle (PLVT-C)	1	33.21^{a}	0.48	37.96^{b}	0.8	37.28^{b}	1.65	9.49	0.000	*
	2	33.59^{a}	0.54	37.10^{b}	0.65	39.69^{c}	0.91	20.41	0.000	*
	3	34.75^{a}	0.45	37.62^{b}	0.45	41.17^{c}	0.52	39.89	0.000	*
	4	35.97^{a}	0.45	38.99^{b}	0.43	42.35^{c}	0.54	39.59	0.000	*
	5	37.27^{a}	0.48	40.44^{b}	0.46	44.09^{c}	0.57	41.53	0.000	*
	6	34.82^{a}	0.44	37.49^{b}	0.47	40.19^{c}	0.55	26.73	0.000	*
Pelvic Triangle Area (PLVT)	1	284.37	17.69	349.85	16.05	399.46	20.31	8.80	0.000	*
	2	286.33	17.32	352.19	18.53	409.33	26.66	9.33	0.000	*
	3	312.68^{a}	7.16	363.79^{b}	8.12	443.75^{c}	11.41	47.61	0.000	*
	4	320.41^{a}	7.16	370.66^{b}	8.12	451.18^{c}	11.41	45.74	0.000	*
	5	323.29^{a}	7.51	377.88	8.50	458.80^{c}	11.67	47.13	0.000	*
	6	314.29^{a}	7.29	366.87^{b}	8.08	439.75^{c}	10.82	45.13	0.000	*
Distance between Tuber Coxae (DTC)	1	8.72^{a}	0.29	10.35^{b}	0.28	10.94^{b}	0.48	13.25	0.000	*
	2	9.41^{a}	0.28	10.78^{b}	0.26	11.35^{b}	0.28	13.95	0.000	*
	3	9.65^{a}	0.22	10.98^{b}	0.18	11.77^{b}	0.20	27.46	0.000	*
	4	9.71^{a}	0.22	11.06^{b}	0.17	11.81^{b}	0.21	27.09	0.000	*
	5	9.80^{a}	0.22	11.14^{b}	0.18	11.87^{b}	0.21	26.42	0.000	*
	6	9.77^{a}	0.22	11.11^{b}	0.18	11.88^{b}	0.20	27.74	0.000	*
Distance between Trochanter Major (DTM)	1	6.71^{a}	0.21	7.88^{ab}	0.35	8.84^{b}	0.54	9.83	0.000	*
	2	7.18^{a}	0.19	8.38^{b}	0.25	9.14^{b}	0.29	17.84	0.000	*
	3	7.37^{a}	0.16	8.63^{b}	0.17	9.23^{b}	0.17	28.92	0.000	*
	4	7.52^{a}	0.15	8.76^{b}	0.17	9.27^{b}	0.17	26.82	0.000	*
	5	7.59^{a}	0.16	8.80^{b}	0.17	9.37^{b}	0.17	27.60	0.000	*
	6	7.59^{a}	0.16	8.80^{b}	0.17	9.39^{b}	0.17	28.12	0.000	*

Where, 6th month denotes after kidding, MOP denotes Months of Pregnancy, * denotes that significance at P<0.01 level, ** denotes that significance at P<0.05 level &NS denotes Non-Significant and ^{abc}means for different groups with different superscript letters within a row differ (P<0.01).

Distance between Trochanter Major (DTM)

Distance between Trochenter Major (DTM), like most of the linear traits were also found to be positively associated with litter size of does, triplet bearing does had the highest DTM (P<0.01) compared to other two groups (Table 1). The reason of such variations suggested earlier. Pan *et al.*

(2015) also worked out on this parameter and observed the similar trend of increasing DTM with increasing litter size.

Month wise phenotypic descriptor

The stepwise discriminant function as presented in Table 2 indicated that seven linear traits (PG, BW, HRL, BL, HRCL, HG and WH) were significant in discriminating the foetal numbers between groups. The standardized canonical discriminant function coefficients showed the multivariate discriminating power of the phenotypic traits. PG measurement might be considered as one of the best indicator for higher LZ during the first, third, fourth, fifth month of pregnancy and after kidding. BW emerged as the second-best indicator for higher LZ during third, fourth, fifth month of pregnancy and after kidding. HRL measurement was found to be the third best indicator for higher LZ from third month to fifth month of pregnancy. BL at third and fifth month of pregnancy might be considered as indicators for higher LZ. HRLC at second month of pregnancy and after kidding might be considered as indicators for higher LZ. Besides, HG at second month of pregnancy and WH at fourth month of pregnancy might be considered as indicators for higher LZ. Discriminant analysis allowed identifying important and informative variables from a lot of traits. The pregnant does could be divided in to classes carrying multiple fetuses and single fetus on the basis of PG, BW, HRL, BL, HRCL, HG and WH. Thus, a parsimonious discrimination between the goat groups may be achieved by using a few discriminant traits. The results of the present finding are in agreement with the previous finding of using phenotypic discriminate variables for classifying different goat breeds by Yakubu *et al.* (2010) and BBG by Pan *et al.* (2015).

By analyzing the eigenvalue of stepwise discriminant function, it is observed that the largest eigenvalue was 1.18 corresponds to the second month of pregnancy of the maximum spread of the parameters, which means the linear traits HRLC and HG in second month of pregnancy is most effective predictor that motivating the maximum fetal numbers. The second largest eigenvalue is 1.09 corresponds to the first month of pregnancy, which means the linear traits PG in first month of pregnancy is influencing the highest fetal numbers, in the direction that has the next largest spread, and so on.

Table 2: Stepwise Discriminant Function Results for month-wise discrimination of variables during pregnancy. (Phenotypic Descriptor Month Wise)

Prediction from	First Month		Second Month			Third Month			Fourth Month			Fifth Month			Sixth Month		
	Var.	Fun.	Var.	Function		Var.	Function		Var.	Function		Var.	Function		Var.	Function	
Canonical Discriminant Function Coefficients		1		1	2		1	2		1	2		1	2		1	2
	PG	0.19	HRLC	0.10	-0.24	HRL	0.05	-0.14	HRL	0.04	-0.14	HRL	0.04	-0.14	HRLC	0.08	0.05
			HG	0.12	0.31	BL	0.04	0.18	WH	0.05	0.16	BL	0.03	0.17	PG	0.08	-0.18
						PG	0.08	-0.10	PG	0.09	-0.08	PG	0.08	-0.11	BW	0.08	0.24
						BW	0.83	0.19	BW	0.08	0.21	BW	0.10	0.20			
Unstandardized Coefficients	Cnt.	-12.75	Cnt.	-12.53	-2.70	Cnt.	-11.93	3.59	Cnt.	-12.45	2.90	Cnt.	-11.96	4.21	Cnt.	-11.69	5.39
Functions at Group Centroids																	
Litter Size		1		1	2		1	2		1	2		1	2		1	2
1		-1.21	1	-1.22	-0.01	1	-1.39	0.22	1	-1.40	0.20	1	-1.41	0.21	1	-1.34	0.13
2		0.64	2	0.21	0.02	2	0.04	-0.33	2	0.03	-0.31	2	0.02	-0.31	2	0.07	-0.20
3		1.14	3	1.44	-0.01	3	1.17	0.24	3	1.19	0.22	3	1.21	0.22	3	1.09	0.15
Eigen value		1.09		1.18	0.00		0.98	0.08		1.01	0.07		1.02	0.07		0.89	0.03
% of Variance		100		100	0		92.74	7.26		93.90	6.10		93.90	6.10		96.90	3.10
% of Original grouped cases correctly classified		55.2	66.4			64.7			64.7			65.1			61.3		

CONCLUSION

Thus it could be concluded that the selection of suitable does for higher Kidding Size may be done based on their phenotypic appearance; like larger body size, bigger ears, and longer neck as found in the present study. With the help of body linear traits, suitable phenotypic descriptors like Punch Girth, Body Length, Head-Rump Length, Pelvic Triangle Area, Body Weight could be used to predict probable kidding size during gestation which in turn can draw appropriate management and nutritional measures for survival of more healthy kids. Out of these phenotypic traits, PG measurement might be considered as one of the best indicator for higher LZ during the first, third, fourth, fifth month of pregnancy and after kidding. BW emerged as the second-best indicator for higher LZ during third, fourth, fifth month of pregnancy and after kidding. The present finding may be need in the field level to find out the prolific goat to have better kid production potential.

REFERENCES

Adhikary, G.N., Haque, M.N., Paul, B., Haque, M.E. and Islaam, K.M. 2009. Relationship of body weight with other morphometric characteristics of male and female Black Bengal Goat. *Int. J. Anim. Fish. Sci*., **2**(6): 243-246.

Chakrabortty, P.S. 2022. Reproductive and morphometric traits influencing variation in prolificacy in Black Bengal Goats. PhD Thesis, Department of Animal Science, BCKV, Mohanpur, Nadia.

Haldar, A., Pal, P., Datta, M., Paul, R., Pal, S.K., Majumdar, D., Biswas, C.K. and Pan, S. 2014a. Prolificacy and its relationship with age, body weight, parity, previous litter size and body linear type traits in meat-type goats, *Asian-Austral. J. Anim. Sci.,* **27**(5): 628-634.

Haldar, A., Pal, P., Majumdar, D., Biswas, C.K., Ghosh, S. and Pan, S. 2014b. Body linear traits for identifying prolific goats. *Vet. World.,* **7**(12): 1103-1107

Jalil, M.A., Kabir, M.M., Choudhury, M.P. and Habib, M.A. 2016. Productive and reproductive performance of black bengal goat under farming condition in Bangladesh. *Asian – Austral. J. Biosci. Biotechnol*., **1**(2): 235-245.

NBAGR. 2021.*National Bureau of Animal Genetic Resources*. Makrampur Campus, Karnal-132001 (Haryana), India.

Pan, S., Biswas, C.K., Majumdar, D., Sengupta, D., Patra, A., Ghosh, S. and Haldar, A. 2015. Influence of age, body weight, parity and morphometric traits on litter size in prolific Black Bengal goats. *J. Appl. Anim. Res.,* **43**(1): 104-111.

Patra, A. 2014. Regulation of Reproduction in Female Black Bengal Goat in Relation to its Prolificacy by Different Non-Hormonal Factors. PhD thesis, Department of Animal Science, B.C.K.V., Mohanpur, Nadia, West Bengal.

Patra, A., Biswas, C.K., Ghosh, N. and Chakrabortty, P.S. 2015. Non-Hormonal Factors Influencing Reproductive Efficiency in Black Bengal Goat. Extended Summaries. National Seminar on *'Sustainable Agriculture for Food Security and Better Environment'* December 17-18, 2015, pp. 280-281.

Paul, R.C., Rahman, A.N.M.I., Debnath, S. and Khandoker, M.A.M.Y. 2014. Evaluation of productive and reproductive performance of Black Bengal goat. *Bangladesh J. Anim. Sci.,* **43**(2): 104-111.

Paul, S. 2008. Characterization of Black Bengal goat.*MS Thesis*. Dept. Anim. Breeding and Genetics. Bang. Agri. Univ., Mymensingh.

Yakubu, A., Salako, A.E., Imumorin, I.G., Ige, A.O. and Akinyemi, M.O. 2010. Discriminant analysis of morphometric differentiation in the West African Dwarf and Red Sokoto goats. *South African J. Anim. Sci*., **40**(4): 381-387.