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## Effect of certain blood parameters on different physiological status of black Bengal goat

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#### Abstract

The present study was undertaken to find out the association of different blood parameters viz., Calcium, phosphorus, haemoglobin and total serum protein with different physiological parameters viz., age, sex, pregnant, non-pregnant and types of kidding. The experiment was conducted on Black Bengal goats for a period of one year at Doloipur village, Nadia district of West Bengal in the month of January, 2011 to January, 2012.

It was observed that the calcium level varies significantly ( $P>0.05$ ) between age group of Black Bengal goat. The range of calcium level decreased with increase in age. Male animal shows higher level of calcium, phosphorus, haemoglobin and total serum protein than the female animal in all the age group. It was observed that the level of phosphorus decrease with age except in 0-3 and 3-6 months of age group, which shows increased level and the total serum protein increases with advancing age except 6-9 and 9-12 months of age. The level of haemoglobin increases with the advancing of age. It was also observed that the Calcium, phosphorus, total serum protein and haemoglobin level was higher in non-pregnant animal as compared to pregnant animal. At different type of birth it was observed that the level of calcium, phosphorus, haemoglobin and total serum protein increase in single born than the other type of birth. For all the blood parameters in different age group, triplets kidding shows lower level than single and twin kidding.

**Keywords:** black Bengal goat, age, sex, pregnant, non-pregnant, type of birth

#### Introduction

Goats have earned a special place in the lives of poor and landless farmers of rural India for their economic significance, low input resources, small generation interval and higher proliferation<sup>[40]</sup>. Examining blood for their constituents is used to monitor and evaluate health and nutritional status of animals<sup>[12]</sup>. Factors such as age, sex, production level, physiologic status can influence requirement levels for minerals<sup>[31]</sup>. The metabolic profile of farm reflects the metabolic condition of the particular animal which may be arising due to the nutritional deficiency and disease condition etc. The important minerals are those of calcium and phosphorus which are present in body mainly in bone, teeth, soft tissue and other physiological function<sup>[29]</sup>. The amount of calcium and phosphorus present in blood serum varies within breed, growth phase, weight of animal, lactating, non lactating, pregnant and non pregnant, type of kidding between sex which may increase in male rather than female, also vary between different age groups of the animal<sup>[5]</sup>. The haemoglobin which is a conjugated protein present in red blood cells containing "heme" as the prosthetic group and "globin" as the protein part by which increase and decrease in the level of haemoglobin may result to many pathological condition. The level may also alter according to different breed, physiological status, sex etc. in normal healthy animal<sup>[22]</sup>.

Generally the haemoglobin level in pregnant animal is low as compared to the non-pregnant animal due to the utilization for foetal development<sup>[4]</sup>. Total serum protein which represents the protein metabolism of the animal. The level of serum protein varies according to sex, age, physiological status of the animal. The normal level of serum protein value is 6.67 g / dl<sup>[22]</sup> it may increase in dehydration. Keeping this in view, the present study was undertaken to find out the association between the different blood parameters with age groups, sex, pregnant, non pregnant and different type of kidding.

#### Materials and Methods

The present study was undertaken on 120 Black Bengal goats in the month of January, 2011 to

January, 2012 at Doloipur village, under Nadia district of West Bengal, which is located 7 km away from University Campus, Mohanpur, West Bengal, which was maintained under AICRP project. Most of the villagers maintained the goat with optimum management and feeding practices. The goats were grouped in 7 different age group viz., 0-3, 3-6, 6-9, 9-12, 12-18, 18-24 and 24-30 months. Out of 120 animals, 59 were male and 61 females which were divided again according to type of kidding and pregnant animal. The experiment was conducted for a period of one year. The blood samples were collected from each animal in the morning through jugular vein puncture. Aseptic measure was taken while collecting the blood so as to avoid the damage of the blood cells. The blood samples to be used for estimation of haemoglobin were collected separately in a vials using heparin as an anticoagulant. After the collection, the vials were gently shaken to prevent the clotting of blood. Serum calcium level was estimated as per Ferro-Ham method [10]. The standard curve for serum calcium made from calcium carbonate was used for calculation. Serum inorganic phosphorus was estimated as per Fiske and Subbarow method [11]. The standard curve was made from pure dry mono potassium phosphate which was used for calculation. The total serum protein was estimated as per Biuret method described by Wootton [41] and standard curve was prepared from bovine albumin which was used for the calculation. The blood haemoglobin was estimated as per Sahli's methods, described by Swenson [37] and the intensity of colour is compared by Hellige Sahli's hemoglobinometer. The statistical analysis was done according to Snedecor and Cochran [36].

**Table 1:** Mean and S.E of certain blood parameters in different age groups

Age (months)	Ca (mg/100ml)	Phosphorus (mg/100ml)	Hb (gm/dl)	TSP (gm/100ml)
0-3	9.204 <sup>a</sup> ±0.15	5.80 <sup>ab</sup> ±0.13	8.00 <sup>c</sup> ±0.13	5.04 <sup>c</sup> ±0.11
3-6	9.13 <sup>a</sup> ±0.24	6.02 <sup>a</sup> ±0.17	8.39 <sup>b</sup> ±0.14	5.52 <sup>b</sup> ±0.11
6-9	9.23 <sup>a</sup> ±0.16	5.63 <sup>bc</sup> ±0.13	8.52 <sup>ab</sup> ±0.12	6.27 <sup>a</sup> ±0.16
9-12	9.34 <sup>a</sup> ±0.14	5.36 <sup>cd</sup> ±0.10	8.60 <sup>ab</sup> ±0.12	6.22 <sup>a</sup> ±0.16
12-18	9.05 <sup>a</sup> ±0.14	5.27 <sup>ed</sup> ±0.13	8.68 <sup>ab</sup> ±0.13	6.42 <sup>a</sup> ±0.14
18-24	8.66 <sup>b</sup> ±0.12	5.12 <sup>de</sup> ±0.27	8.80 <sup>ab</sup> ±0.12	6.50 <sup>a</sup> ±0.13
24-30	8.13 <sup>c</sup> ±0.18	4.96 <sup>e</sup> ±0.11	8.87 <sup>a</sup> ±0.15	6.50 <sup>a</sup> ±0.10

Means bearing different superscripts in a column differ significantly ( $P < 0.05$ )

**Table 2:** Mean and S.E of blood parameters in male and female of Black Bengal goat

Age (months) wise and Sexwise	Ca (mg/100ml)	Phosphorus (mg/100ml)	Hb (g/dl)	TSP (g/100ml)
0-3 M	9.27±0.18	5.97±0.18	8.00±0.20	5.06±0.13
0-3 F	9.11±0.28	5.57±0.97	7.99±0.14	5.02±0.21
3-6 M	9.16±0.10	6.23±0.21	8.52±0.28	5.57±0.18
3-6 F	9.10±0.17	5.80±0.26	8.26±0.80	5.46±0.14
6-9 M	9.37±0.27	5.62±0.25	8.58±0.19	6.33±0.30
6-9 F	9.12±0.19	5.63±0.14	8.46±0.16	6.23±0.19
9-12 M	9.42±0.20	5.46±0.15	8.66±0.17	6.41±0.16
9-12 F	9.27±0.22	5.25±0.14	8.53±0.18	6.00±0.30
12-18 M	9.11±0.26	5.35±0.17	8.76±0.20	6.46±0.24
12-18 F	9.00±0.16	5.21±0.00	8.60±0.18	6.38±0.17
18-24 M	8.84±0.17	5.14±0.17	8.94±0.23	6.62±0.16
18-24 F	8.51±0.15	5.10±0.8	8.68±0.12	6.40±0.20
24-30 M	8.22±0.00	5.00±0.13	8.90±0.17	6.68±0.18
24-30 F	8.03±0.16	4.92±0.18	8.84±0.27	6.32±0.32

**Table 3:** Blood parameters in pregnant and non-pregnant of Black Bengal doe

Pregnant and Non-Pregnant	Ca (mg/100ml)	Phosphorus (mg/100ml)	Hb (gm/dl)	TSP (gm/100ml)
1	8.59*±0.11	5.17±0.82	8.43*±0.45	6.01*±0.10
2	9.10*±0.15	5.30±0.12	8.76*±0.11	6.63*±0.11

Means bearing different superscripts in a column differ significantly ( $P < 0.05$ )

**Table 4:** Mean and S.E of blood parameters in male and female of Black Bengal goat

Age (Month)	Type of kidding	Ca (mg/100ml)	Phosphorus (mg/100ml)	Hb (g/dl)	TSP (g/100ml)
0-3	1	9.81±0.19 <sup>a</sup>	6.01±0.25 <sup>a</sup>	8.50±0.18 <sup>a</sup>	5.40±0.19 <sup>a</sup>
	2	9.19±0.15 <sup>b</sup>	5.77±0.20 <sup>a</sup>	7.94±0.14 <sup>b</sup>	4.97±0.15 <sup>ab</sup>
	3	8.48±0.21 <sup>c</sup>	5.60±0.28 <sup>a</sup>	7.47±0.20 <sup>b</sup>	4.75±0.21 <sup>b</sup>
3-6	1	9.35±0.17 <sup>a</sup>	6.38±0.33 <sup>a</sup>	8.89±0.27 <sup>a</sup>	5.95±0.19 <sup>a</sup>
	2	9.19±0.12 <sup>ab</sup>	6.07±0.23 <sup>a</sup>	8.18±0.19 <sup>a</sup>	5.32±0.14 <sup>b</sup>
	3	8.80±0.17 <sup>b</sup>	5.55±0.33 <sup>a</sup>	8.31±0.27 <sup>a</sup>	5.47±0.19 <sup>ab</sup>
6-9	1	9.97±0.19 <sup>a</sup>	6.06±0.23 <sup>a</sup>	8.82±0.24 <sup>a</sup>	6.94±0.25 <sup>a</sup>
	2	9.21±0.14 <sup>b</sup>	5.61±0.16 <sup>ab</sup>	8.36±0.17 <sup>a</sup>	6.23±0.18 <sup>ab</sup>
	3	8.52±0.19 <sup>c</sup>	5.22±0.23 <sup>b</sup>	8.53±0.24 <sup>a</sup>	5.69±0.24 <sup>b</sup>
9-12	1	9.57±0.34 <sup>a</sup>	5.38±0.92 <sup>a</sup>	8.57±0.99 <sup>a</sup>	6.91±1.11 <sup>a</sup>
	2	9.38±0.25 <sup>a</sup>	5.50±0.68 <sup>a</sup>	8.63±0.74 <sup>a</sup>	5.85±0.83 <sup>b</sup>
	3	9.05±0.34 <sup>a</sup>	5.11±0.92 <sup>a</sup>	8.57±0.99 <sup>a</sup>	6.19±1.11 <sup>ab</sup>
12-18	1	9.41±0.80 <sup>a</sup>	5.46±0.84 <sup>a</sup>	8.54±0.94 <sup>ab</sup>	6.81±0.92 <sup>a</sup>
	2	9.06±2.83 <sup>ab</sup>	5.40±0.92 <sup>a</sup>	8.96±0.70 <sup>a</sup>	6.42±0.69 <sup>ab</sup>
	3	8.56±0.25 <sup>b</sup>	4.76±0.94 <sup>a</sup>	8.25±1.05 <sup>b</sup>	5.93±1.03 <sup>b</sup>
18-24	1	9.39±0.65 <sup>a</sup>	5.32±1.03 <sup>a</sup>	9.00±1.16 <sup>a</sup>	6.91±1.24 <sup>a</sup>
	2	8.48±0.43 <sup>b</sup>	5.19±0.69 <sup>a</sup>	8.83±0.77 <sup>a</sup>	6.54±0.82 <sup>ab</sup>
	3	8.40±0.58 <sup>b</sup>	4.84±0.92 <sup>a</sup>	8.59±1.04 <sup>a</sup>	6.09±1.11 <sup>b</sup>
24-30	1	8.29±0.65 <sup>a</sup>	5.29±1.09 <sup>a</sup>	8.98±1.16 <sup>a</sup>	6.81±1.17 <sup>a</sup>
	2	8.07±0.49 <sup>a</sup>	5.05±0.82 <sup>ab</sup>	8.87±0.88 <sup>a</sup>	6.48±0.88 <sup>a</sup>
	3	8.07±0.58 <sup>a</sup>	4.57±0.97 <sup>b</sup>	8.77±1.04 <sup>a</sup>	6.28±1.05 <sup>a</sup>

Means bearing different superscripts in a column differ significantly ( $P < 0.05$ )

## Results and Discussion

### Calcium

#### Age

It was observed that the calcium level (Table 1) varies significantly ( $P > 0.05$ ) between different age group of Black Bengal goat. The range of calcium level decrease with increasing age except in age group 6-9 and 9-12 months were the level was high in comparison with other age group, this might be because in younger kid calcium is required for growth and development of bones and other vital body parts. Similar observations were reported by [14, 20] who also reported that calcium level varies significantly with increasing age. Contrary to the present finding, [42, 44] observed increasing level of calcium with advancing age.

#### Sex

According to the sex-wise calcium level (Table 2) which shows that it was higher in male animal than females in all the age groups. The difference between sex for calcium level in different age group was found to be non-significant, which might be because it does lesser volume of meat compared to bucks, as calcium concentration increases with the increase in muscle volume or it might be because it does calcium is required for foetal development during pregnancy. The present finding was in agreement with the report of [4, 5] who also observed higher calcium concentration in male than female goat. Contrary to the present finding, [27] observed increasing level of calcium in female goat

#### Pregnant and Non- Pregnant

The calcium level varies significantly ( $P < 0.05$ ) between pregnant and non- pregnant of black Bengal goat (Table 3). The calcium level recorded higher in non-pregnant animal ( $9.10 \pm 0.15$  mg./100 ml) as

compared to pregnant animal ( $8.59 \pm 0.11$  mg/100ml). The lower level of calcium in the pregnant animals in this studies might be due to higher draining of body calcium reserve from doe to the developing foetus which requires calcium for formation of bones and other body tissues, which was in agreement with the finding as reported by [13, 2, 9] who observed that the calcium level increases in non – pregnant animal, which could be attributed to the increase demand for mineralization of fetal skeleton. However, [23] shows non-significantly variation in overall calcium concentration during the pregnancy. But contrary with the present finding [21, 27] reported calcium level increased in pregnant doe. [29] Observed that the concentrations of Calcium in plasma of ewes remained within the normal physiological ranges during different stages of reproduction.

## Phosphorus

### Age

It was observed that the level of phosphorus (Table 1) decrease with the increasing of age except 0-3 and 3-6 months of age, which might be due to increase requirement of phosphorus in growing kid between the age group 0-3 and 3-6 months as this age group is the peak growth phase and phosphorus is required for DNA synthesis for growth and development of body cells. The present finding was in agreement with [39] and [32] who observed that the level of phosphorus varies significantly with advancing age. But contrary with the present finding [14] reported that with increasing age phosphorus level increased which might be due to breed differences or might be due to different feeding regime.

### Sex

The level of phosphorus in different sex was observed to be non-significant (Table 2). Although the level of inorganic phosphorus was higher in male compared to female in all the different age groups, higher level of phosphorus in bucks might be due to higher feed intake, which is rich in phosphorus. Similarly [3, 30] reported the level of phosphorus was higher in male than Female goat.

## Pregnant and Non- Pregnant

The phosphorus level between the pregnant and non-pregnant does was non- significant (Table 3) although the level was higher in non-pregnant does. The phosphorus level in pregnant goat was ( $5.17 \pm 0.82$  mg /100 ml) and in non-pregnant goat was ( $5.30 \pm 0.12$  mg/100 ml) showing not much variation between the pregnant and non - pregnant animals. However the value of non-pregnant animal was slightly higher than the pregnant animal, lower phosphorus level in pregnant does might be due to nutrient drain from does to the developing foetus or might be due to reduce feed intake during advance stage of pregnancy leading to decrease phosphorus concentration in the blood plasma or either of the above. The above finding was similar with [32] who observed higher level of phosphorus in non – pregnant animal but [19] reported uniform circular of phosphorus throughout the pregnancy. Further, similar finding also reported by [9] who observed non-significant changes in serum phosphorus level [21]. Observed that the concentrations of in phosphorus plasma of ewes remained within the normal physiological ranges during different stages of reproduction.

## Total serum protein

### Age

It was observed that the total serum protein level (Table 1) varies significantly ( $P < 0.05$ ) between different age group of black Bengal goat. The level of total serum protein increases with advancing age except 6-9 and 9-12 months of age i.e., total serum protein increases for the age group of 0-3, 3-6 months, but decreased for the age group 6-9, 9-12 months, 12-18, 18-24 and 24-30 months. Similar findings were reported by many researchers, [7, 18, 20] that total serum protein of black Bengal were significantly affected by age.

### Sex

During the study it was observed that the level of serum protein under different sex of black Bengal goat was non – significant (Table

2) whereas the level was higher in male animals than females. These finding was in agreement with, [34, 26] who reported that the effect of sex on serum protein concentration was non- significant and there is not much variation between the sexes.

## Pregnant and Non- Pregnant

The total serum protein level varies significantly ( $P < 0.05$ ) between pregnant and non- pregnant black Bengal goat (Table 3). The value of total serum protein in pregnant animal was ( $6.01 \pm 0.10$  g/ 100 ml) and in non-pregnant animal it was ( $6.63 \pm 0.11$ ) gm /100 ml). The level of total serum protein was higher in non-pregnant than pregnant animal, which might be due to nutrient drain from the blood of the pregnant animals for foetal development. This finding was in agreement with the report of [31, 9] who reported that the total serum protein was decreased in pregnant animal. In contrast, [28] reported non- significant fluctuation of total serum protein concentration in Surti and Marwari goat, which might be due to breed differences. [43, 44] observed no significant changes in total protein levels within the different reproductive status. But contrary with the present finding, [23, 1] reported total serum protein level increased in pregnant doe.

## Haemoglobin

### Age

The level of haemoglobin (Table 1) varies significantly between age group of Black Bengal goat, the level increases with the advancing of age, which is a physiological phenomenon. This finding was similar with [32, 26, 43] who reported the level of haemoglobin increased with the advancing of age. The difference in the observation of adult and young goats suggested that the oxygen carrying capacity of the blood was high in adult goats. However this result was contrary with [17] who reported that haemoglobin level decrease with advancing of age. [6] reported the level of haemoglobin was non- significantly affected by age group.

### Sex

The level of haemoglobin shows non- significant effect on different sex of black Bengal goat (Table 2). The level of haemoglobin was higher in male than female animals. This finding were in agreement with [8, 15] who recorded higher value in male than female. Contrary to this [26] recorded higher level of haemoglobin in female in both kids and adult doe.

## Pregnant and Non- Pregnant

The haemoglobin level (Table 3) varies significantly ( $P < 0.05$ ) in pregnant and non – pregnant black Bengal goat. The value of haemoglobin in pregnant goat was  $8.43 \pm 0.45$  gm/dl and in non – pregnant was  $8.76 \pm 0.11$  gm /dl respectively. There was an increase in the level of haemoglobin in non– pregnant animal, which might be due to active physiological state of pregnant doe compared to non-pregnant doe. The present observation were in agreement with [25, 4, 23] who reported that the haemoglobin level was higher in non-pregnant animal in comparison to pregnant animal.

## Type of kidding

The mean and S.E. (Table 4) for blood parameters with respect to different type of kidding under different age group shows that there was a significant effect for all the blood parameters on different type of birth. It was observed that the level of calcium and phosphorus was higher in single born than twinning or triplets type of birth, lower calcium level in twinning or triplet's type of birth might be due to higher calcium required by more number of foetuses, which requires more calcium for their development and growth compared to single kidding which requires lower calcium than twinning or triplets. The level of phosphorus was generally higher in single than twin or triplets type of birth, this might be due to higher requirement of phosphorus in twin or triplets type of birth to maintain calcium to phosphorus (2:1) for proper growth and development of the growing foetus. For all the blood parameters in different age group, triplets born shows lower level than single and twin type of birth. The present study was in agreement with [15] who reported that the haemoglobin level was higher in single type of birth.

**Conclusion**

It was observed that the mineral level varies with different physiological status of the goat. Male animal shows higher level of calcium, phosphorus, haemoglobin and total serum protein than the female animal in all the age group. It was also observed that the Calcium, phosphorus, total serum protein and haemoglobin level was higher in non-pregnant animal as compared to pregnant animal. At different type of birth it was observed that the level of calcium, phosphorus, haemoglobin and total serum protein increase in single born than the other type of birth. For all the blood parameters in different age group, triplets kidding shows lower level than single and twin kidding. Mineral deficiency may give rise to many metabolic disease hence animal should be given required minerals additional as per the different physiological stages of the animals.

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