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Effect of area specific mineral mixture and antioxidants supplementation on blood serum parameters in Barbari bucks

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Abstract

A study was conducted to assess the effect of area specific mineral mixture (ASMS) and anti oxidant supplementation on serum profile of Barbari goats *viz.* packed cell volume, Hemoglobin, Serum Glucose, Total Protein and Serum Creatinine. Two year old 18 Barbari bucks were selected for the study purpose consisting six bucks in each treatment group by simple random sampling. The bucks were housed in semi-intensive system of housing. Bucks were stallfed as well as pastured. The animals were divided into three group *viz.* control group, treatment 1 and treatment 2. Control group were fed with 300 gm of concentrate feed per head per day for 60 days. Treatment 1 bucks were given with 20g of area specific mineral mixture along with 300 gm of concentrate feed per head per day. Treatment 2 bucks were given with 20g of area specific mineral mixture, selenium 0.5 mg, vitamin- E 250 mg, vitamin -C 2 mg in addition with 300 gram concentrate feed per head per day for 60 days. Blood samples were collected after completion of the experiments in all treatment groups at 2 – 3 days interval and blood parameters were studied. The results of this study revealed that serum glucose levels differed significantly ($P < 0.05$) between control and treatment groups. Highest serum glucose (58.29 ± 2.64 mg/dl) concentration was observed in area specific mineral mixture and antioxidant supplemented group (Treatment 2) and lowest in control group (53.30 ± 2.65 mg/dl). No significant difference noticed between treatment groups on remaining blood parameters like Packed Cell Volume, Hemoglobin level, Total protein and Serum Creatinine in Barbari bucks.

Keywords: Barbari bucks, hemoglobin, packed cell volume, serum glucose, serum creatinine, total protein

Introduction

Goats are the first domesticated ruminant animals. Goats are mainly reared by weaker section of the society providing them a good economical and nutritional security. As per 2018-2019 statistics, 13.53 per cent total meat and 3 per cent of total milk production was contributed by Goat meat and milk respectively with a total population of 148.88 million. India possesses 34 breeds of goat and its produce a variety of products *viz.* milk, meat, fiber (mohair and pashmina) and manure. Barbari goat is the one among the important dual purpose breed, which best suited for cold climate. Barbari goat is a dwarf goat mostly found in the north-western arid and semi-arid regions of Agra, Mathura and Kanpur district of Uttar Pradesh and Bharatpur district of Rajasthan, India. It is a breed having many good traits like high body weight, superior chevon quality, high prolificacy, high reproductive efficiency, good mothering ability, good adaptability and can be bred round the year ^[1]. Nutrition, stress, reproductive status, age, sex, genetics, management, housing, and other environmental factors (temperature, relative humidity etc.) are known to have a profound effect on the hematological and biochemical profiles of small ruminants, ^[2] which are directly related to health of small ruminants. Biochemical and hematological variables of blood are generally used to monitor and evaluate health, nutritional and physiological status of ruminants ^[3]. The reproductive performance of an individual animal can be altered through supplementation of micro minerals and anti oxidants by nutrition, which can be assessed by blood profile estimation. Keeping these in a view, the present study was undertaken to assess the effect of area specific mineral mixture and anti oxidant supplementation on biochemical profile of some serum parameters of Barbari bucks.

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Materials and Methods

The experiment was conducted at experimental shed complex on Central Institute for Research on Goat (C.I.R.G) Makhdoom, Mathura, Uttar Pradesh, India. Barbari bucks were used for the experiment. All the experimental bucks were marked with horn colour for easy identification. Subsequently Bucks were distributed randomly into one control group and two treatment groups, keeping initial body weight in consideration. The bucks were housed in semi-intensive system of housing. They were kept in well ventilated individual pens (3 x 5 Sq.ft) with mud floor and provided uniform housing.

Bucks had been pastured as well as stall fed. They were set on pasture both dawn and dusk during whole study period. Pasture used for grazing contained mainly Doob grass (*Cyanadondactylon*), Berseem (*Trifolium alexandrium*), Athua (*Chenopodium album*), Oats (*Avina sativa*) and leaves of Neem (*Azadirachta indica*), Poplar (*Populus alba*) and Ber (*Zizphus indicus*). After feeding each group was turned out for natural grazing for 4 hrs. The experiment was continued for 60 days.

All experimental animals were pure Barbari goats. Animals were divided randomly into three groups (6 in each group) on basis of initial body weight (32 ± 2 kgs) and kept almost same in every group. First group was kept as control and was fed with concentrated feed of 300 gram without mineral mixture or any kind of mineral supplementation, per head per day for 60 days. Second group (Treatment 1) was fed with 300 gram of concentrated feed fortified with 20g area specific mineral supplementation and Third group (Treatment 2) was fed with 300 gram of concentrated feed added with area specific mineral mixture 20g with selenium 0.5 mg, vitamin- E 250 mg, vitamin -C 2 mg, per head per day for 60 days. Vaccination and Deworming were carried out as per standard schedule and was carried out until the end of experiment.

Necessary blood samples were collected from jugular vein in heparin coated vials at 2,4,7,9,11,14,16 and 18 days after the study period from each animal.

Estimation of glucose was done spectro-photometrically by enzymatic GOD-POD method with the help of Span Diagnostic Kit at 505 nm wavelength [4]. Concentration of blood serum glucose was expressed in mg/dl. Total protein concentration in blood serum was estimated by Biuret method with Span Diagnostic Kit at 540 nm wave length [5] and expressed in g/dl. Creatinine concentration in the blood serum was estimated at 520 nm spectrophotometrically by Alkaline picrate method using Span Diagnostic kit and expressed in mg/dl. Different statistical designs were considered to analyze data [6] and analysis through SPSS programme. One way ANOVA was employed to test the difference between various plasma parameters among treatment groups.

Results and Discussion

1. Packed cell volume

The mean values of packed cell volume (per cent) for all eighteen Barbari bucks on individual as well as overall basis have been depicted in Table 1. The mean value of PCV in control, treatment group 1 and treatment group 2 is 27.39 ± 1.01 , 27.00 ± 14.91 and 27.31 ± 0.83 per cent respectively. PCV value did not show any significance difference ($P > 0.05$) among the treatment and control groups. Sejian et al. [7] studied the effect of heat stress on blood profile by supplementing minerals and anti oxidants and PCV of Malpura ewes 35.70 ± 0.14 per cent, which were higher than the present study. Sathy et al. [8] reported that supplementation of Selenium yeast and Vitamin E or both had no effect on Packed Cell Volume in accordance with findings of this study. Contrary to this, Qureshi et al. [9] reported significantly ($P < 0.05$) higher PCV values in buffaloes supplemented with vitamin E and selenium.

Table 1: Mean \pm SE of PCV of Barbari bucks

Blood Collections after completing the study period (In days)	Control	Treatment group 1	Treatment group 2
2	27.33 ± 1.05	28.00 ± 0.93	27.67 ± 0.49
4	27.00 ± 1.77	27.33 ± 1.15	27.17 ± 1.05
7	27.33 ± 0.71	28.17 ± 1.33	28.50 ± 1.02
9	29.00 ± 1.06	28.00 ± 0.93	26.50 ± 0.76
11	28.50 ± 0.89	27.33 ± 0.99	27.83 ± 1.33
14	26.83 ± 0.91	26.50 ± 0.96	27.67 ± 0.84
16	26.50 ± 0.56	26.33 ± 0.95	27.17 ± 0.70
18	26.67 ± 1.15	27.50 ± 0.56	26.00 ± 0.52
Mean value (%)	27.39 ± 1.01^{NS}	27.00 ± 14.91^{NS}	27.31 ± 0.83^{NS}

2. Hemoglobin

The mean values of Haemoglobin (g) for all eighteen Barbari bucks on individual as well as overall basis have been depicted in Table 2. The mean hemoglobin level in control, treatment group 1 and treatment group 2 is 10.03 ± 0.35 , 9.87 ± 0.36 and 9.39 ± 0.49 per cent respectively. Hemoglobin level did not show any significance difference ($P > 0.05$) among the treatment and control groups at different interval. The results obtained in present study are similar to those

obtained by Sejian et al. [7]. Swain et al. [10] reported that supplementation of inorganic and nano zinc had no effect on blood profile in goats. The Hemoglobin level of this study was found to be in normal range between 8 – 12 gram/dl, which is in accordance with Mohammed et al [11] who compared the blood profile including hemoglobin level of different breeds of goat under intensive production system and did not differ significantly.

Table 2: Mean \pm SE of Haemoglobin of Barbari bucks

Blood Collections after completing the study period (In days)	Control	Treatment group 1	Treatment group 2
2	10.02 ± 0.41	10.10 ± 0.48	9.22 ± 0.46
4	9.70 ± 0.28	10.18 ± 0.53	9.53 ± 0.29
7	9.90 ± 0.36	10.02 ± 0.44	9.48 ± 0.33
9	10.03 ± 0.57	9.83 ± 0.27	9.75 ± 0.38

11	10.15 ± 0.42	9.35 ± 0.28	10.10 ± 0.46
14	10.00 ± 0.20	9.80 ± 0.29	8.20 ± 1.39
16	10.57 ± 0.25	9.77 ± 0.37	9.63 ± 0.32
18	9.90 ± 0.31	9.93 ± 0.21	9.22 ± 0.26
Mean (Gram/dl)	10.03 ± 0.35 ^{NS}	9.87 ± 0.36 ^{NS}	9.39 ± 0.49 ^{NS}

3. Serum Glucose level

Serum Glucose levels of different groups have been presented in table 3. The mean serum glucose level in control, treatment group 1 and treatment group 2 is 53.30 ± 2.65, 57.99 ± 2.37 and 58.29 ± 2.64 gram per dl respectively. Usually normal values of serum glucose level ranges between 50 – 75 mg/dl, meanwhile in this study the values differed significantly ($P < 0.05$) between control and treatment groups by Mohammed et al. [11]. Several previous studies also support the fact that mineral mixture supplementation have had a positive effect on

plasma glucose level in goat by Jain et al. [12]. Contrary to this Sharma et al. [13] reported that minerals supplemented group of crossbred heifers had lower glucose level than control group. ASMS might have enhanced gluconeogenesis and because of this higher serum glucose level was observed in mineral supplemented groups than control group. Godara et al. [14] reported the supplementation of area specific mineral mixture showed improvement in the blood profile in Black Bengal goats.

Table 3: Mean ± SE of Serum Glucose of Barbari bucks

Blood Collections after completing the study period (In days)	Control	Treatment group 1	Treatment group 2
2	47.73±1.76	55.19±3.39	56.98±3.51
4	57.16±1.69	53.32±2.04	60.61±3.07
7	51.16±4.54	58.46±2.47	60.16±2.72
9	49.67±2.30 ^a	55.68±3.17 ^{ac}	61.05±2.89 ^c
11	54.43±2.01	61.87±1.74	60.21±1.54
14	56.42±4.09	62.57±2.11	53.29±2.05
16	52.66±2.77	59.80±3.21	53.34±2.26
18	57.17±2.11	57.07±0.84	60.73±3.09
Mean* (Mg/dl)	53.30 ± 2.65 ^a	57.99 ± 2.37 ^{ac}	58.29 ± 2.64 ^c

4. Total Protein

The mean values of Total protein (g/dl) for all eighteen Barbari bucks on individual as well as overall basis have been depicted in Table 4. The total protein value in control, Treatment 1 and Treatment 2 group was 6.59±0.20 g/dl, 6.63 ± 0.23 g/dl and 6.58±0.23 g/dl respectively. Total Protein did not show any significance difference ($P > 0.05$) between groups. The total protein value of all study groups falls between 6.5 – 6.6, which was in normal range of 6-7 gm/dl. The results obtained in present study are similar to those obtained by Sejian et al. [7] and Tapankumar das *et al.* [15] Who

also reported total protein 8.51 ± 0.34 (g/dl) which were higher than the present study. High serum protein levels may result from high intake of grains, dehydration, and high temperature Sandabe and Chaudhary [16] who's also reported that the total protein value differs between season, i.e high during rainy and low during hot season. Zubcic [17] who reported that total protein value in goat serum could be increased in extensively raised animals. Sakha et al. [18] also reported a total protein value differ significantly between sexes.

Table 4: Mean ± SE of Total protein of Barbari bucks

Blood Collections after completing the study period (In days)	Control	Treatment group 1	Treatment group 2
2	6.59±0.18	6.82±0.24	6.79±0.22
4	6.31±0.22	6.24±0.22	6.41±0.28
7	6.59±0.22	6.88±0.13	7.01±0.10
9	6.79±0.18	6.39±0.28	6.38±0.33
11	6.79±0.23	6.54±0.20	6.63±0.30
14	6.64±0.23	6.42±0.31	6.15±0.24
16	6.40±0.27	6.73±0.19	6.43±0.20
18	6.62±0.12	7.02±0.29	6.85±0.23
Mean value (Gm/dl)	6.59 ± 0.20 ^{NS}	6.63 ± 0.23 ^{NS}	6.58 ± 0.23 ^{NS}

5. Serum Creatinine

The average mean values of Creatinine (mg/dl) for all eighteen Barbari bucks on individual as well as overall basis have been depicted in Table 5. The serum Creatinine level in control, Treatment 1 and Treatment 2 group was 1.63±0.16 (mg/dl), 1.65±0.13 (mg/dl) and 1.63±0.12 (mg/dl) respectively. Serum creatinine level did not show any significance difference ($P > 0.05$) between groups. The findings of this study was higher than the results of Tapankumar das *et al.* [15] who reported that the serum

creatinine level in Vitamin E supplemented goats showed between 0.65 ± 0.08 to 0.81 ± 0.07 (mg/dl) which was lower than the present study. Mohammed et al [11] reported that level of creatinine in the blood serum could be altered due to differences in energy and protein content of feeds. Since, all the treatment groups of this study were fed with same nutrition might be the reason for non significance. Solaiman et al. (2009) showed that creatinine levels in male kids increased linearly when cotton seed (*Gossypium hirsutum*) ration was offered to them.

Table 5: Mean \pm SE of Creatinine of Barbari bucks

Blood Collections after completing the study period (In days)	Control	Treatment group 1	Treatment group 2
2	1.38 \pm 0.12	1.28 \pm 0.03	1.25 \pm 0.02
4	1.82 \pm 0.20	1.57 \pm 0.15	1.92 \pm 0.14
7	1.54 \pm 0.15	1.61 \pm 0.13	1.89 \pm 0.18
9	1.72 \pm 0.19	1.87 \pm 0.19	1.34 \pm 0.05
11	1.84 \pm 0.19	1.63 \pm 0.21	1.78 \pm 0.13
14	1.57 \pm 0.18	2.01 \pm 0.12	1.59 \pm 0.21
16	1.49 \pm 0.10	1.38 \pm 0.10	1.88 \pm 0.12
18	1.72 \pm 0.17	1.65 \pm 0.12	1.46 \pm 0.17
Mean (mg/dl)	1.63 \pm 0.16 ^{NS}	1.65 \pm 0.13 ^{NS}	1.63 \pm 0.12 ^{NS}

Conclusion

A statistically significant difference is noted in the serum Glucose level between area specific mineral mixture and antioxidants supplement group than the control group. There is no other statistically significant difference was seen among other serum biochemical profile between the groups.

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