Effect of prepartum concentrate supplementation on blood biochemical profiles of pregnant Ganjam goat


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ABSTRACT

45 pregnant Ganjam does were randomly distributed into three treatment groups (T₁, T₂, T₃), 15 in each for evaluating the effect of concentrate supplementation 2 months before expected date of kidding on their haematobiochemical profiles. All the does were maintained on browsing besides additional concentrate supplementation @ 200 g/day and @ 300 g/day in T₂ and T₃ respectively. Blood samples were collected at the beginning and 60th day of experiment for analysis of hemoglobin, serum glucose, urea, total protein, albumin, globulin and A/G. Significant differences (P<0.05) were observed for serum glucose in T₂ (52.219 ± 1.315 mg/dl) and T₃ (53.115 ± 2.089 mg/dl) as compared to T₁ (46.730 ± 0.815 mg/dl) while serum urea concentration in T₂ (12.540 ± 0.736 mg/dl) and T₃ (12.193 ± 0.819 mg/dl) was significantly (P<0.05) lower than T₁ (28.733 ± 0.947 mg/dl) on 60th day of feeding. Non significant results were observed for haemoglobin, total protein, albumin, globulin and A/G ratio between the treatments prior to kidding. It was concluded that prepartum concentrate feeding @ 200 g/day/doe is required to maintain the glucose level in does after compensating the energy needs of growing foetus.

Key words: Blood profile, Concentrate, Ganjam goat, Prepartum.

INTRODUCTION

India possesses 140.53 million goats, ranking second in the world. Country has 23 well-described/defined goat breeds, out of which Ganjam goat is recognized for its excellent chevon quality. These goats are reared under extensive system of management without any supplementary feed. Rapid rate of foetal growth during the final 6-8 weeks of pregnancy imposes a metabolic challenge to the doe which is met by the mobilisation of maternal body tissue if the dietary supply of nutrients is inadequate (Martin et al., 2005) and may lead to malnutrition of pregnant does (Patra et al., 2006). Blood biochemical parameters are the true reflection of health status of does. Therefore, an attempt was made to study the relative effect of existing feeding practices and extra allowances of concentrates provided during the pre-parturient period on hemato-biochemical profiles in does.

MATERIALS AND METHODS

The present investigation was carried out in Chhatrapur block of Ganjam district of Orissa where AICRP on Goat Improvement (Ganjam Field Unit) is operating. These areas are dominated by ‘Golla’ people, who rear Ganjam goats traditionally in large number in range system. The animals selected were from the flocks of registered goat farmers of the project. For this study, Ganjam goats (does) of similar body weight (33.91 ± 0.70 kg to 34.59 ± 0.75 kg), age and parity (3rd to 5th parity) were selected. The expected dates of kidding were estimated as per the breeding history of goat given by the flock man. A total of 45 healthy pregnant does were taken for this study. The selected does were randomly allotted to three treatment groups based on complete randomized design, each compromising 15 pregnant does and kept in different feeding regimens viz. (T₁): Control; normal browsing at range system ; (T₂): Control with daily supplementation of 200 g concentrate mixture & (T₃): Control with daily supplementation of 300 g concentrate mixture. This concentration mixture contained 22% crude protein (estimated) with 72% Total Digestible Nutrients (calculated). Concentrate feeding was done in very early morning by confining the goats in partition wall made up of bamboo and taken to the nearby forest thereafter, for the purpose of browsing (Average duration was 8hours, from 9am to 4pm) as it was a routine practice of the flock man. The most common top fodderers were *Andrographis paniculata* (Bhuinimba), *Zizyphus oenoplia* (Kantaikoli), *Azadirachta indica* (Neem), *Ciprodessa bacifera* (fruit) (Totiki), *Acacia leucophloea* (Gahoria), *Streblus asperalour* (Sahada), *Cascuta reflexa*. 
(Nirmuli), Jasminum undulatum (Banamuli), Madhuca indica (Maula), Ziziphus mauritiana (Barakoli), Mimus pudica (Lajakuli), Mangifera indica (Mango). Concentrate feeds were offered up to parturition and average daily Dry Matter Intake (DMI) was 163 g/doe/day and 224.0 g/doe/day in T1 and T3, respectively. Blood samples were collected from the pregnant does from each treatment groups on 0 day and on 60th day of concentrate feeding by jugular vein puncture in morning prior to feeding. For haemoglobin estimation blood was collected in 2 ml micro centrifuge tubes with 1 to 2 mg EDTA/ml of blood and kept at 0 ºC. For analysis of biochemical parameters, serum was separated after collecting 10 ml blood in sterilized dry centrifuge tubes and kept for two hours in slanting position followed by incubation at 37 ºC for 30 minutes and then centrifugation at 3000 rpm for 15 minutes. Collected serum was stored at -20ºC and analysis was done after thawing for various biochemical profiles (total protein, albumin, globulin and A/G ratio) (Table 1) except glucose which was done soon after collection of serum, as per the standard protocol.

Data, thus obtained were subjected to suitable statistical analysis following standard methods described by Snedecor and Cochran (1949) using the SAS 9.2 package.

RESULTS AND DISCUSSION

The haemoglobin level in the present study ranged from 7.493±0.231 to 8.412±0.290 g/dl in various treatments under study on 60 days of concentrate supplementation. The value obtained was in agreement with the report of Kumar et al., (2008) (7.51 to 8.37 g/dl). There was no significant difference in the haemoglobin concentration of blood between different treatments on 0 and 60 day of supplementation. This indicated there was no effect of supplementation of concentrate on haemoglobin but there was significant decrease in haemoglobin from 0 day to 60 days of treatment which might be due to pregnancy.

The prepartum serum glucose level on 60 days of feeding ranged between 46.730 ± 0.815 to 57.133 ± 1.276 mg/dl in the different treatment groups under study. The glucose concentrations recorded in the present study is well within the normal range of 45-60 mg/dl (Altman and Dittmer, 1961) but lower than 63.35 ± 7.70 mg/dl in pregnant Sahel goats (Sandabe et al., 2004). This might be due to the differences in breed, environment and nutritional status of the experimental animals in the two studies. Decrease in the serum glucose concentration in all the treatment groups towards the end of pregnancy might be due to a relatively poor diet and/or a higher energy requirement for foetal anabolism and/or the progressive appearance of foetal insulin as reported by Payne et al., (1970). A significantly higher value of serum glucose in T3 (52.219 ± 1.315 mg/dl) and T1 (53.115 ± 2.089 mg/dl) as compared with T1 (46.730 ± 0.815 mg/dl) might be due to the effect of concentrate supplementation resulting in production of higher amount of propionate, a gluconeogenic substrate, in the rumen fermentation resulting in elevated serum glucose as reported by Thomas et al., (1988) which somewhat compensates the extra energy required by the growing foetus. Also the present study agrees with the significant effect of concentrate supplementation on blood glucose as reported by Porwal et al., (2005).

The average serum total protein ranged from 6.941 ± 0.089 to 8.130 ± 0.076 g/dl during the experimental period in the three treatment groups of Ganjam goats. The results of the present study was in agreement to the value of Kumar et al., (2008) (7.03 to 7.77 g/dl), but much lower than the reporter of Kaushik and Bugalia (1999) (9.41 to 11.34 g/dl). These differences might be due to the effect of breed.

### Table 1: Haematobiochemical profiles of blood/serum in does.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Days of concentrate feeding</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemoglobin (g/dl)</td>
<td>0</td>
<td>8.391 ±0.187 A</td>
<td>8.361 ±0.243 A</td>
<td>8.412 ±0.290 A</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>7.522 ±0.251 A</td>
<td>7.582 ±0.203 A</td>
<td>7.493 ±0.231 A</td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>0</td>
<td>57.133 ±1.276 B</td>
<td>56.881 ±1.460 B</td>
<td>55.994 ±1.320 B</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>46.730 ±0.815 A</td>
<td>52.219 ±1.315 A</td>
<td>53.115 ±2.089 B</td>
</tr>
<tr>
<td>Total Protein (g/dl)</td>
<td>0</td>
<td>8.082 ±0.099 A</td>
<td>8.130 ±0.076 A</td>
<td>7.971 ±0.079 A</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>7.120 ±0.102 A</td>
<td>7.030 ±0.121 A</td>
<td>6.941 ±0.089 A</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>0</td>
<td>4.072 ±0.108 A</td>
<td>4.08 ±0.100 A</td>
<td>4.031 ±0.085 A</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>3.998 ±0.132 A</td>
<td>3.839 ±0.165 A</td>
<td>3.78 ±0.100 A</td>
</tr>
<tr>
<td>Globulin (g/dl)</td>
<td>0</td>
<td>4.010 ±0.044 A</td>
<td>4.050 ±0.065 B</td>
<td>3.940 ±0.054 B</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>3.121 ±0.056 A</td>
<td>3.190 ±0.066 A</td>
<td>3.161 ±0.058 A</td>
</tr>
<tr>
<td>A/G ratio</td>
<td>0</td>
<td>1.019 ±0.034 A</td>
<td>1.014 ±0.038 A</td>
<td>1.027 ±0.032 A</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>1.294 ±0.061 A</td>
<td>1.222 ±0.075 B</td>
<td>1.205 ±0.046 B</td>
</tr>
<tr>
<td>Urea (mg/dl)</td>
<td>0</td>
<td>13.806±0.610 A</td>
<td>14.213 ±0.685 A</td>
<td>13.913 ±0.760 A</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>28.733±0.947 A</td>
<td>12.540 ±0.736 A</td>
<td>12.193 ±0.819 A</td>
</tr>
</tbody>
</table>

Means with different superscripts in a row (a,b) and column (A,B) for the same parameter differ significantly (P<0.05).
environment and nutritional status of the experimental animals in the above studies. A decrease in the serum total protein during the progressive experimental period from 0 to 60 day of feeding in all the treatments was observed. These findings agreed with those of Kaushik and Bugalia (1999). No significant variation was observed among different treatment groups indicating that the different level of supplementation of concentrate had no effect on serum total protein level. Similar types of findings were reported by Porwal et al., (2005) on lambs maintained under extensive, semi intensive and intensive system of management. Also a nonsignificant variation of protein supplementation on the effect of total serum protein concentration was reported by O’Doherty and Crosby (1998). On the contrary, Sahlu et al., (1995) showed a significant (P<0.05) increase in total serum protein value linearly with addition of energy diet.

On 60 days of concentrate supplementation the serum albumin level ranged from 3.78 ± 0.10 to 4.08 ± 0.10 g/dl. The concentrations recorded in the present study were in accordance with report of Kumar et al., (2008) (3.86 to 4.01 g/dl) in pregnant does. No significant difference was observed between treatments obtained on 0 day as well as 60 days of supplementation. Similar type of nonsignificant effect was also reported by Porwal et al., (2005). The present findings are not in agreement with the findings of Chestnut and Wylie (1995) who opined that serum albumin concentration increased as the frequency of concentrate feeding increased between 17/18 and 19/20 wks of pregnancy.

The mean serum globulin level recorded in T1, T2 and T3 were 3.121 ± 0.056 to 4.010 ± 0.044, 3.190 ± 0.066 to 4.050 ± 0.065 and 3.161 ± 0.058 to 3.940 ± 0.054 g/dl, respectively during the experimental period. The concentrations recorded in the present study were in agreement with the values of 3.16 to 3.77 g/dl as reported by Kumar et al., (2008) and higher than 2.71 g/dl as reported by Altman and Dittmer (1961), but much lower than the value of 4.93 to 5.12 g/dl as reported by Bhide et al., (2001). These differences might be due to the effect of breed, environment and nutritional status of the experimental animals in the above studies. There was no significant difference observed among the different treatment groups indicating that the levels of supplementation of concentrate had no effect on serum globulin concentration. Similar findings corroborated with the reports of Porwal et al., (2005). A significant decrease in the serum globulin value from 0 day to 60 day of feeding was observed in all treatment groups and it might be due to the passive transfer of γ-globulin to the growing foetus. These findings are in agreement with the results of Kumar et al., (2008) but not in agreement with Chestnut and Wylie (1995) who reported a significant (P<0.05) rise in serum globulin concentration with increasing level of concentrate supplementation.

The mean serum A/G ratio found in the present study was between 1.014 ± 0.038 to 1.294 ± 0.061 in all the experimental groups irrespective of ages. The A/G value recorded in the present study was close to the value of 1.06 to 1.24 as reported by Kumar et al., (2008) but lower than the value of 0.80 to 0.86 reported by Bhide et al., (2001). No significant difference was found between different treatment groups, but significantly increased value was observed in all the groups as globulin level decreased between 0th day and 60th day. The present study is also in support of the findings of Porwal et al., (2005) who observed a non significant effect of concentrate supplementation on serum A/G ratio.

The serum urea concentration between 0 day and 60 days of concentrate supplementation are well within normal value ranging from 13.806 ± 0.610 to 28.733 ± 0.947, 12.540 ± 0.736 to 14.213 ± 0.685 and 12.193 ± 0.819 to 13.913 ± 0.760 mg/ dl in T1, T2 and T3 respectively. The present result corroborated the findings of Altman and Dittmer (1961). There was no significant difference observed between treatments on 0 day but on 60 day significantly (P<0.05) higher value were observed in T1 (28.733 mg/dl) as compared to T2 (12.540 mg/dl) and T3 (12.193 mg/dl). This indicated that concentrate supplementation had significant effect on serum urea level. This might be due to availability of low quality nitrogen to T1 resulting in higher body catabolism, while in supplemented groups the value remained similar probably due to the availability of good quality nitrogen resulting in lower body catabolism Tainturier et al., (1984). The findings in the present study are in variance with Sahlu et al., (1995) where serum urea concentration was increased significantly (P<0.05) with increase in crude protein level.

This study concluded that extra allowances of concentrate @200g/day/doe besides normal browsing is required to maintain the serum glucose level in does after compensating the energy needs of the growing foetus and prevent the excess body catabolism by providing good quality nitrogen.

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