Journal of Animal Research: v.5 n.4, p. 813-817. December 2015

DOI: 10.5958/2277-940X.2015.00135.7

Effect of Prepartum Concentrate Supplementation on Blood Biochemical Profiles of Native Ewes in Coastal Odisha

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Received: 29 July, 2015 **Accepted:** 26 Nov., 2015

ABSTRACT

Present study was undertaken to elucidate the effect of concentrate supplementation on the periparturient blood biochemical profiles of native ewes, two months before expected date of lambing in coastal Odisha. Forty (40) pregnant ewes were randomly distributed into two treatment groups (T_1 and T_2) based on their body weight, age and parity. First group (T_1) was maintained on grazing only, while the second group (T_2) was supplemented with a balanced concentrate mixture @ 200 g/sheep/day along with grazing. Blood samples were collected one month before and one month after parturition for analysis of serum glucose, total protein, albumin, globulin, A/G, cholesterol, triglyceride, urea and creatinine. Significant ($P<0.05$) increase was observed for serum glucose and globulin, both before and after parturition in (T_2) (before: 56.65 ± 1.86 mg/dl and 5.08 ± 0.59 g/dl; after: 53.93 ± 1.62 mg/dl and 4.04 ± 0.32 g/dl) as compared to T_1 (before: 51.23 ± 1.90 and 4.12 ± 0.45g/dl; after: 45.88 ± 1.57 mg/dl and 3.25 ± 0.45 g/dl). Non significant results were observed for rest of the biochemical parameters studied between the control and the treatment both before and after lambing. It was concluded that prepartum concentrate feeding @ 200 g /day/ewe is required to maintain the glucose and globulin level in ewes after compensating the energy needs of growing foetus and colostrum production in mammary gland.

Keywords: Blood profile, concentrate, Ewe, Odisha, prepartum

Sheep husbandry is backbone of rural economy in India. It is important as helps to sustain the livelihood of rural poor in difficult terrains characterized by spare vegetation, marginal land and a high incidence of poverty. India is endowed with wide diversity of sheep genetic resources. Sheep husbandry faces a dilemma to produce more animal protein for growing human population against the reality of shrinking grazing resources, creating a major constraint to the further growth of sheep population. India accounts for 6.13% of world population (FAO, 2009) with 65.06 millions sheep to its record as per Livestock Census -2012 (DAHD, 2012).

Sheep production success depends on a number of genetic and paragenetic factors. Of the paragenetic factors, nutrition is considered as the most important one influencing ewe and lamb performance. Since 80% of the foetal growth takes place in the last trimester of the pregnancy (Robinson *et al*. 1999) nutritional

requirements of the ewe increase to a great extent during this period. Energy requirements of pregnant ewes increase by 50 to 120% above maintenance in late pregnancy (NRC, 1985). Hence, a supplement of grain in the diet in late pregnancy can help compensate for dietary energy availability.

During late gestation several metabolic changes and adaptations take place in the pregnant animals body (Ingvartsen, 2006). These changes are to some extent reflected in concentrations of certain metabolites in plasma which can provide information regarding adequacy of nutrition at each time. The advantage of measuring blood parameters to estimate nutritional status is that it gives more immediate information compared to ewe weight and BCS, lamb birth weight and growth rate, the latter only presenting adequacy of nutrition on a longer term basis (Russel, 1984; O´Doherty and Crosby, 1998).

An increased plane of nutrition during late gestation has been reported to have various advantages, such as; reduced incidence of pregnancy toxaemia (Fraser *et al.* 1938; Charismiadou *et al.* 2000), less metabolic stress (Kerslake *et al.* 2010). It can be well established that a low cost scientific input as concentrate supplements during late pregnancy will result in improved production performance of the sheep flock thereby providing greater return to the farmers.

Keeping in view of the aforesaid facts, the present study was undertaken to study the effects of a balanced concentrate supplement to ewes in late pregnancy on blood haematological and biochemical indices.

MATERIALS AND METHODS

Location

The experiment was conducted on pregnant ewes available with the farmers of Mundida village in Tirtol block of Jagatsinghpur district which is located in eastern part of Odisha. The overall climate of the region is hot and humid having an average annual normal rainfall of 1501.3 mm and more than 75% of the precipitation is concentrated over five months i.e., from June to October.

Experiment Design

The study was conducted for a period of seven months duration by taking 40 (forty) pregnant ewes after randomly distributed them into two treatment groups (T_1 and T_2) 20 in each based on their body weight (average 13.6 Kg), age (12 months) and parity (Primiparous). First group (T_1) was maintained on grazing only, while the second group (T_2) was supplemented with a balanced concentrate mixture @ 200 g/head/ day along with grazing. The selected ewes were expected to lamb in eight weeks from the start of experiment. This concentrate mixture contained 18.21% crude protein (estimated) with 12.74 MJ/Kg DM Metabolizable Energy (calculated). Concentrate feeding was done in early morning by confining the ewes in separate containers. The sheep flock was taken for grazing along with cattle and goats on paddy stubbles and nearby rangelands in the morning and evening.

Sampling and the analytical methods

Blood samples were randomly collected from six ewes in each group, one month before and one month after lambing in the morning prior to feeding. For estimation of haematological parameters like Haemoglobin, Haematocrit (PCV), TEC, MCV, MCH, MCHC and TLC 3ml blood collected in blood collection tube (K3E, Akuret™, Eastern Medikit Limited) containing EDTA as described by Benjamin (1985). For analysis of biochemical parameters, 20ml blood was collected in sterilized dry centrifuge tubes and kept in slanted position at room temperature for some time and centrifugation was done at 5000rpm for 10 minutes at 4°C. The supernatant (serum) was separated in airtight serum storage vials. After proper labelling serum samples were stored in deep freeze at -20°C till analysis of biochemical parameters. The concentration of Glucose, Total protein, Albumin, Urea, Creatinine, Cholesterol, Triglyceride, Calcium, Alkaline Phosphatase, Serum Glutamate Oxalate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT) (ASAT) in serum were estimated by standard procedure described in the reagent kit supplied by Crest Bio systems, a division of Coral Clinical Systems, Goa, India.

Statistical analysis

Data, thus obtained were analyzed by suitable statistical analysis following standard methods described by Snedecor and Cochran (1994) using the SAS 9.2 package. All data were presented as mean ± standard error of mean (SEM).

RESULTS AND DISCUSSION

Haematological profiles in ewes

The haematological profile like haemoglobin concentrations, PCV values, TECs, MCV, MCH, MCHC and TLCs of experimental ewes under different treatments are presented in Table 1. Haemoglobin

Table 1. Haematological profiles in ewes

Parameters	Before parturition		After parturition	
	T_1	T_2	T_1	T_2
Haemoglobin (g/dL)	9.90 ± 0.43[a]	11.53 ± 0.36[b]	8.16 ± 0.72[a]	9.54 ± 0.63[b]
Haematocrit (PCV)(%)	25.67 ± 1.31[a]	31.33 ± 0.99[b]	23.18 ± 1.46[a]	27.57 ± 1.17[b]
TEC (10^6/µL)	10.42 ± 0.28[a]	11.25 ± 0.21[b]	9.42 ± 0.68	10.56 ± 0.37
MCV (fL)	24.63 ± 1.05[a]	27.89 ± 0.94[b]	24.61 ± 0.78[a]	26.11 ± 0.83[b]
MCH (pg)	9.54 ± 0.51	10.29 ± 0.47	8.66 ± 0.21	9.03 ± 0.18
MCHC (g/dL)	39.14 ± 2.68	37.08 ± 2.04	35.20 ± 1.37	34.60 ± 1.74
TLC (per µL)	9208 ± 109[a]	8838 ± 82[b]	10426 ± 118[a]	9271 ± 153[b]

[a,b] Means in a row bearing different superscripts differ significantly (P<0.05).

Table 2. Biochemical profiles in ewes

Parameters	Before parturition		After parturition	
	T_1	T_2	T_1	T_2
Glucose (mg/dL)	51.23 ± 1.90[a]	56.65 ± 1.86[b]	45.88 ± 1.57[a]	53.93 ± 1.62[b]
Total protein (g/dL)	8.72 ± 0.55[a]	9.92 ± 0.45[b]	6.67 ± 0.46[a]	7.86 ± 0.37[b]
Albumin (g/dL)	4.60 ± 0.14	4.83 ± 0.16	3.42 ± 0.17	3.82 ± 0.10
Globulin (g/dL)	4.12 ± 0.45[a]	5.08 ± 0.59[b]	3.25 ± 0.45[a]	4.04 ± 0.32[b]
A/G ratio	1.11 ± 0.17	1.04 ± 0.17	1.05 ± 0.07	0.94 ± 0.11
Cholesterol (mg/dL)	47.58 ± 1.47	52.77 ± 1.81	44.83 ± 1.03	50.19 ± 0.86
Triglyceride (mg/dL)	20.62 ± 1.51	23.07 ± 2.19	17.78 ± 0.47	17.58 ± 1.07
Urea (mg %)	56.07 ± 1.34	54.20 ± 1.42	61.45 ± 1.37	58.36 ± 1.17
Creatinine (mg/dL)	0.80 ± 0.16	0.82 ± 0.13	1.14 ± 0.08	1.22 ± 0.11
SGPT (ALT) (units/L)	42.82 ± 0.74	42.41 ± 0.82	29.68 ± 0.48	28.77 ± 0.74
ALP (units/L)	164.18 ± 1.85	160.67 ± 1.69	189.13 ± 2.24	191.69 ± 2.46
SGOT (AST) (units/L)	112.35 ± 1.37	115.58 ± 1.46	132.06 ± 1.44	135.88 ± 1.38
Calcium, total (mg/dL)	10.52 ± 0.48	10.73 ± 0.37	8.05 ± 0.48	8.48 ± 0.51

[a,b] Means in a row bearing different superscripts differ significantly (P<0.05).

concentrations, PCV values, TECs values were within the normal range as reported by Coffin (1953) and Holman (1944), for MCV, MCH, MCHC by Benjamin (1985) and Radostits (2005) and for TLCs by Schalm (1959) and Berrier (1961).

The ewes of T_2 showed significantly (P<0.05) higher haemoglobin, PCV and MCV values than those in T_1 both before and after lambing (Table 1). Results of present experiment are similar to the observations made in the West African Dwarf sheep by Olayemi *et al.* (2000). The higher values recorded for the ewes in T_2 might be due to the higher plane of nutrition.

The values of haemoglobin, PCV and erythrocyte count in ewes after lambing were lower than in the ewes before lambing. It is conformation with the reports of El-Sherif and Assad (2001) that in Barki ewes, the PCV value decreased sharply during the first month of lactation (24.25 versus 27.17% in dry ewes) which resulted in a drop in blood haemoglobin at the 4th week (68.42 versus 74.00 g/L). Bozdogan *et al.* (2003) also recorded in Tuj sheep, a decrease in erythrocyte number after parturition with respect to pregnancy. The TEC value was found to be significantly higher ($P<0.05$) in T_2 ewes than T_1 before parturition. After parturition, the value remained high in T_2, but no significant difference was found between the groups.

The MCH and MCHC values were not affected by supplementation of ewes during pregnancy and remained almost same with slight variation between the groups (Olayemi *et al.* 2000).

The ewes in T_2 had significantly ($P<0.01$) lower leukocyte count than the ewes in T_1. This might be due to the difference in the health status between the two groups. The lower leukocyte count as observed for the ewes in T_2 might be due to their better health status and greater resistance to parasitic or other infections resulting from feeding of the balanced concentrate ration containing essential nutrients. The leucocyte counts in ewes after parturition were found to be lower than the ewes before parturition. Our findings are in accordance with the previous findings of, Mahmoud *et al.* (1999); Bozdogn *et al.* (2003).

Biochemical profiles in ewes

The serum biochemical profiles of ewes in the two groups are presented in Table 2. The mean values of serum glucose, total protein, globulin and creatinine concentrations were within the normal range as reported by Kaneko (2008) and for serum Albumin, Cholesterol, SGPT, SGOT, ALP and calcium levels by Radostits *et al.* (2005).

The serum glucose concentration for the ewes in T_2 was significantly ($P<0.05$) higher than that for the ewes in T_1 both before and after parturition, which might be due to the effect of supplementary concentrate feeding. Increase plane of nutrition in pregnant ewes results in increased serum glucose concentrations is in accordance with previous work of Charismiadou *et al.* 2000; Banchero *et al.* 2004; Dash, 2008). A decreased concentration of glucose after parturition may be due to increased utilisation of glucose for milk lactose synthesis (Antunovic *et al.* 2011).

The serum total protein and globins for ewes in T_2 showed significantly ($P<0.05$) higher concentrations than those in T_1 both before and after parturition, this increase in the concentration of total protein and globins might be due to good plane of nutrition. Increased planes of nutrition have been reported to have resulted in increased serum total protein concentration in pregnant ewes (Dalgarno *et al.*1950; Mahmoud *et al.* 1999). Decrease of total protein and globulin after parturition could be explained by a rapid extraction of immunoglobulin from the plasma during the last few months of pregnancy when colostrum is being formed in the mammary gland (Kaneko *et al.* 2008).

The serum albumin, Albumin: Globulin ratios, cholesterol, triglyceride, creatinine levels recorded in the ewes in T_2 showed higher concentration than those in T_1 both before and after parturition, but this increase was not significantly higher between groups. We may conclude that concentrate supplementation had no effect on these attributes.

The mean serum urea also showed no significant difference ($P \geq 0.05$) between the treatment groups; however, in ewes of T_2 serum urea concentration showed slightly lower values compared to ewes of T_1. The serum level of urea was found to be higher in lactating ewes which may be as a result of catabolizing muscle protein when large amounts of body reserves are mobilized to compensate body requirements (Antunovic *et al.* 2011).

The mean serum SGPT, SGOT, ALP and calcium level showed no significant difference between the treatment groups; however during pregnancy there was slight increase in values of SGPT than that of standard values (22-38 U/L) as reported by Radostits *et al.* 2005, but the values remained within normal range after parturition. The mean serum SGOT concentration of ewes in T_2 tended to be higher than that for the ewes in T_1 which might be due to the influence of the concentrate supplementation. The increase in SGOT activity after parturition may be due to increase in hepatic metabolism.

CONCLUSION

The results of the present feeding trial indicated that the extra allowance of concentrate @200 g/day/doe is required besides normal grazing, for the maintenance of various blood biochemical profile of ewes in normal range. For the pregnant ewes it also required for proper development of growing foetus and colostrum production for the young lambs.

Acknowledgments

The authors are thankful to the Vice chancellor of Orissa University of Agriculture and Technology and Dean of College of Veterinary Science and Animal Husbandry, Bhubaneswar for providing necessary facilities in conducting the experiment.

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