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Effect of Replacement of Cotton Seed Cake and Wheat Bran by Formaldehyde Treated Mustard Cake and Bakery Waste on Blood Constituents in Lambs

A.M. Ganai,[1] G.R. Purohit and B.K. Mathur[2]

Department of Animal Nutrition, College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner 334 001, India

Abstract: An experiment was conducted on sixteen male healthy Nali lambs of 7-8 months of age and of uniform conformation and weight, divided randomly into 4 equal groups and were fed four different isonitrogenous rations, viz., T_1 [cotton seed cake (CSC) 38; wheatbran (WB) 22; barley 23; guarkorma 12; jaggery 3; salt 1; min. mix. 1], T_2 [CSC replaced by deoiled mustard cake (DMC) on protein basis], T_3 [DMC treated with 1% formaldehyde (HCHO)] and T_4 [HCHO treated DMC; WB replaced by bakery waste (BW) on protein basis] for a period of 120 days along with sewan (*Lasiurus sindicus*) hay as basal roughage. Haematological studies were conducted in the beginning and thereafter at monthly interval. The blood parameters studied were haemoglobin, packed cell volume, blood glucose, blood urea, total serum proteins, serum albumin and serum globulin. All the parameters were found to be in normal range. No significant effect of the treatments was observed on Hb, PCV, blood glucose, total serum proteins, serum albumin and serum globulin. Significant effect due to treatment was observed on blood urea. The results showed that treatment of DMC with 1% HCHO and replacement of WB by BW in the ration of sheep is safe for optimum biological response.

Key words: Lambs, cotton seed cake, mustard cake, bakery waste, *Lasiurus sindicus*, blood constituents.

In India, to compensate the shortage of conventional concentrates, the inclusion of non-conventional concentrates in the ration of livestock is now a systematic and co-ordinated research to keep pace with the existing deficit of DCP and TDN (Singh, 1994), to make the ration economic and to have maximum livestock returns. Since mustard cake is highly soluble in rumen (Sampath, 1987, 1990) experiments to reduce its solubility with HCHO had been conducted (Bedi and Vijjan, 1978; Giri and Dass, 1993; Tiwari and Yadava, 1994). Treatment with HCHO has been reported to be safe, effective and economical in protecting the protein from excessive ruminal fermentation (Coetzee, 1970). The present investigation was undertaken to replace costlier feed ingredients like CSC and WB by DMC, 1% HCHO treated DMC and bakery waste on certain haematological and biochemical constituents of blood to ascertain general health and physiological status of animals.

Materials and Methods

Sixteen uncastrated male Nali lambs 7-8 months of age and of uniform conformation and weight, were distributed by completely

[1] Department of Animal Husbandry, Sogam Kupwara 193 223, India.

[2] Central Arid Zone Research Institute, Jodhpur 342 003, India.

Table 1. Physical and chemical composition of experimental rations

Attribute	Dietary treatment				Sewan hay
	T_1 (Control)	T_2	T3	T4	
Physical Composition					
Cotton seed cake	38	–	–	–	–
Deoiled mustard cake	–	25	25*	25*	–
Wheat bran	22	25	25	–	–
Bakery waste	–	–	–	35	–
Barley	23	30	30	22	–
Guar korma	12	10	10	11	–
Jaggery (Gur)	3	8	8	5	–
Salt	1	1	1	1	–
Min. Mix.	1	1	1	1	–
Total	100	100	100	100	
Chemical Composition (% DM)					
CP	20.80	20.48	20.48	20.28	4.8
EE	3.88	3.32	3.46	5.70	2.19
CF	13.60	7.39	7.09	4.32	33.2
NFE	55.9	62.53	63.93	63.26	51.11
Ash	5.79	6.28	5.04	6.44	8.7
Ca	1.19	1.87	1.62	1.95	1.29
P	0.88	1.0	0.92	0.99	0.15

* = Formaldehyde treated.

randomized design into 4 groups of 4 animals each. The experimental feeds were analyzed for proximate principles (AOAC, 1990) and calcium and phosphorus (Talpatra *et al.*, 1940). On the basis of chemical composition, four experimental rations (Table 1) were formulated to meet maintenance and growth requirements of lambs (Banerjee, 1988). For effective protein protection to by-pass ruminal degradation, mustard cake was treated with 1.0 ml of 40% formaldehyde solution per 100 g of CP (Tiwari and Yadava, 1994). The individual groups of lambs were fed one of the dietary treatment rations for 120 days with chopped sewan (*Lasiurus sindicus*) hay as basal roughage. All the rations were isonitrogenous and nearly isocaloric.

The haematological studies of the cellular constituents, viz., haemoglobin content (Hb), packed cell volume (PCV) and biochemical constituents of blood, viz., blood glucose, blood urea, total serum proteins, serum albumin and serum globulin were estimated before feeding and watering at the beginning of the experiment and thereafter at monthly interval.

The blood was taken from jugular vein and Hb and PCV were determined (Jain, 1986). Serum was separated and pipetted out in small pyrex tubes and kept at -20°C in a deep fridge. Serum samples were subjected to analysis for biochemical constituents, viz., blood urea (Natelson, 1957), total serum proteins (Doumas *et*

Table 2. Effect of treatment rations on growth rate of lambs.

Particular	Dietary treatment			
	T_1	T_2	T_3	T_4
Initial body weight (kg)	15.69±0.70	15.68±0.73	16.02±0.53	15.81±1.07
Final body weight (kg)	24.92±1.64	22.62±0.55	30.42±0.76	28.07±1.51
Weight gain in 120 days (kg)	9.23	6.94	14.4	12.26
Average daily gain (g)	76.92	57.83	120.00	102.17

al.,1981), serum albumin and serum globulin (Doumas *et al.*, 1971), blood glucose (Trinder, 1969). The data were subjected to statistical analysis as per Steel and Torrie (1980).

Results and Discussion

Data on composition of concentrate mixtures and their chemical composition is given in Table 1. Fortnightly changes in body weight indicated significantly ($P < 0.05$) higher growth rates in animals of T_3 and T_4 groups in comparison to T_1 and T_2, while no significant difference was observed between T_1 and T_2 as well as between T_3 and T_4 (Table 2). The better growth rate response by supplementation of by-pass protein may be due to more nutrient availability at intestinal level and their enhanced utilization at tissue level, which is reflected in blood metabolite concentrations.

Concentration of different blood metabolites is presented in Table 3. The effects of treatment on Hb and PCV were statistically non-significant. The results are in agreement with observations of Konwar and Banerjee (1987) in calves, Matras *et al.* (1992), in sheep fed non- conventional feeds and Bhargava *et al.* (1974) and Mathur *et al.* (1994) where formaldehyde protected proteins were fed to sheep.

Blood glucose levels in all the four groups were statistically alike. The data showed a fall in blood glucose level with animal ageing, but were within normal range of 40-80 mg per dl. However, statistically non-significant lower values in animals of T_3 and T_4 than in T_1 and T_2 groups could be possibly due to some increase in the level of insulin secreted due to formaldehyde treatment of mustard cake (Faichney and Weston, 1971; Singh and Mehra, 1987).

The major nitrogenous biochemical constituents of blood were closely associated with protein metabolism, viz., blood urea, total serum proteins, serum albumin and serum globulin estimated at 0, 30, 60, 90 and 120 days of experiment were in normal range (Swenson, 1982). Blood urea was significantly ($P < 0.05$) lower levels in animals of T_3 and T_4 groups, perhaps due to formaldehyde treatment, indicating better utilization of proteins in animals of T_3 and T_4 groups than in T_1 and T_2. The results are in agreement with the reported observations of Faichney *et al.* (1994), Mathur *et al.* (1994) in lambs fed HCHO treated casein and guar meal, respectively, Tiwari and Yadava (1994), Giri and Dass (1993) in calves fed HCHO treated mustard cake.

Total serum protein level was statistically comparable in four groups which confirm earlier observations on calves fed

Table 3. Effect of treatment rations on blood constituents of lambs (over all means±SE).

Parameter	Treatment groups			
	T_1	T2	T_3	T4
Hb (g per dl)	11.11±0.44	11.20±0.20	10.84±0.52	11.19±0.27
PCV (%)	29.80±0.53	30.90±0.71	30.70±0.80	30.00±0.45
Blood glucose (mg per dl)	57.37±0.56	57.02±1.42	55.46±1.78	55.97±1.75
Blood urea (mg per dl)	30.51^{b}±3.62	30.62^{b}±3.54	22.60^{a}±0.53	22.56^{a}±0.47
Total serum protein (g per dl)	6.59±0.44	6.54±0.44	6.84±0.13	6.68±0.10
Serum albumin (g per dl)	3.37±0.56	3.41±0.08	3.79±0.29	3.56±0.11
Serum globulin (g per dl)	3.22±0.27	3.13±0.23	3.05±0.16	3.12±0.21
A/G ratio	1.046	1.089	1.243	1.141

a,b = means superscripted with different letters differ ($P \leq 0.05$).

formaldehyde treated mustard cake (Giri and Dass, 1993; Tiwari and Yadava, 1994) and in sheep fed faba bean meal with grass hay (Matras *et al.*, 1992). With animal ageing there was slight drop in serum protein level, which may be due to slight increase in blood urea level. Mathur *et al.* (1994) reported significant difference in serum protein level in lambs fed protected proteins with or without urea.

There was no significant difference in serum albumin concentrations between the groups but apparently the serum albumin concentration was more in lambs of T_3 and T_4 groups. This is in agreement with findings of Giri and Dass (1993).

The mean concentration of serum globulin was 3.22, 3.13, 3.05 and 3.12 (g per dl) in four groups, respectively, indicating no statistically significant difference. However, unlike albumin concentration, globulin level decreased slightly with advancement of feeding. This is in agreement with reports of Giri and Dass (1993) who fed protected mustard cake to calves.

All the blood parameters studied were in normal range in all the groups irrespective of feeding regime, pointed to the general health of lambs and relative adequacies of the ration providing blood building factors. The results indicate that HCHO protection of mustard cake and replacement of wheat bran by bakery waste in the ration of sheep is safe and effective for optimum biological response.

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