



*Original Research*

## Effect of Supplementation of Rumen Protected Methionine and Lysine in Crossbred Calves

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### Abstract

Twelve crossbred (Gir X HF, Gir X Jersey) calves above 6 months of age were selected and divided randomly into two equal groups viz. Group- T<sub>1</sub> and T<sub>2</sub>. Group- T<sub>1</sub> (control) received standard concentrate mixture routinely used on the farm whereas Group- T<sub>2</sub> (treatment) received concentrate mixture same as control supplemented with 3 g rumen protected methionine and 20 g rumen protected lysine/calf/day. The roughage feeding was same for both the groups. The average body weights and gain in weight of calves from treatment group were significantly ( $P < 0.01$ ) higher than control group. The average DM, TDN and DCP intake of calves from groups T<sub>1</sub> and T<sub>2</sub> were comparable, however, the average percent DM intake and DM intake per unit metabolic body size of group T<sub>1</sub> was significantly ( $P < 0.05$ ) higher than treatment group T<sub>2</sub>. The efficiency of feed utilization in terms of DM, TDN intake per kg gain in weight was significantly better for treatment group T<sub>2</sub> than control. The mean values of blood glucose, serum NEFA and BUN of calves from groups T<sub>1</sub> and T<sub>2</sub> showed non-significant effect of feed treatment, however, the mean serum triglycerides, VLDL, protein, albumin and globulin levels of calves from treatment group were significantly higher than control group. The digestibility of all the nutrients was significantly ( $P < 0.05$ ) higher for treatment group. The economics of the study revealed that the per kg weight gain cost was reduced by 2.92% in group T<sub>2</sub> when compared with control.

**Key words:** Blood Biochemical Parameters, Crossbred Calves, Growth Performance, Protected Methionine and Lysine, Supplementation

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### Introduction

To improve the efficiency of protein use by ruminants, diets need to be balanced according to the specific amino acid requirements of the animals. Balancing for post ruminal amino acid delivery could allow use of lower CP rations because they would be balanced to supply individual amino acid to the intestinal



absorptive site. Metabolic costs of deamination of excess amino acids and excretion of excess N would be lower, and removal of CP from the ration leaves space to supply other nutrients, such as those that more efficiently supply energy (Lapierre *et al.*, 2002).

In the Indian cattle feed industry, protein sources are mainly derived from plant sources. Unfortunately these plant sources are deficient in lysine and methionine content in comparison to the requirement for enhanced growth and milk production in ruminant animals. The rumen protected methionine and lysine may help in making methionine and lysine available for absorption at intestinal level which in turn will help in improving production performance of the ruminant animals in terms of growth and milk yield. Hence present study has been planned to assess the effect of the supplemental rumen protected methionine plus lysine on growth and nutrient utilization in crossbred calves under Indian feeding conditions.

### Materials and Methods

The twelve crossbred calves above six months of age were selected on the basis of breed, sex, age, body weights and were divided randomly into two equal groups *viz.* T<sub>1</sub> and T<sub>2</sub> of six each. The group-T<sub>1</sub> (control) received standard concentrate mixture routinely used on the farm. Whereas, group-T<sub>2</sub> (Treatment) received concentrate mixture same as control plus supplemented with 3 g rumen protected methionine and 20 g rumen protected lysine per calf per day. The roughage feeding was same both the experimental groups. The trial lasted for 14 weeks period.

### Chemical Composition or Purity of Protected Amino Acids

#### Rumen Protected Methionine

It is product with spray freezing technology to deliver rumen protected methionine with maximum intestinal availability. It contains 55% DL methionine which is embedded in the fat matrix. Spray freezing technology ensures the maximum production of DL methionine.

#### Rumen Protected Lysine

It is also a commercially available product developed by using encapsulated product which ensures rumen bypass and making lysine available in gastrointestinal tract for maximum and efficient absorption.

The experiment animals were housed in an ideal sheds with proper ventilation, flooring and tying arrangements. Normal standard of hygiene, management, feeding practices, vaccination and deworming programs were followed for all experimental calves. Animals were let loose daily in a open paddock for exercise. The managerial practices remained same for all the experimental animals except feed treatments. All the experimental animals were weighed at the start of the experiment before feeding and watering and thereafter weighing was done every fortnightly at the same day and time. The weighing balance of 1000 kg capacity with least count of 0.2 kg was used for weighing the animals. The representative

samples of concentrate mixture, paragrass and sugarcane kutti used for feeding of calves were collected at weekly interval throughout the experimental period, oven dried and the pooled feed and faecal samples collected during digestibility trial were analyzed. The analysis for proximate principles was undertaken as per A.O.A.C. (2005) in the Laboratory of the Department of Animal Nutrition, Bombay Veterinary College, Parel, Mumbai.

Blood samples were collected at fortnightly interval for estimation of various blood parameters, 4.00 hrs post –concentrate feeding from jugular vein of each calf. Blood samples were analysed for various parameters by using commercially available kits with the help of Bio -analyser. In the last week of the experiment a digestibility trial of seven days duration was conducted by total collection method. Observations of various parameters recorded during experimental period were tabulated and data were statistically analyzed as per Snedecor and Cochran (1994) by using paired ‘t’ test.

### Results and Discussion

The average chemical composition (%DMB) of experimental concentrate mixture, para grass and sugarcane kutti is presented in Table 1.

**Table 1:** Average chemical composition (%DMB) of experimental concentrate mixtures, para grass and sugarcane kutti

Nutrient (%)	Concentrate Mixture	Para Grass	Sugarcane Kutti
Dry matter	90.8	30.77	44.51
Organic matter	94.78	87.94	97.26
Crude protein	15.5	11.58	7.4
Ether extract	3.99	2.4	1.08
Crude fibre	14.7	20.52	21.14
N.F.E	60.59	53.44	64.64
Total Ash	5.22	12.06	5.74
AIA	1.08	3.2	2.2
Calcium	0.85	0.55	2.1
Phosphorus	0.36	0.32	1

The overall performance of crossbred calves from both the experimental groups is presented in Table 2. The average body weights and gain in weight of calves from treatment groups were significantly ( $P<0.01$ ) higher than control groups. The higher gain in weight in supplemental group might be due to better methionine and lysine availability for absorption at small intestinal level and utilization of same for synthesis of body protein. Finding of the present study are in agreement with Sai (2013) and Gami *et al.* (2017) who observed higher ( $P<0.05$ ) average daily gain in calves from treatment group supplemented with 2 g rumen protected methionine and 17 g rumen protected lysine. The result of present experiment are not in matching with the findings of Obeidat (2008) who observed that ram Awassi lamb fed increasing level of methionine supplementation did not improve ( $P<0.05$ ) growth performance.

**Table 2:** Overall performances of crossbred calves from both the experimental groups

Parameters	Groups		Result of "t" test
	T <sub>1</sub>	T <sub>2</sub>	
Initial average body weight (kg)	89.10±3.75	90.80±4.38	—
Final body weight (kg)	138.31±7.65	149.02±8.32	—
Total gain in weight (kg)	49.21	58.22	—
Average body weights (kg)	114.15±6.06	120.25±7.20	**
Average fortnightly gain in weight (kg)	7.03±0.146	8.32±0.147	**
Average daily gain in weight(kg)	0.502	0.594	—
Average daily DM intake (kg)	3.23±0.145	3.16±0.118	NS
DM intake (%)	2.75±0.053	2.56±0.077	*
DM intake per unit metabolic body (g)	90.41±1.634	85.19±1.719	*
Average daily TDN intake (kg)	1.93±0.052	1.95±0.057	NS
Average daily DCP intake (kg)	0.304±0.013	0.317±0.011	NS
DM required (kg) per kg gain in weight	6.47±0.385	5.34±0.243	**
TDN requirement (kg)per kg gain in weight	4.00±0.238	3.37±0.154	**
DCP requirement (kg)per kg gain in weight	0.610±0.036	0.535±0.024	*
<b>Blood Biochemical Profile</b>			
Blood glucose (mg/dl)	53.00±2.174	56.50±1.809	NS
Serum Triglycerides (mg/dl)	50.35±1.045	53.14±0.910	*
Serum VLDL (mg/dl)	10.59±0.709	11.22±0.715	*
Serum NEFA (mmol/lit)	96.42±1.810	95.14±1.425	NS
Serum protein (g/dl)	7.17±0.074	7.60±0.081	**
Serum albumin (g/dl)	3.40±0.064	3.60±0.065	**
Serum globulin (g/dl)	3.92±0.064	4.30±0.097	**
BUN (mg/dl)	16.52±0.872	15.77±0.586	NS

NS – Non-Significant; \*Significant at 5% level; \*\*Significant at 1% level

The DM intake of calves from group T<sub>1</sub> and T<sub>2</sub> was comparable. The dry matter intake of control group in present study was numerically higher than treatment group although statistically non-significant, indicating that the palatability of concentrate mixture was not affected due to supplementation of rumen protected amino acids. Findings of the present study corroborated with Singh *et al.* (2015) who observed no difference in dry matter intake in heifers supplemented with rumen protected lysine and methionine.

The percent DM intake and DM intake per unit metabolic body size of group T<sub>1</sub> was significantly (P<0.05) higher than treatment group T<sub>2</sub>. The average TDN and DCP intake of calves from group T<sub>1</sub> and T<sub>2</sub> were non-significant. Sai *et al.* (2013) reported no difference in mean TDN intake in growing crossbred calves supplemented with rumen protected methionine or lysine over control. The efficiency of feed utilization in terms of DM, TDN and DCP intake per kg gain in weight was significantly better for treatment group T<sub>2</sub> than group T<sub>1</sub>. Similar findings were reported by Cole and Van (1994) who reported increased average feed efficiency in crossbred bulls supplemented with rumen protected lysine. The result of present experiment are not in agreement with findings of Obeidat (2008) who observed that ram lamb fed increasing level of methionine supplementation did not improve (P<0.05) performance nor feed conversion ratio.

The average blood glucose, NEFA and BUN levels of calves from groups T<sub>1</sub> and T<sub>2</sub> were comparable. Amrutkar (2011) also did not find any effect on plasma glucose level in lactating cows supplemented with rumen protected methionine and lysine. In the present experiment treatment group showed numerical reduction in BUN concentration which might be due to increased intestinal absorption and utilization of amino acids for tissue growth and reduced deamination of absorbed amino acids. The results of the present study are in line with those of Amrutkar (2011) who recorded lower BUN concentration in cows supplemented with rumen protected methionine and lysine. Movaliya (2013) also observed similar results in Jaffrabadi heifers supplemented with rumen protected methionine and lysine @ 5g and 10g/head/day, respectively.

The average serum triglycerides, VLDL, protein, albumin and globulin levels of treatment group supplemented 20 g protected lysine and 3 g protected methionine was significantly ( $P < 0.01$ ) higher than control group without supplementation. The supplementation of rumen protected methionine might have facilitated lipoprotein synthesis in liver which may be responsible for increase level of VLDL concentration in calves. Davidson (2008) also observed increase in serum VLDL level after supplementation of rumen protected amino acids. The increase in total protein level of blood in supplemented group might be due to higher organic matter and crude protein digestibility and increased level of methionine in blood. Findings of the present study are in agreement with Ganiny and Ashry (2007) who observed increased total protein level in blood of lactating cows supplemented with 15 g rumen protected methionine. However, Sai (2013) who observed no difference in plasma albumin and globulin concentration in crossbred calves supplemented with rumen protected methionine plus lysine. The per kg weight gain cost was reduced by Rs. 3.13 in group T<sub>2</sub> as compare to control group T<sub>1</sub>. The per kg weight gain cost was reduced by 2.92% in group T<sub>2</sub> when compared with group T<sub>1</sub>.

The digestibility of all the nutrients (Table 3) was significantly higher in treatment group T<sub>2</sub>. The higher digestibility of nutrients was also reflected in higher TDN and DCP content in treatment group T<sub>2</sub>. Similar findings were observed by Patel *et al.* (2009) who reported significantly ( $P < 0.05$ ) higher digestibility for DM, CP, EE and CF in buffalo calves heifers fed bypass protein. Ali *et al.* (2009) also reported improved feed consumption and digestibility of nutrients following supplementation of ruminally protected proteins and amino acids to ruminant animals fed poor quality roughages.

**Table 3:** Average percent digestibility coefficient, TDN and DCP contents for both the experimental rations

Parameters	Groups		Significance
	T <sub>1</sub>	T <sub>2</sub>	
Dry Matter	63.36 ±0.34	64.84 ±0.58	*
Organic Matter	65.71 ±0.28	68.96 ±0.44	*
Crude Protein	72.66 ±0.48	73.83 ± 0.67	*
Ether Extract	76.89 ±0.32	78.66 ±0.56	*
Crude Fibre	63.41 ±0.45	66.30 ±0.65	**
Nitrogen Free Extract	69.00 ±0.42	71.00 ±0.56	*
TDN%	61.78±0.24	63.70±0.42	*
DCP%	9.43±0.42	10.02±0.42	*

\*Significant at 5% level; \*\* Significant at 1% level

### Conclusion

From the results obtained under the present study, it is concluded that supplementation of rumen protected methionine @ 3 g/ day and rumen protected lysine @ 20 g/day is beneficial for improving the overall performance of growing calves in terms of weight gain, efficiency of feed utilization and increased digestibility of nutrients and such supplementation is cost effective.

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