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Effect of probiotic supplementation on growth performance and blood biochemicals in crossbred calves

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Dietary supplementation of probiotics in ruminants beneficially affects the host animal by improving its gastro intestinal microbial balance and efficiency of feed utilization. *Saccharomyces* and *Lactobacillus* are extensively used as probiotics which confers beneficial effects on cellulolysis increasing the fiber digestibility in roughage based diet and also reduce the incidence of diarrhoea by competitive exclusion of pathogenic bacteria, respectively (Fuller 1989). There is paucity of data on the effect of feeding probiotics with roughage based diet on blood biochemical profile and health status of growing calves. In the present study, attempts have been made to assess the effect of dietary supplementation of probiotics on nutrient utilization, growth performance and blood biochemical profile in crossbred calves.

Ten crossbred male calves at about 4 months of age with an average body weight of 65.42±5.46 kg were randomly divided into two groups (control, C and treatment, T) of five animals in each. The calves were fed concentrate mixture (maize 35, wheat bran 32, mustard cake 20, barley grain 10, mineral mixture 02 and salt 01% and roughage (maize green fodder: wheat straw = 3:1) at the ratio of 40: 60 for an experimental period of 120 days satisfying the requirement of ICAR (1998). Probiotic (Biobloom) procured from Sarabhai Zydus animal health ltd. consisting 5×10^4 colony forming units (cfu) of live *Lactobacillus sporogens* culture and 1.5×10^{11} of live *Saccharomyces cerevisiae* per kg of product was additionally supplemented @ 0.1% of diet in group T. All the animals were maintained in strict hygienic condition and uniform management during the experiment. A digestion trial of 7 days was conducted at the end of the study and representative samples of feed, fodder and faeces were analyzed for proximate principles as per standard procedures (AOAC 1995). Serum samples collected prior to feeding at 0, 60 and 120 days of growth study, stored at –40°C and subsequently analyzed for the biochemical profile of blood i.e. glucose, total protein, albumin, globulin and enzymes SGOT and SGPT using span diagnostic kits through spectrophotometer. Data were processed statistically for the test of significance as per SPSS (7. 5) programme.

Table 1. Chemical composition of experimental feeds (% DM basis)

Nutrients	CM (C)	CM (T)	Maize	Wheat straw
Organic matter	89.2	89.5	88.2	92.4
Crude protein	19.6	19.8	7.9	2.9
Ether extract	2.0	2.1	1.2	0.8
Crude fibre	8.6	8.4	25.5	48.4
NFE	59.2	60.4	53.5	40.4

CM (C), Concentrate mixture (control); CM (T), concentrate mixture with probiotics.

The chemical composition of maize fodder and wheat straw was within the normal range (ICAR 1998). Supplementation of probiotics did not influence the chemical composition of concentrate mixture (Table 1) and digestibilities of nutrients i.e. DM, OM, CP, EE and NFE except crude fibre (CF) (Table 2). The fibre digestibility was higher ($P<0.05$) in group T due to improvement in cellulolytic microbial action. The yeast culture i.e. *Saccharomyces cerevisiae* supplements stimulate the growth of beneficial microorganism in the rumen, viz. the numbers of total ruminal anaerobes and cellulolytic bacteria which improve fibre digestion, reduce lactate accumulation and improve starch utilization (Jouany *et al*. 2001).Yeast culture also directly stimulate the activity of fibre digesting fungi. It also inhibits the rate of volatile fatty acid production thus increasing the stability of the rumen environment and improves intensity of digestion (Kamra *et al.* 2002). However, some authors

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Table 2. Effect of probiotic supplementation on nutrient utilization in crossbred calves

Attributes	Control (C)	Treatment (T)	Mean± S.E.M	P value
Digestibility of nutrients (%)				
DM	52.35	56.22	54.29±1.45	0.12
OM	55.57	59.62	57.60±1.18	0.09
CP	56.15	60.53	58.34±1.37	0.07
EE	59.23	62.75	60.99±1.57	0.15
CF	48.32 [a]	53.53[b]	50.93±2.33	0.05*
NFE	60.17	63.85	62.02±2.27	0.15
Nutritive value (%)				
DCP	7.18	7.63	7.40±0.85	0.08
TDN	52.35	55.19	53.77±0.97	0.11

[a,b] means bearing different superscripts in a row differ significantly; *P≥0.05.

reported that probiotic supplementation in form of *Saccharomyces* or *Lactobacillus* did not influence the digestibility of various nutrients (Das *et al.* 2001, Kamra *et al.* 2002). Sahoo *et al.* (2009) reported that supplementation of probiotics at 0.2% level of diet improved (P<0.05) nutrient utilization and growth rate of crossbred calves.

The dose of probiotic and its viability in the rumen ecosystem plays very important role in maintaining a balanced direct fed microbial and the resident microflora to establish the required beneficial microbial population. It may results optimum nutrient utilization and better productive performance of animals through enhanced digestive processes and destruction of metabolic intermediates which prevents from ruminal dysfunction (Denev *et al.* 2007).

The average DM intake (kg/day) through concentrate mixture and total DM intake was not changed by supplementation of probiotics (Table 3). However, the

Table 3. Feed intake and growth performance of crossbred calves fed probiotic supplemented diet

Attributes	Control (C)	Treatment (T)	Mean± S.E.M	P value
DM intake (kg/day)				
Concentrate	1.02	1.21	1.12±0.07	0.10
Roughage	1.78[a]	2.11[b]	1.95±0.11	0.05*
Total	2.80	3.34	3.07±0.19	0.08
Initial body weight(kg)	65.5	65.3	65.4±5.46	0.98
Final body weight (kg)	105.9	109.4	107.7±8.18	0.77
Average daily gain (g)	337	368	352.5±0.03	0.45
Feed gain ratio	8.47	9.11	8.80±0.39	0.28

[a,b] Means bearing different superscripts in a row differ significantly; *P≤0.05.

Table 4. Blood biochemicals of cross bred calves fed probiotic supplemented diet

Attributes	Control (C)	Treatment (T)	Mean± S.E.M	Statistical significance		
				T	P	T × P
Glucose (mg/dl)						
0 day	64.15	65.53	64.84±2.69	–	–	–
60 day	61.42	65.54	63.48±2.72	–	–	–
120 day	59.52	63.87	61.69±2.70		0.71	0.91
Mean	61.69	64.98	63.34±2.20	0.30	–	–
Protein (g/dl)						
0 day	6.34	6.51	6.43±0.14	–	–	–
60 day	6.20	6.57	6.38±0.15	–	–	–
120 day	6.06	6.66	6.36±0.16	–	0.94	0.56
Mean	6.20	6.58	6.39±0.13	0.23	–	–
Albumin (g/dl)						
0 day	3.58	3.78	3.68±0.08	–	–	–
60 day		3.47	3.53	3.50±0.06	–	–
120 day	3.34	3.29	3.31±0.07	–	0.57	0.52
Mean	3.46	3.53	3.50±0.06	0.45	–	–
Globulin (g/dl)						
0 day	2.77	2.76	2.76±0.13	–	–	–
60 day	2.70	2.95	2.83±0.15	–	–	–
120 day	2.72	3.38	3.05±0.15	–	0.29	0.21
Mean	2.73	3.03	2.88±0.12	0.24	–	–
SGPT (g/dl)						
0 day	12.80	14.10	13.45[A]±0.76	–	–	–
60 day	20.20[b]	17.42[a]	18.80[B]±0.74	–	–	–
120 day	25.62[b]	19.40[a]	22.50[C]±0.73	–	0.01	0.06
Mean	19.54[b]	16.95[a]	18.25±0.63	0.01	–	–
SGOT (g/dl)						
0 day	56.40	55.20	55.80[A]±1.18	–	–	–
60 day	67.80[b]	60.80[a]	64.10[B]±1.15	–	–	–
120 day	76.80[b]	66.20[a]	71.50[C]±1.20	–	0.01	0.07
Mean	66.87[b]	60.73[a]	63.80±0.96	0.01	–	–

T, Treatment; P, Period; [a,b,A,B,C] means with different superscripts in a row and column differ significantly;**, P≤0.01.

roughage intake was higher (P<0.05) due to stimulation in ruminal activity and fibre digestibility (Saijpaul *et al*. 2007). The mean average daily gain (g/day) were 337 and 368 in group C and T, respectively which were at par (Table 3). The feed gain ratio (DM intake/unit body weight gain) in control (8.47) and treated (9.11) groups was also comparable. Similar DM intake and nutritive value of diet in both the group of animals could not change in growth rate.

Serum glucose, protein, albumin and globulin level at different days of post-feeding was not influenced by supplementation of probiotics at the specified level. The enzymatic activity i.e. SGOT and SGPT were notably lower (P<0.01) in group T than C (Table 4). In consistent with present findings, Antunovic *et al.* (2005) observed lower concentration of SGOT and SGPT in blood sera of lambs fed with supplemental probiotics.

SUMMARY

The present study was conducted to assess the effect of dietary supplementation of the probiotic (at 0.1% level of the diet) on nutrient utilization, growth performance and blood biochemicals in ten crossbred calves divided into two groups (control; C and treatment; T) of five each. The animals were offered concentrate mixture and roughage (green maize fodder and wheat straw = 3:1) at the ratio of 40: 60. DM intake and nutrient digestibility were not influenced except fibre digestibility which was higher ($P<0.05$) in group T. The average daily gain (g/d) and feed gain ratio was also comparable. The enzymatic activity (SGOT and SGPT) were lower ($P<0.01$) in probiotic supplemented group. It was thus inferred that the supplementation of probiotic at the specified level (0.1%) of diet did not have any beneficial effect on growth performance in crossbred calves. However, it was beneficial in improving fibre digestibility and reducing the serum enzymatic activity.

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