EFFECT OF SUPPLEMENTATION OF LYSINE AND METHIONINE IN PLANT PROTEIN BASED CALF STARTER ON GROWTH IN CROSS BRED CALVES*

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Abstract

A growth trial was conducted with fourteen crossbred calves below one month of age for 145 days to study the effect of replacement of unsalted dry fish in the calf starter with soyabean, supplemented with lysine and methionine. Calves were divided into two groups as uniformly as possible and allotted randomly to two dietary treatments. The control group was fed with a calf starter containing unsalted dry fish. The treatment group was fed a calf starter with only vegetable protein sources formulated to be isonitrogenous and isocaloric with control calf starter and equated by supplementation, with the same as regard to amino acids lysine and methionine plus cystine. Statistical analysis of the data showed that there was no significant difference in any of the parameters recorded during the study. An average daily gain of 325 g and 348 g were obtained in calves fed with the control and treatment diets respectively. Feed to gain ratio for the control and treatment groups were 3.85 and 3.81 respectively. Identical performances were obtained in all the parameters recorded. Cost per kilogram body weight gain was Rs 71.40 for the control group and Rs. 69.63 in the treatment group. It could be inferred from the study that unsalted fish in a calf starter can be fully replaced by plant protein sources supplemented for existing deficiencies in lysine and methionine plus cystine to obtain similar growth performance of cross bred pre-ruminant calves.

Key words: *Lysine-Methionine, growth, pre- ruminant calf*

Similar to monogastric animals pre-ruminant calves are to be fed with good quality protein till microbes establish themselves satisfactorily in the rumen. For this, calves up to an age of six months are usually fed with a concentrate mixture (calf starter) which invariably contains an animal protein source. Unsalted dried fish is the most common animal protein source included in calf starter in India. Unsalted dry fish available in India is markedly inferior in quality compared to the international standards for fish meal (Zombade *et al.,* 1980). More than half of calf deaths occurring with in the first month of birth is mainly due to digestive disturbances (Khera, 1981; Jain and Sharma, 1982) caused by the pathogens present in poor quality unsalted dry fish. Unsalted dry fish is prone to autolytic, lipolytic and microbial spoilage (Hussein and Jordan, 1991) and may lodge harmful pathogens dangerous for the newborn calf. In such a scenario, replacement of fish protein with alternative sources of good quality protein in the diet of pre-ruminant calves achieves considerable practical importance. Substitution with a plant protein source in place of fishmeal is limited due to deficiencies of indispensable amino acids in them. Methionine is the first limiting and lysine

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the second limiting amino acid in a corn and soyabean meal based diet for calves weaned at less than three months of age (Abe *et al.*, 1998). This study was under taken to assess the effect of replacing unsalted dry fish in the calf starter by cent per cent vegetable protein sources equated with regard to energy, protein and amino acids - lysine and methionine plus cystine in the calf starter on the growth performance of crossbred calves.

Materials and Methods

Fourteen crossbred calves between three to twenty days of age, belonging to University Livestock Farm & Fodder Research and Development Scheme, Mannuthy were randomly selected for the experiment and they were grouped into two as uniformly as possible with regard to the breed, age, sex and body weight. They were randomly allotted to the experimental diets, the control and treatment which were isonitrogenous and isocaloric concentrate mixtures (BIS, 1983). The ingredient compositions of both diets are given in Table1. The control diet had unsalted dry fish as the source of animal protein while the treatment diet did not contain any animal protein source. The lysine and methionine plus cystine content of the treatment diet were equated with that of control diet by supplementing it with synthetic lysine and methionine. The calculated crude protein (CP), total digestible nutrient (TDN), lysine and methionine plus cystine content of the two diets are given in Table 2. The calves were fed with milk at the rate of 1/10th of their body weight in the first month, 1/12th of their body weight in the second month and 1/15th of body weight in the third month. For the initial two weeks, the calf starter was fed mixed with milk, thereafter it was fed separately once daily during the first month then increased to twice daily, from second month onwards. The body weight of calves was recorded on day one of experiment and every fortnight thereafter till the end of experiment. The daily dry matter (DM) given to each animal was documented and revised every fortnight according to the body weight. The quantity of calf starter fed to animals of each group was fixed as per standards (NRC, 1989). Green grass was provided *ad libitum.* Clean drinking water was provided round the clock all through the trial period of 145 days. The data on fortnightly body weight were analysed using covariance analysis. From the results obtained the performance of the calves were assessed and the means were compared using students 't' test (Snedecor and Cochran, 1985).

Results and Discussion

The average body weight of experimental calves that received one of the two dietary treatments, recorded at fortnightly intervals are documented in Table 3. Data were analyzed using covariance and are given in Table 4. In the control and treatment groups, the average initial body weights were 25.66 ± 1.54 and 25.81 ± 1.51 kg and average final body weights were 71.21 ± 2.70 and 74.57 ± 2.96 kg respectively. Total weight gain in the control group was 45.55 ± 2.14 kg and the same in treatment group was 48.76 ± 2.69 kg. Average daily gain as represented in Table 5 was 325 ± 30g in the control group and 348 ± 27 g in the treatment group. There was no significant difference between the body weights of the calves maintained on two dietary treatments. The animals fed the treatment diet showed a numerical superiority in body weight gain over the animals receiving control diet through out the trial. The supplementation of lysine and methionine to a calf starter with cent per cent vegetable protein had resulted in significantly better average daily gain in calves (Kanjana-pruthipong, 1998; Khan *et al.,* 2002; Mandal *et al.,* 2002). However Preston *et al.* (1964) in a similar experiment with pre-ruminant calves found average daily gains significantly lower in groups fed ground nut meal diet equated in lysine and methionine plus cystine content compared to the groups fed on diets having fish meal. Zombade *et al.* (1980) reviewed the inferior nature of Indian source of fish protein for animal consumption.

Total dry matter intake in 140 days (kg/calf) as represented in Table 5 was 181.65 ± 9.36 in the control group and 188.20 ± 7.53 in the treatment group. Average dry matter intake (kg /day) was 1.29 ± 0.07 in the control group and 1.34 ± 0.05 in the treatment group. The dry matter intake of calves was similar in the two dietary treatments. Kay *et al.* (1966) reported that dry matter intake in calves was not affected by the protein source and was similar among those fed soyabean meal or fish meal as their main protein source. Similar lack of influence of the source of protein in the diet on DMI was also reported by Davenport *et al.* (1990) and Abu-Ghazaleh *et al.* (2001).

The mean feed conversion efficiency (kg feed / kg gain) was 3.85 ± 0.43 for the control and 3.81 ± 0.51 for the treatment group. There was no significant difference in feed efficiency between the experimental diets when analyzed

statistically. Mandal *et al.* (2002) reported similar feed efficiency among calves in the groups fed diets supplemented with lysine and methionine (6.97) and the group receiving diets without supplementation. Khan *et al.* (2002) reported that feed efficiency was significantly improved when calves fed cotton seed meal were supplemented with lysine and methionine.

The feed cost per kg weight gain obtained in the present experiment for the control and treatment group were Rs. 71.40 and Rs. 69.63, respectively. Mandal *et al.* (2002) reported that there was no difference in cost per kilogram gain among calves, older than six months, fed lysine and methionine supplemented diets (Rs 43.14) and those on diets without supplementation (Rs 43.55). Khan *et al.* (2002) observed that cost of feed to produce one kilogram live body weight gain in calves reared without milk was similar in groups fed diets with lysine and methionine supplementation (Rs 17.92) and without supplementation (Rs 19.19). A higher cost incurred in rearing calves in the present study is justified by the milk feeding regimen followed. The economics of the study is depicted in Table 5.

Table1. Ingredient composition of the two concentrate mixtures given to the experiment animals (kg)

Ingredient	Control	Treatment
Maize	33.0	31.5
Wheat bran	22.5	22.0
Soya bean meal	34.0	44.0
Unsalted dry fish	8.5	Nil
Shell grit	1.5	2.0
Salt	0.5	0.5
L-Lysine	Nil	0.23
DL-Methionine	Nil	0.12

To every 100 kg calf starter, 100 g of Ultra-TM* and 8 g of Indomix-AB_2D_3K** were added.

* Trace mineral mixture supplied by Neospark Drugs and Chemicals Pvt Ltd., Unit-2, 64-B, I.D.A, Jeedimetla, Hyderabad-500055, having in every 5 kg, Manganese-270 g, Zinc-260 g, Iron-100 g, Iodine-10 g, Copper-10 g, Cobalt -5 g.

** Vitamin premix supplied by Nicholas Piramal India Ltd, 100, Centrepoint, Dr Ambedkar road, Parel, Mumbai-400012, having in every gram, Vitamin A-82500 I.U, Vitamin D_3-12000 I.U, Vitamin B_2-50 mg, Vitamin K-10 mg.

Table 2. Calculated crude protein, total digestible nutrients, lysine and methionine plus cystine content of the two experimental concentrate mixtures after supplementation

Nutrient	Control	Treatment
CP (%)	23.42	23.64
TDN (%)	72.65	72.83
Lysine (g /kg feed)	1.88	1.88
Methionine plus Cystine(g /kg feed)	0.96	0.96

Table 3. Fortnightly average body weight (kg) of calves maintained on the two experimental rations

Fortnight	Control	Treatment
0	25.66 ± 1.54	25.81 ± 1.51
1	28.43 ± 1.71	29.86 ± 1.97
2	31.99 ± 1.97	32.86 ± 2.16
3	35.00 ± 2.25	36.50 ± 2.00
4	39.14 ± 1.99	41.71 ± 2.37
5	42.86 ± 1.74	45.71 ± 2.13
6	48.43 ± 2.15	52.29 ± 2.75
7	53.93 ± 2.39	58.07 ± 2.90
8	60.57 ± 2.49	64.50 ± 2.62
9	66.43 ± 2.94	70.00 ± 2.78
10	71.21 ± 2.70	74.57 ± 2.96

Table 4. Analysis of covariance of body weight of calves maintained on the two experimental rations recorded at fortnightly intervals

Fortnights	Mean sum of squares			Probability
	Groups	Covariate	Error	
1	5.471	250.996	3.189	0.2169
2	1.661	263.119	8.677	–
3	6.251	211.154	15.395	–
4	20.223	221.293	16.499	0.2919
5	25.971	139.117	16.197	0.2316
6	47.976	187.734	29.446	0.2281
7	55.849	171.955	38.316	0.2526
8	5.007	173.082	34.057	0.2510
9	40.568	218.551	42.606	–
10	35.977	178.937	44.973	–

Table 5. Growth rate, feed efficiency and cost per kg gain of calves maintained on the two rations

Parameter	Control	Treatment
Total dry matter intake in 140 days (kg/calf)	181.65 ± 9.36	188.20 ± 7.53
Average dry matter intake, (kg/day)	1.29 ± 0.07	1.34 ± 0.05
Average daily gain (g)	325 ± 30	348 ± 27
Dry matter intake per100 kg body weight (kg)	3.06 ± 0 .07	3.14 ± 0.11
Total body weight gain (kg)	45.55 ± 2.14	48.76 ± 2.69
Feed efficiency (kg feed/ kg gain)	3.85 ± 0.43	3.81 ± 0.51
Total milk intake (kg/calf)	170.64	170.64
Total grass intake (kg/calf)	361.01	394.22
Total calf starter intake (kg/calf)	104.77	104.34
Total cost of feed (Rs/calf)	3252.97	3395.16
Cost/ kg gain (Rs)	71.40	69.63

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