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Health performance of crossbred calves under different feeding systems

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Abstract
The present study was conducted to evaluate the health and haemato-biochemical performance of feeding different milk replacers in crossbred calves. Eighteen healthy crossbred calves both male and female around one week of age were selected and randomly divided into three groups of six each (T1, T2, and T3), as uniformly as possible with regard to age, sex, and body weight. The calves of T1 received whole milk as per routine farm practice, T2 group was offered whole milk plus commercial milk replacer as per manufacturers recommendation and T3 group was offered a formulated milk replacer @ 12.5 per cent of body weight. All the calves received ad libitum green fodder. First fortnight Faecal Consistency Score (FCS) in T1, T2 and T3 was 1.26±0.03, 1.23±0.05 and 1.26±0.07 and was 1.41±0.22, 1.56±0.14 and 1.36 in respective groups in the second fortnights. In the last fortnight FCS was 1.07±0.05, 1.02±0.02 and 1.00±0 in T1, T2 and T3 experiment group. The faecal score was initially high followed by a decreasing trend. The mean faecal consistency score had no significant difference among the treatment group. The values of hematological parameters for treatment groups T1, T2 and T3 recorded at the end of the experiment were Haemoglobin (Hb:g/dl) 8.31±0.36, 8.91±0.31 and 8.98±0.52, Blood urea nitrogen (BUN:mg/dl) 23.58±0.94, 21.47±0.35 and 21.42±1.77, Plasma total protein (g/dl) 6.48±0.11, 6.59±0.15, and 6.46±0.21, Glucose (mg/dl) 65.33±1.46, 64.19±0.99, and 64.96±0.59, Calcium (mg/dl) 9.64±0.09, 9.56±0.63 and 9.67±0.44, Phosphorus(mg/dl) 6.77±0.15, 6.22±0.33 and 6.18±0.14 respectively. Statistical analysis revealed no significant difference in blood parameters during initial and final stage of the experiments. It was concluded that rising of crossbred calves fed with milk replacers was not impact the health of crossbred calves.

Keywords: crossbred calves, milk replacer, hematology parameters, faecal consistency

Introduction
Nutritional and health care aspects of calf rearing are the prime concern for dairy calf management. Apart from that, economics of rearing should always be kept in mind as whole milk feeding may affect the profitability of dairy farm. The first 90 days of calves was always neglected by dairy farmers in terms of feeding milk which resulted in mortality and delayed puberty. Therefore, initial milk feeding and impact on farmers economy has to be addressed. As an alternative to milk feeding, many countries today developed milk replacers, thus cutting down the rearing cost and sparing milk for human consumption (Mete *et al*., 2000) [6]. Milk replacer is a good liquid feed alternative to raise calves. It is having many advantages like being cheaper than whole milk, storage flexibility, and day to day constancy of product and conducive to the control of diseases in the calves (Heinrichs, 1995) [5]. The present study was undertaken to compare the health and hemato-biochemical of crossbred calves.

Materials and Methods
The study was conducted for a period of three months in University Livestock Farm and Fodder Research and Development Scheme (ULF and FRDS), College of Veterinary and Animal Sciences, Mannuthy during 2017-2018. Eighteen healthy crossbred calves both male and female around one week of age were selected and randomly divided into three groups of six each (T1, T2, and T3), as uniformly as possible with regard to age, sex and body weight. The calves were dewormed as per routine farm practice (at 15th and 45th day of age) during the experimental period. All the experimental calves were maintained under identical conditions of feeding and management throughout the experimental period, except for milk feeding as followed.
T1: Feeding whole milk (Farm practice)
T2: Feeding commercially available milk replacer (CMR)

T3: Feeding formulated milk replacer (FMR) (consisting of Milk, skimmed milk powder, Soya meal, Maize, Palm oil mineral and salt) with 25 per cent crude protein.

All the calves were weaned in the first week of age and fed colostrum @ 10% body weight. From the first week to 90 days T1 was fed with whole milk as per standard routine farm practice. The group T2 was fed with a combination of Commercial milk replacer (Jeevan-Amul®) and whole milk as per manufacturer recommendations and the group T3 was fed with a formulated milk replacer given @ 12.5 per cent body weight. The formulated milk replacer consists of Table -1 proportion (Shukla *et al*., 2016) [8]. All calves were fed liquid milk and milk replacer with an upper limit of 4 kg/day. The liquid milk replacer of T2 and T3 was prepared by dissolving 100 g powder in one liter of boiled water and fed at 38 °C to 40°C temperature in two equal parts. All the groups were fed throughout the experiment period as per the schedule Table-2, Table-3 and Table-4.

Table 1: Composition formulated of milk replacer

Ingredients	Parts (%)
Milk	20
Skimmed milk powder	10
Soya meal	25
Maize	30
Palm Oil	12
Minerals	2
Salt	1
Nicomix	0.020
Total	100

Table 2: Feeding schedule of treatment 1 group of calves

Age in weeks	Whole milk (Body weight)	Calf starter (g)
1 wk	Colostrum 1/10 B.wt	Nil
2 wk	1/10	Nil
3-4 wks	1/10	150g
5-6 wks	1/10	400g
7-8 wks	1/15	
9-12 wks	1/20	600g

Table 3: Feeding schedule of treatment 2 group of calves

Age in weeks	Whole milk(kg)	Commercial milk replacer(g)	Calf starter (g)
1 week	Colostrum 1/10 B.wt	Nil	Nil
2 week	3.0	50	Nil
3week	1.0	150	150g
4 week	1.0	250	
5 week	Nil	350	400g
6 week		450	
7 week		500	
8 week		400	
9-12 weeks		400	600g

(*As recommended by manufacturer)

Table 4: Feeding schedule of treatment 3 group of calves

Age in weeks	Whole milk	Formulated milk replacer	Calf starter (g)
1 week	Colostrum 1/10 B.wt	Nil	Nil
2 wk	1/10	Nil	Nil
3-4 wks	Nil	Milk @ 12.5 % of body weight upper limit 4 kg	150g
5-8 wks	Nil		400g
9-12 wks	Nil		600g

* Green fodder will be fed ad libitum in all three experiment groups.

Faecal consistency score (FCS) was recorded as outlined by Larson *et al.* (1977) [4], were recorded twice a day from birth and throughout the 12 weeks experimental period. Data was analyzed by Kruskal Walis test.

The Fecal consistency scores were recorded for each individual calf according to the following scale:

1. for Normal fecal consistency.
2. for Slightly liquid feces.
3. for Moderately liquid feces.
4. for Severely liquid feces.

Fecal consistency score more than 2 was considered as diarrhoea.

Blood samples were collected from all animals at the beginning and end of the feeding experiment. The Blood hemoglobin was estimated by using Hematology Analyzer. The plasma and serum were separated using the refrigerated centrifuge at 3000 rpm for 10 minutes. All the analysis was done with the help of autoanalyzer, which works on the principle of electrical impedance. Plasma samples were used to determine total protein (biuret method), serum samples were used to determine blood urea nitrogen (GLDH kinetic method), glucose (GOD/POD method), calcium (Arsenazo – III method) and phosphorus (Molybdate U.V. method) by using Semi-Automated Biochemical Analyser (Master T). The standard biochemical kits used for these assays were procured from Euro Diagnostic Systems Pvt.Ltd, Chennai, Tamil Nadu

Results

The mean faecal consistency score observed at fortnightly intervals is presented in Table 1. The faecal score showed an initial rise followed by a decreasing trend. The mean faecal consistency score has no significant difference among the treatment groups.

Average Faecal consistency score (FCS) of experimental calves at Fortnight basis

Fortnight	Dietary treatments			χ^2 value	P value
	T_1	T_2	T_3		
1	1.26±0.03	1.23±0.05	1.26±0.07	0.27 ns	0.87
2	1.41±0.22	1.56±0.14	1.36±0.11	1.93 ns	0.38
3	1.32±0.13	1.19±0.11	1.17±0.05	0.82 ns	0.66
4	1.04±0.02	1.03±0.01	1.00±0	4.19 ns	0.12
5	1.08±0.07	1.02±0.01	1.08±0.05	0.30 ns	0.86
6	1.07±0.05	1.02±0.02	1.00±0	2.24 ns	0.32

[1]Average of 15 days faecal consistency score with SE
ns- Non significant, $P>0.05$

Haematological parameters such as haemoglobin, blood urea nitrogen (BUN), plasma total protein, glucose, calcium and phosphorus, recorded at the beginning and at the end of the experiment are listed in Table 2 The values of haematological parameters for treatment groups T1, T2 and T3 recorded at the end of the experiment were Haemoglobin (Hb:g/dl) 8.31±0.36, 8.91±0.31 and 8.98±0.52, Blood urea nitrogen (BUN:mg/dl) 23.58±0.94, 21.47±0.35 and 21.42±1.77, Plasma total protein (g/dl) 6.48±0.11,6.59±0.15, and 6.46±0.21, Glucose (mg/dl) 65.33±1.46, 64.19±0.99, and 64.96±0.59, Calcium (mg/dl) 9.64±0.09, 9.56±0.63 and 9.67±0.44, Phosphorus(mg/dl) 6.77±0.15, 6.22±0.33 and 6.18±0.14 respectively. Statistical analysis revealed no significant difference in blood parameters during initial and final stage of the experiments.

Table 2: Haematological parameters of calves [1]

Parameter Initial	Group			P Value
	I	II	III	
Haemoglobin (Hb:g/dl)	8.18±0.33	8.74±0.63	8.67±0.84	0.803 ns
Blood urea nitrogen (BUN:mg/dl)	22.62±1.50	22.38±1.16	21.85±1.55	0.926 ns
Plasma total protein (g/dl)	6.58±0.39	6.57±0.31	6.09±0.21	0.482 ns
Glucose (mg/dl)	65.03±0.97	64.16±0.40	64.90±0.74	0.678 ns
Calcium (mg/dl)	9.95±0.27	9.66±0.20	9.16±0.28	0.125 ns
Phosphorus(mg/dl)	6.62±0.27	6.51±0.46	6.56±0.40	0.980 ns
Final				
Haemoglobin (Hb:g/dl)	8.32±0.36	8.91±0.31	8.98±0.52	0.470 ns
Blood urea nitrogen (BUN: mg/dl)	23.59±0.94	21.48±0.35	21.42±1.78	0.360 ns
Plasma total protein (g/dl)	6.48±0.11	6.59±0.15	6.46±0.21	0.853 ns
Glucose(mg/dl)	65.33±1.46	64.19±0.99	64.96±0.59	0.752 ns
Calcium (mg/dl)	9.64±0.09	9.56±0.63	9.67±0.44	0.984 ns
Phosphorus(mg/dl)	6.77±0.15	6.22±0.33	6.18±0.14	0.169 ns

[1]Average of six values means with SE
ns- Non significant, $P>0.05$

Discussion

In first fortnight faecal consistency score in T1, T2 and T3 was 1.26±0.03, 1.23±0.05 and 1.26±0.07 and was 1.41±0.22, 1.56±0.14 and 1.36 in respective groups in the second fortnights. In the last fortnight FCS was 1.07±0.05, 1.02±0.02 and 1.00±0 in T1, T2 and T3 experiment group. The faecal score was initially high followed by a decreasing trend. The mean faecal consistency score had no significant difference among the treatment group. FCS was high initially due to physiological adaptive changes in digestive systems. The FCS was non-significant on feeding milk replacer and soy milk as reported by Quigley *et al.* (2006) [7] and Ghorbani *et al.* (2007) [2]. Similarly addition of acidifiers in milk and milk replacer in calves did not affect the faecal scores according to Ribeiro *et al*. (2009) [8]. There was no significant difference in initial and final value haemotological parameters between the dietary groups. Similarly reported that no significant difference was noticed in the initial and final values of hematological parameters, Shakya *et al.* (2017) [19], Shukala *et al.* (2017)

Conclusion

From the results of the present study it is evident that feeding milk replacers have no impact on health of calves and it is economical for dairy farmers to raise calves with milk replacer.

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