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Effect of feeding milk replacer on the nutrient digestibility of crossbred calves

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Abstract
This study aimed to investigate the effect of feeding milk replacer on the nutrient digestibility of 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. The apparent nutrient digestibility of crossbred calves has no significant difference between groups. This result shows that feeding of milk replacer does not affect the digestibility of crossbred calves.

Keywords: crossbred calves, milk replacer, nutrient digestibility

Introduction
Calf is the future of a dairy herd. The success of dairy farming mainly depends on rearing of calves to a breedable age at a faster rate with minimum mortality. The first 90 days of calves was always neglected by dairy farmers in terms of milk feeding resulting in mortality and delayed puberty. So initial milk feeding and impact on farmers economy has to be addressed. For this an alternatives was milk replacers which were developed in many countries to cut down rearing cost and to spare milk for human consumption (Mete *et al*., 2000) [4]. Being a good liquid feed alternative to raise calves, Milk replacer has many advantages like; it is cheaper than whole milk, storage flexibility, day to day constancy of product and conducive to the control of diseases in the calves (Heinrichs, 1995) [2]. The present study aimed to investigate the digestibility of milk replacer in 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) with 25 per cent crude protein
All the calves were weaned in the first week of age and fed colostrum at the rate of 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). 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.

A digestion trial involving five days of collection was carried out at the end of study period. Representative samples of milk, milk replacers, calf starter, green grass offered were taken daily during the digestion trial. The balance of feed and grass samples if any were also collected from individual animals and their moisture content was determined. The dung was collected manually as and when it was voided. All the precautions were taken to collect the dung quantitatively, uncontaminated by urine, feed residue or dirt. The dung voided during each day was weighed accurately, mixed thoroughly and representative samples (10 percent of the total quantity voided) were collected in air-tight, double lined plastic bags and stored in a deep freezer. At the end of the collection period, individual samples were pooled and were subjected to further chemical analysis. From the data obtained on the intake and outgo of different nutrients during the digestion trial, digestibility coefficient of nutrients was calculated. The fecal samples collected from each animal for the five consecutive days were pooled, mixed thoroughly and representative samples were taken for analysis. The apparent digestibility coefficient of dry matter, crude protein, ether extract and crude fiber were calculated using appropriate formulae.

Results

Data on digestion trail conducted in experimental calves maintained on three dietary treatments is given in Table 5. The chemical composition of the dung of collected during digestion trail is presented in Table 6. The apparent nutrients digestibility is presented in Table 7.

Table 5: DMI from different nutrients in calves (kg)

	Animal no	DMI from milk	DMI from milk replacers	DMI from grass (kg)	DMI from concentrate (kg)	*Total DMI	DM outgo through dung (kg)
T_1	49	2.39	-	1.50	2.91	6.81	1.17
	48	2.52	-	1.58	2.94	7.03	1.38
	40	2.52	-	1.42	3.64	7.58	1.71
	37	2.52	-	1.71	2.70	6.93	0.91
	35	2.52	-	1.51	2.70	6.73	1.19
	33	2.39	-	1.35	2.30	6.05	0.80
T_2	47	-	1.83	1.60	2.94	6.37	1.38
	45	-	1.83	1.64	2.77	6.24	1.18
	42	-	1.83	1.37	2.47	5.66	1.15
	39	-	1.83	1.49	2.82	6.13	1.26
	28	-	1.83	0.59	2.75	5.16	0.65
	26	-	1.83	0.86	2.40	5.08	0.99

T_3	46	-	1.82	1.60	2.94	6.36	1.27
	44	-	1.82	1.62	2.94	6.37	1.45
	36	-	1.82	0.90	2.33	5.04	0.87
	30	-	1.82	1.04	2.21	5.06	0.78
	29	-	1.82	1.13	2.35	5.29	1.06
	20	-	1.82	1.09	2.21	5.11	1.01

*Total DM intake during five days of collection

Table 6: Chemical composition of dung (DM basis)

	Animal no	DM	CP	CF	EE	NFE	TA
T_1	49	22.02	23.27	21.45	5.23	51.28	11.06
	48	24.14	25.27	24.27	5.68	53.67	9.85
	40	24.84	24.32	25.78	6.23	52.47	13.8
	37	20.62	23.7	26.78	4.78	51.09	12.1
	35	17.55	23.27	25.34	5.12	55.04	10.36
	33	17.63	22.2	21.56	4.98	54.46	11.98
T_2	47	22.25	24.32	26.86	4.58	55.32	13.69
	45	18.89	26.34	27.45	5.23	59.67	13.58
	42	22.97	26.34	25.38	3.58	56.07	12.28
	39	23.46	25.27	26.76	6.74	55.14	13
	28	17.86	26.28	27.79	5.35	57.18	13.6
	26	23.58	27.35	28.16	4.92	56.9	12.8
T_3	46	21.38	25.45	26.34	3.92	51.32	14.89
	44	22.14	28.7	24.12	3.34	49.56	11.23
	36	19.94	26.35	25.32	4.58	53.7	11.36
	30	17.34	24.25	24.18	5.84	55.28	13.14
	29	22.80	26.32	26.38	4.26	53.95	10.59
	20	20.34	25.78	27.78	5.56	57.74	12.2

Table 7: Apparent nutrients digestibility in calves [1](per cent)

Parameter	Dietary treatments			P value
	T_1	T_2	T_3	
Dry matter	78.51±0.85	77.09±1.20	77.43±0.87	0.583
Crude protein	78.71±2.02	77.89±1.46	78.57±1.61	0.937
Crude fiber	70.85±2.27	68.45±2.46	69.28±1.83	0.741
Ether extract	88.01±1.09	85.75±1.73	87.33±0.59	0.434
Nitrogen free extract	79.78±1.80	78.49±1.36	79.71±0.94	0.814
Total ash	73.01±2.88	71.31±2.14	71.95±1.92	0.876

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

Discussion

The digestibility of the nutrients had no significant difference in between groups. Feeding of milk replacer in crossbred calves did not affect the digestability of the nutrients. In agreement with present findings, Ghosh *et al.* (2011) [1] observed no significant difference in TDN among the control and garlic extract supplementation feeding of crossbred calves. On contrary to the present results, Li *et al.* (2008) [3] found that CP was having significantly higher digestibility in calves fed with milk replacer containing crude protein of 22 per cent than 18 and 26 percent. Similarly, Tu *et al.* (2015) [7] observed significant differences in DM digestibility coefficient when milk replacer supplemented with bee pollen.

Conclusion

From the present experiment results, it can be concluded that feeding of milk replacers in crossbred calves did not affect their digestibility. Formulated milk replacer is better option for dairy farmers rearing of calves.

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