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Research Article

STUDY ON COMPARATIVE EFFECT OF WHOLE MILK AND MILK REPLACER FEEDING ON HEALTH STATUS IN MURRAH BUFFALO CALVES

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ABSTRACT

Present study was conducted to compare the effect of whole milk and milk replacer feeding on health parameters in Murrah buffalo calves. 5-day old eighteen Murrah buffalo calves were divided into three treatment groups *viz*. C (control), T_1 (treatment 1) and T_2 (treatment 2). The calves of C group received whole milk, T_1 group received commercial milk replacer (CMR) and T_2 group received formulated milk replacer (FMR) as per the feeding schedule of the farm. All calves received calf starter starting from 10 days of age. Health parameters (temperature, pulse rate, respiration rate, fecal consistency score (FCS) and diarrhoea days) were recorded once daily in the morning throughout the trial period. The results revealed a non-significant difference in the rectal temperature between the treatment groups; overall pulse rate differed significantly ($p \leq 0.05$) between T_1 and C and T_1 and T_2 group; overall respiration rate varied significantly ($P \leq 0.05$) between T_2 and C and T_2 and T_1 group. A non-significant difference was observed in the overall FCS between the treatment groups. However, mean diarrhoea days was more in milk replacer fed group. It is concluded that milk replacer feeding does not have adverse health effects in calves in comparison to whole milk feeding except more diarrhoea days.

Keywords: Health, Buffalo calves, Whole milk, Milk replacer

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For running a profitable dairy industry, proper rearing of calves is utmost important. Proper nutrition and health care aspects is a major area of concern under calf management. Nevertheless, many dairy farms overlook this, as seen by the higher mortality rate of 30-35 percent in newborn calves (Thomas *et al.*, 2012). High mortality rates in young calves during initial stages of calf's life are attributed to poor nutrition and environmental conditions which ultimately reduces the health status of calves. For optimum performance and welfare, calves must get a sufficient amount of nutrients through liquid feed either milk or milk substitute (Lee *et al.*, 2009). An important factor influencing inadequate nutrients availability is the economics of rearing calves under whole milk feeding system. Also, general practice of feeding whole milk to young calves besides some advantages has many disadvantages like higher cost, less milk available for sale and quality of milk, if not stored properly act as an ideal bacterial culture. Therefore, it is necessary to address these issues of whole milk feeding and its effects on farmers' economy. Today, several countries have created milk substitutes as an alternative to whole milk feeding thus, reducing the expense of calf rearing and freeing up milk for human use (Mete *et al.*, 2000). Besides being an economical alternative to whole milk, milk replacer feeding have other advantages *viz*. better calf performance, lower cost, saving of milk for sale and longer shelf life (Jasper and Weary, 2002). So, keeping this in view the present study was conducted to compare the effect of whole milk and milk replacer feeding on health parameters of Murrah buffalo calves.

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MATERIALS AND METHODS

The present study was conducted in Dairy Farm of Directorate of Livestock Farms, GADVASU, Ludhiana from beginning of spring season in 2022 for 2-months starting from mid-February. Eighteen Murrah buffalo calves (9 males and 9 females) were selected at 6 days of age,then alternately distributed into three treatment groups *viz*. Control (C), T_1 and T_2 based onbody weight and sex. Almost same body weight and equal number of male and female calves were allotted in each treatment group. All calves were dewormed as per farm's schedule during the experimental period and were kept under similar management conditions. The study trial was partitioned in to three phases namely phase 1 (6-21 days), 2 (22-42 days) and 3 (43-65 days).

Housing of calves

The calves were maintained under loose housing conditions in shed directed in east-west direction. The roof (RCC) and floor of the shed was made of concrete. Calves were kept individually in pens of $1 \times 1 m^2$ dimension. The shed had proper facilities of lighting, ventilation fans etc. The shed has two gates with adjoining open paddock where calves were let loose for five hours (9:00 AM to 2:00 PM) for exercise. In open paddock too feeding and watering facilities were available. Proper cleaning and washing of pens and floors were done daily and

disinfection was done once weekly using suitable disinfectant.

Feeding and watering of calves

All calves were weaned at 0 day of age and were fed colostrum @ 10% body weight up to 5 days. From 6th day to 65th day of age C group was fed whole milk, T_1 group was fed commercial milk replacer (CMR) manufactured by Bonilait Proteins Ltd. France and T_2 group was fed formulated milk replacer (FMR) as per the feeding schedule given in Table 1. The composition of commercial and formulated milk replacer is given in Table 2. Milk replacer was reconstitutedby dissolving 125g of milk replacer powder in 1 liter of luke warm water (40-45 °C) and was fed after cooling up to 37-40 °C. Reconstituted milk replacer was fed two times daily at 6.00 a.m. in the morning and 5.00 p.m. in the evening. Fresh and clean water was provided to the calves of different treatment groups from 10 days onwards *Ad lib* in day time during the trial period.

Recording of health parameters

Day to day monitoring of calves was done and sick animals were identified and promptly treated. Health parameters (temperature, respiration rate (RR), pulse rate (PR), fecal consistency score (FCS) and diarrhoea days) were recorded once daily in the morning hours throughout the experimental period. Body temperature was recorded using clinical thermometer inserted inside rectum. Respiration rate was measured by visually counting the flank movementsand pulse rate was recorded manually by placing two fingers below the tail over coccygeal artery for 15 seconds and multiplied by four to calculate value per minute. Fecal consistency score (FCS) was measured as per the scale outlined by Larson *et al.* (1977). Fecal consistency score was recorded for individual calves on the basis of four levels.

0- Normal (firm but not hard)

1- Soft (does not hold form, piles but spreads slightly)

2- Runny (spreads readily)

3- Watery (liquid consistency, splatters)

Total number of diarrhoea days was recorded based on fecal consistency score (above 1 considered as diarrhoea). The collected data on different health parameters were analyzed using Software Package for Social Sciences (SPSS Version 24.0) at 5% level of significance using Tukey's post-hoc test to compare the difference among treatment means.

Table 1. Feeding schedule of calves fed whole milk, CMR and FMR

Age	Colostrum	Whole milk/ Milk Replacer	Calf starter
0-5 days	1/10th of body weight	Nil	Nil
6-10 days	Nil	3.5kg/ head/ day	Nil
11-14 days	Nil	3.5kg/ head/ day	Nil
15-30 days	Nil	3.5kg/ head/ day	Ad-lib.
31-40 days	Nil	4kg/ head/ day	Ad-lib.
41-65 days	Nil	3kg/ head/ day	Ad-lib.

RESULTS AND DISCUSSION

Phase wise mean and std. error of temperature, pulse rate and respiration rate arepresentedin Table 3. The result revealed a non-significant difference in the rectal temperature of calves between the groups during different phases. The overall rectal temperature during the complete trial was also found to be non-significant in between the groups. The mean temperatures of claves were within the normal physiological range (100.4-102.8 ºF) as stated by Kahn *et at.*, 2010. Asignificant ($P \leq 0.01$) difference in pulse rate (PR) was found between T_1 and C and T_1 and T_2 group during phase 1 and 2. PR differed significantly ($P \leq 0.05$) between T_1 and T_2 group during phase 3. The overall pulse rate also differed significantly ($P \leq 0.01$) between T_1 and C and T_1 and T_2 group. Though these values varied significantly between the groups but were in the normal range (100-120 beats/min.) as reported by Kahn *et al.* (2010). The respiration rate (RR) of calves varied significantly ($P \leq 0.05$) between C and T_1 and C and T_2 in phase 1 and between T_2 and C and T_2 and T_1 group in phase 2. A non-significant difference in respiration rate of calves were observed between the groups during phase 3. Also, overall respiration rate of calves varied significantly ($P \leq 0.05$) between T_2 and C and T_2 and T_1 group. However, these RR values were in the normal physiological limits (20-30 respiration/min.) as reported by Kahn *et al.* (2010). No

Table 2. Composition of commercial and formulated milk replacers

Commercial milk replacer	Formulated milk replacer
Whey powder, palm oil, wheat gluten, coco oil, soya protein concentrate, inactive yeast extract, wheat flour, pea flour, delactosed whey, vitamin, and minerals	Skim milk powder, dried whey powder (DM40), spray dried eggpowder, cornstarch, soy lecithin, Palm oil, dicalcium phosphate, sodium butyrate, vitamin, minerals, and antibiotics
CP-22%, Fat-20%, Ash-7.8%, DM-98.4% CF-0.2%	CP-22%, Fat-20%, Ash-7.9%, DM-97.3%, CF-0.4%

Table 3. Effect of whole milk and milk replacer feeding on rectal temperature, pulse rate and respiration rate

Parameters	Phase	Treatment			P value
		C	T_1	T_2	
Rectal temperature (ºF)	1	100.39±0.028	100.58±0.024	100.56±0.013	0.79
	2	100.41±0.023	100.53±0.021	100.54±0.015	0.81
	3	100.50±0.022	100.60±0.024	100.47±0.018	0.65
	Overall	100.43±0.014	100.57±0.013	100.52±0.012	0.72
Pulse rate (beats/minute)	1	106.84±0.261^{b}	108.69±0.209^{a}	106.85±0.181^{b}	<0.01
	2	107.12±0.247^{b}	108.60±0.217^{a}	106.73±0.203^{b}	<0.01
	3	107.13±0.274^{ab}	107.94±0.217^{a}	106.80±0.246^{b}	<0.05
	Overall	107.03±0.150^{b}	108.41±0.124^{a}	106.79±0.120^{b}	<0.01
Respiration rate (breaths/minute)	1	26.42±0.210^{a}	25.50±0.253^{b}	25.05±0.240^{b}	<0.05
	2	25.89±0.220^{a}	25.62±0.261^{a}	24.54±0.211^{b}	<0.05
	3	25.26±0.283	25.33±0.299	24.81±0.246	0.383
	Overall	25.89±0.138^{a}	25.48±0.155^{a}	24.80±0.134^{b}	<0.05

a, b Mean values bearing different superscript within a row varies significantly (p< 0.01) and (p< 0.05)

Table 4. Effect of whole milk and milk replacer feeding on faecal consistency score

Phase	Treatment			P value
	C (n=6)	T_1 (n=6)	T_2 (n=6)	
1	1.206±0.045	1.310±0.066	1.290±0.062	0.325
2	0.138±0.038	0.176±0.034	0.175±0.033	0.418
3	0.001±0.044^{b}	0.046±0.020^{a}	0.001±0.044^{b}	<0.05
Overall	0.451±0.034	0.511±0.040	0.455±0.037	0.206

a, b Mean values bearing different superscript within a row varies significantly (P< 0.05)

Table 5. Effect of milk replacer feeding on diarrhoea days

Parameter	Treatment			P value
	C (n=6)	T_1 (n=6)	T_2 (n=6)	
Mean diarrhoea (days)	4.00± 0.816^{a}	7.33± 1.115^{b}	6.17± 0.477^{ab}	<0.05

a, b Mean values bearing different superscript within a row varies significantly (P< 0.05)

incidence of fever, pneumonic enteritis, ocular discharge was found in calves of any of the treatment group. No mortality was occurred in calves of any of the treatment group. Contrary to the present study Bharti *et al.* (2012) found minimum percentage of enteric and reparatory disorders in claves except for few cases of eye infection, bloat, navel ill, pneumonia and fever.

The results depicted in the Table 4 revealed that FCS of calves of different treatment groups did not vary significantly during the phase 1 and 2. However, a significantly ($P \leq 0.05$) higher FCS was observed for T_1 group of calves as compared to C and T_2 group during the third phase with normal fecal consistency. Moreover, theoverall faecal consistency score was non-significantly different between the treatment groups during the entire study. The FCS of all the groups were higher in first phase i.e., first 21 days and subsequently in phase 2 and 3 the faecal consistency of calves of all the groups were almost normal. FCS counts were significantly higher in all the groups in 1st phase indicating the higher incidences of diarrhoea. Similar results were reported by Kamalahasan and George (2021) and Bharti *et al.* (2014) while feeding whole milk, commercial milk replacer and formulated milk replacer). However, they reported initially higher FCS due to physiological adaptive changes in digestive systems. Furthermore, the mean diarrhoea days were significantly higher (P<0.05) in CMR group as compared to whole milk groupalthough, a non-significant difference was found in mean diarrhoea days of calves ofwhole milk and FMR group (Table 5). The higher mean diarrhoea days in buffalo calves of CMR group might be due to low immunity in calves and low nutritive values in CMR required for buffalo calvesto fulfil their dietary needs as compared to whole milk fed group. The commercial milk replacers used in the study was primarily formulated for crossbred calves and after reconstitution it contained on an average 3.5% fat, 6.1% lactose, 10.51 % SNF and 4.5 % protein which had lesser SNF, protein and fat as compared to buffalo milk. The one of the aims of the present study was also to formulate animal protein-based milk replacer and test the efficacy of milk replacer in buffalo calves in comparison to commercially available milk replacer. The mean diarrhoea days in T_2 (FMR) group was in between the whole milk and CMR fed group and that might be due to

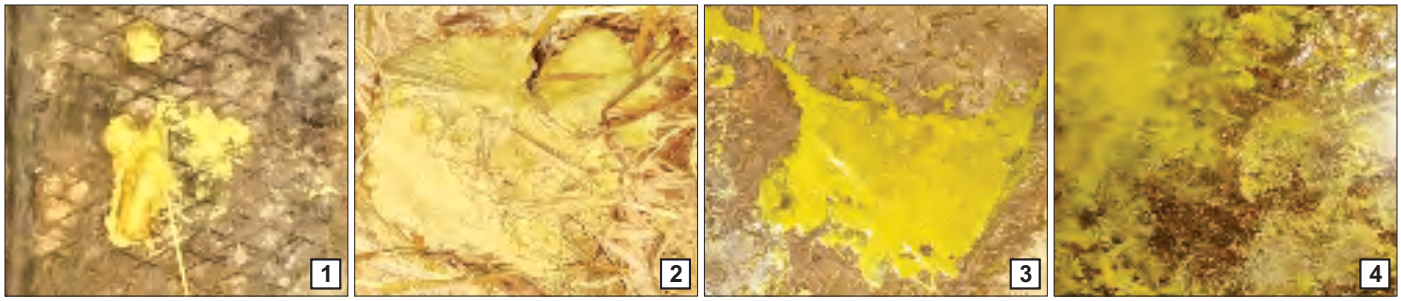

Fig. 1-4. **(1)** Faecal consistency score 0; **(2)** Faecal consistency score 1; **(3)** Faecal consistency score 2; **(4)** Faecal consistency score 3

the use of antibiotics (Aureomycin) as growth promoter in FMR.These findingsare in agreement with the findings of Bharti *et al.* (2014) who also reported similar results higher incidence of diarrhoea in 1st month as well as higher incidence of diarrhoea in milk replacer fed calves as compared to whole milk fed calves.

The present study results suggested that there were no adverse effect on health of calves fed with milk replacer compared to whole milk feeding except more incidence of diarrhoea and diarrhoea days. However, no relationship could be established between FCS and health status of calves in the present study. The incidence of diarrhoeais usually due to calves' health (immunity), management (high plane of feeding, isolation of infected calves etc.) and housing conditions (clean and hygenic pens, warm comfortable environment etc.).

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