RESEARCH ARTICLE

Effect of Milk Feeding Practices on Behaviour and Faecal Consistency of Dairy Calves

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Abstract

Nutrition in early-life plays a key role in determining growth performance and long-term productivity in dairy calves. Higher milk allowances have been increasingly recommended to improve pre-weaning performance, although their effects on digestive responses and behaviour remain under debate. The present study was conducted to evaluate the influence of different milk feeding levels on behavioural responses and faecal consistency in crossbred (HF × Kankrej) calves. The experiment was carried out at the University Livestock Research Station in Anand, Gujarat, using 20 newborn calves distributed into four equal treatment groups. Calves were fed colostrum during the first three days of life, followed by a standard milk allowance of 4 L/day during the first week. Thereafter, calves were subjected to graded milk feeding levels of 4.0, 5.0, 6.0, and 7.0 L/day in groups 1, 2, 3 & 4, respectively from 2nd to 9th week of age. Behavioural observations were recorded for 1 h after morning feeding, while faecal consistency was assessed daily during the pre-weaning period (0-63 days) using a standard scoring system. Results indicated that calves receiving the highest milk allowance exhibited a greater proportion of softer faeces compared to restricted-fed groups. However, behavioural indicators associated with discomfort, including abnormal postures or pain-related activities, were not observed across treatments. The findings suggest that higher milk feeding levels may influence faecal consistency without adversely affecting behavioural welfare indicators. Overall, calves demonstrated the ability to tolerate increased milk intake without signs of stress under the present management conditions.

Keywords: Behaviour, Crossbred calves, Faecal score, Milk nutrition, Pre-weaning phase, Welfare indicators.

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Introduction

Dairy calves represent the future replacement stock of commercial dairy herds and play a crucial role in maintaining herd productivity and profitability (Fischer *et al*., 2019). Inadequate milk feeding during early life can result in increased mortality, reduced feed intake, slower growth, delayed puberty, and ultimately adverse economic consequences for dairy farms (Kamalahasan *et al*., 2018). During the neonatal period, calves function physiologically as monogastric animals because the abomasum is the predominant functional stomach compartment, accounting for approximately 65% of total stomach capacity, while the rumen constitutes only about 25%. As calves grow, substantial development of the rumen occurs, and by 3-4 months of age, the rumen accounts for nearly 65% of total stomach capacity, whereas the abomasum decreases to approximately 20%. Since the rumen is not fully developed during early life, milk serves as the primary source of nutrients required for maintenance, growth, and development.

The quantity of milk offered during the pre-weaning period has a significant influence on the physiological, immunological, behavioural, and productive performance of dairy calves. Milk allowance during this stage affects growth rate, health status, and starter feed intake (Appleby *et al*., 2001). Increased milk consumption during the first few weeks of life has been associated with improved growth performance (Appleby *et al*., 2001) and enhanced health status (Soberon *et al*., 2012). Higher nutritional planes during the pre-weaning period promote greater average daily gain and improved overall performance (Khan *et al*., 2007), which may subsequently contribute to increased milk yield during the first lactation (Soberon *et al*., 2012), improved calf welfare, and enhanced lifetime productivity (Khan *et al*., 2011).

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Behavioural responses and faecal consistency are important indicators of calf welfare and health. Behavioural activities such as cross-suckling, abdominal licking, biting, kicking, and changes in resting patterns may reflect nutritional adequacy, comfort, and welfare status. Similarly, faecal consistency scoring provides a practical measure of digestive health and the occurrence of enteric disorders. Patel (2022) described a five-point faecal consistency scoring system ranging from firm faeces to watery faeces containing mucus or traces of blood. Adequate milk feeding may improve feeding satisfaction and digestive efficiency, partly through increased suckling activity and saliva secretion, which support digestive processes in young calves (Singh *et al.,* 2019). Improved digestion and nutrient utilization contribute to better growth performance and future productivity. Considering these aspects, the present investigation was designed to evaluate the effects of different milk feeding levels on behavioural responses and faecal consistency in crossbred dairy calves (HF × Kankrej) during the pre-weaning period.

Materials and Methods

The study was conducted at the Livestock Research Station, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Anand, Gujarat (India). The experimental protocol was approved by the Institutional Animal Ethics Committee (IAEC) (Approval No. 454/LFC/2024). A total of 20 newborn calves were included in the study and randomly allocated into four treatment groups, with five calves in each group (two males and three females). The milk feeding experiment was conducted for a period of first 63 days of life.

All calves received colostrum during the first three days after birth. Thereafter, fresh milk was offered at the rate of 4 L/day from 4 to 7 days of age. Calves in the T1 group were maintained on 4 L/day of milk until weaning at 63 days of age. Calves in the T2, T3, and T4 groups were fed 5.0, 6.0, and 7.0 L/day of milk, respectively, from the 2nd to the 9th week of age. A total mixed ration (TMR-1) consisting of 65% concentrate and 35% roughage, with groundnut gotar as the roughage source, was offered *ad libitum* from 8 to 30 days of age. Subsequently, calves were provided *ad libitum* TMR-2 from 31 to 126 days of age, containing 65% concentrate and 35% roughage, comprising 17.5% green Hybrid Napier and 17.5% groundnut gotar. All calves were housed individually in a well-ventilated calf shed with separate feeding mangers created through partitioning. Standard management and health care practices were followed throughout the experimental period.

Behavioural and health observations were conducted during the pre-weaning period (0-63 days of age). Behavioural parameters were recorded immediately after milk feeding for 1 h daily according to the method described by Ellingsen *et al*. (2016). The behaviours monitored included licking at the abdomen, biting at the abdomen, kicking at the abdomen, getting up and lying down, cross-suckling, urination, and defecation. Normal frequencies of getting up and lying down, along with regular urination and defecation, were considered indicators of good health and welfare (de Passillé and Rushen, 2006; Quigley *et al*., 2006). These observations were used to evaluate the effects of different milk feeding levels on calf health and welfare.

Faecal consistency (scour score) was recorded daily during the pre-weaning period using the scoring system described by Patel (2022), where 1 = normal and firm; 2 = soft and spreads easily; 3 = very soft or runny; 4 = watery with liquid consistency; and 5 = mucus or traces of blood. The incidence of faecal scour was expressed as a percentage of the total faecal scores recorded during the 63-day pre-weaning period and was used as an indicator of calf health status and digestive well-being.

Results and Discussion

Behaviour of Calves

The behavioural responses of crossbred calves observed during the experimental period are presented in Table 1. The average frequencies of urination, standing up and lying down, licking of the abdomen, kicking of the abdomen, biting at the abdomen, cross-suckling, sitting, and defecation recorded over 63 days milking feeding period were 3.25, 0.05, 0.20, 0.05, 0.00, 45.70, 10.20, and 2.85 times, respectively.

Among the treatment groups, the frequency of urination was lowest in calves of the T3 group and highest in those of the T4 group. Similarly, the frequency of defecation was greatest in T4 calves (3.40 times), which may be attributed to the higher volume of milk consumed per feeding, resulting in increased gastrointestinal motility and faster digesta passage. Cross-suckling and abdominal licking behaviours were observed more frequently in T1 calves than in calves receiving higher milk allowances. The greater incidence of cross-suckling in restricted-fed calves suggests that lower milk intake may not completely satisfy the calves' sucking motivation.

Behavioural monitoring was undertaken to detect any signs of abdominal pain or discomfort associated with the consumption of larger milk meals. Although some calves consumed milk quantities exceeding 10% of their body weight, no behavioural indicators of abdominal discomfort were observed. Occasional abdominal licking was recorded; however, this appeared to be part of normal grooming behaviour rather than a response to pain. Likewise, calves were observed lying down and standing up during the observation period, but these movements were not repetitive or abrupt, as would typically be expected in calves experiencing abdominal distress or colic. The absence of pain-related behaviours indicates that calves were able to tolerate higher milk allowances without apparent discomfort.

Table 1: Behaviour of early-weaned crossbred calves over 63 days during milk feeding and up to 1 h post milk feeding

Sr. No.	Parameters	Frequency	T_1	T_2	T_3	T_4	Overall
1	Urination	Days	3.40	3.20	2.60	3.80	3.25
		%	5.40	5.08	4.13	6.03	5.16
2	Standing up/ down	Days	0.00	0.00	0.20	0.00	0.05
		%	0.00	0.00	0.32	0.00	0.08
3	Licking of abdomen	Days	0.40	0.40	0.00	0.00	0.20
		%	0.63	0.63	0.00	0.00	0.32
4	Kicking of abdomen	Days	0.00	0.20	0.00	0.00	0.05
		%	0.00	0.32	0.00	0.00	0.08
5	Biting at abdomen	Days	0.00	0.00	0.00	0.00	0.00
		%	0.00	0.00	0.00	0.00	0.00
6	Cross suckling	Days	47.60	44.80	43.20	47.20	45.70
		%	75.56	71.11	68.57	74.92	72.54
7	Sitting	Days	8.60	11.80	11.80	8.60	10.20
		%	13.65	18.73	18.73	13.65	16.19
8	Defication	Days	2.80	2.40	2.80	3.40	2.85
		%	4.44	3.81	4.44	5.40	4.52

The present findings were in agreement with those of Uys *et al*. (2011), who reported cross-suckling behaviour in 75% of calves receiving restricted milk allowances compared with only 2% of calves offered higher milk allowances ($p < 0.01$). Similar observations were reported by Patel (2022), who documented incidences of similar observations within 1 h of milk feeding in experimental calves. Furthermore, Vikas *et al*. (2024) also reported no major signs of discomfort in calves receiving higher quantities of milk. Collectively, these findings suggest that increased milk allowance during the pre-weaning period does not adversely affect calf behaviour and may reduce the occurrence of non-nutritive behaviours such as cross-suckling.

Faecal Consistency and Incidence of Diarrhoea

The data on faecal consistency and incidence of diarrhoea in crossbred calves under different milk feeding regimes are presented in Table 2. The overall distribution of faecal consistency scores (1 to 5) was 89.68, 4.52, 3.49, 2.06, and 0.16%, respectively. Calves exhibited normal faecal consistency (score 1) for an average of 56.50 days out of the 63-day pre-weaning period, indicating that the calves were well adapted to the milk feeding protocols. The overall mean faecal consistency score and incidence of diarrhoea were 1.18 and 1.29, respectively.

Among the treatment groups, calves in T4 exhibited the highest faecal consistency score, followed by T2, T1, and T3. The greater occurrence of very soft or pasty faeces in T4 calves may be attributed to their higher milk intake. Consumption of larger quantities of milk per feeding could increase the digestive load and alter gastrointestinal passage rate, resulting in softer faeces and occasional diarrhoeal episodes. Ellingsen *et al*. (2016) suggested that young calves require sufficient time for efficient digestion of milk, and excessive milk intake in a single feeding may influence faecal consistency.

The mean faecal consistency scores recorded in T1, T2, T3, and T4 calves were 1.18, 1.19, 1.10, and 1.26, respectively. The generally low faecal consistency scores observed across all treatment groups indicate good digestive health throughout the experimental period. Proper suckling during milk feeding stimulates saliva secretion and facilitates efficient digestion through enhanced enzyme activity, thereby contributing to normal faecal consistency (Singh *et al*., 2019). However, the relatively higher score observed in T4 calves may reflect mild digestive disturbances associated with increased milk consumption.

Table 2: Faecal consistency of experimental calves under different milk feeding regimes for 63 days

Faecal score criteria	Frequency	T_1	T_2	T_3	T_4
1= Normal, firm	Days	55.40	56.60	59.80	54.20
	%	87.94	89.84	94.92	86.03
2= Soft, spread easily	Days	4.60	2.80	1.00	3.00
	%	7.30	4.44	1.59	4.76
3= Very soft or runny	Days	2.20	1.80	0.60	4.20
	%	3.49	2.86	0.95	6.67
4= Watery, liquid consistency	Days	0.80	1.60	1.40	1.40
	%	1.27	2.54	2.22	2.22
5= Mucus or trace of blood	Days	0.00	0.20	0.00	0.20
	%	0.00	0.32	0.00	0.32
Total Score		**74.40**	**75.00**	**69.20**	**79.40**
Feacal consistency score per day (Total score/63 days)		1.18	1.19	1.10	1.26
Incidence of diarrhea per calf: (Score 2+3+4+5)/No. of calf per treatment)		1.52	1.28	0.60	1.76

The incidence of diarrhoea was highest in T4 calves, followed by T1, T2, and T3 calves. Similar findings were reported by Arens *et al*. (2023), who observed a greater occurrence of loose faeces in calves fed milk *ad libitum*, likely due to higher milk intake. Likewise, Abbasa *et al*. (2017) reported a significantly greater number of days of diarrhoea ($p<0.01$) in calves receiving higher milk allowances compared with calves fed restricted quantities of milk. In contrast, Khan *et al*. (2007) suggested that diarrhoea incidence is more strongly influenced by environmental hygiene and management practices than by the quantity of milk consumed. Furthermore, Borderas *et al*. (2009), Uys *et al*. (2011), and Yavuz *et al*. (2015) reported that varying milk allowances did not significantly affect the occurrence of gastrointestinal diseases in dairy calves.

The present findings indicate that although higher milk allowances may increase the frequency of softer faeces

and mild diarrhoeal episodes, they do not necessarily lead to severe digestive disorders when calves are managed under appropriate hygienic and feeding conditions. Similar observations were reported by Thakkar (2024), who found that calves maintained normal faecal consistency for 58.52 days out of the 63-day pre-weaning period, which is comparable to the results obtained in the present study.

Conclusion

Based on the results of the present study no clear optimal milk meal size could be established. Pre-weaned calves getting 7.0 L of milk against 4.0 to 6.0 L per day showed a lower proportion of normal faeces, and feeding larger quantities of milk at a single time was associated with an increased incidence of loose faecal consistency. However, when calves voluntarily consumed between 4.0 and 7.0 litres of whole milk through an artificial teat, no behavioural signs indicative of abdominal pain or discomfort were observed, regardless of the level of milk intake. Overall, the findings suggest that while higher milk allowances may influence faecal consistency, they do not appear to adversely affect calf behaviour or welfare under the conditions of the present study. Thus, dairy calves can be fed milk meals exceeding traditionally recommended levels without negative effects on health or behavioural responses.

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References

Abbasa, W., Shaukat, A., Bhattia, M.S., Khana, N.S., Hassan, M., Warriachc, P.W., & David, M. (2017). Effect of weaning age and milk feeding volume on growth performance of Nili-Ravi buffalo calves. *Italian Journal of Animal Science*, *16*(3), 490-499.

Appleby, M.C., Weary, D.M., & Chua, B. (2001). Performance and feeding behaviour of calves on ad libitum milk from artificial teats. *Applied Animal Behaviour Science, 74*(3), 191-201.

Arens, S.C., Sharpe, K.T., Schutz, M.M., & Heins, B.J. (2023). Response to ad libitum milk allowance by crossbred dairy and dairy-beef calves in an automated feeding system. *Translational Animal Science, 7*(1), 1-8.

Borderas, T.F., de Passillé, A.M., & Rushen, J. (2009). Feeding behaviour of calves fed small or large amounts of milk. *Journal of Dairy Science, 92*, 2843-2852.

de Passillé, A.M., & Rushen, J. (2006). Calves' behaviour during and after feeding in an automatic milk feeder. *Journal of Dairy Science, 89*(10), 4218-4224.

Ellingsen, K., Mejdell, C.M., Ottesen, N., Larsen, S., & Grøndahl, A.M. (2016). The effect of large milk meals on digestive physiology and behaviour in dairy calves. *Physiology & Behaviour, 154*, 169-174.

Fischer, A.J., Villot, C., Van Niekerk, J.K., Yohe, T.T., Renaud, D.L., & Steele, M.A. (2019). Nutritional regulation of gut function in dairy calves: From colostrum to weaning. *Applied Animal Science, 35*, 498-510.

Kamalahasan, K., Sasikala, N., Sabin, G., Prakash, G., & Kumar, C.B. (2018). Economics of feeding milk replacers in crossbred calves. *The Pharma Innovation Journal, 7*, 322324.

Khan, M.A., Lee, H.J., Lee, W.S., Kim, H.S., Ki, K.S., Hur, T.Y., & Choi, Y.J. (2007). Structural growth, rumen development, and metabolic and immune responses of Holstein male calves fed milk through step-down and conventional methods. *Journal of Dairy Science, 90*(7), 3376-3387.

Khan, M.A., Weary, D.M., & von Keyserlingk, M.A.G. (2011). Hay intake improves performance and rumen development of calves fed higher quantities of milk. *Journal of Dairy Science, 94*(7), 3547-3553.

Patel, J.H. (2022). Performance of preweaned crossbred (HF × Kankrej) calves under different milk feeding methods and frequencies under intensive production system. *Ph.D. Thesis*. Kamdhenu University, Gujarat, Gandhinagar, India.

Quigley, J.D., Drewry, J.J., Martin, K.R., & Polo, J. (2006). Effects of a colostrum supplement on intake, body weight, and serum immunoglobulins in dairy calves. *Journal of Dairy Science, 89*(5), 2056-2065.

Singh, P., Kamboj, M.L., Chandra, S., & Amit, N. (2019). Influence of weaning on growth, health and behaviour of buffalo (*Bubalus bubalis*) calves. *Indian Journal of Animal Research, 53*(5), 680-684.

Soberon, F., Raffrenato, E., Everett, R.W., & Van Amburgh, M.E. (2012). Preweaning milk replacer intake and effects on long-term productivity of dairy calves. *Journal of Dairy Science, 95*(2), 783-793.

Thakkar, N.K. (2024). Comparative performance of crossbred (HF × K) calves under different milk feeding regimes. *Ph.D. Thesis*. Kamdhenu University, Gujarat, Gandhinagar, India.

Uys, J.L., Lourens, D.C., & Thompson, P.N. (2011). The effect of unrestricted milk feeding on the growth and health of Jersey calves. *Journal of the South African Veterinary Association, 82*(1), 47-52.

Vikas, G., Rakesh, M., Priyam, A., Pravinchandra, L., & Kishankumar, W. (2024). Impact of milk feeding regimens on growth, intake, efficiency, and costs in pre-weaned crossbred calves. *Indian Journal of Animal Sciences, 94*(10), 871-875.

Yavuz, E., Todorov, N., Ganchev, G., & Nedelkov, K. (2015). The effect of feeding different milk programs on dairy calf growth, health and development. *Bulgarian Journal of Agricultural Science, 21*(2), 384-393.