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Effect of Traditional Curd Supplementation and Probiotics on Growth Performance and Frequency of Diarrohea in Cattle Calves Under Farmer's Field

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ABSTRACT

A trial was conducted to evaluate the effect of supplementary feeding of curd as probiotics on growth performance and frequency of diarrohea in pre- ruminant cattle calves under farmer's field in semi- arid condition of Gujarat, India. Twenty four, pre-ruminant female Gir cattle calves with average age of fifteen days were selected randomly and distributed equally in to four groups, six each in a completely randomized design i.e. T1- basal diet (control), T2 - basal diet + Saccharomyces cerevisiae @ 5 g per calf/ day, T3 - basal diet + Lactobacillus acidophilus @ 1 g (2 x 1010 cfu/ g) per calf/ day and T4 - basal diet + Traditional curd @ 50 ml per calf/ day, respectively for a period of 90 days. The results of the study revealed that the average daily gains and final body weight of calves was significantly ($P<0.01$) higher in curd and probiotics groups as compared to the control group. The average daily weight gains were statistically higher in curd group (410±14.92g) followed by Lactobacillus acidophilus (407±15.12g), Saccharomyces cerevisiae (393±14.86g) group as compared to control group (301±10.74g). There were significant difference in the faecal score between the treatment group and the control after two weeks of the experiment; subsequently, faecal score became constant in the treatment groups and never exceeded the normal value. However, curd and Lactobacillus acidophilus was found to be more effective to control/ reduce the incidence of diarrhea after one weeks of application as compared to Saccharomyces cerevisiae. The incremental Benefit: Cost Ratio was found to be 5.27, 10.55 and 21.77 in group T2, T3 and T4, respectively which appears to be very encouraging. Based on these observations, it may be inferred that the traditionally fermented curd, can be effectively used as a probiotic supplement and has a desirable effect in terms of higher growth rate and checking diarrhea in pre ruminant calves.

Key words: Body weight, Calves, Curd, Diarrhea, Pre-ruminant, Probiotics

INTRODUCTION

Dairy production from centuries has been an integral component of farming system and a primary source of livelihood for farming community. Probiotics are defined as live microbial feed supplements that improve the health of livestock, or in other words, organisms or substances that contribute to intestinal microbial balance referred as probiotics (Parker *et al.,* 1974). Beneficial bacterial concentrates, i.e., probiotics used in feed, have been reported to enhance growth rate and metabolic activities by stimulating digestion and immunity and also to act as prophylactic and therapeutic medium (Rolef, 2000). Microbial probiotics are culture of viable microorganisms and beneficial to host when consumed in appropriate quantities. Although probiotics are present in different form in the market either in freeze dried capsules or spray dried foods but if they provided in live form such as chass (Buttermilk), lassi (sweetened yoghurt), fermented milk dahi (curd) they give more beneficial effects. Dahi (curd), chass (Buttermilk), Lassi (sweetened yoghurt) are some of the traditionally fermented dairy products being used in every household of the Indian subcontinent. Fermented milks offer tremendous potential for improving nutrition, sooth intestinal disorders, improving immune function, optimize gut ecology and promoting overall health (Kore, 2012). In the Ayurveda dahi has been recommended for treatment of diarrhea and other acute/ chronic gastrointestinal disorders from time immemorial. Curds, a traditional

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dish in India, are fermented milk product produced by microbial fermentation by predominantly Lactobacillus species. Apart from well known palatability, nutritious and therapeutic value of curd, it also has a viable bacterial count of 106-107 cfu/ ml which includes lactobacilli, yeast and mould (Sakore, 2007). Traditionally prepared fermented milk dahi contains promising lactic acid bacteria known their probiotic potential with beneficial heath effects on consumers (Harun ur Rashid, 2007). Curd is a natural, cheaper and easily available probiotic supplement could serve as a nutritional intervention for augmenting growth of calves. Resource poor rural farmer cannot procure commercial probiotic from market but if advised them to feed traditionally fermented dahi (curd) as probiotics they would accept it easily due to viability at their home. Therefore, the present experiment was conducted to evaluate the effect of supplementary feeding of traditionally fermented curd as a source of natural probiotic on the growth of cow calves.

MATERIALS AND METHODS

An on-farm trial was conducted under the banner of ICAR- KVK- Panchmahal, Gujarat, India, to assess the effect of supplementary feeding of curd as probiotics on growth performance and frequency of diarrhea in pre- ruminant cattle calves under farmer's field conditions. Twenty four, pre-ruminant female Gir calves with average age of fifteen days were selected randomly and distributed equally in to four groups, six each in a completely randomized design i.e. T1- basal diet (control), T2 - basal diet + Saccharomyces cerevisiae @ 5 g per calf/ day, T3 - basal diet + Lactobacillus acidophilus @ 1 g (2 x 1010 cfu/ g) per calf/ day and T4 - basal diet + Traditional curd @ 50 ml per calf/ day, respectively for a period of 90 days. The commercial probiotics were procured from market. The curd containing lactobacillus species (106-107 cfu/ ml) was prepared fresh daily by incubating the cow's milk with house hold curd culture 1-2 percent for 10-12 h at 35- 37 Co. The experimental group calves were offered curds at the rate of 50 ml/ day throughout the 90 days of the experiment, while the control group did not receive any such supplement. Around 7.00 AM daily, the powder containing probiotics was mixed in milk and curds were offered by drenching the calves with a syringe, taking due care to avoid aspiration. The calves were fed as per the details given in table 1.

Table 1. Feeding schedule of cattle calves during on farm trial

Age of calves (Weeks)	Milk (part of BW)	Concentrate mixture (g)	Mixed green fodder (lucerne & hybrid napier)
2-4	1/10	-	*ad lib*
5-6	1/15	-	*ad lib*
7-8	1/20	400	*ad lib*
9-15	Quantity sufficient to mix the supplement	800	*ad lib*

The basal diet fed to experimental calves consisted of concentrate mixture and mixed green grasses (lucerne and hybrid napier). The proximate composition of feedstuffs used during the on farm trial given in table 2. Fresh and clean drinking water was provided ad libitum throughout the experiment.

Table 2. Proximate composition of feedstuffs used during the on farm trial (% on DM basis)

Particular	Concentrate mixture	Hybrid napier green grass	Lucerne green grass
DM	90.4±1.04	16.2±1.23	22.1±1.31
OM	89.8±2.11	90.6±1.56	85.4±1.82
CP	19.9±1.20	9.12±0.80	18.1±0.64
CF	8.6±1.04	32.1±2.1	19.9±1.67
EE	3.0±1.21	1.34±0.60	2.74±0.49
NFE	58.1±2.10	44.0±2.1	44.6±2.06
Total Ash	10.1±0.91	9.32±0.40	14.5±0.29

All the calves were dewormed with fenbendazole (5 mg/ kg body weight) one week prior to start of the experiment and were maintained under uniform managerial conditions. Deworming was repeated after 60 days of experimental feeding. All the calves of the control and experimental groups were housed in a well-ventilated shed during night time and were left to move outdoors during day time. The body weight and body measurements such as body length, height at withers, heart girth and paunch girth were recorded initially and subsequently at fortnightly intervals before feeding and watering. Fecal scoring for estimation of fecal fluidity was conducted daily in the morning (8.00 AM) according to the procedure of Larson et al. (1977). Fecal scores based on a four-point scale were recorded. Scoring was as follows: for fecal fluidity, 1 = normal (firm but not hard, original form is distorted slightly after dropping to floor and settling), 2 = soft (does not hold form, piles but spreads slightly), 3 = runny (spreads readily) and 4 = watery (liquid consistency). A scour day was recorded if fecal fluidity = 3 or 4. The data were analysed using the statistical software program of SPSS (SPSS, Chicago, Ilinois, USA). Treatments were compared with the Tukey test. Difference between groups were considered significant when P values were <0.05.

RESULTS AND DISCUSSION

The study revealed that, the average initial body weight of calves was 26.40±0.81, 25.90±0.96, 26.10 ±0.84 and 26.30±0.93 kg, respectively in T1, T2, T3 and T4 groups. The results of the study revealed that the maximum body weight of calves was attained in T4 (63.20±1.23kg.) followed by T3 (62.70±1.10 kg.), T2 (61.30±1.27 kg) as compared to control (53.50 ±1.16 kg) after 90 days feeding (Table 3).

Table 3. Growth performance (Mean±SE) of pre-ruminant calves in different feeding groups

Parameter	T1	T2	T3	T4
No. of calves	6	6	6	6
Average initial body weight (kg)	26.4±0.81	25.9±0.96	26.1 ±0.84	26.3±0.93
Average final body weight (kg)	53.5 ±1.16 ^{b}	61.3±1.27^{a}	62.7±1.10^{a}	63.2±1.23^{a}
Average total body weight gain (kg)	27.1±0.96^{b}	35.4±1.21^{a}	36.6±1.09^{a}	36.9±1.26^{a}
Average daily weight gain (g)	301±10.74^{b}	393±14.86^{a}	407±15.12^{a}	410±14.92^{a}

Means with different superscripts in a row differ significantly, P<0.05

The final body weight of calves was statistically (P<0.01) higher in curd and probiotics groups as compared to the control group. The average daily weight gains (ADG) were significantly (P<0.01) higher in curd group (410±14.92g) followed by Lactobacillus acidophilus (407±15.12g), Saccharomyces cerevisiae (393±14.86g) group as compared to control group (301±10.74g). The better growth performance might be due to better intestinal microbial balance in case of curd and probiotic groups which might have lead to increased digestion and absorption of nutrients and minerals from the gastrointestinal tract. During preparation of curd, microbial fermentation produces antibacterial compounds, lowering the pH of the intestines and inhibiting the growth of undesirable organisms and helps improve digestion either due to increased retention of nutrients or partial breakdown of indigestible compounds, ultimately results are increase in body growth. The present study was in agreement with the results of Mudgal and Baghel (2010), Abdel-Raheem *et al.* (2012), Ramachandran *et al.* (2014), Sharma *et al.* (2016), Dar *et al.* (2017) and Khadda *et al.* (2020) those reported better performance in curd and probiotic group with improved final body weight, body weight gain than control group.

Mean diarrhoea score of calves supplemented with or without probiotic is shown in Figure 1. Calve diarrhea was evaluated using the faecal score. A faecal score greater or equivalent to 3 was used as an indicator of diarrhea in the study. Diarrhoea incidence was found to be in both the treated calves and the control calves during first week of the experiment and then reduced speedy in curd and probiotics groups. The fortnightly as well as overall highest faecal score was recorded in control group T1 and the least faecal score was recorded in curd group T4 (Table 4).

Table 4. Fecal score of pre- ruminant cattle calves supplemented with or without probiotics

Period (Fortnight)	T1	T2	T3	T4
First	3.42±0.49	2.67±0.29	2.33±0.29	2.11±0.62
Second	3.50±0.31	2.08±0.66	1.51±0.53	1.25±0.35
Third	3.63±0.47	1.43±0.31	1.26±0.26	1.17±0.29
Forth	2.83±0.43	1.20±0.23	1.20±0.29	1.13±0.21
Fifth	2.97±0.67	1.22±0.24	1.22±0.23	1.14±0.20
Over all	3.27±0.20[a]	1.72±0.37[b]	1.50±0.27[b]	1.36±0.24[b]

Means with different superscripts in a row differ significantly, P<0.05

There were significant difference in the faecal score between the treatment group and the control after two weeks of the experiment; subsequently, faecal score became constant in the treatment groups and never exceeded the normal value. However, curd and Lactobacillus acidophilus was found to be more effective to control/ reduce the incidence of diarrhea after one weeks of application as compared to Saccharomyces cerevisiae. The reduced incidence of diarrhea may be as a result of an improved intestinal bacterial flora in calves supplemented with curd and probiotics. Fermented curd is known to have several desirable effects on regulars, such as prevention of pathogen overgrowth by lactic acid bacteria and improve appetite, vitality and has been recommended for indigestion, dysentery or other intestinal disorder. The similar findings were also reported by Khuntia *et al.* (2002), Frizzo *et al.* (2010) and Khadda *et al.* (2020). Furthermore, Gorgulu *et al.* (2003) also reported that calves supplemented with probiotics were superior with respect to diarrhea than the control groups and concluded that probiotics supplementation before weaning could boost calf health and reduce mortality.

Feed economics was calculated on the basis of partial budget analysis i.e. the cost of production was calculated in terms of 1kg additional body weight gain by supplementations of curd and probiotic above the control group. The cost of probiotics was calculated on basis of market rate prevalent during the study period which was purchased respondent. The cost of traditionally fermented curd was counted on the basis of cost of household milk production, because it was made from cow's milk at home. Selling price of calves was estimated Rs. 100/- per kg live weight. The feed economics and cost of production of 1kg additional body weight over the control group in curd and probiotics has been given in table 5.

Table 5. Feed economics of pre-ruminant calves in control and probiotics and curd groups

Parameter	T1	T2	T3	T4
Additional weight gain above control (kg)	-	8.30	9.50	9.80
Additional feed supplement Consumed (g)	-	450	90	4500
Additional Cost (Rs.)	-	157	90	45
Additional Return (Rs.)	-	830	950	980
Effective Gain (Rs.)	-	672	860	935
Incremental Benefit: Cost Ratio	-	5.27	10.5	21.7
Cost of per kg additional body weight gain (Rs.)	-	18.9	9.47	4.59

The group T2 (Saccharomyces cerevisiae), T3 (Lactobacillus acidophilus) and T4 (Curd) gained 8.30, 9.50 and 9.80 kg more weight than control group. The cost for production of 1kg more weight gain in group T2, T3 and T4 than control was recorded Rs. 18.97, 9.47 and 4.59, respectively. The

incremental B:C Ratio was calculated to be 5.27, 10.55 and 21.77 in group T2, T3 and T4, respectively which appears to be very encouraging.

CONCLUSION

Based on the study, it may be inferred that the traditionally fermented curd can be effectively used as a probiotic supplement and has a desirable effect in terms of higher growth rate and checking diarrhea in pre-ruminant calves. This is of special significance to poor dairy under village conditions wherein, diarrhoea is a common problem for neonatal calves and most of the farmers do not have ready to access commercial probiotics and anti diarrhoeal medicines. Under these situations dahi/ curd can be a good substitute as they are not only readily accessible and economical but also gain higher net income from rearing of calves under field condition.

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