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BIOLOGICAL PERFORMANCE OF FEMALE CALVES FED DIETS SUPPLEMENTED WITH DIFFERENT STRAINS OF LACTOBACILLI

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Abstract: Day old female crossbred calves were divided into three groups viz. T_1, T_2 andT_3 (six calves in each group) and were fed on milk and milk replacer up to three months of age. Group T_1 was standard control whereas group T_2 and T_3 were supplemented with *L. acidophillus* (leopard excreta) and *L. plantarum* (carrot) @ 6.8 x 10^8 cells/litter of milk, respectively. The average daily gain in body weight was 195.37 ± 6.92, 290.74 ± 15.56 and 269.44 ± 12.07g in T_1, T_2 and T_3 treatments, respectively. The DMI (kg) was significantly ($P\leq 0.05$) higher in Lactobacilli fed groups (T_2 and T_3) as compared to control (T_1). The feed conversion ratio was 2.34 ± 0.04, 2.08 ± 0.01 and 2.15 ± 0.01 in T_1, T_2 and T_3 treatments, respectively. The digestibility coefficient of DM, CP, CF and NDF was significantly ($P\leq 0.05$) higher in Lactobacilli fed groups (T_2 and T_3) as compared to the control (T_1). Gains in body weight and body measurements (body height, body length and heart girth) were significantly ($P\leq 0.05$) higher in Lactobacilli fed groups (T_2 and T_3) as compared to control (T_1). The lactobacillus supplementation showed positive effect on growth performance and digestibility in calves.

Keywords: Milk replacer, *L. acidophillus*, Leopard excreta, *L. plantarum*, Carrot.

Introduction

The productive status of adult cows depends on the growth and vigour of their early life which emphasizes the importance of proper feeding and management practices during the early part of calf's life. Whole milk feeding is cost effective but sometimes milk is not always available in required quantity to fulfil the need of growing calves or the calf allowance of the milk is needed to be reduced in order to save the milk for human consumption. In such cases, milk is replaced with milk replacer gradually. The calves are more sensitive to diseases and environmental challenges especially when early weaned. Thus it becomes extremely important that they must be given proper care and nutrition as per their requirement.

The performance of calves can be improved by manipulating the micro-flora in their gastro intestinal tract. The usefulness of probiotics came in the light when antibiotics were being

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discouraged (Bidarkar *et al.,* 2014) or even banned in some countries due to their residual effects and risk of antibiotic resistance.

The first scientific report on the use of lactic acid bacteria was published by Marriot *et al*. (1924). The term "probiotics" was first introduced in 1953 by Kollath (Hamilton-Miller *et al*., 2003). Probiotics are “live microorganisms which, when administered in adequate amounts in feed, confer a health benefit on the host” (FAO/WHO, 2002) by improving its intestinal microbial balance.

In the present investigation, different strains of Lactobacilli were used to supplement diet to study its influence on growth performance and nutrient digestibility in crossbred female calves up to 3 months of age.

MATERIALS AND MEHTODS

Day old female crossbred calves were randomly distributed into three groups (six calves per group). Group T_1 was kept as control and fed on milk whereas T_2 and T_3 were fed on milk replacer. The composition of the milk replacer is presented in table 1. The milk in group T_2 and T_3 was fortified with *Lactobacillus acidophilus* (leopard excreta) and *Lactobacillus plantarum* (carrot) @ 6.8 x 10^8 cells /litter milk, respectively. Body weight and body measurement were recorded at day old age and thereafter at fortnight interval in the morning before offering feed and water to assess live weight gain. Body measurements including body length (pin bone to shoulder point), body height (wither to feet touching the ground) and heart girth (around the heart) were also recorded.

Digestibility trial was conducted by total collection method at three months of age and sample of milk replacer, forage offered and residues left were collected and analysed for proximate principals (AOAC, 1990) and cell wall constituents (Robertson and Van Soest, 1981). The data was statistically analysed as per standard methods of Snedecor and Cochran (1967).

TABLE 1 Proximate composition of milk replacer (% in dry matter)

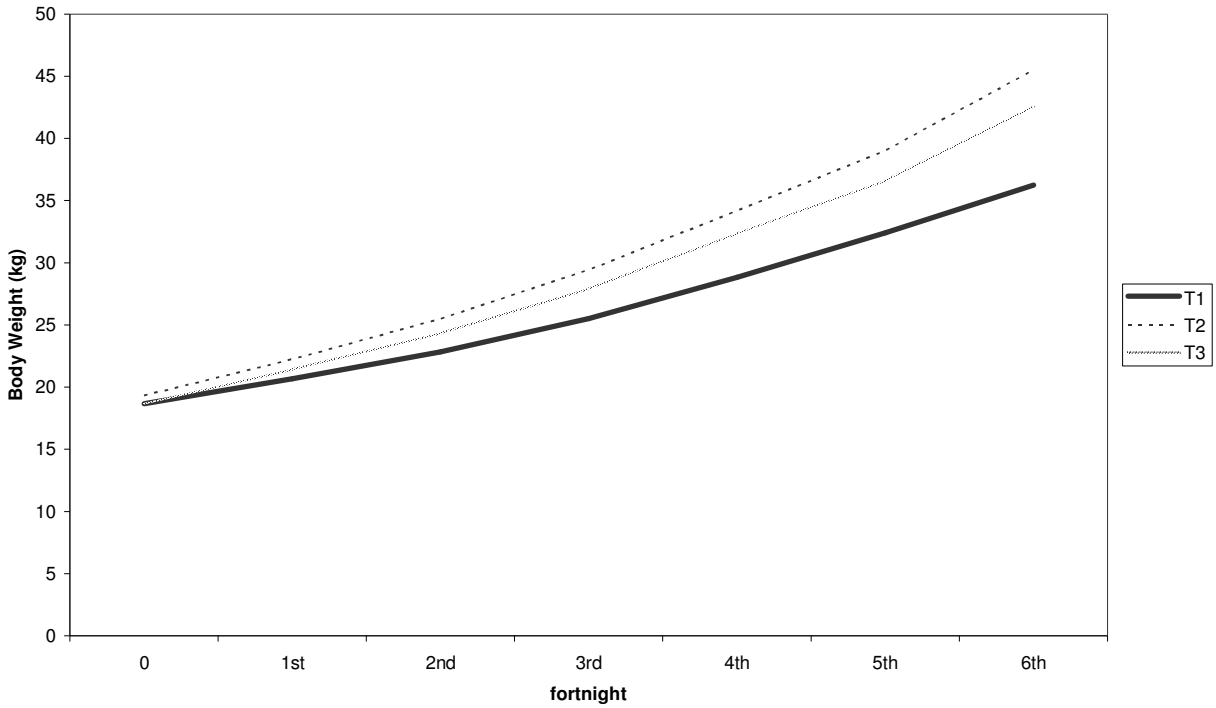
Nutrients	Percentage
Dry matter (DM)	86.14
Crude protein (CP)	22.37
Crude fibre (CF)	4.46
Either extract (EE)	15.63
Nitrogen free extract (NFE)	42.83
Total ash (TA)	14.71
Calcium (Ca)	1.81
Phosphorus (P)	0.87

Each figure is a mean of duplicate determinations

RESULTS AND DISCUSSION

The average gain in body weight (GIW) was significantly (P≤0.05) higher in Lactobacilli fed groups (T_2 26.17and T_3 24.25 kg) as compared to control (T_1 17.58 kg) (Table 2). However, the differences among the Lactobacilli fed groups (T_2 and T_3) were non-significant. The overall body weight gains at fortnightly interval are presented in figure 1. The final body measurements viz. body height, body length and heart girth were statistically non-significant among all the groups. The average gain in body measurements viz. body height, body length and heart girth were significantly (P≤ 0.05) higher during the experiment period in Lactobacilli fed groups (T_2 and T_3) as compared to T_1 (control). Jatkauskas *et al*. (2010) reported that body weight and daily weight gain were significantly improved by probiotic supplemented diets in calves. Frizzo *et al*. (2008) reported non significant differences in body weight, whither height and heart girth. Mudgal and Baghel (2010) reported that supplementation of diet had positive effect in early stages of life in buffalo calves and the effect subsided with advancement of age due to rumen development. The metabolic weight (kg) size was significantly (P≤ 0.05) higher in Lactobacilli fed groups (T_2 17.53 $W^{0.75}$and $T_3$16.66 $W^{0.75}$) as compared to control ($T_1$14.79 $W^{0.75}$). The gain/ day (g) up to 3 months of age was significantly (P≤ 0.05) higher in T_2 and T_3 as compared to T_1 (control). The DMI (kg) was significantly (P≤ 0.05) higher in Lactobacilli fed groups (T_2 and T_3) as compared to control (T_1). These results were in agreement with the findings of Bhupal (1999) and Ramaswami *et al.,* (2005) who reported significantly (P≤ 0.05) higher DMI (kg) in Lactobacilli fed groups as compared to control. The mean feed conversion ratio was significantly broader in T_1 (2.34) as compared to T_2 (2.08) and T_3 (2.15). Group T_2 had narrow FCR than T_3. This indicated that feed conversion efficiency is better in culture fed groups which corresponded to higher growth performance in treatments T_2 and T_3. The results of present investigations are in accordance with the findings of Tripathi (2002) who also recorded better mean FCR value in *L. acidophilus* fed calves as compared to other treatments. The digestibility coefficient of DM, CP, CF and NFE were significantly (P≤ 0.05) higher in Lactobacilli fed groups (T_2 and T_3) as compared to control (T_1), however there was no significant difference among the culture fed groups. The higher DM digestibility in Lactobacilli fed groups may be due to the impact of lactic acid production by the Lactobacilli microbes leading to fall in pH, thereby helping in elimination of undesirable microorganisms. Zheng *et al*., (2015) reported an increase in the apparent digestibility of crude protein in Holstein calves on oral administration of *L. plantarum* alone.

Fig 1 Effect of supplementation of different strains of Lactobacilli on growth curve in female calves



Better CP and CF digestibility in Lactobacilli fed groups (T_2 and T_3) was in agreement with Sharma and Malik (1992). Similarly, Devchand *et al*. (2013) reported that supplementation of probiotics significantly influenced digestibility of DM, Crude protein and NFE in Mehsana buffalo calves. Significantly ($P \leq 0.05$) higher digestibility of DM, CP, CF and NFE reflected better availability of nutrients in the Lactobacilli fed groups, which resulted in faster growth rates in female calves. The digestibility coefficient of EE, NDF and ADF was non-significant among all the groups. Schwab *et al.* (1980), Panda *et al.* (1995), Bhupal (1999) and Ramaswami *et al.* (2005) have also reported no significant effects of supplementation of Lactobacilli on EE digestibility. This might be due to presence of higher quantity of carotenoid and chlorophyll pigments in green fodder, which are poorly digestible (Ranjhan, 1994). Similarly Abu–Tarboush *et. al.* (1996) reported no significant effect of supplementation of Lactobacilli on ADF digestibility in Holstein calves.

Thus, female crossbred calves fed on lactobacillus supplementation were found to have increased body weight and growth parameters due to increase dry matter intake and digestibility of nutrient.

Table 2: Biological Performance of female calves fed *Lactobacilli* supplementation under different treatments

Parameter	Treatments			CD
	T1 (Control)	**T2** (***L. acidophillus***) Leopard Excreta	**T3** (***L.plantarum***) Carrot	
Body weight (kg)				
Initial	18.67±0.67	19.33±0.71	18.67±0.49	NS
Final	36.25±1.27	45.50±2.05	42.58±1.49	NS
Gain	17.58^{b}±0.62	26.17^{a}±1.40	24.25^{a}±1.09	5.66
Body height (cm)				
Initial	58.17±1.62	60.33±1.72	61.25±2.75	NS
Final	74.25±1.63	78.75±1.24	79.58±3.01	NS
Gain	16.08^{b} ±0.44	18.42^{a} ±0.63	18.08^{a} ±0.35	2.02
Body length (cm)				
Initial	58.50±1.67	56.83±1.72	60.33±0.88	NS
Final	71.42±1.73	72.33±1.43	76.75±1.35	NS
Gain	12.92^{b} ±0.52	17.00^{a} ±0.43	16.47^{a} ±0.75	4.81
Heart girth (cm)				
Initial	62.33±1.28	61.16±0.83	63.50±1.25	NS
Final	73.33±1.19	74.17±1.00	76.08±1.43	NS
Gain	11.17^{b} ±0.38	13.00^{a} ±0.63	12.50^{a} ±0.96	1.30
Biological performance				
Metabolic body size ($W^{0.75}$)	14.79^{b}±0.39	17.53^{a}±0.60	16.66^{a}±0.44	2.53
Gain/day(g)	195.37^{b}±6.92	290.74^{a}±15.56	269.44^{a}±12.07	62.92
DMI/day (g)	0.472^{b}±0.05	0.618^{a}±0.02	0.591^{a}±0.03	0.95
Total DMI/day(Kg)	42.146^{b}±4.42	56.14^{a}±2.17	54.52^{a}±2.95	7.30
FCR	2.34^{a}±0.04	2.08^{b}±0.01	2.15^{b}±0.01	0.16
Digestibility (%)				
Dry matter	64.38^{b}±2.17	70.64^{a}±1.63	68.65^{a}±2.03	5.21
Crude protein	71.48^{b}±2.08	78.29^{a}±2.67	75.54^{a}±1.89	6.79
Crude fibre	56.16^{b}±1.98	60.38^{a}±2.07	59.22^{a}±3.02	3.29
Ether extract	64.53±1.60	66.98±1.58	65.46±1.83	NS
Nitrogen free extract	67.05^{b}±1.53	70.66^{a}±1.58	68.50^{a}±1.21	3.05
Neutral detergent fibre	59.60±1.55	66.42±1.49	63.19±1.71	NS
Acid detergent fibre	58.55±2.17	63.19±1.56	61.66±1.48	NS

Each figure is a mean value of six calves.

Mean bearing different superscripts in a column differ significantly ($P \leq 0.05$)

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