

Effects of Probiotics and Antibiotic Supplementation in Daily Milk Intake of Newborn Calves on Feed Intake Body Weight Gain, Fecal Scores and Health Condition

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Abstract: The effects of probiotic and antibiotic administration were studied in an experiment, using 24 newborn calves. Calves were randomly assigned to three experimental groups (eight calves for each group). Probiotic (2 g day⁻¹) and antibiotic (2 g day⁻¹) was added in their daily milk intake until age of weaning. After the 3 days, all calves (including control group) received starter ration containing 21.540% crude protein and 2.75 Mcal kg⁻¹ energy. Feed intake, Body weight gain, Fecal scores and general health condition of all calves were observed at per week. Also condition of feces was examined daily and the occurrence of diarrhea was recorded throughout the experiment. Mean values of weight gain during tow months for treatments probiotic, antibiotic and control groups were 36.75, 35.41 and 31.83 kg, respectively. DMI illustrated that calves fed antibiotic (T₂) thorough had greater DMI than control calves (p<0.05). Body weight gained was not significantly different for first and second months between treatments probiotic, antibiotic and control groups (11.750 and 25, 12.91 and 22.5 versus 11 and 20.75 for fist and second months in treatments and control groups, respectively). When the entire study period, calves fed probiotic (T₁) and antibiotic (T₂) had greater BWG (p<0.05) than control calves, also calves fed probiotic (T₁) and antibiotic (T₂) had greater ADG (p<0.05) than control calves. The results of this study indicated that present probiotic compound have beneficial effects, especially on the 2 months of age in rearing calves.

Key words: Probiotic, body weight gain, newborn calves, antibiotic, control groups

INTRODUCTION

Probiotic compounds have recently been used for controlling and maintaining the intestinal bacteria. For a long time, antibiotics have been widely used to promote growth in calves (Abe *et al.*, 1995). It is suggested that in newborn calves, administration of antibiotics are useful for prevention of infections caused by pathogenic bacteria (Fuller, 1989). However, the use of antibiotics could have serious consequences such as drug resistance and harmful alteration of bacterial population in the intestine (Abe *et al.*, 1995). Therefore, some researchers have replaced it with probiotics (Donovan *et al.*, 2002). It has been reported that probiotics play an essential role in the completeness of intestinal mucosa busier, some probiotic could modulate intestinal mucosal immune response, some could play protective roles by inhibiting the adhesion of pathogenic bacteria to intestinal epithelia. This has been tested by Bal *et al.* (2004) *in vitro* and showed its beneficial effects and probable role of probiotic to reduce intestinal disease.

These products are used as food additives to improve performance of dairy cattle. However, some researchers such as Zhao *et al.* (1998) have used injection

roots and reported that selected probiotic bacteria administered to cattle prior to exposure to *E. coli* 0157: H7 could reduce the level of carriage of *E. coli* 0157:H7 in most animals. Tkalcic *et al.* (2003) have given *E. coli* 0157:H7 and *E. coli* 0111:NM orally and found them effective. Zhao *et al.* (2003) have tried *E. coli* 026:Hi 1 and had the same results. On the other hands, Harp *et al.* (1996) could not find any significant difference in the incidence of diarrhea and oocyst shedding among three groups of calves infected with *Cryptosporidium parvum*. Some others have used dietary probiotic for layer hens (Balevi *et al.*, 2001) or broiler chicks (Modirsanei *et al.*, 2003). Jukna *et al.* (2003) reported that in probiotics treated groups of calves, hematological parameters were in physiological range and indicated good status of calves. They also reported that immune system was enhanced in treated calves. On the other hands, no significant differences in the hematological, immunological, energy, mineral, nitrogen and vitamin profiles were observed among the groups by Huska *et al.* (2002). Whereas, a positive effect of probiotics on the incidence of diarrhea and also a positive effect on the health and weight gains of experimental groups was reported.

Despite the fact that many antibiotic products are now in use for therapeutic purposes for newborn calves in dairy industry, diarrhea is still a relevant problem and blamed for one of the highest economic loss in such operations.

Some probiotic compounds are claimed to have formulae designed to provide suitable condition in alimentary tract so as to minimize the incidence of diarrhea, therefore improvement in body weight gain, body height and general health condition. This study was conducted to find whether or not administration of probiotic bacteria (*Lactobacillus acidophilus*, *Lactobacillus casei*, *Bifidiobacterium thennophilus*, *Streptococcus faecium*) in this product were effective in promoting the growth of newborn calves and decrease of diarrhea.

MATERIALS AND METHODS

Twenty fore newborn calves were divided into three groups (T₁) probiotic (T₂) antibiotic and control group of which half male and half female. Both groups were fed milk, water and starter were offered for *ad libitum* intake throughout the trial. The following composition was supplemented (Table 1 and 2).

A probiotic compound containing, *Lactobacillus acidophilus*, *Lactobacillus casei* *Bifidiobacterium thennophilus*, *Streptococcus faecium*, with the total viable count of 2.5×10⁸ cfu g⁻¹ was supplemented in the daily milk intake of treatment group, 2 g and antibiotic neomycin 2 g calf⁻¹ for 60 days, until all calves were weaned. In the first and second week calve 10% and than weaning 4.0 L of milk were fed daily to the calves of three groups (all calves were received colostrum immediately after birth).

Also each calf consumed between 27.0-30.0 kg of DM feed over the 60 days of experiment with insignificant amount of orts. Each calf was placed in an individual concrete pen and kept independently to prevent cross-contamination among calves. Water and were and starter available for ad lib consumption throughout the trail period. Body Weight Gain (BWG) weekly, feed intake, fecal scores and health condition were observed daily. But condition of feces was observed daily and the fecal scores in different stages were recorded throughout the experimental period.

Statistical analysis: The mean values of BWG, fecal scores and were analyzed by one-way ANOVA and Fishers test using SAS software.

Table 1: Starter ration composition

Nutrients	Percentage
Barely grain	15.0
Corn grain	35.0
Soybean meal 44%	30.0
Fish meal	1.0
Wheat bran	9.0
Lime	1.5
Plain salt	0.5
Wheat bran bicarbonate	5.0
Min. supple	0.5
Vitamin premix	1.5
	1.0

Table 2: Ingredients analyze

Ingredients	Values
ME	82.75 Mcal kg ⁻¹
NEm	1.9 Mcal kg ⁻¹
NEg	1.21 Mcal kg ⁻¹
CP	18.59 (%)

RESULTS AND DISCUSSION

Survey of weekly DMI described that calves fed probiotic (T₁) and antibiotic (T₂) thorough had greater DMI than control group. But only treatment antibiotic was significantly different to control grope (p<0.05) (Table 3).

The initial body weight for T₁ (probiotic), T₂ (antibiotic) and T₃ control groups were 40.17, 39.17 and 39.25 kg, respectively (Table 4). BWG was not significantly different between treatment probiotic (T₁) prebiotic (T₂) and control group (36.75 kg, 35.41 vs. 31.75 kg for treatment and control groups, respectively). However BWG treatments probiotic (T₁) and pntibiotic (T₂) 15.75 and 11.52% more than control group, respectively (Table 4).

Observed significant difference in Average Daily Gain between treatments probiotic (T₁) and prebiotic (T₂) with control group during this study (Table 3). No treatment differences in feed efficiency, fecal scores and respiratory scores were detected during the trial. However, fecal scores treatments probiotic (T₁) and prebiotic (T₂) was benefit of control group.

Abe *et al.* (1995) reported that probiotics had beneficial effect on body weight of newborn calves until 25 days of age. However, they did not mention the results of their study afterwards. Muscato *et al.* (2002) have also reported that ruminal fluid (their choice of probiotics) supplementation could be a practical tool for improving calf health. Prahallada *et al.* (2001) also found beneficial effects when they fed *Saccharomyces cerevisiae* or *Lactobacillus acidophilus* to crossbred calves (*Bos taurus* x *Bos indicus*) of 12 months of age. Morrill *et al.* (1995) did not observe a significant different in body weight of calves fed probiotics during a 6 weeks trial, neither (Kamra *et al.*, 2002), Nor (Gorgulu *et al.*, 2003)

Table 3: The feed intake calves during the trial

Weeks	Treatments					Sex		
	T ₁	T ₂	T ₃	SE	Pr>F	Male	Female	Pr>F
1	264.33 ^b	306.00 ^b	207.17 ^b	52.4182867	0.0281	232.00 ^a	383.50 ^a	0.0988
2	849.83 ^{ab}	1198.50 ^{ba}	1244.67 ^{ba}	123.8676635	0.1185	1100.94 ^a	1233.3 ^a	0.5809
3	1879.17 ^a	2260.17 ^a	2049.17 ^a	133.6147232	0.0013	1647.6 ^b	2133.3 ^a	0.049
4	3560.00 ^{ab}	4137.50 ^a	3138.50 ^b	194.2077557	<0.0001	3313.83 ^a	3596.2 ^a	0.1664
5	4829.3 ^{bc}	6028.2 ^{ba}	4213.5 ^{bc}	312.4698131	0.0001	4473.2 ^b	5617.44 ^a	0.0039
6	7873.0 ^{ba}	8228.2 ^{ba}	6982.7 ^b	424.2059070	0.0002	7325.06 ^b	8245.83 ^a	0.0447
7	11180.3 ^{ba}	13207.5 ^a	9898.5 ^{bc}	480.8456464	0.0007	11247.0 ^a	11736.1 ^a	0.4516
8	15776.5 ^a	14534.0 ^{ba}	12660 ^b	412.7330054	0.0083	14405.9 ^a	15062.8 ^a	0.3058
Total	46213 ^{ba}	49917 ^a	40394 ^{bc}	1816.89	<0.0001	43746 ^b	48008 ^a	0.0358

Table 4: The initial body weight and BWG of calves during the trial

Weeks	Treatments					Sex		
	T ₁	T ₂	T ₃	SE	Pr>F	Male	Female	SE
	40.17 ^a	39.17 ^a	39.25 ^a	0.6647918	<0.0001	39.75 ^a	39.67 ^a	<0.0001
1	1.33 ^a	2.00 ^a	1.75 ^a	0.2001983	0.7728	1.61 ^a	1.72 ^a	0.7964
2	2.66 ^a	2.75 ^a	2.75 ^a	0.1079664	0.9816	2.94 ^a	2.63 ^a	0.1851
3	3.25 ^a	3.08 ^a	2.58 ^a	0.1939762	0.0022	2.25 ^a	2.55 ^a	0.2132
4	4.50b ^a	5.08 ^a	3.91 ^b	0.1785913	0.0016	4.61 ^a	4.30 ^a	0.2010
5	4.58 ^a	4.50 ^a	3.83 ^a	0.2016248	0.0001	4.08 ^a	4.47 ^a	0.1680
6	6.41 ^a	5.91 ^a	6.08 ^a	0.1640502	0.6072	6.33 ^a	5.86 ^a	0.1229
7	6.33b ^a	6.83 ^a	4.58 ^b	0.2301536	0.0005	5.66 ^a	5.80 ^a	0.6548
8	7.66 ^a	5.25 ^c	6.25 ^{bc}	0.2476076	0.0023	6.86 ^a	6.97 ^a	0.7669
Total	36.75 ^a	35.41 ^a	31.75 ^b	0.7332304	0.0007	34.36 ^a	34.33 ^a	9768.0
ADG	0.656 ^a	0.632 ^a	0.566 ^b	0.6133433	0.0007	0.613 ^a	0.613 ^a	9768.0
BVG (%)	15.75	11.52	0	-	-	-	-	-

^{a,b}Means in each column with different superscripts are significantly different (p<0.05); W = Week; T = Treatment

have reported a significant different in body weight gain for calves fed probiotics. In the present study, BWG was monitored for 2 months, probiotic (T₁) and antibiotic (T₂) fed group had significantly higher body weight than others (p<0.05), which is in agreement with Higginbotham and Bath (1993), who studied the body weight until 1st month and Abdala *et al.* (2002), who reported a significant difference in body weight gain of probiotics fed groups for 21 and 42 days but not in agreement with Alves *et al.* (2000), who reported a significant effect for probiotics on body weight gain during the period of study in which calves were between 160 and 190 kg body weight, Gorgulu *et al.* (2003) reported that with respect to diarrhea, the probiotics fed calves were superior to control group.

They concluded that probiotics administration before weaning could improve calf health and decrease mortality and medication cost, the same results as the present study. Marcin *et al.* (2003) had the same conclusion for piglets and calves. Surprisingly Abdala *et al.* (2002) reported no significant differences in diarrhea occurrence among treatment (probiotics fed and control) groups.

Ohya *et al.* (2001) have reported that probiotic product could reduce faecal shedding of *E. coli* 0157 from experimentally infected calves. In the present study, we concluded that this probiotic significantly improved production parameters (FI, BWG and ADG) as well as

general health condition by reduction in diarrhea cases and the type of diarrhea calves affected during the nursing period. The results of this research are in agreement with many different researchers in this area in different parts of the world although we suggest that supplemental experiment should be done in various climatic conditions.

CONCLUSION

Supplement diet with probiotic had benefit effect on BWG, ADG, score fecal and health condition.

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