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Effect of probiotics supplementation on live weight in lactating Barbari goats

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ABSTRACT

In the present study, probiotic supplementation on lactation performance in Barbari goats was carried out. Twenty lactating Barbari goats were randomly divided into two equal groups. Goats in T_1 group served as control (no probiotics) and goats in T_2 group were offered probiotic culture (*Saccharomyces cerevisiae*) with a dose of 1.5×10^9 colony forming unit (cfu/goat/day) along with wheat bran at the time of morning feeding. The experiment in both groups almost similar types feeding schedule and probiotic treatment in order to observe the effect of probiotic (*S. cerevisiae*) on body weight change in lactation performance in Barbari goats. The observations recorded on change in body weight and voluntary nutrient intake was recorded in 145 days at fortnightly intervals. Permissive ration, combination of concentrate mixture and gram straw at the ratio of 50:50. DM intake through concentrate and roughage sources, total DMI, DMI/100kg BW and DMI/kg $W^{0.75}$ were statistically similar between two groups. The CP percentage in the total diet was also similar between two groups. Percent weight loss at 45 days, at 90 days and at 135 days of lactation was also statistically similar between two groups, however, weight loss was found minimum in yeast supplemented group T_2. Therefore, it may be concluded that intake of Dry matter and Crude Protein remained unchanged due to addition of *S. cerevisiae* in the diet of lactating Barbari goats. Body weight changes were also similar between treatment and control groups. Such treatment resulted by no improvement in weight gain of breed able female goats over the control group.

Introduction

The term probiotic means "for life" and has a contrast with the term antibiotic which means "against life". According to Khalid et al. (2011) probiotics are naturally occurring microbes, which upon administration, improve the health status of the animal by competing the pathogenic microbes and nutrient utilization by having a positive influence on gut microflora.

Probiotics recently termed as direct fed microbial (DFM). It has diversified use in domesticated animals (like small and large ruminants, pig and poultry) and in human beings. Different probiotics like bacteria, yeast, and fungi are used for manipulating rumen fermentation and the microbial eco-system of the gastro-intestinal tract of animals, to harvest maximum energy from the feed fed to the animals.

At present, probiotics are classified as GRAS (Generally Recognized As Safe) ingredient by the US Food and Drug Administration. According to EEC directive 70/524, several microorganisms have been authorized as a new additive for feedstuffs. Now, it is generally accepted that certain viable microbial cultures beneficially affect the productive potentials of small and large ruminants, pig, rabbits and poultry.

The level of biological expression of direct fed microbial in the animals depends on the factors like dose, type and strain of DFM, feed of animal, stage of an animal etc. (Raeth-Knight et al., 2007). According to Singh et al. (2008) oral supplementation of *S. cerevisiae* improved the digestive efficiency of ruminants. According to Mukhtar et al. (2010) the daily weight gain was 7% higher in post-weaned *Lohi* male lamb when supplemented with probiotics (*Saccharomyces cerevisiae*). Yeast culture has changed the rumen atmosphere resulting increased weight gains when supplemented with *S. cerevisiae* in calves, ADG was significantly ($P<0.05$) higher (Sahoo et al., 2009).

Since, studies related to the efficacy of such probiotics on growth modulation, to investigate the response of feeding probiotics on dry matter intake, crude protein intake and change in body weight in lactating Barbari goats.

Materials and Methods

Experimental station

The experimental work was carried out in the Nutrition, Feed Resource and Products Technology Division, Central Institute for Research on Goats (CIRG), Makhdoom, P.O.-Farah, Mathura (U.P.) during summer to winter season of 2009-2010. Makhdoom is situated at $27^0$10' N latitude and $70^0$02'E longitude at an attitude of 169 meters above sea level. Annual rainfall of the area varies between 300-500 mm and falls under semi-arid region.

Housing and management

All the pregnant lactation Barbari goats were housed in well-ventilated pens with an open yard outside. All the Barbari goats were dewormed at the beginning of the experiment and throughout the experiment period healthy surrounding and proper cleanliness was maintained in the experimental shed.

The experiment in both groups during lactation period with almost similar type feeding schedule and probiotics treatment in order to observe the effect of probiotics (*S. cerevisiae*) on lactation performance in Indian goats (Barbari breed).

Selection and distribution of animals

Twenty lactating Barbari goats were randomly divided into two equal groups the live weight (31.91 in T_1; 29.48 in T_2) and parity (1.7). Goats in T_1 group served as control (no probiotics) and goats in T_2 group were offered probiotic culture (*Saccharomyces cerevisiae*) with a dose of 1.5×10^9 colony forming unit (cfu/goat/day) along with wheat bran at the time of morning feeding.

Feeding schedule and feeding

Wheat bran (500g/each treatment group) containing yeast culture was fed to experimental lactating goats at about 10.00 AM followed by concentrate mixture supplementation at about 10.30 AM and gram straw at about 11.30 AM. All lactating goats were offered concentrate mixture @ 2.0% of the body weight and roughage (gram straw) *ad lib* with the basic aim to maintain the roughage to concentrate ratio of 50:50. Fresh drinking water was always made available to all the goats throughout the experimental period. Lactating goats under control group were also offered wheat bran (without yeast) at the same rate as placebo. Other feeds were similar in both experimental groups. The concentrate mixture for lactating Barbari goats was same as used in the pregnancy trial, which was described in above. In lactating Barbari goats, green fodder (seasonal green fodder) added with gram straw and maintained concentrate ratio of 50:50.

Analytical Procedure

Proximate analysis of all the milk composition, concentrate mixture, gram were analyzed for proximate analysis (OM, CP, Total carbohydrate, EE and Total Ash) of feed samples and residues were done as per AOAC (1984). Estimation of cell wall components of representative samples of milk composition, concentrates, gram straw was analyzed for cell wall components (NDF, ADF, Hemi cellulose, Cellulose and Lignin) in accordance with Goering and Van Soest method (1970).

Observations

The experimental lactating Barbari goats were observed effect of probiotics (*Saccharomyces cerevisiae*) supplementation by changes in body weight. The observations of weight change were recorded up to the end of a lactation phase of Barbari breed. The experiment in both group during lactation period with almost similar type feeding schedule and probiotic treatment in order to observe the effect of probiotics (*S. cerevisiae*) on body weight change in lactation performance in Indian goats (Barbari breed). The observations of change in body weight and voluntary nutrient intake were recorded in 145 days on fortnightly intervals. Permissive ration combination in lactation Barbari goats, concentrate mixture and gram straw at the ratio of 50:50.

Statistical analysis

Data pertaining to supplementation of probiotics to lactating Barbari goats were statistically analyzed using student t-test method (Snedecor and Cochran 1995).

Results

Voluntary intake

Proximate and cell wall composition of feeds and fodder offered to lactating Barbari goats were presented in Table 1. DM intake through concentrate and roughage sources, total DMI, DMI/100kg BW and DMI/kg $W^{0.75}$ were statistically similar between two groups. DMI (g)/kg $W^{0.75}$ was 91.84 and 91.90g in T_1 and T_2, respectively (Table 2). The pattern of CP intake followed the same trend of DM intake. CP intake/ kg $W^{0.75}$ was 10.86 and 10.17g in T_1 and T_2, respectively. The CP percentage in the total diet was also similar between two groups (T_1: 11.86% and T_2: 12.17%).

Body weight change

Body weight at lactation initiation was 31.91 and 29.48kg in T_1 and T_2 groups, respectively (Table 3). However, the differences were found non-significant. Percent weight loss in 45 days, at 90 days and at 135 days of lactation was also statistically similar between T_1 (14.71, 14.47 and 10.63, respectively) and T_2 (13.43, 11.87 and 9.85, respectively) groups, however, weight loss was found minimum in yeast supplemented group T_2 (Fig.1).

Discussion

Voluntary intake

The results corroborated the findings of earlier workers. Supplementation of yeast culture in lactating animals resulted, no positive response on DMI in cows (Arambel and Kent 1990; Wholt et al. 1998; Soder and Holden 1999; Schingoethe et al. 2004). However, in most cases, offering the ration in restricted amounts bring about its complete consumption, and so no effect of added yeast on DMI is seen in lactating animals (Kung et al. 1997; Bagheri et al. 2009; Yalcin et al. 2011), in lactating goats (Garcia et al. 2000; Salama et al. 2002) and in lamb and kids (Adams et al. 1981; Tripathi et al. 2008; Sarma 2009). Similarly, DM intake was not changed in Holstein cow when supplemented with *Saccharomyces cerevisiae* or *Aspergillus oryzae* (Bach et al. 2007).

By contrast, in dairy cows, when rations are offered *ad libitum*, added yeast generally tends to stimulate intake (Williams et al. 1991; Dann et al. 2000, Kumar 2016).

Table 1: Chemical composition (g/kg) of feeds used in Barbari goat

Parameters	Concentrate mixture	Wheat bran	Gram straw	Cowpea fodder	Oat	Barley	Berseem
Linseed cake	300						
Barley grain	300						
Wheat bran	220						
Gram straw	150						
Mineral mixture*	20						
Common salt	10						
Chemical composition (in DM) of lactating							
Organic matter	895.0	937.8	897.0	901.5	861.3	872.5	871.5
Crude protein	186.3	106.5	41.2	134.0	113.2	120.5	201.4
Fat	52.5	25.4	19.4	59.0	29.9	28.6	27.7
Total carbohydrate	656.2	805.9	836.5	708.5	718.2	723.4	642.4
Ash	105.0	62.2	103.0	98.5	138.7	127.5	128.5
Neutral detergent fiber	422.3	471.1	648.4	531.1	565.1	550.5	456.4
Acid detergent fiber	205.8	141.1	395.7	256.8	227.2	300.6	350.6
Cellulose	173.8	117.4	293.6	201.7	194.4	266.0	303.2
Hemi-cellulose	216.5	330.0	252.7	274.3	337.9	249.9	105.7

Berseem – *Trifolium alexandrinum;* Barley – *Hordium vulgare;* Cowpea fodder – *Vigna sinensis;* Gram straw - *Cicer arietinum;* Oat – *Avena sativa*

*Mineral mixture was used with vitamin powder as Nutrimilk (Pfizer)

Each kg Mineral mixture contains: vitamin A, 625000 IU; vitamin D3, 62500 IU; Vitamin E, 250 IU; Niacinamide, 1g; Calcium, 280g; Phosphorus, 120g; Cobalt, 0.2g; Copper, 1g; Iodine, 1g; Iron, 6g; Manganese, 1.2g; Selenium, 10.0g; Zinc, 2g.

Table 2: Voluntary intake in Barbari goats fed diet supplemented with *Saccharomyces cerevisiae*

Parameters	T_1	T_2	Significance
DM Intake			
Concentrate (g)	510.02	510.40	NS
Gram straw (g)	461.81	416.20	NS
Green fodder (g)	140.50	135.47	NS
Roughage (g)	602.31	551.66	NS
Total (g)	1112.33	1062.06	NS
Per100kg BW (kg)	4.00	4.07	NS
Per kg $W^{0.75}$ (g)	91.84	91.90	NS
Conc.: Roughage ratio	45:54	48:51	
CP Intake			
Total (g)	131.61	129.12	NS
Per 100 kg BW (g)	472.64	493.92	NS
Per kg $W^{0.75}$ (g)	10.86	11.17	NS
CP % in diet	11.86	12.17	NS

Table 3: Body weight changes in lactating Barbari goats supplemented with *S. cerevisiae*

Parameters	T_1	T_2	Significance
Initial BW (kg)	31.91	29.48	NS
Final BW (kg)	28.48	26.54	NS
Wt. gain/loss (kg)	-3.43	-2.93	NS
Wt. gain/day (g)	-25.09	-20.89	NS
Wt. diff. in 1st qrt. (at 45days)	14.71	13.43	NS
Wt. diff. in 2nd qrt.(at 90days)	14.47	11.87	NS
Wt. diff. in 3rd qrt. (at135days)	10.63	9.85	NS

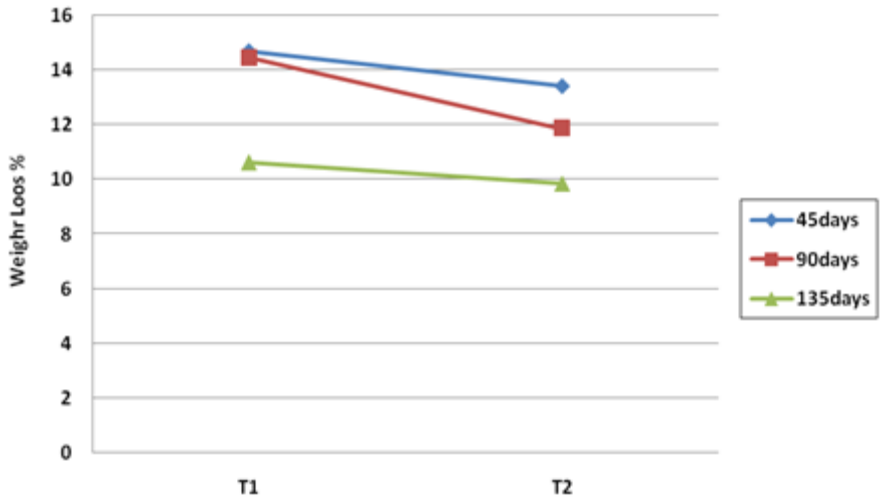

Fig 1: Effects of Yeast culture on body weight loss percentage in lactating Barbari goats

The use of probiotic culture in large and small ruminants has been appreciated for the improvement in feed intake when supplemented with yeast (Williams et al. 1991; Salama et al. 2002; El-Ghani 2004; Nocek and Kautz 2006).

Body weight changes

The results partially corroborated the findings of earlier workers. Supplementation of probiotics improved microbial ecology in ruminants (Musa et al. 2009), nutrient synthesis and their bio-availability resulting in better weight gain in farm animals (Oyetayo and Oyetayo 2005). Salama et al. (2002) reported that goats supplemented with malate plus yeast culture actually gained weight during lactation. According to Jinturkar et al. (2009), the use of probiotics either single (2g *Lactobacillus acidophillus* or 2g *Saccharomyces cerevisiae* per kg feed) or in combination (1g *Lactobacillus acidophillus* plus 1g *Saccharomyces cerevisiae* per kg feed) was useful for weight gain in goats.

Conclusions

Voluntary intake of dry matter and crude protein remained unchanged due to addition of *S. cerevisiae* in the diet of lactating Barbari goats. Body weight changes were also similar between treatment and control groups. Such treatment concluded not any improvement in weight gain of breed able female goats over control group.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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