EFFECT OF SUPPLEMENTATION OF PROBIOTICS AND RUMEN BUFFER ON PERFORMANCE OF LACTATING BUFFALOES

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ABSTRACT

The study involved 12 Murrah buffaloes which were divided into two groups of six each *viz*. Control (T_0) and Treatment group (T_1). The buffaloes from Group T_0 received standard concentrate mixture and roughages as per the routine practice of the farm. Whereas Group T_1 received same ration as that of Group T_0 along with supplement containing probiotics like yeast (*Saccharomyces cerevisiae*), bacteria (*Bacillus subtilis, Bacillus pumilus* and *Bacillus amyloliquifaciens*) and rumen buffer 10 g/day/animal. The experiment lasted for 91 days. The average daily milk yield and FCM yield, DMI, TDN and DCP intake of buffaloes from Treatment group (T_1) was significantly ($P<0.01$) higher than Control group. The efficiency of feed utilization in terms of dry matter required per kg of FCM yield produced was significantly ($P<0.01$) better in Group T_1 than Control group. The average milk fat, protein, total solids, SNF and lactose percentage of Group T_1 was significantly ($P<0.01$) higher than Control group. The average somatic cell count of milk of buffaloes form Group T_1 was significantly ($P<0.05$) lower than Control group. The economics of the study showed an extra profit of ₹ 25.20 in Supplemented group over Control group.

Keywords: *Buffalo bubalis*, buffaloes, yeast culture, buffers, milk yield, milk composition

INTRODUCTION

In dairy farming, feed is the most important factor which accounts for about 60 to 65% of the total cost of rearing. In order to get maximum profitability, the feed must be balanced nutritionally and also be economical. The economy of feed is not only assessed by the apparent cost per kg of feed but also by the cost of feed required to produce a kg of milk. For achieving maximum profitability in dairy farming there is need to adopt the scientific feeding strategies for dairy animals. In such situations various feed additives like probiotics, enzymes, buffering agents and herbs can be used for improving health status and production performance of the farm animals.

Probiotics like yeast (*Saccharomyces cerevisiae*), and bacteria (*Bacillus subtilis, Bacillus pumilus* and *Bacillus amyloliquifaciens*) are widely

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utilized to improve livestock productivity, and the underlying mechanisms for such enhancement, have attracted increasing attention during recent years. Yeast cells are known to be a rich source of vitamins, enzymes and yeast is also found to stimulate cellulolytic bacteria in the rumen, improve fibre digestion and flow of microbial protein from the rumen. Hence, yeast supplementation has been shown to improve the growth rate and feed conversion efficiency. In some studies, yeast supplementation has resulted in increasing milk production and milk fat percentage in lactating cows (Ayad *et al*., 2013). Supplementation of probiotic in lactating ruminant animals resulted in increased dry matter intake, nutrient digestibility, body weight gain, milk yield and its composition. *Bacillus subtilis* (probiotic bacteria) is a rod-shaped gram-positive bacteria that is commonly observed in the soil and the gut of humans and animals. Bacterial spores like *bacillus subtillis, bacillus pumilus and bacillus amyloliquefaciens* increases milk production and milk components yield, decreases somatic cell count and promotes growth of total rumen bacteria, proteolytic and amylolytic bacteria (Luan *et al*., 2015).

Buffers in dairy rations are compounds that neutralizes excess acid production within the animal digestive system and thus help in restoring rumen pH to its normal level. Buffers are a combination of weak acid and its salt, which resists changes in pH or hydrogen ion concentration. Buffers increase ability to overcome the harmful effects of too much acid production and helps in maintaining rumen microbial fermentation process. Keeping this view in mind it was decided to study and evaluate the effect of probiotic and rumen buffering agent on the milk yield and its composition in lactating buffaloes.

MATERIALS AND METHODS

Twelve Murrah buffaloes in early stage of lactation were used in this experiment. Animals were selected on the basis of breed, stage of lactation and daily milk yield. The selected buffaloes were divided into two groups of six each *viz*, Group T_0 (Control) and T_1 (Treatment). Group T_0 (Control) received standard concentrate mixture and Croup T_1 (Treatment) was fed as per Group T_0 plus supplemented with probiotics and rumen buffer 10 g/head/per day. The concentrate mixture was prepared as per BIS 1990 (Type-II) standards.

Composition of probiotics and rumen buffer

Live yeast count (Saccharomyces cerevisiae): Min 20×1012 CFU/kg

Bacillus Spores: Min 3×1011 CFU/kg

Buffer- Soda-bicarbonate: 62.7 Percentage

The present experiment was conducted on Murrah buffaloes at M.S. Patel buffalo Farm, Unit No.13, Aarey Colony, Goregaon, Mumbai-65, and in the Department of Animal Nutrition, Mumbai Veterinary College, Parel, Mumbai - 400012. This farm has standard housing, feeding and management practices with standard health care.

During trial period, the observation pertaining to daily milk yield, weekly milk composition and feed intake were recorded for both (Control and Treatment) the groups. The milk composition was studied in terms of milk protein, fat, total solids and SNF at weekly interval. The weekly efficiency of feed utilization was also calculated in terms of DM, TDN and DCP intake per kg FCM yield. The somatic cell count of milk was determined at fortnightly interval. The economics of milk production was also studied.

Analysis of feed, fodders and milk samples

The analysis for proximate principles and phosphorus was undertaken as per A.O.A.C. (2005) and calcium and phosphorus estimation were done as per Talapatra *et al.* (1940) in the laboratory of Department of Animal Nutrition, Mumbai Veterinary College, Parel, Mumbai - 400012.

The Composition of milk in relation to Total solids, Fat, Protein, Solids Not Fat (SNF) was studied at weekly interval with the help of Milkoscan (auto analyser). The fat corrected (7%) milk yield was calculated by using following formula given by Raafat and Saleh (1962).

7% FCM (kg) = (0.265 x milk yield in kg)+(10.5 x fat yield in kg)

Statistical analysis

Observations of various parameters recorded during experimental period were tabulated and data were statistically analyzed as per Snedecor and Cochran (1994) by using Complete Randomized Design.

RESULTS AND DISCUSSIONS

The average chemical composition (% DMB) of concentrate mixture, paragrass and paddy straw is given in Table 1.

The Overall performance of buffaloes from both the experimental groups is presented in Table 2. The average dry matter intake of buffaloes from Treatment group (T_1) was significantly (P<0.01) higher than Control group. Degirmencioglu *et al.* (2013) also found that yeast cultures (*Saccharomyces cerevisiae*) supplemented Jersey cows consumed significantly more DMI than non- Supplemented group. Opposing to the findings of present study, Alzahal *et al.* (2014) found that supplementation of direct-fed microbial (5.0×10^9 cfu/d of 3 strains of *Enterococcus faecium* and 2.0×10^9 cfu/d of *Saccharomyces cerevisiae*) (DFM) in diet had no effect on dry matter intake of Holstein Friesian cows.

The average milk yield and FCM yield of buffaloes from Treatment group (T_1) was significantly (P<0.01) higher than Control group. Related findings are reported by Acharya and Dhital (2018) observed that supplementation of *Saccharomyces cerevisiae* (SC) resulted in significant increase in milk yield than Control group. Azzaz *et al.* (2015) also observed that yeast culture (*Saccharomyces cerevisiae*) alone or in combination with *Propionibacterium freudenreichii* strain P169 had significantly increased (P<0.05) 4% FCM yield in mid lactating buffaloes. Contrary observations of present study, Clark *et al.* (2009) concluded that supplementation of *Sodium sesquicarbonate* did not affect 4% fat-corrected milk in Holstein cow. The efficiency of feed utilization in terms of DM required per kg of FCM yield produced was significantly (P<0.01) better in Group T_1 than Control group.

The average milk fat, protein, total solids, SNF and lactose percentage of Group T_1 was significantly (P<0.01) higher than Control group. Finding of present study resembled with Musa (2017) who reported that supplementation of sodium bicarnate (bicarb) significantly increase mean fat percentage of milk in Holstein Friesian crossbred cows. Maamouri *et al.* (2014) reported significant increase in milk fat in Treatment group i.e supplemented with 2.5 g of yeast *Saccharomyces cerevisiae* per cow per day as compare to Control group. Hossain *et al.* (2014) found that probiotics (*Saccharomyces cerevisiae*) supplementation had significant (P<0.05) increase SNF percentage of milk in multiparous cows. The average somatic

Table 1. Average chemical composition (% DMB) of concentrate mixture, paragrass and paddy straw.

Nutrient %	Concentrate mixture (For all the groups)	Paragrass	Paddy straw
Moisture	8.86	63.65	7.57
Organic matter	94.27	88.78	87.13
Crude protein	15.96	7.89	3.25
Ether extract	4.26	2.85	1.23
Crude fibre	14.00	26.74	35.36
Nitrogen free extract	60.05	51.3	47.29
Total ash	5.73	11.22	12.87
Calcium	1.15	0.25	0.41
Phosphorus	0.41	0.21	0.18

Table 2. Overall performance of buffaloes from both the experimental groups.

Parameters	Control	Treatment	Significance
Dry matter intake (kg)	15.36±0.021	15.62±0.038	**
Milk yield (kg)	9.47±0.04	9.89±0.03	**
FCM yield (kg)	9.73±0.07	10.54±0.08	**
Feed efficiency			
DM intake (kg)/kg FCM yield	1.58±0.01	1.48±0.01	**
Milk composition			
Fat (%)	7.26±0.05	7.62±0.05	**
Protein (%)	3.16±0.02	3.41±0.04	**
Total solids (%)	15.84±0.06	16.72±0.10	**
S.N.F. (%)	8.58±0.03	9.09±0.06	**
Lactose %	4.34±0.02	4.50±0.03	**
SCC (somatic cell count) ($\times 10^5$ /ml of milk)	2.97±0.07	2.12±0.37	*
Economics			
Average daily FCM production (kg/buffalo)	9.73	10.53	
Total cost of FCM production (₹ /kg)	43.01	39.94	
Daily income from milk sale** (₹)	615.55	642.85	
Daily profit through sale of milk (₹ /buffalo)	197.05	222.25	
Extra profit over control (₹ /buffalo)	--	25.20	

*Significant at 5% level, **Significant at 1% level

cell count of milk of buffaloes form Group T_1 was significantly ($P<0.05$) lower than Control group. This indicated positive effect of probiotic and buffer supplementation on udder or mammary health. Lower SCC credited to favorable role of probiotic and rumen buffer that are intermediating immune response for fighting mastitis infection of the udder. Degirmencioglu *et al*. (2013) also reported that supplementation of *Saccharomyces cerevisiae* significantly lowers the somatic cell count (SCC) in milk ($P<0.05$; 3.33 and 1.08 SCC (log 10/mL) for control and SC-treated groups, respectively).

The economics of the study showed that group receiving probiotics and rumen buffer recorded more profit over Control group by ₹. 25.20. Thus, it is seen that combine supplementation of probiotics and rumen buffer in lactating buffalo was cost effective.

CONCLUSION

Overall findings of the present study, it can be concluded that combined supplementation of probiotics like yeast (*Saccharomyces cerevisiae*), bacteria (*Bacillus subtilis, Bacillus pumilus* and *Bacillus amyloliquifaciens*) and rumen buffer 10 g/day/buffalo is beneficial for improving production performance of buffaloes in terms of milk production, its composition, nutrient intake, feed efficiency with positive effect on udder health by reducing milk somatic cell count. Such combine supplementation is also cost effective. Thus, it can be inferred that for enhanced production performance in lactating buffaloes and for higher profit margin use of combined supplementation of probiotics and rumen buffer is beneficial.

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