

Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1005.048>

Effect of Feeding Multi-Strain Probiotic on Feed Intake and Milk Production Performance in Murrah Buffaloes

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ABSTRACT

Keywords

Murrah buffaloes, milk production performance, multi-strain probiotic, dry matter intake, milk yield, body condition score

Article Info

Accepted:
12 April 2021
Available Online:
10 May 2021

Twelve Murrah buffaloes (in their early lactation) were divided into two groups of six buffaloes each on the basis of average daily milk yield. Group I was set as control and Group-II was supplemented with multi-strain probiotic @ 20gm/animal/day for a period of 90 days. The feed intake, body condition score (BCS), feed conversion ratio (FCR), milk yield and 6% fat corrected milk yield were recorded. Significant difference in mean DMI (kg/d) was not observed between the treatment and control groups. The average daily milk yield was significantly ($P < 0.05$) higher in treatment group compared to control group of buffaloes. The feed conversion ratio (FCR) was significantly ($P < 0.05$) low in treatment group compared to control group of buffaloes. Supplementation of multi-strain probiotic did not have any influence on body condition score in Murrah buffaloes. The present research concludes that multi-strain probiotic supplementation @ 20gms/animal/day significantly lowered the FCR and significantly increased the milk yield in Murrah buffaloes.

Introduction

Livestock sector plays an important role in Indian economy and is an essential part of Indian agriculture. India is regarded as a home

of world's best buffalo germplasm. Among the Indian buffalo breeds, Murrah breed is unique and popular for its milk production. Murrah buffaloes are found throughout the country due to their higher milk production

potential coupled with adaptation to wide environmental conditions and feed conversion efficiency. Hence, it has been appropriately named as the black gold of India. Buffalo milk plays an important role in providing nutritive food to families both in rural and urban areas. Composition of milk is economically important to milk producers, important to dairy industries for producing better quality products and nutritionally important to milk consumers for their health. Nowadays along with fat percentage, other milk components such as solid not fat (SNF), total solids (TS), protein, lactose and ash are also measured (Malek dos Reis *et al.*, 2013). Milk fat represents chief constituent of buffalo milk followed by lactose and protein.

Modern dairy farms are targeting high milk production utilizing feed composed of high concentrates to meet the metabolic demand of the higher milk production. Such feeding system is associated with metabolic dysfunctions especially during poor feeding condition and composition. One of the novel approach to counter the effects of metabolic disorders and to improve the milk production in dairy animals is the supplementation of probiotics.

Probiotics are live micro-organisms which when administered in adequate amounts confer a health benefit on the host (WHO). Most of commercial products use multi-strain probiotics, although the benefits of incorporating more strain and/or species in one product has not been clearly determined. The microorganisms, that are frequently used as probiotics in animal feeds includes, lactic acid bacteria (such as *Lactobacillus* spp., *Streptococci* spp., *Bifidobacterial* spp.) and anaerobic fungi (yeast) (i.e. *Saccharomyces cerevisiae*, *Saccharomyces boulardii* and *Aspergillus oryzae*) that are normally, found in the gut of the animal (Jouany and Morgavi, 2007). In dairy animals, probiotics are

commonly used to improve ruminal and intestinal microflora populations, consequentially enhance the performance and health of animal, and boosts synthesis of protein and vitamins, as well as milk production and compositions. Several researchers reported that milk yield, milk fat yield, milk protein yield, casein yield, lactose percentage, total solid and solid-not-fat were significantly improved with probiotic feeding (Iwanska *et al.*, 2000; Meeske *et al.*, 2002 ; Hossain, *et al.*, 2014). Most of the literatures enlists that, modification of rumen microbial populations, enhancing feed digestibility and nutrient absorption, rumen pH regulation, colonization of gastro-intestinal tracts and competitive exclusion of pathogenic agents, production of antimicrobial substances and altering gene expression of pathogenic microorganisms were among common modes of action of probiotics in improving the production performance of dairy animals. Since there is paucity of information on the effect of feeding multi-strain probiotics on milk production performance in Murrah buffaloes, the present research is proposed with the following objectives to find effect of multi-strain probiotic supplementation on feed intake, body condition score, milk production, milk constituents and cost on milk production in Murrah buffaloes.

Materials and Methods

Twelve Murrah buffaloes in their early lactation were selected from Buffalo Research Station, Venkataramannagudem and divided into two groups of six buffaloes each on the basis on average daily milk yield in a completely randomized design (CRD). The average daily milk yield in each of the groups was similar before the start of the experiment. All the buffaloes were housed individually in a well-ventilated shed with a provision for individual feeding and watering facilities. The shed was provided with concrete flooring and

asbestos roof with good ventilation facilities. All the buffaloes were fed with chopped green fodder (Hybrid Napier), dry fodder (paddy straw) and concentrate as the basal diet individually as per their nutrient requirements (ICAR 2013). The buffaloes were divided into two groups i.e. Group I is control and Group-II was supplemented with multi-strain probiotic containing 6 bacterial strains (*Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Lactobacillus reuteri*, *Lactobacillus lactis*, *Streptococcus faecium*) and 2 yeast strains (*Aspergillus oryzae*, *Saccharomyces cerevisiae*) (2×10^9 cfu/gm) @ 20gm/animal/day for a period of 90 days.

All the experimental buffaloes were identified using ear tags. All the animals were vaccinated against HS and FMD and were dewormed one week prior to the start of the experiment. All the animals were allowed to have adaptation period for 15 days before the actual trial, during which they were fed with basal diet. After the adaptation period animals were fed with their respective treatment diets for 90 days. The diet of the experimental animals included chopped Hybrid Napier as roughage source and concentrate mixture. The feeding and watering of experimental animals was done individually and the amount of concentrate mixture and fodder was offered as per their nutrient requirement (ICAR 2013). The multi-strain probiotic Lactose Plus® was procured from International Health Care Limited, Vijayawada, Andhra Pradesh. The probiotic was mixed with concentrate mixture and offered as per the dose rate. Concentrate mixture was offered daily before milking the animals and green fodder at 10:00 h and 15:00 h. Clean drinking water was made available to animals round the clock. Daily feed offerings and refusals were recorded prior to the morning feeding to obtain feed intake of each animal. The leftover of the concentrate mixture, if any was weighed one hour after it

was offered. Feed intake (kg) was obtained at every 24 hours by subtracting the quantity of feed left from the quantity of feed offered. Milking was done twice daily (AM and PM) and milk yield records were maintained throughout the experimental period (90 days after start of experimental period). Daily milk yield was obtained by adding AM and PM yields. Feed conversion ratio was calculated by dividing the total DMI (kg) by the milk yield (kg) of the experimental animals. Body condition score (BCS) was determined by using BCS scale developed by Alapati *et al.*, (2010). The Body condition score will be studied at monthly intervals. The properly classified and tabulated data collected during the experimental period were subjected to statistical analysis by adopting appropriate methods of analysis of variance as described by Snedecor and Cochran (1994). The data obtained was analyzed according to statistic computer program SPSS version (15.01) (SPSS, 2006).

Results and Discussion

Dry matter intake

The effect of multi-strain probiotic supplementation on mean DM intake (DMI) in Murrah buffaloes is represented in the Table 1. The results of the present study revealed that there was no significant difference in DMI (kg/d and % body weight) between the treatment and control groups. Similar results of non-significant difference in DM intake with probiotic supplementation was reported by Gujjar *et al.*, (2006) in lactating buffaloes. The DM intake was also not influenced with supplementation of *Saccharomyces cerevisiae* or *Aspergillus oryzae* (Bach *et al.*, 2007) in Holstein cows. Kumar (*et al.*, 2016c) observed no significant difference in DMI (% body weight) with probiotic supplementation on lactating Barbari goats corroborated with present results. The present results were also

consistent with the findings of Arambel and Kent (1990); Wholt *et al.*, (1991); Soder and Holden (1999); Schingoethe *et al.*, (2004) who reported no significant difference in DM intake in lactating cows supplemented with probiotic. Earlier reports revealed that probiotics are metabolically active in the rumen, at least for a short time (Kung *et al.*, 1997), thereby modifying ruminal fermentation and stimulating microbial growth (Erasmus *et al.*, 2005). Such changes are often associated with increased dietary fiber digestibility (Guedes *et al.*, 2008), which could increase rate of passage and therefore improve DMI. In the current study, multi-strain probiotic supplementation was improved DMI in buffaloes compared to the control, but the difference was not significant. Contrary to the present findings, Alshaikh *et al.*, (2002) and Kumar *et al.*, (2011b) reported a decrease and increase in DMI in cows and Graded Murrah buffaloes, respectively supplemented with yeast culture.

Effect on daily milk yield (kg) and 6% fat corrected milk yield

Effect of probiotic supplementation on average daily milk yield (kg) and 6% fat corrected milk yield in Murrah buffaloes is represented in the Table 2. From 2nd week onwards, the average daily milk yield started to increase in probiotic supplemented buffaloes compared to the control buffaloes and the difference was statistically significant ($P < 0.05$) from 8th week onwards till the end of the experiment. From 2nd week onwards, the 6% fat corrected milk yield started to increase in probiotic supplemented buffaloes compared to the control buffaloes and the difference was statistically significant ($P < 0.05$) from 9th week onwards till the end of the experiment. The results obtained in the present study is consistent with the findings of El-Bordeny *et al.*, (2019) who reported increased milk

production in Egyptian buffaloes supplemented with yeast-based probiotics. Similar results of increased milk yield and 4% fat corrected milk yield ($P < 0.05$) was reported in probiotic supplemented buffaloes compared to the control (Azzaz *et al.*, 2015). A significant ($P > 0.05$) increase in 6% fat corrected milk (FCM) yield was also observed by Kumar *et al.*, (2011b) in probiotic supplemented buffaloes over to the control group. Increase in 4% fat corrected milk in probiotic supplemented cows reported by several earlier studies (Sretenovic *et al.*, 2008; Alshaikh *et al.*, 2002; Moallem *et al.*, 2009) corroborated with present research. In a similar study, milk yield was increased from third week onwards in cows supplemented with multi-strain probiotic (Vibhute *et al.*, 2011) is consistent with present findings. Parallel to the present findings, Shreedhar *et al.*, (2016) reported that multi-strain probiotic supplementation increased milk production in crossbred cows. In the present study, multi-strain probiotic supplementation increased 15.53% milk yield in Murrah buffaloes compared to the control. Similar results of 11.5 and 12.7% higher daily milk yield was reported with probiotic feeding in cows (Diler *et al.*, 2014). Parallel to the present findings Yasuda *et al.*, (2007) reported 3-16% increase of milk production in Holstein Friesian cows with probiotics supplementation.

The increased milk production with multi-strain probiotic supplementation in buffaloes in the present study might be due to the altered rumen fermentation patterns in favour of propionate, (Aikman *et al.*, 2011) and stabilization of ruminal pH which improved propionic acid production resulted increased milk production (Beauchemin *et al.*, 2003). Further, the yeast in the multi-strain probiotic supplementation may increase the cellulolytic bacteria and fibre digestion in the feed (Denev *et al.*, 2007).

Table.1 Effect of probiotic supplementation on dry matter intake in Murrah buffaloes

Week	Dry matter intake (kg)	
	C	T
1	17.58±0.12	17.59±0.33
12	19.45±0.17	22.40±0.25
Overall mean	18.59±0.21	19.52±0.34

Table.2 Effect of probiotic supplementation on daily milk yield and 6% fat corrected milk in Murrah buffaloes

	Week	C	T
	Daily milk yield	1	7.58±0.5
12*		9.14±0.1 ^a	11.78±0.36 ^b
Overall mean		8.24±0.34 ^a	9.52±0.14 ^b
6% fat corrected milk	1	8.51±0.16	8.52±0.39
	12*	8.94±0.14 ^a	10.47±0.23 ^b
	Overall mean	8.74±0.23 ^a	9.56±0.41 ^b

Means with different superscripts in a row differ significantly (*P<0.05).

Table.3 Effect of probiotic supplementation on feed conversion ratio in Murrah buffaloes

Week	Feed conversion ratio	
	C	T
1	2.31±0.32	2.31±0.31
12*	2.12±0.45 ^a	1.89±0.21 ^b
Overall mean	2.25±0.33 ^a	1.73±0.13 ^b

Means with different superscripts in a row differ significantly (*P<0.05)

Table.4 Effect of probiotic supplementation on body condition score in Murrah buffaloes

Days	Body condition score	
	C	T
0th Day	3.16 ±0.15	3.2±0.13
90th Day	3.47±0.26	3.51±0.15
Overall mean	3.29 ±0.10	3.36±0.11

Yeast supplements containing *Saccharomyces cerevisiae*, are known to be rich sources of enzymes, vitamins, other nutrients and important co-factors, have been reported to produce a variety of beneficial production responses (Rai *et al.*, 2013). Probiotics may also improve the immune mechanism against the gastrointestinal pathogens and hence more productivity (Walker, 2008). However, Raeth-

knight *et al.*, (2007) observed no significant effect of direct fed microbials in the milk yield of Holstein dairy cows.

Feed Conversion Ratio (FCR)

Effect of multi-strain probiotic supplementation on feed conversion ratio in Murrah buffaloes is represented in the Table 3.

From 2nd week onwards, the feed conversion ratio (FCR) was decreased in probiotic supplemented buffaloes compared to the control buffaloes and the difference was statistically significant ($P < 0.05$) from 8th week onwards. The results of the present study are consistent with the findings of Zhang *et al.*, (2013) who reported decreased FCR in probiotic supplemented buffaloes compared to the control. The increased feed efficiency reported by Hansen *et al.*, (2017) in probiotic supplemented buffaloes also corroborated with present findings. Similar results of increased feed efficiency with probiotic supplementation also reported by several authors (Hagg *et al.*, 2010; Moallem *et al.*, 2009; Schingoethe *et al.*, 2004) in cows. The multi-strain probiotic supplementation might have increased various digestive processes, especially cellulolysis and the synthesis of microbial proteins. The cells of *Saccharomyces cerevisiae* provide growth factors for rumen microbes, including organic acids and oligosaccharides, B vitamins, and amino acids, which stimulate microbial growth in the rumen, thereby indirectly stabilizing ruminal pH (McDonald *et al.*, 2011). This might be responsible for better FCR in probiotic supplemented buffaloes

Body condition score

Effect of multi-strain probiotic supplementation on mean body condition score in Murrah buffaloes is represented in the Table 4. The results of the present study revealed that the BCS was not significantly different between the control and experimental buffaloes throughout the experiment. Similar findings were observed by Dann *et al.*, (2000), Nocek and Kautz (2006) and Bruno *et al.*, (2009) who reported no significant difference in mean body condition score when cows supplemented with probiotics. Previous reported data on Holstein Friesian dairy cows (Berry *et al.*, 2006) revealed that the average change in body weight per unit change in BCS

(scale of 1 to 10) was 31 kg. Enevoldsen and Kirstensen (1997) reported that a change of 1 unit in BCS (scale 1 to 5) was associated with a change of 32 to 47 kg LWT, while Grainger, Wilhems and McGowan (1982) reported a change of 42 kg LWT per unit change in BCS (scale 1 to 8). In the present study, the BCS was high in probiotic supplemented buffaloes but the difference was not significant. From the above findings it was evident that due to less difference in bodyweight changes during lactation between the treatment and control groups, the BCS difference may be not significant between the groups.

Multi-strain probiotic may be supplemented to the buffaloes @ 20gms/animal/day for economic milk production. Milk quantity and quality in terms of its constituents may be improved particularly under roughage-based buffalo productions system.

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How to cite this article:

Yaswanth Naidu, Y., K. Ananda Rao, Ch. Venkata Sessaiah, D. Srinivas Kumar and Sri Lekha, M. 2021. Effect of Feeding Multi-Strain Probiotic on Feed Intake and Milk Production Performance in Murrah Buffaloes. *Int.J.Curr.Microbiol.App.Sci*. 10(05): 409-417.
doi: <https://doi.org/10.20546/ijcmas.2021.1005.048>