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Performance Analysis of Post-weaned Buffalo Calves Using Probiotic Supplement Under Stall Feeding System

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Abstract

The present study was conducted to evaluate post-weaned buffalo calves that were fed a basal diet and a probiotic-supplemented diet under a stall-feeding system. The parameters recorded were body weight, weekly body weight, final body weight, and body confirmation (height, length, and girth). The results showed that, compared with group A, the initial and final body weight gains at the end of the first week and 12th week of the experiment were higher (P<0.05) in Kundhi buffalo calves of group B supplemented with probiotics. The results for initial and total body height of Kundhi buffalo calves during the 1st week and 12th week were, respectively, comparatively higher in group B than in group A. The results for initial and total body length of Kundhi buffalo calves during the 1st week and 12th week were compared with group A calves fed on a basal diet, and were comparatively (P < 0.05) higher in group B. The results for initial and final heart girths of Kundhi buffalo calves during the 1st week and 12th week were observed to be comparatively (P<0.05) higher in group B than in group A. Health status was better in group B than in group A. The final body weight gain and (length, height, and girth) were observed to be maximum in the Kundhi buffalo calves, which were fed on the probiotic-fed diet enriched with nutrients, as compared with other fed diets in the stall-feeding management system.

Keywords: Buffalo, calves, feeding system, performance, post-weaned, probiotics, stall feeding system

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Introduction

Calves are generally a significant profit source for farms; hence, calving is one of the most essential and complicated management strategies in cow farms. As a result, it is critical to implement nutrition strategies to optimise calves' growth and health (Kumalasari et al., 2025; Arain et al., 2021). Many farmers use various antibiotics to treat and prevent diarrhoea in calves. Such a practice has been very effective on food security because it is possible to find out the residual medication in foods from animal origin that could affect animal as well as human health in different forms of intoxication and allergies, as well as increasing antimicrobial resistance in bacteria, humans, as well as in animals (Nursakilah et al., 2025; Bhutto et al., 2025)

Probiotics are living microorganisms that improve the gut microbiota and immune system in livestock and humans; they also serve as prophylactics and therapeutic agents in various clinical and subclinical veterinary practices (Celiberto et al., 2017; Khan et al., 2023). Probiotics are widely used in various forms due to their beneficial effects on the host body when administered at appropriate doses. Various species related to Bifidobacterium, Lactobacillus and Lactococcus are famous probiotic agents today (Khan et al., 2024). Currently, the use of dietary probiotics is preferred for their nutritional benefits, their role in maintaining animal health, and their potential to enhance feed efficiency, despite adverse effects on consumers (Shehata et al., 2024; Ogahi et al., 2025). It has been proven that probiotics have a very beneficial influence on the GIT tract (gastrointestinal tract (GIT), such as reducing the risk of diarrhoea and improving the immune system. Different strains of probiotics, such as Enterococcus faecium, have been studied in piglets that showed beneficial effects on the microbiota of the intestine, which showed a decrease in enteropathogenic bacteria load of some suckling piglets that were fed (SF68) (Shehata et al., 2024; Vessar et al., 2024).

The present study is designed to evaluate the growth performance, body conformation, and health conditions of buffalo calves under a stall-feeding management system that fed a probiotic-supplemented ration.

Material and methods

Animals and their management

Twelve post-weaned buffalo calves, about 3 months old (90 - 100 days old), were preferred for the experimental work. At the start of the experiment, each kid was assigned a unique identification number using ear tags and was also treated for external and internal parasites with Ivermectin and Albendazole. The present experiment was performed at the experimental station of the Livestock Department, Sindh Agriculture University, Tandojam.

Experimental design

The calves were randomly divided into two groups (A and B). Group A comprised 06 post-weaned buffalo calves, which were reared under a stall-feeding management system. They were fed a concentrate ration and green fodder at the animal shed. The water was provided ad libitum. Group B: Comprised of 06 post-weaned buffalo calves, which were kept under stall feeding management at the livestock experimental station. They were fed a concentrate ration mixed with probiotic supplements Calf Pre RD by Ghazi Brothers (4 grams/calf/day), functional ingredients are present in Table 1, and green fodder. During the experiment following parameters were recorded:

Body weight (kg):

The initial body weight of calves was recorded after 15 days of arrival by a weighing machine at the livestock experimental station. Weekly body weight

was recorded in the morning before feeding, and final body weight was recorded at the end of the research (Noori et al., 2016).

Body confirmation:

Body conformation (Height, Length, and Girth) was measured every week. The height of the body was measured from the wither top to the end of the roof, and the length of the body was recorded from the shoulder point to the pin bone. The girth of the body was recorded by the circumference of the chest behind the elbow point (Noori et al., 2016; Farooq et al., 2022).

Health status:

Kundhi buffalo calves were monitored regularly for conditions such as Enteritis, Diarrhoea, Calf scour, Pneumonia, Joint ill, Temperature and Anorexia

Functional Ingredients	Contents per kilogram
Enterococcus faecium	$3.125x10^{11}$ CFU/kg
Bacillus subtilis	$3.2x10^{11}$ CFU/kg
Bacillus licheniformis	$3.2x10^{11}$CFU/kg
Ruminal bacteria fermentation	10.0
Vitamin A	500. IU
Vitamin B	500. IU
Vitamin C	500. IU
Vitamin D3	500. IU
Vitamin E	500. IU
Organic Zinc	0.5
Acetic Acid	0.5

Table No 1: Composition of probiotic supplements

Statistical analysis:

The collected data were tabulated and analysed using one-way analysis of variance (ANOVA) in Statistics 8.1. In case of significant differences that appeared, the means were compared using Tukey's comparison test at 95% level of Probability.

Results

Total body weight (kg) of buffalo calves fed with a basal diet and supplemented with probiotics:

The effect of experimental treatments on total body weight (kg) of buffalo calves fed with a basal diet and supplemented with probiotics is shown in Table 2. The initial body weight of group A (fed on a basal diet) and group B (supplemented with probiotics) was observed as 50.60 kg and 50.49 kg, respectively, where, up to the end of the experimental trial (12^{th} week), it was recorded at 83.54 kg and 92.23 kg in both groups A and B, respectively. Statistical results revealed significant ($P<0.05$) variation in the weekly weight gain of calves within and between both groups (A and B). However, the increase in weight gain was comparatively ($P<0.05$) higher in Kundhi buffalo calves of group B supplemented with probiotics compared to group A calves fed on a basal diet. Means with common superscript alphabets each column is significantly ($P < 0.05$) different.

Weeks	Group A (Basal diet)	Group B (Probiotic supplementation)
0 (Initial body weight)	50.60^{o}	50.49^{o}
1	52.62^{no}	53.51^{no}
2	55.36^{mo}	56.59^{lo}
3	58.42^{ko}	59.57^{jo}
4	61.28^{io}	63.22^{hn}
5	64.69^{gm}	66.52^{gl}
6	66.39^{gl}	70.60^{ei}
7	69.38^{fj}	67.77^{fk}
8	72.29^{dh}	78.64^{bf}
9	75.49^{cg}	82.36^{ad}
10	70.14^{ej}	85.87^{ac}
11	80.83^{be}	89.05^{ab}
12	83.54^{ac}	92.23^{a}
Total increase in body weight (kg)	861.03	916.42
LSD (0.05) = 10.875 SE± = 2.9585		

Table No 2: Total body weight (kg) of buffalo calves fed with a basal diet and supplemented with probiotics

Body height (cm) of buffalo calves fed

with a basal diet and supplemented with probiotics:

The results for initial body height and total body height of Kundhi buffalo calves fed a basal diet and supplemented with probiotics are described in Table 3. The initial body height of group A (fed on a basal diet) and group B (supplemented with probiotics) was observed as 66.92 and 67.31 cm, respectively, where, up to the end of the experimental trial (12th week), it was recorded at 77.47 and 79.40 cm in both groups A and B, respectively. Statistical results revealed significant ($P<0.05$) variation in the weekly height of calves within and between both groups (A and B). However, the increase in height was comparatively ($P<0.05$) higher in Kundhi buffalo calves of group B supplemented with probiotics compared to group A calves fed on a basal diet. Means with common superscript alphabets each column is significantly ($P < 0.05$) different.

Weeks	Group A (Basal diet)	Group B (Probiotic supplementation)
0 (Initial body height)	66.92^{i}	67.31^{i}
1	67.18^{i}	68.78^{gi}
2	67.94^{hi}	69.82^{fi}
3	68.91^{gi}	70.96^{ei}
4	69.97^{fi}	71.98^{dh}
5	70.18^{ae}	73.96^{cf}
6	72.05^{dh}	74.37^{cf}
7	72.89^{dg}	74.82^{be}
8	73.63^{cf}	75.79^{ad}
9	74.65^{be}	76.45^{ad}
10	75.48^{ae}	77.67^{ac}
11	76.53^{ad}	78.94^{ab}
12	77.47^{ac}	79.40^{a}
Total increase in body height (c.m)	10.55	12.09
LSD (0.05) = 1.7960 SE± = 0.4886		

Table No 3: Body height (cm) of buffalo calves fed with a basal diet and supplemented with probiotics

Body length (cm) of buffalo calves fed with a basal diet and supplemented with probiotics

The results for initial body length and total body length of Kundhi buffalo calves fed a basal diet and supplemented with probiotics are presented in Table 4. The initial body length of group A (fed on a basal diet) and group B (supplemented with probiotics) was observed as 77.06 and 75.94 cm, respectively. Up to the end of the experimental trial (12th week), it was recorded at 92.07 and 96.39 cm in both groups A and B, respectively. Statistical results show significant ($P<0.05$) variation in the weekly length of calves within and between both groups (A and B). However, the increase in length was comparatively ($P<0.05$) higher in Kundhi buffalo calves of group B supplemented with probiotics compared to group A calves fed on a basal diet. Means with common superscript alphabets each column is significantly ($P < 0.05$) different

Weeks	Group A (Basal diet)	Group B (Probiotic supplementation)
0 (Initial body length)	77.06^{df}	75.94^{ef}
1	78.02^{df}	77.57^{df}
2	79.24^{bf}	79.04^{cf}
3	81.28^{af}	81.20^{af}
4	83.21^{af}	82.42^{f}
5	84.25^{ae}	83.82^{ae}
6	85.49^{ae}	84.88^{ae}
7	87.32^{ae}	86.86^{ae}
8	89.17^{ae}	88.92^{ae}
9	90.29^{ad}	90.80^{ad}
10	90.90^{ad}	89.89^{ae}
11	91.44^{ac}	92.71^{ac}
12	92.07^{ab}	96.39^{a}
Total increase in body length (c.m)	15.01	20.45
LSD (0.05) = 5.5703 SE± = 1.4882		

Table No 4: Body length (cm) of buffalo calves fed with a basal diet and supplemented with probiotics

Heart girth (cm) of buffalo calves fed with a basal diet and supplemented with probiotics:

The results related to the initial heart girth and total heart girth of Kundhi buffalo calves fed with a basal diet and supplemented with probiotics are shown in Table 5. The initial heart girths of group A (fed on basal diet) and group B (supplemented with probiotics) were observed as 84.32 and 84.81 cm, respectively, where, up to the end of the experimental trial (12th week), they were recorded at 98.52 and 103.07 cm in both groups A and B, respectively. Statistical results revealed significant ($P<0.05$) variation in the weekly heart girth of calves within and between both groups (A and B). However, the increase in heart girth was comparatively ($P<0.05$) higher in Kundhi buffalo calves of group B supplemented with probiotics compared to group A calves fed on a basal diet. Means with common superscript alphabets each column is significantly ($P < 0.05$) different.

Weeks	Group A (Basal diet)	Group B (Probiotic supplementation)
0 (Initial heart girth)	84.32^{r}	84.81^{qr}
1	85.39^{q}	86.41^{p}
2	87.17^{op}	87.98^{no}
3	88.16^{n}	89.07^{m}
4	89.33^{m}	90.95^{l}
5	91.10^{l}	92.17^{jk}
6	89.10^{kl}	94.84^{h}
7	92.73^{ij}	96.54^{g}
8	93.54^{i}	97.79^{ef}
9	95.35^{h}	99.06^{d}
10	96.57^{g}	100.68^{c}
11	97.43^{f}	101.82^{b}
12	98.52^{e}	103.07^{a}
Total increase in heart girth (cm)	14.2	18.26
LSD (0.05) = 0.3382 SE± = 0.0920		

Table No. 5: Heart girth (cm) of buffalo calves fed with basal diet and supplemented with probiotics

Health status

The results for health status, as described in Table 6, showed that, due to proper vaccination and management practices, no health status was diagnosed in Kundhi buffalo calves fed the probiotic-supplemented diet in group B. In contrast, Diarrhea and sneezing were observed in the Kundhi buffalo calves fed the basal diet in group A.

Observations	Group A	Group B
Sneezing	Diagnosed	-
Diarrhea	Diagnosed	-
Constipation	-	-
Pneumonia	-	-
Dehydration	-	-

Table No 6: Health status of Kundhi buffalo calves fed with a basal diet and supplemented with a probiotic supplement

Morbidity and mortality of Kundhi buffalo calves (%):

The results for health status parameters in our study showed that (16.67%) morbidity was observed in group A, and (0%) morbidity was observed in group B calves of Kundhi buffalo fed on a basal diet and probiotic supplemented. Details are given in Table 6. However, there was (0%) mortality observed in both groups of calves fed on a basal diet and probiotic-supplemented diets.

Group	Morbidity%	Mortality %
A	16.67%	0%
B	0%	0%

Table No 7: Health status, morbidity, and mortality % of Kundhi buffalo calves fed with a basal diet and supplemented with a probiotic supplement

Discussion

In Pakistan, keeping buffalo, especially In Sindh, it is done using traditional methods, and there has been no significant development in modern farming. However, the Kundhi buffalo, mainly found along the Indus River across Sindh, has the potential to not only meet the

requirement for earning foreign currency by exporting meat, milk, and other byproducts. In such an earning process, management and feeding play a key role in body growth and the confirmation of Kundhi buffalo calves (Bacchu et al., 2015).

The findings of our study showed that initial body weight and total weight gain during the 1st week and 12th week were observed (50.60o kg and 50.49o kg), (83.54 kg and 92.23 kg) in groups A and B, respectively. The results of the study showed that there was a significant difference (P<0.05) in the total weight gain of Kundhi buffalo calves fed a probiotic-supplemented diet as compared with Kundhi buffalo calves fed a basal diet. The findings of the current study are supported by Hussein's (2014) experiment, in which calves fed probiotic supplementation and antibiotics showed a significantly higher initial body weight than the control group, which was fed green fodder and a concentrated ration under the stall-feeding management system. Similar types of results described by (Higginbotham & Celiberto, 2017; Barham et al., 2024) were also investigated during the month. They reported that significant differences in final body weight gain and growth rate were observed in calves fed a probiotic-supplemented diet compared with other feeding rations in the stall-feeding management system.

In the present study, results showed a positive increase in weekly body weight in both groups at the end of the experimental week. However, the results showed that calves fed only mother's milk showed decreased weight gain and weekly body weight. While significant (P<0.05) increases in weekly body weight and weight gain were observed in the calves reared on a probiotic supplement. The findings of our investigation were consistent with those of Roodposhti and Dabiri. (2012), who reported that the buffalo calves that were fed probiotic supplementation showed significant improvement in the weekly body weight, growth rate, feed conversion ratio, and body weight gain. In our study the results for initial and final body height of Kundhi buffalo calves during the 1st week and 12th week were observed to be significantly higher (P<0.05) in group B with probiotic-supplemented diet as compared with A group calves fed with basal diet (66.92 and 67.31 cm), (77.47 and 79.40 cm) in group A and B, respectively. The results of the study showed that final body height was higher in Kundhi buffalo calves fed a probiotic-supplemented diet than in those fed a basal diet. Similar type of experiment conducted by Frizzo et al. (2010), who reported that increased the in weekly body height, length and heart girth, body growth, body weight and body length is very much beneficial condition due to such continuation calves can be able to improve their immune system and resist different types of neonatal diseases, which mainly affect the calves during this stage such as diarrhea, worms and colic etc. He further reported that various methods of probiotic functional activity could enable them to work with different types of nutrients released by antibacterial compounds in the GIT tract and allow them to establish a proper niche in the intestinal mucosa, thereby enhancing the immune system of calves.

The results for initial and final body length of Kundhi buffalo calves during the 1st week and 12th week was observed significantly higher (P<0.05) in group B Kundhi buffalo calves fed on probiotic supplemented as compared with calves of group A fed with basal diet (77.06 and 75.94 cm), (92.07 and 96.39 cm) in group A and B, respectively. The results of the study

showed that the final body length was higher in Kundhi buffalo calves fed a probiotic-supplemented diet than in those fed a basal diet. The findings of our study are consistent with those of Salvedia and Supungcoto (2017) and Du et al. (2025), who reported that probiotic supplementation increased growth performance traits, such as average body length and body girth, in crossbred calves by improving metabolism and body weight. The results for initial heart girth and final heart girth of Kundhi buffalo calves during the 1st week and 12th week was observed significantly higher ($P<0.05$) in Kundhi buffalo calves of group B fed with probiotic supplemented diet as compared with calves of group A fed with basal diet (84.32 and 84.81 cm), (98.52 and 103.07 cm) in group A and B respectively. The results of the study showed that initial body length was higher in Kundhi buffalo calves fed a probiotic-supplemented diet than in those fed a basal diet. The results of our study are consistent with those of Frizzo et al. (2010) and Yu et al. (2024), who reported that probiotic supplementation may help improve calves' intestinal health during periods of challenge. The transportation of animals from far-off places also seriously affects body weight and external and internal health, including the microflora, which may cause multiple pathogenic diseases, such as diarrhoea.

The results for body health conditions were significantly better in group B than in group A. The Kundhi buffalo calves fed on a basal diet were observed to have a 16.67% morbidity rate in group A and 0% in group B; however, both groups fed a basal diet and a probiotic-supplemented diet had 0% mortality. The findings of Frizzo et al. (2010) and Alharbi (2025) are consistent with our study. Both groups showed better health performance, as measured by the concentration ratio and the probiotic-supplemented ratio, in dairy calves. It is reported that in our country, animals are kept on a grazing method or provided with green fodder, which may include poor-quality, nutrient-dense feedstuffs with low protein and energy and a high fibre content. It is also reported that a higher-protein, higher-energy feeding method is a significant factor in improving rumen activity. Low provision of major nutrients leads to reduced utilisation of essential nutrients. The findings of Tauqir et al. (2011) and Yu et al. (2024), who reported that the feeding system for calves should be based on a scientific method, which does not decrease the pathogen threats but also improves the deficiency of proper nutrients that are required by the animal body for adequate growth, weight, height, length, and girth. He said that probiotic supplementation can enhance rumen activity to the maximum by improving and increasing the population and growth of rumen microflora. Hence, such activity can also improve the fermentation activity of the rumen, which is required for better performance and production from buffalo calves.

Innovation statement

This study highlights the effectiveness of probiotic supplementation in improving growth performance, body conformation, and health status of post-weaned Kundhi buffalo calves under a stall-feeding system. It shows that a low-dose commercial probiotic supplementation can increase weight gain and structural traits while reducing morbidity without the use of antibiotics. These findings support antibiotic-free feeding strategies and provide practical evidence for improving the productivity of indigenous buffalo breeds through better gut health management.

Conclusion

The final body weight gain and (length, height, and girth) were observed to be maximum in the Kundhi buffalo calves, which were fed on the probiotic-fed diet enriched with nutrients, as compared with other fed diets in the stall-feeding management system.

Recommendations

Based on the findings of this study, it is recommended that probiotic supplementation (4 g/calf/day) should be incorporated into the feeding regimen of post-weaned buffalo calves to improve growth performance, body conformation, and overall health under stall-feeding systems. Farmers are encouraged to reduce the routine use of antibiotics and adopt probiotics as a safer alternative to minimise antimicrobial resistance and drug residues in animal products. The inclusion of probiotics in balanced concentrate diets along with good-quality green fodder can further enhance nutrient utilisation and rumen activity. This approach is particularly beneficial for traditional farming systems in regions like Sindh to improve the productivity of indigenous breeds such as the Kundhi buffalo. Additionally, regular health monitoring should be practiced reducing disease incidence and improve calf welfare. Future research with larger sample sizes, extended study periods, and different probiotic strains is also suggested to validate these results and assess economic feasibility.

Conflict of interest

The authors have declared no conflict of interest.

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