**Short Communication**

# Managmental Studies of Different Liquid Feeding Regimes for Nili-Ravi Buffalo Calves

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**Keywords:** Dry matter intake, linear body measurements, milk replacer, Nili-Ravi buffalo calves, weight gain, whole milk

**Abstract:**A liquid feeding trial was carried out at the Dairy Animals Training and Research Centre, UVAS Ravi Campus, Pattoki, to explore effective methods for rearing Nili-Ravi buffalo calves using alternative feeding sources. Twenty-four (n=24) buffalo calves were divided into three groups, with eight calves in each group, and fed for 90 days. The feeding regimes included Whole Milk (WM), Milk Replacer-Vegetable Protein (MR-VP), and Milk Replacer-Milk Protein (MR-MP), following a Completely Randomized Design. Data on daily dry matter intake, weekly weight gain, feed efficiency, fecal score and linear body measurements was collected and analyzed accordingly. Mean daily dry matter intake was significantly ($P<0.001$) higher (991.89±331.41gm) in calves on WM and lowest in calves raised on milk replacer (833.07±297.64 gm) diet. Mean daily weight gain in buffalo calves on WM, MR-VP and MR-MP was 227.18±88.04, 135.34±47.17, 189.72±86.99gm, respectively. Feed efficiency in calves

on MR-VP was best (0.23±0.08) as compared to calves raised on WM and MR-MP. The daily fecal score in calves on MR-VP was high (1.75±0.10) followed by MR-MP (1.70±0.16) and WM treatment (1.58±0.16), however statistically non-significant (P>0.05) difference among treatments. Body measurement (height at withers, body length and heart girth) data indicated a significant (P<0.05) difference between treatments. The results suggested mass scale use of milk replacer–vegetable protein source as an alternate to costly whole milk and furthermore, there is need to further investigate the indigenous milk replacers to make it more efficient and easily accessible to local farming community.

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**Abbreviations**

CP: Crude Protein

WM: whole milk

MR-VP: Milk replacer with vegetable protein

MR-MP: Milk replacer with milk protein

DM: Dry Matter

DMI: Dry Matter Intake

The livestock sub-sector serves as a vital component of our country's economy, providing essential food products such as milk, meat, and eggs. Buffalo, often referred to as the "Black Gold of Pakistan," holds critical significance due to its contributions to milk and meat production. In 2023–2024, Pakistan's buffalo population was estimated at 46.3 million, producing approximately 41.9 million tons of milk annually, with only 5% of milk is allocated for nourishing calves [1]. Modern dairy farming incorporates diverse feeding and management practices, such as the use of milk replacers, calf starters, and concentrate mixtures, to optimize general productivity [2,3].

Buffaloes are renowned for their naturally high milk fat content, ranging between 6-8.5%, and it is noteworthy that over 98.97% of the worldwide buffalo population, estimated at 205 million, is concentrated in Asia [4]. In South Asia, buffalo milk is more valued over cow milk due to its superior quality and commands a higher price in the market [5,6].

Economic constraints often prevent newborn calves from being fed whole milk in quantities adequate to meet their nutritional needs. Additionally, a significant number of calves are slaughtered at an early age to reserve milk for human utilization [7]. This practice contributes to increased early mortality and suboptimal growth in calves [8]. Given the increasing demand and rising cost of milk, raising calves on whole milk has become economically impractical. However, employing alternative feeding strategies can enhance both beef production and general development of replacement female calves, addressing these challenges viably [9].

Milk replacer is preferred and desirable when the price of whole milk is high as it resembles with fresh milk in composition and digestibility. Using milk replacer provides several advantages. It is free from diseases, including salmonella, and can be medicated to help prevent diseases. Additionally, it reduces the rate of incidence of scour in calves and enhances their nutritional intake by supplementing essential vitamins such as A, D, E, and B. Whole milk and milk replacer

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(20-22% CP and 15-20% fat) are early feeding regimens for dairy calves. Calves raised with a diet containing 20% crude protein (CP) have illustrated superior weight gain and improved feed efficiency [10].

During the early stages of life, calves rely completely on milk or similar liquid feeds and gradually transition to solid feed. Like other species, young calves cannot digest hard solid feed initially, making liquid feeds, such as whole milk or milk replacers, essential for their early growth, development and nutrition [11].

To address challenges such as sluggish growth and high early mortality rates in calves, techniques like substituting whole milk with milk replacers and early weaning need to be explored more. These approaches are broadly executed in modern dairy systems for breeds such as Holstein Friesian and Jersey cattle [8]. However, similar data or studies focusing on buffalo calves are not available, highlighting the need for further research in this area.

Considering the significance of alternative feeding programs for cost-effective raising of calves, a study was conducted to evaluate the impact of different feeding regimes, including whole milk and milk replacer, on the growth performance of Nili-Ravi buffalo calves. The study focused on key parameters such as weight gain, dry matter intake, body measurements, and fecal scores to evaluate the effectiveness of these feeding strategies in enhancing growth rate and feed efficiency.

A liquid feeding management study was conducted at the Dairy Animals Training and Research Centre, UVAS Ravi Campus, Pattoki, to evaluate alternative feeding strategies for Nili-Ravi buffalo calves. Twenty-four (n=24) calves, aged 3-4 days, were randomly allocated into three groups, each consisting of eight calves. The groups were raised on either whole milk (WM), milk replacer with vegetable protein (MR-VP), or milk replacer with milk protein (MR-MP). Liquid

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diets were administered at 10% of each calf's body weight, and calves had free-choice access to calf starter. Data were collected on parameters such as daily dry matter intake, weekly weight gain, feed efficiency, linear body measurements, and fecal scores, with feed intake measured on a dry matter basis.

The average initial body weight of each calf was noted at the start of the experiment. Thereafter, the weight of each calf was weighed at weekly intervals to monitor growth throughout the study period. Feed efficiency was calculated using the weekly feed consumption and weekly weight gain of calves by dividing weight gain (kg) from feed intake (DM basis). Fecal score of each calf was noted on daily basis. Fecal scoring, which shows the digestive health of calves, was evaluated on a scale from 1 to 5. Feces that retained their shape upon falling to the ground were scored as 1, while semi-formed, pasty feces were given a score of 2, loose feces that remained on top of the bedding were scored as 3, watery feces that seeped through the bedding were relegated a score of 4, and watery feces containing blood received a score of 5. Additionally, the body length (cm) of each calf was measured from the pin bone to the point of the shoulder. Heart girth (cm) was measured as the chest circumference behind forelegs. Body length (cm) was taken as length from the withers to the platform surface. Collected data were recorded in a spreadsheet and analyzed using Analysis of Variance Technique under Completely Randomized Design and means were compared through Least Significant Difference Test [12].

Mean daily dry matter intake was significantly ($P<0.001$) higher (991.89±331.41gm) in calves on WM and lowest in calves fed milk replacer containing vegetable protein (833.07±297.64gm) diet (Table 1). The findings of the present study indicated higher DMI on milk replacer-milk protein source than milk replacer-vegetable source but some studies reported no significant difference in DMI in Holstein Friesian calves fed on different sources of milk replacers during pre-weaning

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period [13,14]. The findings of Moallem et al. [15] contrast with the results of the present study as they reported higher DMI in Israeli Holstein heifer calves reared on milk replacer as compared to the whole milk during pre-weaning period.

Mean daily weight gain of buffalo calves on WM, MR-VP and MR-MP was 227.18±88.04, 135.34±47.17, 189.72±86.99gm, respectively (Table 1). Least Significant Difference (LSD) analysis revealed a significant ($P<0.05$) difference between the calves on WM and MR-VP but the non-significant difference between MR-MP and MR-VP. Some research studies also reporting higher weight gain in Sahiwal and Holstein calves on whole milk than on milk replacer [8,16-18].

Feed efficiency for each calf was recorded on weekly basis allocated to different treatments. Highest (0.23±0.08) feed efficiency was recorded on WM (control) feeding followed by MR-MP and MR-VP, respectively. Statistically feed efficiency difference was non-significant between treatments. Donovan et al. [13] also reported similar finding and recorded a non-significant ($P>0.05$) difference for feed efficiency in calves raised under different feeding regimes. The findings of Bhatti et al. [8] are consistent with the present findings and reported better feed efficiency in calves raised on whole milk as compared to those calves raised on milk replacer.

The daily fecal score of calves in on WM, MR-VP and MR-MP feeding was 1.58±0.16, 1.75±0.10, and 1.70±0.16, respectively. Statistically fecal score data indicated a significant ($P<0.05$) difference between the calves on WM and MR diets. The findings of Hill et al. [19] and Donovan et al. [13] are not in line with the present results as they reported no differences in fecal scores of calves on WM and milk replacer diets.

Mean height at wither (0.13±0.03cm) was highest in calves on WM followed by MR-MP (0.12±0.03 cm) and MR-VP (Table 2). The BL and heart girth in calves fed on WM, MR-VP and

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MR-MP was 0.13±0.03, 0.07±0.02 and 0.12±0.03 cm, 0.22±0.06, 0.13±0.06 and 0.20±0.06 cm, respectively. Body measurements regarding height at withers, body length and heart girth indicated a significant (P<0.05) difference between WM and MR-VP diets. Significantly (P<0.05) higher wither height, body length and heart girth was also reported in calves raised on WM as compared milk replacer [17,20].

The feeding trial assessed the impact of Whole Milk, Milk Replacer-Vegetable Protein, and Milk Replacer-Milk Protein on the growth performance of Nili-Ravi buffalo calves over a 90-day period. Results showed higher dry matter intake and weight gain in WM-fed calves, while MR-VP demonstrated superior feed efficiency. The study suggests milk replacers as cost-effective alternatives and highlights the need for further research on indigenous milk replacers for improved accessibility.

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**Table 1:** Mean (±SD) daily dry matter intake (DMI) weight gain, feed efficiency and fecal score in Nili-Ravi buffalo calves fed on different liquid feeding regimes

a,b,c Means with different superscripts within same column are significantly different (P<0.05)

| Treatments | DMI (gms) | Weight Gain (gms) | Feed Efficiency | Fecal Score |
|---|---|---|---|---|
| Whole Milk (WM) | 991.89±331.41[a] | 227.18±88.04[a] | 0.23±0.08[a] | 1.58±0.16[b] |
| Milk Replacer (MR-VP) | 833.07±297.64[c] | 135.34±47.17[b] | 0.16±0.05[a] | 1.75±0.10[a] |
| Milk Replacer (MR-MP) | 884.35±505.45[b] | 189.72±86.99[ab] | 0.21±0.08[a] | 1.70±0.16[ab] |

**Table 2.** Means (±SD) of height at wither (HAW), body length (BL) and heart girth (HG) in Nili-Ravi buffalo calves on weekly basis fed on different liquid feeding regimes

| Treatments | HAW (cm) | BL (cm) | HG (cm) |
|---|---|---|---|
| **Whole Milk (WM)** | 0.13±0.03[a] | 0.13±0.03[a] | 0.22±0.06[a] |
| **Milk Replacer (MR-VP)** | 0.08±0.03[b] | 0.07±0.02[b] | 0.13±0.06[b] |
| **Milk Replacer (MR-MP)** | 0.12±0.03[a] | 0.12±0.03[a] | 0.20±0.06[a] |

a,b Means with different superscripts within same column are significant (P<0.05)

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