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Optimizing reproductive performance: Substituting green fodder with concentrate mixture in lactating Murrah buffaloes

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Abstract

Livestock productivity, particularly within the dairy industry, relies heavily on optimizing feed resources. This study investigates the implications of replacing green fodder with concentrate mixture on reproductive parameters in lactating Murrah buffaloes. Murrah buffaloes play a crucial role in agricultural landscapes, particularly in countries like India, contributing significantly to milk, meat, and other by-products. Despite their importance, challenges such as low milk yield and poor reproductive performance persist, often due to inadequate feed resources and malnutrition. This study conducted at the Buffalo farm of the Department of Livestock Production Management, aimed to explore the impact of replacing green fodder with concentrate mixture on reproductive parameters. Eighteen lactating Murrah buffaloes were allocated to three dietary treatment groups. Various reproductive parameters, including days to attain post-partum estrus, open days, and number of services per conception, were observed. The findings reveal that replacing green fodder with concentrate mixture resulted in significant improvements in reproductive parameters. Buffaloes in treatment groups exhibited earlier attainment of post-partum estrus and reduced open days, indicating enhanced reproductive efficiency. These results align with previous research, reaffirming the positive impact of concentrate supplementation on reproductive performance in dairy animals. In conclusion, optimizing feed resources, particularly by increasing the concentration of concentrate mixture in the ration, can significantly improve the reproductive performance of lactating Murrah buffaloes. This study underscores the importance of feed optimization in ensuring the sustainability of the dairy industry amidst evolving agricultural landscapes and resource constraints.

Keywords: Optimizing, Substituting, green, concentrate, Murrah buffaloes

Introduction

In the pursuit of enhancing livestock productivity, particularly in the dairy industry, a pivotal focus lies on optimizing feed resources. This is particularly relevant in the context of lactating Murrah buffaloes, where the replacement of green fodder with concentrate mixture holds significant implications for reproductive parameters (Habib *et al.*, 2020; Mohd Azmi *et al.*, 2021; Mahesh and Thakur, 2018) [3, 7, 6]. Buffaloes, specifically Murrah breed, stand as an indispensable asset in the agricultural landscape of countries like India, contributing substantially to milk, meat, and other by-products.

Globally, the buffalo population, predominantly concentrated in Asia, underscores its agricultural importance. In India alone, which harbors a significant share of the world's buffaloes, the livestock sector's contribution to the economy is substantial (Wanapat and Chanthakhoun, 2015) [12]. However, challenges such as low milk yield and poor reproductive performance persist, often attributed to factors like inadequate feed resources and malnutrition.

Traditionally, livestock in developing countries, including India, rely heavily on agricultural by-products, crop residues, and grazing, supplemented with occasional concentrates. However, fluctuations in forage availability, exacerbated by factors like drought, necessitate adjustments in feeding strategies (Giridhar and Samireddypalle, 2015) [2]. During periods of fodder scarcity, buffaloes are often transitioned to cereal-based rations to meet their nutritional needs.

Recognizing the pivotal role of nutrition in livestock productivity, especially in dairy animals, feed formulation becomes paramount. Studies have demonstrated the positive correlation between concentrate supplementation and key performance indicators such as milk yield and body weight gain in high-yielding cows (Hills *et al.*, 2015) [4].

In this context, exploring the impact of replacing green fodder with concentrate mixture on the reproductive parameters of lactating Murrah buffaloes becomes imperative, not only for optimizing production but also for ensuring the sustainability of the dairy industry amidst evolving agricultural landscapes and resource constraints.

Materials and Methods

The study was conducted at the Buffalo farm of the Department of Livestock Production Management, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar. The farm is situated in a semi-arid, sub-tropical region, with geographical coordinates of 29°10' N latitude, 75°40' E longitude, and an altitude of 215.2 meters. Ethical approval was obtained from the Institutional Animal Ethics Committee of LUVAS in its 11th meeting on February 6th, 2018. Eighteen lactating Murrah buffaloes, in their 1st to 2nd lactation stage, were selected under a loose housing system and allocated to three dietary treatment groups (T₁, T₂, and T₃) using a Factorial Completely Randomized Design (FCRD).

Feeding Plan: The feeding strategies for each treatment group were as follows:

T₁ (Control): Lactating buffaloes were fed with a ratio of 30:35:35 of wheat straw, green fodder, and concentrate mixture (on DM basis) to meet the nutrient requirements as per ICAR (2013) standards.

T₂: 30% of the crude protein and total digestible nutrient content of green fodder from T₁ were replaced with concentrate mixture for feeding lactating buffaloes.

T₃: 40% of the crude protein and total digestible nutrient content of green fodder from T₁ were replaced with concentrate mixture for feeding lactating buffaloes.

Buffaloes were individually fed according to their dietary requirements, and the three dietary treatments were iso-nitrogenous and iso-caloric. Standard management practices and biosecurity measures, including deworming, ectoparasite disinfection, and immunization against diseases, were followed. A 10-day adjustment period preceded the experiment for acclimatization. The study spanned from 10 days postpartum to 6 months of lactation.

Parameters Observed: Various reproductive parameters were observed, including:

1. Days to attain post-partum estrus.
2. Open days (Days to first conception after calving).
3. Number of services per conception.

Statistical analysis: Data were analyzed using the General Linear Models procedure of SPSS-23 software, with ANOVA conducted. Duncan's multiple range tests were employed for mean separation at a significance level of $p < 0.05$.

Results and Discussion

Following parturition, the reproductive parameters of experimental buffaloes, including days to attain post-partum estrus, the number of services per conception, and open days (days from calving to conception), were meticulously recorded, as compiled in Table 1 and depicted in Figure 1.

Table 1: Average reproductive performance of experimental buffaloes during the experimental period under different dietary treatments

Particulars	Treatments		
	T ₁	T ₂	T ₃
No. of buffaloes exhibit oestrous during the feeding trial	4	5	6
No. of days taken to attain post-partum oestrous	61.25±7.76	59.60±1.96	57.67±4.34
No. of buffaloes conceived during the feeding trial	4	4	4
Open days (days from calving to conception)	66.50±6.96 (4)	60.75±3.40 (4)	54.25±5.86 (4)
Number of services / conception	1.25±0.25 (4)	1.25±0.25 (4)	1.00±0.00 (4)

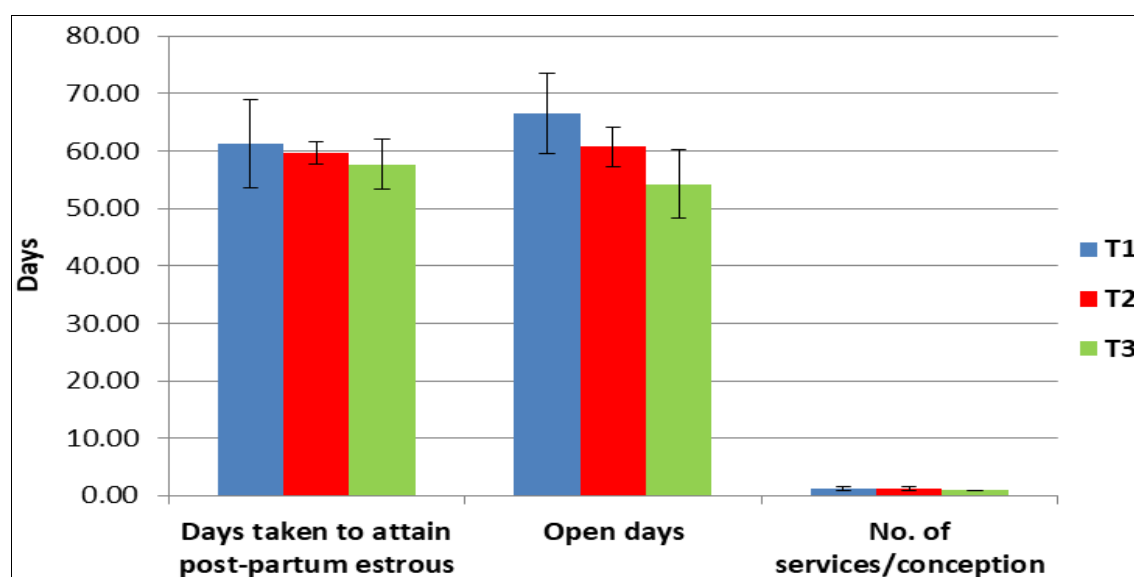


Fig 1: Overall mean reproductive parameters of experimental buffaloes

Days to attain post-partum estrus

Post-partum estrus, signified by the acceptance of a male by the female, served as the most conspicuous and reliable indicator of estrus in buffaloes. The mean values of days to attain post-partum estrus in experimental buffaloes were 61.25, 59.60, and 57.67 days in treatment groups T₁, T₂, and T₃, respectively. Buffaloes in treatment groups T₂ and T₃ exhibited earlier attainment of post-partum estrus compared to those in the control group (T₁); however, statistical analysis revealed that the observed differences were non-significant.

These results align with the research of Sanh *et al.* (2002) [8], who demonstrated that cows fed with a high concentrate ratio in the diet experienced shorter postpartum estrus intervals. Similarly, Tessmann *et al.* (1991) [10] reported that the days to first estrus in Holstein cows were reduced, albeit not significantly affected by the dietary forage concentrate ratio. The present findings are consistent with the majority of earlier research outcomes. Based on the current results, it is reaffirmed that reducing the days required to attain postpartum estrus can be achieved by increasing the concentration of concentrate mixture in the ration of lactating Murrah buffaloes, corroborating the assertions of prior researchers.

Open days (Days from calving to conception)

Data pertaining to open days were meticulously extracted from the farm records. It was observed that buffaloes receiving rations with a replacement of 30% or 40% crude protein (CP) and total digestible nutrient (TDN) content of green fodder with concentrate mixture exhibited a reduction in the duration of open days or the service period (days from calving to conception). However, statistical analysis revealed that these differences were nonsignificant. Buffaloes in the control group (T₁) took an average of 66.50 days to conceive, whereas those in treatment groups T₂ and T₃ took 60.75 and 54.25 days, respectively.

The findings of the present study corroborate with Tessmann *et al.* (1991) [10], who observed that open days in Holstein cows were reduced, albeit not significantly affected by the feeding of a high proportion of concentrate in the diet. Similarly, Utama *et al.* (2018) [11] reported improved reproductive efficiency, characterized by reduced open days in dairy cows fed a higher proportion of concentrate in the diet. The present results align with the majority of earlier research findings. Based on these findings, it is concluded that reducing open days can be achieved by increasing the concentration of concentrate mixture in the ration of lactating Murrah buffaloes, as observed by previous researchers.

Services per conception

Data regarding the number of services per conception were meticulously documented. This parameter, calculated as the number of services leading to successful insemination and conception, revealed mean values of 1.25, 1.25, and 1.00 in treatment groups T₁, T₂, and T₃, respectively. Nonetheless, statistical analysis indicated that the observed differences were no significant. In essence, it can be inferred that buffaloes in treatment groups fed rations with a replacement of 40% CP and TDN of green fodder with concentrate mixture conceived during their initial estrus cycle post-calving.

Parallel to the findings of the present study, Tessmann *et al.* (1991) [10] observed reduced services per conception in Holstein cows, with no significant impact from the dietary forage grain ratio. Likewise, Utama *et al.* (2018) [11] reported enhanced reproductive efficiency, characterized by fewer services per conception in dairy cows fed a higher proportion of concentrate

in the diet. The present results align with the majority of earlier research findings. Based on these findings, it is reaffirmed that reducing services per conception can be achieved by increasing the concentration of concentrate mixture in the ration of lactating Murrah buffaloes, as evidenced by prior research.

Conclusion

In conclusion, this study sheds light on the crucial role of feed optimization in enhancing the reproductive performance of lactating Murrah buffaloes. The replacement of green fodder with concentrate mixture has significant implications for reproductive parameters, as evidenced by the findings of this research. The results demonstrate that buffaloes fed with concentrate mixture exhibited earlier attainment of post-partum estrus and reduced open days, indicating improved reproductive efficiency. These findings are consistent with previous research, affirming the positive correlation between concentrate supplementation and reproductive performance in dairy animals. The implications of these findings are profound for the dairy industry, particularly in regions like India where Murrah buffaloes play a crucial role in agricultural productivity. By optimizing feed resources and incorporating concentrate mixture into the ration, farmers can effectively enhance the reproductive performance of their herds, thereby increasing overall productivity and profitability.

Furthermore, these findings underscore the importance of nutrition in livestock productivity and the need for strategic feed formulation to meet the evolving demands of the dairy sector. As global populations continue to rise and resources become increasingly constrained, maximizing the efficiency of livestock production becomes paramount. Moreover, this research contributes to the growing body of knowledge regarding feed optimization strategies in dairy animals, particularly Murrah buffaloes. By highlighting the benefits of concentrate supplementation, this study provides valuable insights for farmers, researchers, and policymakers aiming to improve the sustainability and resilience of the dairy industry. Overall, the findings of this study emphasize the importance of implementing strategic feed management practices to optimize reproductive performance and ensure the long-term viability of dairy farming enterprises.

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