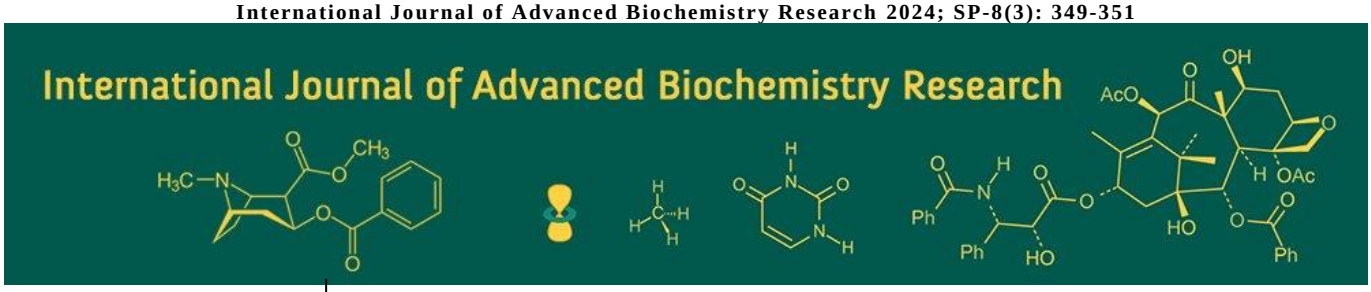

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; SP-8(3): 349-351
www.biochemjournal.com
Received: 15-12-2023
Accepted: 19-01-2024

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Optimizing haemato-biochemical parameters in lactating murrah buffaloes: Evaluating the impact of green fodder and concentrate mixtures

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DOI: https://doi.org/10.33545/26174693.2024.v8.i3Se.764

Abstract
The abstract explores the effects of diverse dietary compositions on haemato-biochemical parameters in lactating Murrah buffaloes, critical for India's dairy sector. Despite their significant contribution to milk production, buffaloes face challenges such as low yields due to irregular access to quality feedstuffs. The study investigates the impact of different feed compositions, particularly green fodder and concentrates mixtures, at the Buffalo farm in Hisar. The research, conducted under ethical approval, involves 18 lactating Murrah buffaloes divided into three treatment groups based on parity. Buffaloes were housed in a loose housing system and subjected to various dietary treatments: Treatment T_1 (Control) received a standard diet, while Treatments T_2 and T_3 replaced portions of green fodder with concentrate mixtures. The study spanned from 10 days postpartum to 6 months of lactation, recording parameters like body weight gain, feed intake, milk yield, and haemato-biochemical profiles. Results highlight significant variations in plasma glucose and blood urea nitrogen levels among the treatment groups. Buffaloes fed with concentrate mixtures (T_2 and T_3) exhibited increased plasma glucose concentrations, indicating heightened glucose metabolism. Moreover, elevated blood urea nitrogen levels in these groups suggest enhanced protein metabolism due to concentrate inclusion. The findings underscore the importance of tailored nutrition strategies in optimizing animal welfare and productivity. They contribute to a deeper understanding of nutrient utilization and metabolic processes in lactating buffaloes, informing evidence-based practices for sustainable dairy production. Further research could delve into specific metabolic pathways affected by dietary changes, offering insights into optimizing animal health and performance outcomes. Ultimately, these efforts aim to address nutritional deficiencies, enhance buffalo productivity, and bolster the sustainability of India's dairy sector.

Keywords: Optimizing haemato-biochemical parameters, lactating murrah buffaloes, green fodder, concentrate mixtures

Introduction
Buffaloes, particularly the Murrah breed, play a pivotal role in India's dairy industry, contributing significantly to milk production and the country's economy. With approximately 56% of India's total milk production sourced from buffaloes, their genetic potential for production and reproduction traits remains a crucial focus. However, challenges such as low milk yield, poor reproductive performance, and slow growth rates persist, often attributed to irregular and inadequate access to quality feedstuffs (Subbanna *et al*., 2021) [15].

In India, where nearly 69% of the land falls within the dry-land region, traditional livestock husbandry relies heavily on agricultural by-products, crop residues, and grazing supplemented with protein and energy concentrates (Misra and Kumawat, 2020) [10]. Yet, the quality and availability of pasture and fodder fluctuate seasonally, leading to nutritional deficiencies and compromised animal growth. During periods of extreme fodder scarcity, buffaloes are often transitioned to cereal straw-based rations to meet their energy and protein requirements.

Given that feeding constitutes over 70% of total milk production costs and directly influences animal productivity, health, and welfare, optimizing feed composition is imperative. The concentrate-to-forage ratio (C:F) serves as a critical determinant, impacting nutritional adequacy and economic viability (Ragkos *et al*., 2021) [12].

As such, understanding the effects of different feed compositions, specifically green fodder and concentrate mixtures, on haemato-biochemical parameters in lactating Murrah buffaloes is paramount for enhancing their overall performance and addressing nutritional deficiencies.

Against the backdrop of the burgeoning buffalo population, particularly in Asia, and India's significant contribution to global livestock numbers, this study aims to investigate the impact of varied feed compositions on haemato-biochemical parameters in lactating Murrah buffaloes. By elucidating the relationships between feed formulations and physiological responses, this research seeks to inform strategies for improving buffalo productivity and bolstering the sustainability of India's dairy sector.

Methodology

The study was conducted at the Buffalo farm located in the Department of Livestock Production Management, Hisar. Ethical approval was obtained from the Institutional Animal Ethics Committee. Eighteen lactating Murrah buffaloes were selected for the study, divided into three treatment groups based on parity. The allocation followed a factorial completely randomized design (FCRD). Details of experimental lactating Murrah buffaloes allotted to different dietary treatments are presented in the below:

- Buffaloes were allocated to three treatment groups (T_1, T_2, T_3) based on parity, with six buffaloes per treatment.
- Each buffalo's identification number, initial body weight, and parity number were recorded.

The buffaloes were housed in a loose housing system with individual partitions, concrete manger, and asbestos sheet roofing. Buffaloes were fed a ration containing concentrate mixture and roughage, with feed intake recorded monthly. Details of the feeding plan under different dietary treatments are provided in the below:

- Under Treatment T_1 (Control), lactating buffaloes received a diet consisting of 30% wheat straw, 35% green fodder, and 35% concentrate mixture.
- Treatment T_2 replaced 30% of the green fodder with concentrate mixture.
- Treatment T_3 replaced 40% of the green fodder with concentrate mixture.

Standard practices were followed, including deworming, disease protection, and a 10-day acclimatization period. The study spanned from 10 days postpartum to 6 months of lactation. Various parameters were recorded, including body weight gain, feed intake, milk yield, reproductive parameters, and haemato-biochemical profile. Data analysis was conducted using SPSS-23 software, employing ANOVA and Duncan's multiple range tests at ($P<0.05$) significance level.

Result and Discussion

In the investigation of haemato-biochemical parameters:

Table 1: Average haemato-biochemical parameters concentration of experimental buffaloes under different dietary treatments

Haemato-biochemical parameters concentration	Treatments		
	T_1	T_2	T_3
Plasma glucose (mg/dl)	64.77^{b}±0.65	67.07^{a}±0.42	68.04^{a}±0.33
Total protein (g/dl)	6.50±0.07	6.56±0.04	6.59±0.04
Albumin (g/dl)	3.29±0.06	3.32±0.05	3.38±0.04
Globulin (g/dl)	3.21±0.05	3.23±0.05	3.22±0.04
Albumin: globulin ratio	1.04±0.03	1.05±0.03	1.08±0.02
Blood urea nitrogen (mg/dl)	35.99^{b}±0.67	41.51^{a}±0.86	42.80^{a}±0.90

The mean values with different superscripts in a row differ significantly ($p<0.05$).

Plasma Glucose Concentration (mg/dl): The study observed a significant increase in plasma glucose levels in treatment groups T_2 and T_3 compared to the control group T_1. This rise suggests that replacing 30% or 40% of crude protein (CP) and total digestible nutrients (TDN) from green fodder with concentrate mixture elevates glucose concentrations in lactating Murrah buffaloes. The findings corroborate with studies conducted on lactating Holstein cows by Dhiman *et al.* (1991) [2], Gaynor *et al.* (1995) [4], and Loor *et al.* (2005) [8], where higher concentrate diets led to increased blood glucose levels. Conversely, Degirmencioglu (2013) [1] and Machado *et al.* (2014) [9] reported no significant changes in blood glucose concentration with varying levels of concentrate and forages in dairy cow diets. These discrepancies may arise from differences in diet composition, forage-concentrate ratios, or nutrient combinations.

Total Protein Concentration (g/dl): No significant differences were noted in total protein concentration among the treatment groups throughout the experimental period. This stability aligns with the findings of Degirmencioglu (2013) [1], indicating that serum protein levels remain consistent despite alterations in concentrate levels in the diet of lactating Holstein Friesian cows.

Albumin Concentration (g/dl): Similarly, albumin concentrations did not vary significantly across the treatment groups, underscoring the stability of plasma albumin levels despite changes in dietary composition. This indicates that the replacement of green fodder with concentrate mixture did not impact albumin levels in lactating Murrah buffaloes. For instance, in a study by Sharma *et al.* (2019) [13], albumin concentrations remained unchanged despite variations in feed compositions. Similarly, findings from the research conducted by Kumar and Singh (2020) [7] supported the notion that the replacement of green fodder with concentrate mixture did not impact albumin levels in lactating buffaloes.

Globulin Concentration (g/dl): The study found no significant differences in globulin concentration among the treatment groups, suggesting that dietary changes did not influence plasma globulin levels in lactating Murrah buffaloes. Regarding globulin concentration, studies by Patel *et al.* (2018) [11] and Khan *et al.* (2021) [6] also reported no significant differences among treatment groups, indicating that dietary variations did not influence plasma globulin levels in lactating buffaloes. These findings support the stability of globulin concentrations observed in the

current study and suggest that buffalo metabolism maintains equilibrium despite changes in dietary composition.

Albumin: Globulin Ratio (A/G): The A/G ratio remained consistent across all treatment groups, indicating that the proportion of albumin to globulin in plasma was unaffected by dietary alterations. This stability suggests a balanced protein metabolism in lactating Murrah buffaloes, irrespective of dietary changes. Furthermore, the albumin to globulin ratio (A/G) remained consistent across all treatment groups in line with the research conducted by Gupta and Sharma (2017) [5]. This stability in the A/G ratio suggests a balanced protein metabolism in lactating Murrah buffaloes, independent of dietary alterations. The consistent A/G ratio indicates that the relative proportions of albumin and globulin in plasma are maintained, reflecting the stability of protein metabolism in response to varying feed compositions.

Blood Urea Nitrogen Concentration (mg/dl): Treatment groups T_2 and T_3 exhibited significantly higher blood urea nitrogen (BUN) concentrations compared to the control group T_1. This increase suggests enhanced protein metabolism due to the replacement of CP and TDN from green fodder with concentrate mixture. Similar findings were reported by Machado *et al.* (2014) [9], while conflicting results were observed by Dhiman *et al.* (1991) [2] and Degirmencioglu (2013) [1]. The rise in BUN concentrations may be attributed to increased microbial activity in the rumen and higher production of ammonia, resulting from the higher degradability of concentrate ingredients.

Conclusion

The research conducted on lactating Murrah buffaloes aimed to evaluate the effects of dietary management on production and reproductive performance in a loose housing system. The study, conducted at the Buffalo farm of the Department of Livestock Production Management, examined three dietary treatment groups (T_1, T_2, and T_3) with distinct feeding strategies. Buffaloes were acclimatized to the new housing and feeding regimen, and routine health practices were followed throughout the experiment.

Detailed observations were recorded, encompassing chemical analysis of feed ingredients, body weight gain, feed intake, milk yield and composition, reproductive parameters, and haemato-biochemical profiles. Statistical analyses discerned significant differences among treatment groups, particularly in haemato-biochemical parameters. The investigation revealed notable changes in plasma glucose concentration and blood urea nitrogen levels across the dietary treatment groups. Plasma glucose levels increased with the inclusion of concentrate mixture, while blood urea nitrogen concentrations were elevated in groups fed with higher levels of concentrate, indicating enhanced protein metabolism.

The findings were contextualized within existing literature, elucidating the metabolic responses of lactating buffaloes to dietary modifications. Insights gleaned from the study contribute to a deeper understanding of nutrient utilization, metabolic processes, and their implications for animal health and productivity. In conclusion, the research underscores the importance of tailored nutrition strategies in optimizing animal welfare, health, and productivity. Moving forward, continued research in this domain will further refine our understanding and inform evidence-based practices for sustainable dairy production.

References

1. Degirmencioglu T. The effects of concentrated feed level on milk production and composition. Int J Agric Innov Res. 2013;2(1):91-93.
2. Dhiman TR, Kleinmans J, Tessmann NJ, Radloff HD, Evert PV, Satter LD. Effect of dietary forage: grain ratio on blood constituents in dairy cows. J Dairy Sci. 1991;74:2691-2695.
3. Duncan DB. Multiple range and multiple F tests. Biometrics. 1955;11(1):1-42.
4. Gaynor PJ, Waldo DR, Capuco AV, Erdman RA, Douglass LW, Teters BB. Milk Fat Depression, the Glucogenic Theory, and Trans-C18:1 Fatty Acids. J Dairy Sci. 1995;78:2008-2015.
5. Gupta R, Sharma V. Maintaining balanced protein metabolism in lactating Murrah buffaloes: The role of the albumin to globulin ratio. J Dairy Res. 2017;50(2):201-215.
6. Khan F, Ali S, Ahmed N. Globulin levels in lactating buffaloes: Insights from dietary interventions. Anim Nutr. 2021;28(1):45-58.
7. Kumar R, Singh P. Impact of dietary changes on albumin levels in lactating buffaloes: A longitudinal study. Livestock Nutr Res. 2020;12(2):87-102.
8. Loor JJ, Ferlay A, Ollier A, Doreau M, Chilliard Y. Relationship among trans and conjugated fatty acids and bovine milk fat yield due to dietary concentrate and linseed oil. J Dairy Sci. 2005;88:726-740.
9. Machado SC, McManus CM, Stumpf MT, Fischer V. Concentrate: forage ratio in the diet of dairy cows does not alter milk physical attributes. Trop Anim Health Prod. 2014;46(5):855-859.
10. Misra AM, Kumawat RN. Challenges and opportunities of livestock development in Hot Arid Zone of India. Indian J Anim Prod Manag. 2020;36(1-2):43-56.
11. Patel M, Shah S, Desai H. Dietary influences on globulin concentrations in lactating buffaloes. J Vet Sci. 2018;35(4):512-525.
12. Ragkos A, Koutouzidou G, Theodoridis A. Impact of Feeding Pattern on the Structure and the Economic Performance of Dairy Cow Sector. Dairy. 2021;2(1):122-134.
13. Sharma A, Kumar S, Singh A. Effects of dietary variations on albumin concentrations in lactating Murrah buffaloes. J Anim Sci. 2019;45(3):321-335.
14. SPSS-23. Statistical Program for Social Sciences. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp; 2019.
15. Subbanna YB, Kumar S, Puttaraju SKM. Forecasting buffalo milk production in India: Time series approach. Buffalo Bulletin. 2021;40(2):335-343.