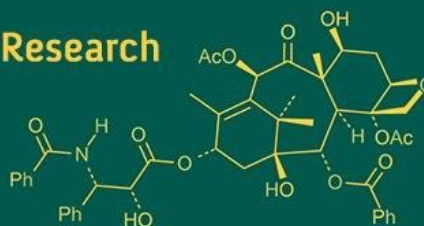


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; 10(2): 466-470
www.biochemjournal.com
Received: 15-12-2025
Accepted: 18-01-2026

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Influence of dietary monensin sodium, yeast metabolites and neem (*Azadirachta indica*) leaf supplementation on body condition score of lactating Sahiwal cows

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i2f.7636>

Abstract

The present study was conducted to evaluate the effect of monensin sodium, yeast metabolites, and neem (*Azadirachta indica*) leaf supplementation on body condition score (BCS) of lactating Sahiwal cows. Twenty-four cows were randomly allotted to four dietary treatments group with six animals in each group: T₀ is control (basal diet), T₁ with monensin sodium, T₂ with yeast metabolites and T₃ with neem leaf supplementation. Initial BCS was similar across all groups, indicating uniformity of animals. The experiment lasted 90 days, and BCS was recorded at 0, 30, 60, and 90 days using a standard 5-point scoring system. Analysis of variance revealed that there are no significant differences in BCS among treatment groups at any stage of the experiment. However, within the group there is a significant effect of time was observed, with BCS values at 0, 30, and 60 days postpartum being significantly ($p < 0.05$) lower than those at 90 days postpartum. Overall, BCS followed a characteristic postpartum pattern, declining during early lactation up to 45 to 60 days after calving and subsequently improving as lactation progressed, coinciding with the attainment of peak milk yield between 45 and 60 days postpartum. These findings indicate that BCS dynamics in lactating Sahiwal cows are primarily influenced by physiological changes associated with stage of lactation rather than by the dietary supplements evaluated.

Keywords: Body condition score, monensin sodium, yeast metabolites, neem leaf, Sahiwal cattle

Introduction

Body condition score (BCS) is a widely used and reliable indicator of body energy reserves and nutritional status in dairy cattle (Edmonson *et al.*, 1989) [6]. It serves as a practical tool to assess the balance between energy intake and energy expenditure and is strongly associated with productivity and metabolic health (Wildman *et al.*, 1982) [18]. Maintenance of optimal BCS during lactation is essential because excessive loss of body reserves can impair milk production, fertility, and immune function (Roche *et al.*, 2009) [14]. Changes in BCS reflect long-term energy balance and are influenced by feeding level, nutrient digestibility, and metabolic adaptations during lactation (Garnsworthy, 1988) [7]. Nutritional strategies that improve rumen fermentation efficiency and nutrient utilization may help stabilize energy balance and support maintenance of body reserves (NRC, 2001). Feed additives that enhance rumen microbial activity are therefore considered important tools in improving metabolic efficiency of dairy cows (Russell and Strobel, 1989) [16]. *Saccharomyces cerevisiae* fermentation products and yeast metabolites have been reported to stabilize rumen pH, enhance fibre digestion, and promote microbial growth, thereby improving nutrient availability to the host animal (Chaucheyras-Durand *et al.*, 2008) [2]. Supplementation of yeast products has also been associated with improved feed efficiency and reduced metabolic stress, which may contribute to better maintenance of body condition (Desnoyers *et al.*, 2009) [3].

Monensin sodium, an ionophore antibiotic, modifies rumen fermentation patterns by increasing propionate production and improving the efficiency of energy metabolism (McGuffey *et al.*, 2001) [8].

Its use has been linked with improved feed conversion and reduced incidence of metabolic disorders in dairy cattle, particularly during early lactation (Duffield *et al.*, 2008) [4]. Improved energy utilization associated with monensin may influence body energy reserves, although effects on BCS are often variable (Plaizier *et al.*, 2000) [11]. Phytogetic feed additives such as neem (*Azadirachta indica*) have gained attention as natural alternatives to synthetic growth promoters (Windisch *et al.*, 2008) [19]. Neem leaves contain bioactive compounds with antimicrobial and antioxidant properties that may influence rumen microbial ecology and nutrient utilization (Biswas *et al.*, 2002) [1]. Herbal supplements have been suggested to support digestion and metabolic stability in ruminants (Patra and Saxena, 2010) [10]. Despite the recognized roles of ionophores, yeast metabolites, and phytogetic additives in improving rumen efficiency and metabolic function, limited information is available on their comparative influence on BCS dynamics in indigenous dairy breeds. Sahiwal cattle, known for their adaptability and milk production potential under tropical conditions, may respond differently to dietary supplementation compared to exotic breeds. Therefore, the present study was undertaken to evaluate the effect of monensin sodium, yeast metabolites, and neem leaf supplementation on body condition score of lactating Sahiwal cows.

Although these additives have been studied in various livestock species, information regarding their influence on body condition score in indigenous dairy breeds like Sahiwal cattle is limited. Sahiwal cows are an important dairy breed in tropical regions due to their adaptability and milk production potential. Understanding how dietary supplementation affects their body condition during lactation is essential for developing efficient feeding strategies. Therefore, the present study was conducted to evaluate the effect of dietary supplementation of monensin sodium, yeast metabolites and neem (*Azadirachta indica*) leaf on body condition score of lactating Sahiwal cattle.

Materials and Methods

Location of study: The present investigation was conducted at the Bull Mother Experimental Farm (BMEF), College of Veterinary Science and Animal Husbandry, Anjora, Durg, Chhattisgarh, India. Durg is situated at an altitude of 317 m above mean sea level between 20°23' to 22°02' N latitude and 80°46' to 81°58' E longitude. The region has a dry tropical climate with hot summers (up to 45 °C), mild winters (minimum around 10 °C), and monsoon rainfall extending from July to September.

Selection of animals and Experimental Design

Twenty-four lactating Sahiwal cows in early lactation were selected from the farm herd based on milk yield, parity (1st to 6th lactation) and body weight (350-400 kg). Animals were distributed across treatments group to maintain uniformity of parity, Milk yield and physiological status. The cows were divided into four groups with six animals in each group:

T₀ (Control): Basal diet only

T₁: Basal diet + Monensin sodium (Monovet 200) @ 1 g/head/day

T₂: Basal diet + Yeast metabolites(celmanax) @ 3 g/head/day

T₃: Basal diet + Neem (*Azadirachta indica*) leaf @ 200 mg/kg BW/day

All animals were dewormed with fenbendazole (7.5-10 mg/kg body weight) before the start of the experiment. The feeding trial was conducted for a duration of 90 days.

Feeding and Management

All experimental animals were maintained under a uniform housing system (double-row conventional barn with concrete flooring). The diet consisted of green fodder (Hybrid Napier, Sudan grass, Berseem and local grasses as per availability), dry fodder and concentrate mixture. The concentrate contained 20% crude protein, 0.93% ether extract, 18% crude fiber and was offered during morning and evening milking. The animals were allowed routine grooming and had ad libitum access to clean drinking water.

Body condition Score

Body condition scoring was carried out through visual and tactile assessment using a five-point scale (1-5) as described by Wildman *et al.* (1982) [18], with slight modifications. Whereas 1 = very thin, 2 = Poor body condition, 3 = average body condition, 4 = fat body condition and 5 = excessively fat. Scoring focused on the backbone, hips, shoulders, ribs, tail head and body outline, following standard guidelines. BCS was recorded at the start of the experiment (Day 0) and subsequently at 30-day intervals (Days 30, 60 and 90). BCS refers to the relative amount of subcutaneous body fat or energy reserves in a cow.

Statistical Analysis

Data on body condition score were analyzed using SPSS 26.0 software (SPSS Inc., USA). One-way analysis of variance (ANOVA) was applied to compare treatment means at each observation period as described by Snedecor and Cochran (1994). The means were compared using a Tukey test LSD and $p \leq 0.05$ was considered statistically significant.

Results

The body condition score (BCS) of lactating Sahiwal cows under different dietary treatments is presented in Table 1. At the start of the experiment (Day 0), the mean BCS was identical around 3.0 in all groups, indicating uniformity of animals before the initiation of treatments. During the experimental period, changes in body condition score (BCS) were observed across all treatment groups. On day 30 of the feeding trial, the mean BCS values were 2.75, 2.79, 2.71 and 2.83 in the control, monensin sodium, yeast metabolite, and neem leaf-supplemented groups, respectively. The observed decline in BCS at 30 days may be attributed to increased milk production during early lactation, which resulted in a negative energy balance and subsequent mobilization of body fat reserves in the animals. On days 60 and 90 of the experimental period, body condition score (BCS) showed a gradual increase in all treatment groups. However, cows supplemented with monensin sodium (3.08 and 3.54) and yeast metabolites (3.04 and 3.38) recorded slightly lower BCS values compared to the control group (3.33 and 3.79).

and the neem leaf supplemented group (3.13 and 3.63) at the respective time points (Fig 1 & 2).

Analysis of variance indicated that dietary supplementation had no significant effect on body condition score (BCS) among the different treatment groups (Fig. 1). However, a significant effect of time was evident within treatments, with BCS values at 0, 30 and 60 days postpartum being significantly ($p < 0.05$) lower than those observed at 90 days postpartum across all groups (Fig. 2). The temporal changes

in BCS followed a characteristic postpartum pattern, characterized by a marked decline during early lactation up to 45 to 60 days after calving, reflecting increased mobilization of body energy reserves to support rising milk production and coinciding with the attainment of peak milk yield between 45 and 60 days postpartum; thereafter, BCS gradually improved, indicating a progressive restoration of energy balance.

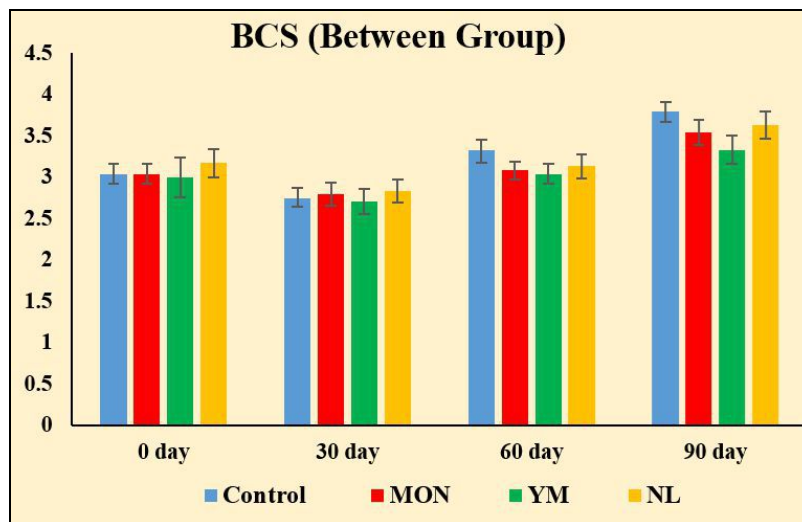


Fig 1: BCS of lactating Sahiwal cows under different dietary treatments

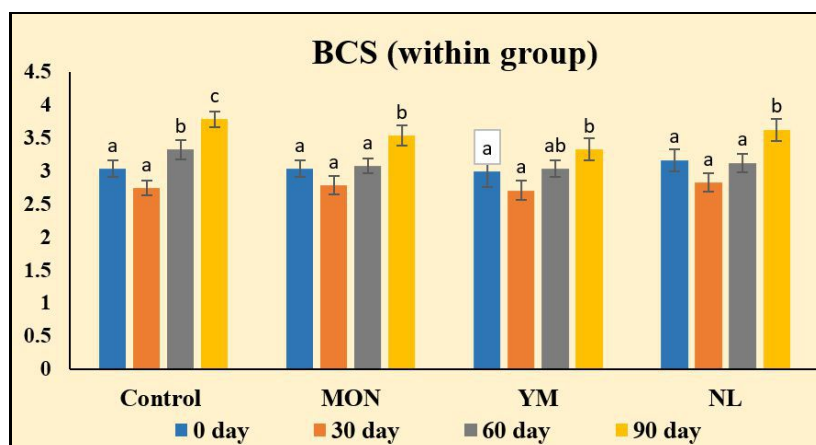


Fig 2: BCS of lactating Sahiwal cows within different dietary treatments

Table 1: Body condition score of lactating Sahiwal cows under different dietary treatments

Time (days)	T0	T1	T2	T3	P value (between group)
0	3.04 ^a ± 0.12	3.04 ^a ± 0.12	3.00 ^{ab} ± 0.24	3.17 ^a ± 0.17	0.615
30	2.75 ^a ± 0.11	2.79 ^a ± 0.14	2.71 ^a ± 0.15	2.83 ^a ± 0.14	0.923
60	3.33 ^b ± 0.15	3.08 ^a ± 0.11	3.04 ^{ab} ± 0.12	3.13 ^a ± 0.14	0.272
90	3.79 ^c ± 0.12	3.54 ^b ± 0.15	3.33 ^{a±} 0.17	3.63 ^{b±} 0.17	0.304
P value (within group)	0.000	0.005	0.0046	0.014	

Discussion

Body condition score (BCS) is a widely accepted indicator of the energy status and nutritional balance of dairy cattle and reflects the relationship between feed intake, metabolic demand and body reserve mobilization (Edmonson *et al.*, 1989; Roche *et al.*, 2009) [6, 14]. In the present study, dietary supplementation of monensin sodium, yeast metabolites and neem leaf did not produce a significant ($p > 0.05$) effect on BCS of lactating Sahiwal cows throughout the 90-day experimental period.

BCS values within groups at 0, 30, and 60 days postpartum were significantly lower than those recorded at 90 days postpartum in the control, monensin, and neem leaf supplemented groups. The observed BCS values remained within the optimal range (2.71-3.79), indicating that the basal diet adequately met the energy requirements of the animals. Furthermore, the supplementation of feed additives did not lead to excessive body fat deposition or excessive mobilization of body reserves, suggesting maintenance of an adequate energy balance throughout the experimental

period. (Roche *et al.*, 2013) ^[14]. The findings of the present study are in agreement with those of Sharma *et al.* (2020) ^[17], who reported that average daily milk yield increased progressively up to the 60th day of lactation, followed by a gradual decline up to the 90th day. The significant increase in fortnightly daily milk yield observed between the 15th and 60th days of lactation in the present study is consistent with the typical lactation curve. Furthermore, Pryce *et al.* (2000) ^[12] reported higher feed intake and milk yield in cows that were thin at calving compared to obese cows, highlighting the critical role of body condition at parturition in influencing subsequent productive performance.

The absence of significant differences among treatments indicates that the energy balance of cows was maintained similarly across groups. Body condition score changes slowly and is less sensitive to short-term dietary modifications compared to production traits such as milk yield, because it represents long-term energy storage (Garnsworthy, 1988; Wildman *et al.*, 1982) ^[7, 18]. Since animals were already in satisfactory body condition at the start of the trial, moderate nutritional interventions were unlikely to cause marked alterations in BCS (Roche *et al.*, 2009) ^[14]. Uniform initial BCS across groups further confirms proper randomization and comparable physiological status of animals (Edmonson *et al.*, 1989) ^[6]. Monensin sodium improves rumen fermentation efficiency by increasing propionate production and enhancing metabolizable energy supply (Russell and Strobel, 1989; Duffield *et al.*, 2008) ^[16, 4]. However, its primary role is improving feed efficiency rather than increasing body fat reserves (McGuffey *et al.*, 2001) ^[8]. The lack of a significant rise in BCS in the monensin group suggests that the additional available energy may have been utilized for productive functions rather than stored as adipose tissue, which agrees with previous findings where monensin improved metabolic efficiency without markedly affecting body condition (Duffield *et al.*, 2008) ^[4].

Yeast metabolites help stabilize rumen pH, enhance fiber digestion, and improve nutrient utilization (Chaucheyras-Durand *et al.*, 2008; Desnoyers *et al.*, 2009) ^[2, 3]. Despite improved digestion, their influence on BCS is often limited when basal nutrition is already adequate (Poppy *et al.*, 2012) ^[13]. In the present study, the yeast metabolite group showed numerically higher BCS values, but differences were not significant, indicating that improved digestion did not translate into measurable changes in body reserves.

Neem (*Azadirachta indica*) leaf is recognized for antimicrobial, antioxidant, and digestive stimulant properties (Biswas *et al.*, 2002; Dutta *et al.*, 2012) ^[1, 5]. Its direct effect on energy partitioning and body reserve deposition is not well established. The comparable BCS between neem-supplemented and control cows suggests that neem inclusion did not adversely affect feed intake or metabolic status, supporting its safety as a phyto-genic feed additive (Windisch *et al.*, 2008) ^[19].

The slight increase in BCS observed across all groups over time may be attributed to adaptation to feeding conditions and improved nutrient intake during the experimental period rather than treatment effect (Roche *et al.*, 2013) ^[15]. Since treatment × time interaction was not significant, the pattern of BCS change was similar in all groups, indicating that the additives maintained normal energy balance without inducing metabolic stress.

Overall, the findings demonstrate that supplementation of monensin sodium, yeast metabolites, and neem leaf-maintained body condition without causing excessive fat mobilization or deposition. This indicates that these additives can be used safely in lactating Sahiwal cattle without negative effects on body energy reserves (Duffield *et al.*, 2008; Poppy *et al.*, 2012) ^[4, 13].

Conclusion

The present study demonstrated that dietary supplementation of monensin sodium, yeast metabolites and neem (*Azadirachta indica*) leaf had no significant effect on body condition score (BCS) of lactating Sahiwal cows during the 90-day experimental period as compared to control diet. However, BCS was significantly affected by stage of lactation, showing a marked decline during early postpartum periods due to negative energy balance associated with increasing milk production, followed by a gradual recovery as lactation progressed. The overall BCS values remained within the optimal physiological range throughout the experimental period, indicating that the basal diet adequately met the energy requirements of the animals and that the dietary additives neither induced excessive mobilization of body reserves nor promoted undue fat deposition. These findings suggest that BCS dynamics in Sahiwal cows are primarily governed by physiological changes associated with lactation rather than by the dietary supplements evaluated in the present study.

Acknowledgments

The authors are thankful to the Dean, College of Veterinary Science and Animal Husbandry, Anjora, Durg, for providing facilities to conduct this research.

References

1. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. Biological activities and medicinal properties of neem (*Azadirachta indica*). Curr Sci. 2002;82(11):1336-1345.
2. Chaucheyras-Durand F, Walker ND, Bach A. Effects of active dry yeasts on the rumen microbial ecosystem: Past, present and future. Anim Feed Sci Technol. 2008;145(1-4):5-26.
3. Desnoyers M, Giger-Reverdin S, Bertin G, Duvaux-Ponter C, Sauvant D. Meta-analysis of the influence of *Saccharomyces cerevisiae* supplementation on ruminal parameters and milk production of ruminants. J Dairy Sci. 2009;92(4):1620-1632.
4. Duffield TF, Rabiee AR, Lean IJ. A meta-analysis of the impact of monensin in lactating dairy cattle. Part 1. Metabolic effects. J Dairy Sci. 2008;91(4):1334-1346.
5. Dutta N, Panda AK, Kamra DN, Makkar HPS. Use of *Pongamia glabra* and *Azadirachta indica* seed cakes for feeding livestock. In: Makkar HPS, editor. Biofuel co-products as livestock feed: Opportunities and challenges. Rome: FAO; 2012. p.379-402.
6. Edmonson AJ, Lean IJ, Weaver LD, Farver T, Webster G. A body condition scoring chart for Holstein dairy cows. J Dairy Sci. 1989;72(1):68-78.
7. Garnsworthy PC. The effect of energy reserves at calving on performance of dairy cows. In: Nutrition and Lactation in the Dairy Cow. London: Butterworths; 1988. p.157-170.

8. McGuffey RK, Richardson LF, Wilkinson JID. Ionophores for dairy cattle: Current status and future outlook. *J Dairy Sci.* 2001;84(Suppl E):E194-E203.
9. National Research Council. Nutrient requirements of dairy cattle. 7th rev ed. Washington (DC): National Academy Press; 2001.
10. Patra AK, Saxena J. A review of the effect and mode of action of saponins on microbial populations and fermentation in the rumen. *J Appl Microbiol.* 2010;109(4):1087-1098.
11. Plaizier JC, Martin A, Duffield TF, Bagg R. Effect of monensin on milk production and energy balance of dairy cows. *Can J Anim Sci.* 2000;80(4):673-678.
12. Pryce JE, Coffey MP, Brotherstone S. The genetic relationship between calving interval, body condition score and linear type and management traits in registered Holsteins. *J Dairy Sci.* 2000;83:2664-2667.
13. Poppy GD, Rabiee AR, Lean IJ, Sanchez WK, Dorton KL, Morley PS, *et al.* A meta-analysis of the effects of feeding yeast culture produced by anaerobic fermentation of *Saccharomyces cerevisiae* on milk production of lactating dairy cows. *J Dairy Sci.* 2012;95(10):6027-6041.
14. Roche JR, Friggens NC, Kay JK, Fisher MW, Stafford KJ, Berry DP. Invited review: Body condition score and its association with dairy cow productivity, health, and welfare. *J Dairy Sci.* 2009;92(12):5769-5801.
15. Roche JR, Macdonald KA, Schütz KE, Matthews LR, Verkerk GA, Meier S, *et al.* Calving body condition score affects indicators of health in grazing dairy cows. *J Dairy Sci.* 2013;96(9):5811-5825.
16. Russell JB, Strobel HJ. Effect of ionophores on ruminal fermentation. *Appl Environ Microbiol.* 1989;55(1):1-6.
17. Sharma V, Jhirwal AK, Goswami SC, Choudhary VK, Singh V, Meena BP. Effect of body condition score (BCS) on production performance of Sahiwal cattle. *J Anim Res.* 2020;10(1):53-57.
18. Wildman EE, Jones GM, Wagner PE, Bowman RL, Troutt HF, Lesch TN. A dairy cow body condition scoring system and its relationship to selected production characteristics. *J Dairy Sci.* 1982;65(3):495-501.
19. Windisch W, Schedle K, Plitzner C, Kroismayr A. Use of phytogetic products as feed additives for swine and poultry. *J Anim Sci.* 2008;86(Suppl E):E140-E148.