



Optimizing Dairy Cow Performance: Influence of Fortified Urea Molasses Mineral Block on Milk Yield in Winter

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The article is good contribution to refresh cost effective feed supplementation strategies especially to cater climate effect. This study evaluated the effect of urea-molasses mineral blocks (UMMBs), with or without enzyme and herb enrichment, on the milk yield and composition of dairy cows during the winter months in two phases. In Phase 1, experimental multinutrient blocks were prepared, and dairy cows were grouped based on body weight, stage of lactation, milk yield, and parity. In Phase 2, animals were offered UMMBs, and milk samples were collected. Milk yield was recorded daily, while milk composition was analyzed at three points: the start of the experiment, mid-trial, and at the end of the experiment (days 0, 22, and 45). Milk yield increased in the treatment groups compared

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to the control group, where it declined during the experimental period (December to February). However, this increase was not statistically significant. The highest milk production was recorded in T4 (*Urtica dioica* + enzyme-enriched UMMB), while the lowest was in T0 (control group). A significant ($P<0.05$) increase in milk protein percentage was observed in all treatment groups compared to the control, with the highest protein percentage in T4 (*Urtica dioica* + enzyme-fortified UMMB) and the lowest in T1 (control group). Although milk fat percentage and 3.5% fat-corrected milk (FCM) increased in all treatment groups compared to the control, the differences were not statistically significant. However, milk solids-not-fat (SNF) percentage was significantly ($P<0.05$) higher in T4 compared to other treatment and control groups. Additionally, milk lactose percentage was significantly ($P<0.05$) higher in T1 and T4 than in T0 (control group). This study highlights the importance of UMMB supplementation in sustaining milk production and composition during winter forage scarcity. It suggests that enzyme- and herb-enriched UMMBs can enhance milk yield, protein, and SNF content in dairy cows. The findings of the study provide valuable insights for optimizing ruminant nutrition and improving dairy performance in harsh climates.

Keywords: Dairy cow nutrition; exogenous fibrolytic enzyme; milk composition; urea molasses mineral block; *urtica dioica*.

ABBREVIATIONS

FCM : Fat corrected milk;
MLRI : Mountain Livestock Research Institute;
SNF : Solid not fat;
UMMB : Urea molasses mineral block.

1. INTRODUCTION

Around two-thirds of India's population depends on agriculture, contributing 17% to GDP, with 27% from animal husbandry (Livestock statistics, 2024). Success in dairy farming around world depends on many factors like environment conditions, availability of animals with good genetic merit, availability of feed and fodder, production scale and culture. Dairy producers in South East Asia are small holders adopting low input output production system, local crops being mostly used (Oliveros, 2019). Besides milk production, the reproduction, growth and vitality of dairy cattle under Indian conditions show decimal results with non- scientific feeding being predominant one. In India, farmers rely mostly on agro- industrial byproducts, straws and other fibrous feeds for livestock feeding. Such feeds are deficient in energy, proteins, minerals and vitamins. Poor nutrition due to non-scientific feeding is a key factor, with fodder shortages of 33% (concentrates), 60% (green fodder), and 42% (dry fodder) (Datta, 2013). Jammu & Kashmir faces a 40% fodder deficit, with Kashmir (49%) and Ladakh (85%) worst affected (Ganai et al., 2006). Urea Molasses Mineral Blocks (UMMBs) offer a cost-effective solution to fortify

low-quality roughage (Jayawickrama et al., 2013). These blocks, containing urea, molasses, minerals, and additives, improve digestibility, feed intake, and milk yield while enhancing microbial growth in the rumen. UMMB supplementation increases feed intake by 25-30%, digestibility by 20% (Yami, 2007), and milk yield (Ramesh et al., 2009), improving fertility (Mengistu and Hassan, 2017) and reducing stress. Fortification with probiotics, enzymes, and herbs further enhances UMMB benefits. *Urtica dioica*, a wild herb rich in minerals and proteins, boosts digestion and immunity (Andualem et al., 2016b, Mehboob et al., 2022). Exogenous fibrolytic enzymes improve fiber digestibility (Burroughs et al., 1960) optimizing forage utilization. With technological advancements, enzyme supplementation has become cost-effective. Given these advantages, a study was conducted to evaluate UMMB's impact on milk yield and composition in dairy cows. *Leucaena leucocephala* based multi-nutrient lick blocks depicted increases dry matter and crude protein intake with non-significant change in growth performance of buffaloes (Llantada et al., 2024).

2. METHODS

The present study was carried out to assess the effect of fortification of urea molasses mineral blocks by *Urtica dioica* and exogenous fibrolytic enzyme in ration of dairy cows on milk yield and milk composition during stressful harsh winter conditions. The study was carried out in two phases;

2.1 Preparation of UMMBs and Grouping of Experimental Animals

2.1.1 Feeding of UMMBs, collection and analysis of milk

2.1.1.1 Preparation of UMMBs and grouping of experimental animals

Collection of Additives: Stinging nettle (Bichu buti, kandali, soy, Burn nettle, Devil's leaf) was collected from the premises of Mountain Livestock Research Institute (MLRI), Manasbal, Kashmir. It was freed from dirt and dust and allowed to dry under shade. Dried stinging nettle was crushed using grinding machine and stored in air tight containers after proper labeling at room temperature. Exogenous fibrolytic enzyme used in the present study was received from Division of Animal Nutrition, FVSC SKUAST-K formulated by Sheikh et al. (2017). Exogenous fibrolytic enzyme contained Xylanase (350000U), Beta-glucanase (480000U), Cellulase (1200000U), Amylase (5250000U), Pectinase (250000U), Phytase (500000U), Mannase (100000U) (Dose= 0.9g/kg straw)

Experimental Ration: The ration comprised of roughage (maize silage, mixed hay, root crops) and concentrate mixture (compound cattle feed) manufactured at Feed Mill at MLRI, Manasbal. The feeding schedule of experimental animals as in vogue at MLRI Manasbal is given in Table 3. The animals were not supplemented with UMMB in control group (T_0), 300g of non-fortified UMMB was offered to T_1 , 300g of Urtica fortified UMMB in T_2 , 300g of fibrolytic enzyme fortified UMMB in T_3 and 300g of Urtica and enzyme fortified UMMB in T_4 , respectively. UMMBs were prepared by cold process dissolving urea in lukewarm and then with molasses in a container. This mixture was added with Salt-cement paste prepared in another container. Other ingredients like wheat bran, mineral mixture, grinded mustard oil cake, Urtica powder and enzyme were added to this mixture after proper weighing. After thorough mixing, the mixture was put in wooden molder with polythene sheet at base and properly pressed so that the mixture gets in proper shape. Then the molder was emptied by turning it upside down and the block was kept for proper solidification and drying. The ingredient composition of UMMBs used in the experiment are given in Table 1.

Grouping of Experimental Animals: The experiment was conducted on thirty lactating

Jersey cows in early stages of lactation. The animals were randomly divided into 5 experimental groups of 6 animals each based on average body weight, stage of lactation, average milk yield per day and parity (Table 2). All the experimental animals were kept under similar managemental conditions with respect to housing, basal feeding and watering. The animals were kept indoor within well-ventilated cemented floor sheds during the entire experimental period and left loose in the paddock briefly for exercise. The animals were treated for ecto and endoparasites with proper doses of standard anthelmintics. Clean, wholesome drinking water was kept available all the time within shed.

2.2 Feeding of UMMBs, Collection and Analysis of Milk Samples

Feeding of UMMBs: Before the start of experimental trail, an adaptation period of 15 days was provided to introduce animal to the UMMB supplementation, during which the experimental animals were allowed to lick the UMMB for specified time period to prevent toxicity. During the 45 days of the feeding trial, the animals were offered 300 grams of UMMB daily (Upadhyay et al, 2018). Animals in the T_0 (control) were offered conventional feeding as per feeding schedule of MLRI, Manasbal without any supplementation. However, animals of experimental groups were provided with 300g of non-fortified UMMB, 300g of Urtica fortified UMMB, 300g of fibrolytic enzyme fortified UMMB and 300g of Urtica and enzyme fortified UMMB in T_1 , T_2 , T_3 , T_4 , respectively in T_4 respectively in addition to conventional feeding. Concentrate feed and roughage was offered individually to all animals twice daily in equal amounts in morning and evening, whereas UMMBs were offered once daily in the morning. Blocks were weighed before and after feeding to record the intake. Experimental animals were provided with free access to clean drinking water throughout the experimental period of 60 days. Feeding schedule of experimental animals is given in Table 3.

The chemical analysis of the root of turnip showed that it is rich in multiple carbohydrate, protein, dietary fiber, vitamin C, essential amino acid, and mineral element, but less fat. Maize is one of the most high-yielding forage crops, requires less labour (since it is harvested in a single operation) and is generally less costly (per t DM) to produce than other forage crops.

Table 1. Composition of UMMBs used during the trial

Ingredients (kg)	T ₁ (Non-fortified UMMB)	T ₂ (Urtica fortified UMMB)	T ₃ (F. Enzyme fortified UMMB)	T ₄ (Urtica and F. Enzyme fortified UMMB)
Urea	10.00	10.00	10.00	10.00
Molasses	45.00	45.00	45.00	45.00
Wheat bran	21.00	21.00	21.00	21.00
Mustard oil cake	10.00	10.00	10.00	10.00
Mineral mixture	10.00	10.00	10.00	10.00
Salt	2.00	2.00	2.00	2.00
Cement	3.00	2.00	2.00	2.00
Urtica	-	2.00	-	1.00
Enzyme	-	-	2.00	1.00

Table 2. Grouping of experimental animals

S. No.	Lactation stage (month)	Body weight (kg)	Milk production (liters)	Parity
T₀ (Conventional feeding)				
Avg.	6.75	288.00	5.50	3
T₁ (Group receiving CF+ Non fortified UMMB)				
Avg.	6.50	302.16	4.75	3
T₂ (Group receiving CF+UMMB fortified with 1% Urtica)				
Avg.	6.50	301.00	4.40	3
T₃ (Group receiving CF+ UMMB containing 1% enzyme)				
Avg.	6.00	295.25	4.75	4
T₄ (Group receiving CF+UMMB containing 1% Urtica and 1% enzyme)				
Avg.	6.50	293.25	5.03	3

Table 3. Feeding schedule of experimental animals

S. No.	Group	Routine diet (kg/animal/day)			Compound Cattle Feed	UMMB supplementation (grams/animal/day)	
		Root crops (Chaffed turnips)	Maize Silage	Mixed hay		Adaptation	Trial
1	T ₀	4.00	5.00	2.00	4.00	100-300	300
2	T ₁	4.00	5.00	2.00	4.00		
3	T ₂	4.00	5.00	2.00	4.00		
4	T ₃	4.00	5.00	2.00	4.00		
5	T ₄	4.00	5.00	2.00	4.00		

Maize silage is also a good way to secure the crops as it is possible to turn a maize grain crop damaged by frost, rain or drought into maize silage (Arvalis, 2011; Roth et al., 2001). Compound cattle feed was prepared from maize, wheat bran, mustard oil cake, rice polish, molasses, salt and mineral mixture at experimental station.

2.3 Parameters Studied and Observation taken

Milk Yield: The milk yield was recorded daily in the morning at 7 am and in afternoon at 5 pm

with the help of measuring cylinder during the experimental period.

Milk Composition: Composition of milk with respect to protein (%), fat (%), lactose(%), SNF(%) was analyzed using automatic milk analyzer (EKOMILK ultra PRO) on day 0, day 22, day 45 of the trial period). Fat corrected milk (FCM) was estimated using the formula given by Parekh, 1986:

$$\text{FCM (3.5\%)} = 0.35M + 18.57F$$

Where,

M = quantity of milk in kg

F = quantity of fat in kg

2.4 Statistical Analysis

The data obtained in the experiment was analyzed using statistical procedures as given by Snedecor and Cochran (1994) and significance of mean difference was tested by Duncan's New Multiple Range Test (DNMRT) using the Statistical Package for the Social Sciences, Base 20.0 (SPSS Software products, Marketing Department, SPSS Inc. Chicago, USA).

3. RESULTS AND DISCUSSION

In order to assess the impact of UMMB supplementation with or without feed additives on performance of dairy cattle during winter months, four types of blocks viz., Non -fortified UMMB (T₁), *Urtica* fortified UMMB (T₂), Enzyme fortified UMMB (T₃) and enzyme and *Urtica* fortified UMMBs (T₄) were formulated and fed to dairy animals for sixty days including fifteen days of adaptation period. The following results were obtained during the experiment.

3.1 Effect on Milk yield

Effect of supplementation of urea molasses mineral blocks with or without feed additives on the milk yield (liters) of dairy cattle is shown in Table 4. Statistical analysis of the data revealed non-significant difference in average milk yield from 0 to 30 day of the experimental period. Significant ($P=0.05$) difference in average milk yield was found during 30-45 days of the trial with significantly ($P=0.05$) higher milk yield in T₄ group than control (T₀). However, there was non-significant difference in milk yield between animals of T₁, T₂ and T₃ groups than control (T₀). Statistically there was no significant difference in average milk yield between animals of treatment (supplemented) and control groups, however in control group reduction in milk yield (870 ml/day) was noticed as winter progressed. Maximum increase in milk production was recorded in T₄ (710 ml/day). Supplementation of UMMB not only sustained milk production but also yielded non-significant increase in average milk yield. The reason behind decrease in milk yield in control group could be the stress due to sub-zero temperature prevalent in Kashmir during winter months (Dec- Feb). Our results fall in line with the observations of Upreti et al. (2010) and Jayawickrama et al. (2013) who reported non-significant increase of 1.1 liters milk/animal/day (17.1%) in crossbred Jersey cows under hill management system and non-significant increase of about 6% was recorded in milk

offtake in treatment groups, respectively on supplementation of UMMB. Alam et al. (2006) also reported non-significant increase in milk yield in cows till day 60 postpartum, thereafter plateau was observed till day 90 postpartum in milk yield in the treatment group after UMMB supplementation. Regarding effect of supplementing *Urtica dioica*, no significant change in milk yield following addition of stinging nettle haylage to the total mixed ration of lactating cattle was reported by Humpries and Reynolds (2014). Results of our study with respect to fibrolytic enzyme fortified UMMB on milk yield finds support from Zilio et al. (2019) who reported no significant change in milk yield between control and fibrolytic, amylolytic and combination of fibrolytic and amylolytic enzyme fed in HF cows.

3.2 Effect on Milk Composition

3.2.1 Effect on milk protein percentage

A significant ($P=0.05$) increase in milk protein percentage was found in all treatments as compared to control. Highest average protein percentage (3.22%) was found in T₄ and the lowest (2.71%) in T₁ (control) group. Increase in milk protein in treatment groups could be due to urea supplementation as source of NPN in UMMB. Our results are in line with reports of Duressa and Berissa, (2016) who found significant ($P=0.05$) increase (3.46%) in milk protein percentage in treatment groups compared to control group after UMMB supplementation. Regarding effect of *Urtica dioica*, Khanal et al, (2017) and Andualem et al, (2016b) found significant ($P=0.05$) difference in milk protein percentage following nettle inclusion in the diet. Enhancement of milk protein by exogenous fibrolytic enzyme supplementation are similar to results obtained by Lunagariya et al. (2019) who reported significantly ($P=0.05$) higher milk protein percentage in cows fed exogenous fibrolytic enzyme (Xylanase, glucanase). However Zilio et al. (2019) reported lower milk protein percentage in enzyme fed groups as compared to control group, whereas, Mohamad et al. (2013), Rodea et al. (2013) and Azam et al. (2017) reported non-significant change in milk protein percentage compared to control group following exogenous fibrolytic enzyme treatment of rations. The variation in milk protein percentage may be due to different dietary regimes under varied environmental and physiological conditions.

3.2.2 Effect on milk fat percentage

Non-significant increase in milk fat percentage was recorded in all treatment groups compared to control group during the entire trial period. Our results are in agreement with Akhter et al. (2004) and Jayawickrama et al. (2013) who found non-significant increase in milk fat percentage after UMMB feeding. Our results are also in line with observations of Duressa and Berissa, (2016) who reported non-significant increase in milk fat in treatment group (6.20%) compared to control group (6.0%) on UMMB supplementation. However, Shah et al. (2018) found significant ($P=.05$) increase of 8.23% in milk fat following UMMB supplementation.

Inclusion of nettle in the diet showed non-significant increase in milk fat percentage. Andualem et al. (2016b) also reported non-significant change in milk fat percentage following replacement of graded percentage of concentrate by stinging nettle leaf. However Khanal et al. (2017) reported significant increase in milk fat percentage from 4.61 to 5.61% two weeks after nettle supplementation in treatment

group as compared to control group. Pertaining to exogenous fibrolytic enzyme supplementation, our results are in agreement with Zilio et al. (2019), Rodea et al. (2013), Azam et al. (2017) who reported non-significant change in milk fat percentage in exogenous fibrolytic enzyme offered groups as compared to control group. However Lunagariya et al. (2019) reported significantly ($P=.05$) higher milk fat percentage in cows provided exogenous fibrolytic enzyme (Xylanase, glucanase).

3.2.3 Effect on milk solid not fat (SNF) percentage

Significantly ($P=.05$) higher milk SNF percentage was recorded in T₄ (8.00%) as compared to other treatment groups and control (7.47%). Results obtained for milk SNF are in agreement with Jayawickrama et al. (2013) who reported non-significant change in milk SNF upon supplementation of UMMBs. However, Lawania and Khadda, (2017) reported significant ($P=.05$) increase in milk SNF following usage of UMMBs in feed of dairy cattle.

Table 4. Milk yield of animals affected by UMMB supplementation

Experimental period	T ₀	T ₁	T ₂	T ₃	T ₄
Day 0	5.00 ±1.08	4.75 ±0.45	4.37 ±0.71	4.75 ±1.01	5.00 ±0.40
0-15 days	5.17 ±0.60	4.95 ±0.47	4.53 ±0.27	4.83 ±0.11	5.10 ±0.54
15-30days	4.71 ±0.85	5.01 ±0.43	4.82 ±0.24	5.05 ±0.17	5.38 ±0.47
30-45 days	4.30 ±0.76 ^a	5.05 ±0.47 ^{ab}	5.02 ±0.22 ^{ab}	5.30 ±0.61 ^{ab}	5.81 ±0.36 ^b
Average	4.73 ±0.41	5.00 ±0.25	4.79 ±0.14	5.06 ±0.09	5.43 ±0.26
Gain/loss(ml)	-870	+100	+490	+470	+710

Means superscripted with different letters in a row (^{a, b, c, d}) for a particular data differ significantly from each other ($P=.05$)

Table 5. Milk protein (%) following UMMB supplementation

Experimental period	T ₀	T ₁	T ₂	T ₃	T ₄
0 day	2.62±6.12	2.91±0.13	2.87±0.04	2.93±0.10	2.89±0.21
22 day	2.72±0.12 ^a	3.09±0.19 ^{ab}	3.19±0.10 ^b	3.92±0.13 ^b	3.18±0.21 ^b
45 day	2.79±0.11 ^a	3.36±0.07 ^b	3.52±0.13 ^b	3.44±0.15 ^b	3.60±0.15 ^b
Average	2.71±0.06^a	3.12±0.07^b	3.19±0.08^b	3.22±0.08^b	3.22±0.12^b

Means superscripted with different letters in a row (^{a, b, c, d}) for a particular data differ significantly from each other ($P=.05$)

Table 6. Milk fat (%) following UMMB supplementation

Experimental period	T ₀	T ₁	T ₂	T ₃	T ₄
0 day	3.99±0.34	3.87±0.20	3.73±0.18	3.84±0.32	3.72±0.08
22 day	4.08±0.25	4.05±0.18	3.86±0.20	3.63±0.11	3.96±0.06
45 day	3.88±0.34	4.21±0.16	4.07±0.16	3.70±0.11	4.15±0.13
Average	3.98±0.17	4.04 ±0.4	3.88±0.10	3.72±0.11	3.94±0.06

Pertaining to *Urtica dioica* supplementation, SNF percentage showed significant ($P=.05$) increase following nettle inclusion in diet (Khanal et al., 2017). However Andualem et al. (2016b) reported non-significant change in milk SNF percentage following replacement of graded percentage of concentrate by stinging nettle leaf meal. Lunagariya et al. (2018) reported higher SNF percentage in milk of cows fed exogenous fibrolytic enzyme (Xylanase, glucanase). However, Mohamed et al. (2013), Azam et al. (2017) reported non-significant increase in milk SNF in exogenous fibrolytic enzyme supplemented groups as compared to control.

3.2.4 Effect on milk lactose percentage

Milk lactose was reported significantly ($P=.05$) higher in T_1 and T_4 than control. Likewise, Lunagariya et al. (2019) reported higher lactose percentage in cows fed exogenous fibrolytic enzyme (Xylanase, glucanase). However, Jayawickrama et al. (2013) did not find any change in milk lactose on supplementation of UMMB. Zilio et al. (2019), Rodea et al. (2013)

and Mohamed et al. (2013) reported non-significant change in milk lactose percentage in enzyme fed groups as compared to control group.

3.2.5 Effect on fat corrected milk

Fat corrected milk (FCM) was found non-significantly higher in all treatments as compared to control. Sudhakar et al. (2002) reported 1.5 kg higher milk yield in buffaloes offered UMMB as compared to control. Similarly, Sevilla Lacandula. (2001) published increase in 4% FCM in cows following UMMB inclusion in the diet.

Urtica dioica supplementation didn't resulted in significant change in fat and protein corrected milk (Humpries and Reynolds, 2014). Considering exogenous fibrolytic enzyme supplementation, Non-significant change in 4% FCM was found (Peters et al., 2015). On the other hand, Bordeny et al. (2015) and Mohamad et al. (2013) reported significant ($P=.05$) change in FCM after exogenous fibrolytic enzyme mixture in the diet.

Table 7. Milk SNF (%) following UMMB supplementation

Experimental period	T_0	T_1	T_2	T_3	T_4
0 day	7.44±0.19	7.51±0.10	7.48±0.07	7.41±0.17	7.72±0.20
22 day	7.51±0.21 ^a	7.66±0.16 ^a	7.63±0.09 ^a	7.59±0.14 ^a	8.03±0.18 ^b
45 day	7.45±0.23 ^a	7.69±0.13 ^a	7.91±0.12 ^a	7.69±0.15 ^a	8.27±0.18 ^b
Average	7.47±0.11^a	7.62±0.07^A	7.67±0.07^a	7.56±0.08^a	8.00±0.11^b

Means superscripted with different letters in a row (^{a, b, c, d}) for a particular data differ significantly from each other ($P=.05$)

Table 8. Milk Lactose (%) following UMMB supplementation

Experimental period	T_0	T_1	T_2	T_3	T_4
0 day	3.89±0.06	3.95±0.07	3.75±0.08	3.83±0.09	3.93±0.07
22 day	3.91±0.03	4.11±0.07	4.02±0.06	4.10±0.13	4.14±0.09
45 day	3.94±0.03 ^a	4.30±0.11 ^b	4.32±0.07 ^b	4.22±0.14 ^{ab}	4.46±0.07 ^b
Average	3.91±0.02^a	4.12±0.05^b	4.03±0.07^{ab}	4.05±0.07^{ab}	4.18±0.06^b

Means superscripted with different letters in a row (^{a, b, c, d}) for a particular data differ significantly from each other ($P=.05$)

Table 9. Fat corrected milk (3.5%) of dairy cattle following UMMB supplementation

Experimental period	T_0	T_1	T_2	T_3	T_4
0 day	5.70±0.81	4.86±0.37	5.20±0.62	5.31±0.46	5.03±0.14
22 day	5.31±1.13	5.35±0.41	5.39±0.60	5.48±0.42	5.49±0.20
45 day	4.64±0.97	5.71±0.39	5.63±0.65	6.00±0.28	5.95±0.22
Average	5.22±0.55	5.31±0.23	5.41±0.34	5.60±0.22	5.49±0.14

4. CONCLUSION

Based on the above findings, it is concluded that supplementation with UMMB, whether enriched with enzymes and herbs or not, had a positive but non-significant effect on milk production and composition in dairy cows during the winter months. The inclusion of *Urtica dioica* and exogenous fibrolytic enzymes in UMMBs showed the highest improvements in milk yield, protein percentage, and SNF content compared to the control group. Additionally, UMMB supplementation helped animals maintain their productivity and adapt to the harsh winter conditions of the Kashmir Valley. Further research with a larger sample size and extended duration is recommended to validate these findings and explore the long-term benefits of UMMB supplementation in dairy production.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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