**Optimizing Dairy Cow Performance: Influence of fortified Urea Molasses Mineral Block on Milk Yield in winter**

**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 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 dioca.*

**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 SouthEast 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 dioca*, 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 dioca* 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

2.2. Feeding of UMMBs, collection and analysis of milk.

**2.1. Preparation of UMMBs and grouping of experimental animals**

**2.1.1. 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)

**2.1.2. 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 3.3. The animals were not supplemented with UMMB in control group (T0), 300g of non-fortified UMMB was offered to T1, 300g of Urtica fortified UMMB in T2, 300g of fibrolytic enzyme fortified UMMB in T3 and 300g of Urtica and enzyme fortified UMMB in T4, 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 through 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.

**Table-1: Composition of UMMBs used during the trial**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ingredients (kg)** | **T1**  **(Non-fortified UMMB)** | **T2**  **(Urtica fortified UMMB)** | **T3**  **(F. Enzyme fortified UMMB)** | **T4**  **(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 |

**2.1.3. 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 anthelminthics. Clean, wholesome drinking water was kept available all the time within shed.

**2.2. Feeding of UMMBs, collection and analysis of milk samples.**

**2.2.1. *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 T0 (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 T1, T2, T3, T4, respectively.

**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** |

in T4 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.

**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 | T0 | 4.00 | 5.00 | 2.00 | 4.00 | 100-300 | 300 |
| 2 | T1 | 4.00 | 5.00 | 2.00 | 4.00 |
| 3 | T2 | 4.00 | 5.00 | 2.00 | 4.00 |
| 4 | T3 | 4.00 | 5.00 | 2.00 | 4.00 |
| 5 | T4 | 4.00 | 5.00 | 2.00 | 4.00 |

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. 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**

**2.3.1. 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.

**2.3.2. 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:

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 & 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=.05) difference in average milk yield was found during 30-45 days of the trial with significantly (P=.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 pleateau was observed till day 90 postpartum in milk yield in the treatment group after UMMB supplementation. Regarding effect of supplementing *Urtica dioca,* 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

**Table 4: Milk yield of animals affected by UMMB supplementation.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Experimental period** | **T0** | **T1** | **T2** | **T3** | **T4** |
| 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 ±0.76a | 5.05 ±0.47ab | 5.02 ±0.22ab | 5.30 ±0.61ab | 5.81 ±0.36b |
| **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).

**3.2. Effect on milk composition**

**3.2.1. Effect on milk protein percentage*:*** A significant (P=.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=.05) increase (3.46%) in milk protein percentage in treatment groups compared to control group after UMMB supplementation. Regarding effect of *Urtica dioca*, Khanal *et al,* (2017) and Andualem *et al,* (2016b) found significant (P=.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=.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

**Table 5. Milk protein (%) following UMMB supplementation.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Experimental period** | **T0** | **T1** | **T2** | **T3** | **T4** |
| 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±0.12a | 3.09±0.19ab | 3.19±0.10b | 3.92±0.13b | 3.18±0.21b |
| 45 day | 2.79±0.11a | 3.36±0.07b | 3.52±0.13b | 3.44±0.15b | 3.60±0.15b |
| **Average** | **2.71±0.06a** | **3.12±0.07b** | **3.19±0.08b** | **3.22±0.08b** | **3.22±0.12b** |

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

**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).

**Table 6. Milk fat (%) following UMMB Supplementation.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Experimental period** | **T0** | **T1** | **T2** | **T3** | **T4** |
| 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** |

**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.

Pertaining to *Urtica dioca* 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.

**Table 7. Milk SNF (%) following UMMB supplementation.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Experimental period** | **T0** | **T1** | **T2** | **T3** | **T4** |
| 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±0.21a | 7.66±0.16a | 7.63±0.09a | 7.59±0.14a | 8.03±0.18b |
| 45 day | 7.45±0.23a | 7.69±0.13a | 7.91±0.12a | 7.69±0.15a | 8.27±0.18b |
| **Average** | **7.47±0.11a** | **7.62±0.07A** | **7.67±0.07a** | **7.56±0.08a** | **8.00±0.11b** |

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

**3.2.4. Effect on milk lactose percentage:** Milk lactose was reported significantly (P=.05) higher in T1 and T4 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.

**Table 8. Milk Lactose (%) following UMMB supplementation.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Experimental period** | **T0** | **T1** | **T2** | **T3** | **T4** |
| 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±0.03a | 4.30±0.11b | 4.32±0.07b | 4.22±0.14ab | 4.46±0.07b |
| **Average** | **3.91±0.02a** | **4.12±0.05b** | **4.03±0.07ab** | **4.05±0.07ab** | **4.18±0.06b** |

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

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Experimental period** | **T0** | **T1** | **T2** | **T3** | **T4** |
| 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 dioca* 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

**5. Abbreviations**

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

**6. 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

**Refrences**

Akhter, Y., Akbar, M.A., Shahjahal, M. and Ahmad, T.U. 2004. Effect of urea molasses multinutrient block supplementation of dairy cows fed rice straw and green grasses on milk yield, composition, live weight gain of cows and calves and feed intake. *Pakistan Journal of Biological Sciences* **7**:1523-1525.

Alam, M. G. S., Azam, M. S. and Khan, M. J. 2006. Supplementation with urea and molasses and body weight, milk yield and onset of ovarian cyclicity in cows. *Journal of Reproduction and Development* **52**: 529-535.

Andualem, D., Negesse, T. and Tolera, A. 2016b. Milk yield and composition of grazing arsi-bale does supplemented with dried stinging nettle (*Urtica simensis*) leaf meal and growth rate of their suckling kids. *Advances in Biological Research* **10**(3): 191-199.

Annual Report 2019-2020. Department of Animal Husbandry and Dairying. Ministry of Fisheries, Animal Husbandry and Dairying. Government of India.

Anonymous, 2017. CLFMA of idia calls for allied and integrated agriculture industry. The Economic Time.

Arvalis, 2011. Les territoires du maïs fourrage en France. Arvalis, FNPSMS, UFS

Azam, B., Tahir, M.N., Shahzad, F., Ghaffar, A., Abbas, G., Gohar, M. and Saima, 2017. Exogenous fibrolytic enzymes addition in concentrate ration of lactating Nili Ravi buffaloes: Effects on milk production and diet digestibility. *Pakistan J. Zool*. **49**: 1359-1364.

Bohra, H.C., Patel, A.K., Rohilla, P.P., Mathur, B.K., Patil, N.V. and Misra, A.K. 2012. Feed Production Technology for Sustainable Livestock Production in Arid Areas. Zone Research Institute, Jodhpur, India, **38**: 52-57.

Bordeny, N. E., Abedo, A. A., El-Sayed, H. M., Daoud, E. N., Soliman, H. S. and Mahmoud, A. E. M. 2015. Effect of exogenous fibrolytic enzyme application on productive response of dairy cows at different lactation stages. *Asian Journal of Animal and Veterinary Advancement* **10**(5): 226-236.

Burroughs, W., W. Woods, S. A. Ewing, J. Greig, and B. Theurer. 1960. Enzyme additions to fattening cattle rations. Journal of Animal Science.**19**:458–464

Datta, D. 2013. Indian fodder management towards 2030: A case of vision or myopia. *International Journal of Management and*  *Social Science Research* **2**(2): 33-41.

Duressa, D. and Bersissa, T. 2016. Effects of Urea-Molasses Multi-nutrient Blocks (UMMB) Supplementation on Some Production Parameters of Lactating Horro Cows at Horro Guduru Animal Production and Research Center, Western Ethiopia. *Science. Technology Arts Research Journal* **5**(1): 35-38.

FAO, 2007b. Food and Agricultural Organization. Experiences with urea-molasses multi-nutrient blocks in buffalo production and reproduction in smallholder dairy farming, Punjab, India. Food and Agriculture Organization of the United Nations Rome. pp. 59-70.

Ganai, A. M., Matoo, F. A., Singh, P. K., Ahmad, H. A. and Samoon, M. H. 2006.Chemical composition of some feeds, fodders and plane nutrition of livestock of Kashmir valley. *SKUAST Journal of Research* **8**: 145-151.

Humpries, D. J. and Reynolds, C. K. 2014. Effect of adding stinging nettle (*Urtica dioica*) haylage to a total mixed ration on performance and rumen function of lactating dairy cows. *Animal Feed Science and Technology* **189**: 72-81.

Indian livestock statistics, 2024. Department of Animal Husbandry and Dairying. Ministry of Fisheries, Animal Husbandry and Dairying. Government of India.

Jayawickrama, D. R., Weerasinghe, P., Jayasena, D. and Mudannayake, D. C. 2013. Effects of supplementation of urea-molasses multinutrient block (UMMB) on the performance of dairy cows fed good quality forage based diets with rice straw as a night feeding. *Journal of* *Agricultural Science* **40**(2): 123-129.

Jayawickrama, D. R., Weerasinghe, P., Jayasena, D. and Mudannayake, D. C. 2013. Effects of supplementation of urea-molasses multinutrient block (UMMB) on the performance of dairy cows fed good quality forage based diets with rice straw as a night feeding. *Journal of* *Agricultural Science* **40**(2): 123-129.

Khanal, B., Sah, R., Shah, S., Dhakal, B. and Steneroden, K. 2017. Effect of medicated and non-medicated urea molasses multi-nutrient block (UMMB) on milk production, milk composition and gastro-intestinal parasites in buffalo. **In***: Proceedings of International Buffalo Symposium.,* pp. 163-169.

Lawania, P. and Khadda, B.S. 2017. Efficacy of urea molasses mineral block on milk production and reproductive performance of zebu cattle under field condition. *Journal of Krishi Vigyan*  **6**:83-87.

Lawania, P. and Khadda, B.S. 2017. Efficacy of urea molasses mineral block on milk production and reproductive performance of zebu cattle under field condition. *Journal of Krishi Vigyan*  **6**:83-87.

Li, H., Wang, K., Lang, L., Lan, Y., Hou, Z., Zhang, L., Zhu, W., Yang Q. and Wang, J. 2014. Study the use of urea molasses multi-nutrient block on pica symptom of cattle. *Journal Animal Vet. Adv*. **13**(3):152-158.

Llantada PLT, Castillo CI, Uy-De Guia MRD, Amido RD, Grospe VKA, Lavarias PJF, Gonzales EG, and Del Barrio AN. (2024). Effect of Leucaena leucocephalabased multi-nutrient lick blocks on the feed intake and growth performance of buffaloes. Online J. Anim. Feed Res., **14**(6): 367-375

Lunagariya, P.M., Gupta, R.S., Shah, S.V., Patel, Y.G., 2019. Digestibility of nutrients as influenced by supplementation of exogenous fibrolytic enzymes in dry non-pregnant cows. *Indian Journal of Veterinary Science and Biotechnology* **14**(4) : 45-48.

Mehboob, S. 2017. Effect of herb (*Urtica dioica*) and yeast (*Saccharomyces cerevisiae*) as feed additives on performance of polled cross lambs fed paddy straw based complete feed. Thesis submitted to Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Jammu and Kashmir, India.

Mengistu, G. and Hassen, W. 2017. Supplementary feeding of urea molasses multi-nutrient blocks to ruminant animals for improving productivity. *Academic Research Journal of Agricultural Science and Research* **6**: 52-61.

Mohamed, D.E.A., B.E. Borhami, K.A. El-Shazly and S.M.A. Sallam, 2013. Effect of dietary supplementation with fibrolytic enzymes on the productive performance of early lactating dairy cows. *Journal of Agricultural Science*, **5**: 146-155

Parekh, H. K. 1986. A new formula for fat-corrected milk*. Indian Journal of Animal Science* **56**:608–609

Paul S, Geng C-A, Yang T-H, Yang Y-P, Chen J-J. Comparative study of the glucosinolate profiles in turnip from four agroclimatic zones of china and neighboring countries. J Food Meas Characterization. (2019) 13:2798–811.

Peters, A., Meyer, U. and Danicke, S. 2015. Effect of exogenous fibrolytic enzymes on performance and blood profile in early and mid-lactation Holstein cows. *Animal Nutrition*. **1**: 229- 238.

Ramesh, B. K., Thirumalesh, T. and Suresh, B.N. 2009. Effect of feeding of urea mineral molasses block on milk production, milk composition and onset of estrus in dairy animals. *Indian Journal of Animal Nutrition* **26**:322-326.

Rodea, O.A., Noriega-Carrillo, A., Salem, A.Z.M., Ortega, O.C. and Gonzalez-Ronquillo, M. 2013. The use of exogenous enzymes in dairy cattle on milk production and their chemical composition: A meta-analysis. *Animal Nutrition and Feed Technol*. **13**: 399-409.

Roth, G. W.; Heinrich, A. J., 2001. Corn silage production and management. PennState Ext., Agron. Facts, 18

Sevilla, C. and Lacandula, B. 2001. Effects of concentrate and urea-molasses-mineral block on the body conditions and milk production of dairy cows. En Castillo L. (Ed) National Academy of Science and Technology (Philippines). pp. 53-54.

Shah, S., Khanal, B., Dhakal, B. and Sah, R. 2018. Effect of urea molasses multi-nutrient block (Ummb) on milk and gastro intestinal parasites in buffalo” *International Journal of Current Research in Life Sciences* **7**(09):2661-2665.

Sheikh, G.G., Ganai, A.M., Sheikh, F.A., Bhat, S.A., Masood, D., Mir, S., Ahmad, I. and Bhat, M.A. 2017. Effect of feeding urea molasses treated rice straw along with fibrolytic enzymes on the performance of Corriedale Sheep*. Journal of Entomology and Zoology Studies* **5**(6): 2626-2630.

Singh, G., Singh, R. and Singh, D. 2013. Effect of UMMB (Urea Molasses Mineral Block) supplementation on rumen profile in Buffaloes. *Webmed Central Veterinary Medicine* **4**: WMC004340

Snedecor, G.W. and Cochran, W.G. 1994. Statistical Methods. (8th edn.), Iowa State University Press, Ames, Iowa, USA

Sudhaker, K., Reddy, G. V. K. and Krishina, N. 2002. Effect of supplementation of urea- molasses mineral block on quantity and quality of milk production in Murrah buffaloes. *Indian Journal of Animal Nutrition* **19** (4) : 301-305.

Upadhyay, N., Tiwari, M.R., Pandey, L.N., Karki, T.B., Acharya, R., Gairhe, S. and Acharya, Y. 2018. Economic analysis of the urea molasses mineral block feeding to lactating cattle of Nepal. *Nepalese Journal of Agricultural Sciences* **16**: 50-59.

Upreti, C.R., Shrestha, B. K. and Ghimire, B. 2010 Effect of UMMB Supplementation during winter on the milk production and its composition and infertility in dairy cattle in hill management production system. *Nepal Journal of Science and Technology* **11**: 71-78.0

Wani, S. A., Shaheen, F. A., Wani, M. H. and Saraf, S. A. 2014.Fodder budgeting in Jammu and Kashmir: status, issues and policy implications. *Journal of Animal Science* **84**(1): 52-57.

Yami, A. 2007. How to make urea molasses blocks and feed to sheep and goats. *A Bulletin of the Ethiopian Sheep and Goat Productivity Improvement Programme* **7**: 52-56.

Zilio, E. M. C., Del Valle, T. A., Ghizzi, L. G., Takiya, C. S., Dias, M. S. S., Nunes, A. T., Silva, G. G. and Rennó, F. P. 2019. Effects of exogenous fibrolytic and amylolytic enzymes on ruminal fermentation and performance of mid-lactation dairy cows. *Journal of Dairy Science*. **102** : 4179-4189.