Annual Research & Review in Biology

Volume 39, Issue 1, Page 21-26, 2024; Article no.ARRB.112524
ISSN: 2347-565X, NLM ID: 101632869

Economic Assessment of Specialized Ingredient-treated Feed for Crossbred Dairy Cattle in Subtropical Climates

Dhawal Kant Yadava [a++*], Parth Gaur [b], Garima Kansal [b], Rahul Singh Chandel [b] and Panch Kishor Bhartib [c]

[a] Department of LPM, IIVER, Rohtak–124002, India.
[b] ICAR-National Dairy Research Institute, Karnal – 132001, India.
[c] Livestock Production and Management, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh- 243122, India.

Authors' contributions

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

Article Information

DOI: 10.9734/ARRB/2024/v39i130625

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/112524

Original Research Article

Received: 23/11/2023
Accepted: 28/01/2024
Published: 01/02/2024

ABSTRACT

This experiment aimed to reduce the cost of feeding dairy cattle that were crossbred using a total of twenty-four crossbred animals. Four groups of six animals each were randomly selected from among the animals. Group 2 (76% treated feed), Group 3 (49% treated feed), Group 4 (100% treated green fodder), and Group 4 (Control) made up Group 1 (Gr-1). The remaining feed A-1, A-2, A-3, A-4, A-5, and A-6 received 1.5% urea+5% molasses+0.5% salt, 1.5% urea+5% molasses+1.5% salt, 1.5% urea+10% molasses+1.5% salt, 5% molasses+0.5% salt, and 10% molasses+0.5% salt were applied, respectively. Each animal at the farm cost 81Rs to feed on average. By contrast, under typical conditions, the feeding expenses for the first group in the A1, A2, A3, A4, A5, and A6 groups were 35, 35, 67, 71, 36, and 70 rupees, respectively. There was a

[++] *Assistant Professor;*
**Corresponding author: E-mail: dhawalk793@gmail.com;*

decrease of 43, 42, 11, 11, 44, and 10 rupees as a result. In the second group, the reduction for the A1, A2, A3, A4, A5, and A6 treatment groups was 30Rs, 29Rs, 10Rs, 9Rs, 30Rs, and 10Rs, respectively. In the third group, the reduction was 19Rs, 18Rs, 5Rs, 4Rs, 21Rs, and 7Rs, respectively.

Keywords: Cost; economics; molasses; palatability; urea; vrindavani are some of the related terms.

1. INTRODUCTION

There is currently a shortage of 35.5% of green fodder, 10.94% of dry agricultural leftovers, and 44% of concentrate feed components. On the other hand, there is an abundance of dry roughages all year round due to roughages spending more time in the rumen. Animal productivity can be increased by utilizing these resources without compromising the welfare or health of the animals. Nonetheless, these factors necessitate consistent evaluation and sound protocols. Large dairy animals primarily eat concentrate combinations, dry roughage, and green fodder. There is a large potential to reduce the cost of animal raising if innovative techniques are implemented, as the cost of feeding the animals equals 61–70% of the investment made in the dairy business. Rarely, but occasionally, cow manure is employed. Remaining feed is viewed as trash and abandoned in most Indian farms and families. The contents of this waste vary according to what is available, but in general, maize, sorghum, millets, clover, and Napier grass make up the majority of the leftovers on the northern plains of India [1]. Studies [2,3] show that feed intake, digestibility, and palatability of rice straw all increase when animals fed straw combined with molasses and urea. Research on treating low-quality feed using urea, ammonia, and molasses at different inclusion levels was done with encouraging results in order to achieve this goal. It was discovered that urea treatment might increase the nutritional value of straw by 46% because it breaks down the bonds between the lignin, hemicellulose, and cellulose [4]. The production of dairy cows has also increased as a result of the feeding practices using this feed, according to Singh et al. [5]. A examination of the literature revealed that most previous research initiatives concentrated on treating dry leftovers (such wheat or rice straw) by adding urea as nitrogen or molasses as energy sources. On the other hand, the management of fresh residual feed with high moisture contents (more than 50%) has not been studied. By treating residual feed with different urea, molasses, and salt mixes, its nutritional value can be increased. This higher-quality feed is a better choice when there is little or no accessible fodder. It also helped to reduce the expense of feeding the animals without impairing their performance.

2. MATERIALS AND METHODS

2.1 Study Location

The study was conducted in the Cattle and Buffalo Farm, ICAR-Indian Veterinary Research Institute, Izatnagar, India. The location is 28° 22' north, 79° 24' east, and 79° 24' latitude, and it is located at a height of 169.2 meters above mean sea level. The region, which is a part of the upper Gangetic plain, has a subtropical climate with high levels of humidity, particularly during the winter. Every year, winter spans from November to February and summer spans from May to August. Rainfall varies from 90 to 120 cm per year, with July and August seeing the most of it.

2.2 The Experiment's Plan

Several combinations of processed residual feed and fresh fodder were tried in an effort to reduce feeding costs. Chaffed fodder such as sorghum, millets, maize, napier grass, and berseem (clover) used as the raw materials for the waste feed. To increase the nutritional value and reduce feeding costs, six different combinations of urea, molasses, and salt were applied to the leftover feed (Table 1).

The six different urea, molasses, and salt mixes used to cure leftover feed are displayed in Table 1.

2.3 The Experiment's Design

To lower the cost of feeding, several combinations of processed residual feed and fresh fodder were attempted. The basic materials for the waste feed were chaffed fodder, sorghum, millets, corn, napier grass, and berseem (clover). To improve the nutritional value and lower the cost of feeding, the leftover feed was treated with six different combinations of urea, molasses, and salt (Table 1).

Table 1. Treatment of residual feed using six different urea, molasses, and salt combinations

Baseline feed ingredient (based on fresh materials)	Chemical composition (based on basal feed dry matter percentage) processed feed (final product)			Chemical composition (based on basal feed dry matter percentage) processed feed (final product)
	Urea	Molasses	Salt	
Leftover feed	1.51	4.1	0.51	A1
	1.51	4.1	1.51	A2
	1.51	10.1	0.51	A3
	1.51	10.1	1.51	A4
	Nil	4.1	0.51	A5
	Nil	10.5	0.55	A6

Table 2. The results of a feeding trial using different mixes of processed leftover feed and green fodder

Feeds	B1 group	B2 group	B3 group	B4 Control
Green: leftover feed	0: 100	24:76	49:51	100:0
Concentrate ration	given equitably to each group (in accordance with the institute's feeding procedure)			

2.4 The Choice of Test Subjects

24 crossbred animals, ages 8 to 12 months, were selected, and they were split into four groups of six animals each at random. 100% treated residual feed made up Group-1 (Gr-1); 74% treated feed made up Group-2; 51% treated feed made up Group-3; and 100% green fodder, without the use of treated feed, made up Group-4 (Gr-4), also known as the Control. Four distinct volumes of fresh and processed green fodder were fed for seven days (Table 2).

After every feeding trail, the 24 animals were weighed both before and after, and the weight increases were compared at the conclusion of each trial [6].

2.5 Chemical Analysis of Feed

Leftover feed was assessed both before and after treatment to ascertain alterations in the nutritional values (crude protein, crude fiber, moisture, dry matter, and ash content). The capacity of fungus to create toxins, such as mycotoxin and ochratoxin levels in the diet that was treated, was also investigated.

2.6 Animal Performance

Each feeding trail's weight gain before and after was utilized to gauge the animal's performance.

2.7 Statistical Analysis

The SPSS 20.0 software program was used to analyze the experiment data.

3. RESULTS AND DISCUSSION

3.1 Economics of the feed

The various groups' treated feed's economic feasibility was assessed using the scorecards displayed in Table 3.

The feeding cost chart shows that feeding expenditures were cut by up to half in the first and second treatment groups. Due to a greater molasses cost, feeding costs in the third treatment group were somewhat higher than in the control group, but they were still more reasonable and helpful. The treatments that combined fresh and treated feed (in a ratio of 51:49 and 75:25) yielded the best outcomes in terms of feed acceptance without impairing the animals' growth. The advantages of utilizing non-conventional feedstuffs in animal feeding include sustainability, potential cost savings, and reduced reliance on traditional feed sources. The advantages of utilizing non-conventional feedstuffs in animal feeding include sustainability and potential cost savings.

3.2 Animal Feeding Costs

Based on the scorecards, it was observed that there was a notable decrease in feeding

Table 3. The cost of feeding for each experimental group

Groups	A1 feed	A2 feed	A3 feed	A4 feed	A5 feed	A6 feed
Group 1	35	35	72	70	35	67
Group 2	52	52	70	72	51	71
Group 3	63	60	75	73	61	73
Group 4	80	81	80	81	81	81

expenses when the leftover feed was put to use, without compromising the performance of the animals throughout the growing period. The reason the first animal group's expenses were lowest was because their feed was less palatable due to a higher concentration of urea, but the third group's expenses were highest because their molas were more costly. The third group came highly recommended because of its somewhat positive results, palatability, and reasonable feeding expenses.

3.3 Proximate Analysis of Feed

The urea ammoniation of leftover feed and the presence of minerals in salt and other contaminants in premix caused an increase in the content of carbohydrates, molasses, and ash. Proximate analysis of feed showed an increase in nutritional value following each treatment [6]. The content of crude protein and crude fiber has increased, according to Gordon and Chesson [7] and Sarwar et al. [8] who found higher levels of crude protein and total protein in barley or wheat straw treated with 4% urea. The results are in line with those of Saadullah et al. [9] who discovered that the crude protein content of rice straw rose from 2.9 to 5.9% and to 6.7% when treated with 3% urea. Hassan et al. [10] reported that ruminal NH_3-N levels were raised in bulls fed straw treated with urea. Fike et al. [11] and Dass et al. [12] urea-ammoniated wheat straw and reported higher crude protein levels; however, Prasad et al. [13] showed higher digestible protein and digestible nutrients in rations that contained either stacked or baled urea-treated rice straw. Treatments five and six had only molasses and salt, and due to their nice aroma and golden brown color, they were substantially more palatable. Sahoo et al. [14] found that wheat straw treated with urea had the highest amounts of hemicellulose digestibility, neutral detergent fiber, and organic matter. Other publications have reported similar conclusions, such as Manyuchi et al. [15] Nisa et al. [16] and Sarwar as, Sarwar as al. [17] and Jabbar et al. [18].

3.4 Evaluation of Animal Performance

The animals' beginning and ending weights did not differ statistically from one another, but the F3 and F5 feed treatment groups gained weight at a much slower rate than the other three groups. This could be because the treated feed is less palatable than fresh green fodder. The control group's diet's higher nutritional values, acceptability, and palatability may have contributed to their identical performance in Gr-2 [19]. But in the current study, weight gain and feed palatability were included while evaluating performance. According to Kilic and Emre [20] certain additives can increase the digestibility of wheat and soybean straw. According to Mishra et al. [21] supplementing urea molasses block boosted cows' milk production, live weight, and body score considerably. Similarly, crossbred heifers Pathak et al., [22] and lambs Rath et al., [23] showed improved feed acceptability after being treated with molasses.

4. CONCLUSIONS

Utilizing different quantities of urea, molasses, and salt to treat residual feed was feasible and cost-effective. By adding more crude protein and fiber without creating mycotoxins or ochratoxin-like fungal toxins, this technique also improved nutritional characteristics. The animals on a diet consisting of 50% fresh green forage and 50% treated feed gained weight just as well and at a much lower cost as the control group. In addition to being a more cost-effective option in times of poor fodder production, farms can use the excess feed to feed other classes of dairy animals and lower the cost of raising them.

INTEREST DECLARATIONS

Regarding the subject matter of this research, the authors disclose no conflicts of interest.

ACKNOWLEDGEMENTS

The Director of the ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar, is acknowledged by the authors for providing the necessary resources for the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Birthal PS, Jha AK, Various economic losses due to various constraints in dairy production in India, Indian J. of Anim. Sci. 2005.75(12):1470-1475.
2. Sahoo A, Elangovan AV, Mehra UR, Singh UB, Catalytic Supplementation of Urea-molasses on Nutritional Performance of male buffaloes, Asian Australian J Anim Sci. 2004;17(5).621-628.
3. Verma AK, Singh P, Dass RS, Mehra UR, Impact of feeding urea ammoniated and urea supplemented wheat straw on intake and utilization of nutrients in crossbred cattle, Indian J Anim Sci. 2006;76(6):46-470.
4. Wanapat M, Cherdthong A, Effects of treating rice straw with urea or urea calcium hydroxide upon intake, digestibility, rumen fermentation and milk yield of dairy cows, Asian-Australian J Anim Sci. 2009;12:294-299.
5. Singh S, Mishra AK, Singh JB, Rai SK, Baig MJ, Biradar N, Kumar A, Verma OPS,. Water requirement estimates of feed and fodder production for Indian livestock vis a vis livestock water productivity. Indian J Anim Sci. 2014;(84)10:1090-1094.
6. Yadav DK, Yadav R, Bharti PK. Economic evaluation of treated feed in crossbred dairy cattle in subtropical conditions with specific ingredients. The Pharma Innovation Journal. 2023;12(6):3344-3347.
7. Gordon AH, Chesson A, The effect of prolonged storage on the digestibility and nitrogen content of ammonia-treated barley straw, Anim. Feed Sci.Technol. 1983;8(2):147-153.
8. Sarwar M, Shahzad MA, Nisa M, Afzal D, Sharif M, Saddiqi HA, Feeding value of urea molasses treated wheat straw ensiled with fresh cattle manure for growing crossbred cattle calves. Trop Anim Health Prod; 2010.
   DOI:10.1007/s11250-010-9745-5
9. Saadullah M, Haque M, Dolberg F, Unpublished data DANIDA/Bangladesh Agricultural UniversityStraw Treatment Programme. 1980;1979-1980.
10. Hassan Z, Shahzad, MA, Nisa M, Sarwar M. Replacing concentrate with wheat straw treated with urea molasses and ensiled with manure, Asian-Aust. J.Anim. Sci. 201124(8):1092-1099.
11. Fike GD, Simms DD, Cochran RC, Vanzant ES, Kuhl GL, Brandt RT, Protein Supplementation of Ammoniated Wheat Straw: Effect on performance and Forage Utilization in Beef Cattle, J. Anim. Sci. 1995;73:1595-1601.
12. Dass RS, Mehra UR, Verma AK, Nitrogen Fixation and In-Situ dry matter and fibre constituents' disappearance of wheat straw treated with urea and Boric Acid in Murrah buffaloes, Asian-Aust. J. Anim. Sci. 2000; 13(8):1133-1136.
13. Prasad RDD, Reddy MR, Reddy GVN, Effect of feeding baled and stacked urea treated rice straw on the performance of crossbred cows, Anim Feed Sci Technol. 1998;73:347-352.
14. Sahoo B, Saraswat ML, Haque N, Khan MY, Chemical treatment of wheat straw on intake and nutrient utilization in sheep, Indian J Anim Sci. 2002;72(12):1162-1165.
15. Manyuchi, B, Orskov ER, Kay RN. B, Effect of feeding small amounts of ammonia treated straw on degradation rate and intake of untreated straw. Anim. Feed Sci. Technol. 1992;38:293-304.
16. Nisa M, Sarwar M Khan MA, Influence of adlibitumfeeding of urea treated Wheat straw with or withoutcorn steep liquor on intake, in situ digestion kinetics, Nitrogen Metabolism and nutrient digestion in Nili-Ravi buffalo bulls.Aust. J. Agric. Res. 2004;55:229-236.
17. Sarwar M, Khan MA, Nisa M, Effect of organic acids or fermentable Carbohydrates on digestibility and nitrogen utilisation of urea-treated wheat straw in Buffalo bulls. Aust. J. Agric. Res. 2004;55:223-228
18. Jabbar MA, Muzafar H, Khattak FM, Pasha TN, Khalique A, Simplification of urea treatment method of wheat straw for its better adoption by farmers, South African J Anim Sci. 2008;39(5):58-61.
19. Garg MR, Mehla AK, Singh DK, Advances in in the production and use of urea molasses mineral blocks in India, A

technical manual of NDDB, Anand part. 2006;(4):22-27.
20. Kilic U, Emre G, Effects of Some Additives on In Vitro True Digestibility of Wheat and Soybean Straw Pellets, Open Life Sci. 2017;12:206–213.
21. Mishra AK, Reddy GS, Ramakrishna YS, Participatory on-farm evaluation of urea molasses mineral block as a supplement to crossbred cows for dry season feeding in rain-fed agro-ecosystem in India, Livestock Res.Rural Develop. 2012;18(2).
22. Pathak R, Jaiswal RS, Thakur TC, Joshi YP. Paudy H, Effect of feeding ammonia treated baled wheat straw with different levels of concentrate on nutrient utilization and growth of cross bred heifers. Indian J Anim. Sci. 2005;5:252-255.
23. Rath S, Verma, AK, Singh P, Dass, RS, Mehra UR, Performance of growing lambs fed urea ammoniated and urea supplemented wheat straw based diets., Asian Australian J Anim Sci. 2001;(14)8:1078-1084.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/112524