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Dhawal Kant Yadav
ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Ramdev Yadav
Animal Nutrition, National Dairy Research Institute, Karnal, Haryana, India

Panch KishorBharti
ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Corresponding Author:
Dhawal Kant Yadav
ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Evaluation of the performance of animals fed treated feed containing specific ingredients in crossbred dairy cattle in subtropical environments

Dhawal Kant Yadav, Ramdev Yadav and Panch KishorBharti

Abstract

24 crossbred animals (8 to 12 months of age) were divided into four groups of six randomly in order to evaluate their performance in the experiment. Group 1 (Gr-1) consisted of 100% treated residual feed, Group 2 (74% treated feed), Group 3 (51%) treated feed, Group 4 (100%) green fodder, and Group 4 (Control). 1.5% urea+5% molasses+0.5% salt, 1.5% urea+5% molasses+1.5% salt, 1.5% urea+10% molasses+0.5% salt, 1.5% urea+10% molasses+1.5% salt, 5% molasses+0.5% salt, and 10% molasses+0.5% salt, respectively, were applied to the remaining feed S-1, S-2, S-3, S-4, S-5, and S-6. For the first, second, third, and fourth groups of animals, the average weight gain for the S1 treatment group was 1.661.60, 3.501.56, 2.660.0.66, and 3.330.61 correspondingly. For the S2 group of animals, weight gains were 0.330.61, 4.001.84, 2.330.67, and 3.660.67, respectively. For the S3 group, the results were 0.500.56a, 3.330.55b, 2.830.70ab, and 3.660.80b, respectively. The weight gains for the S4 group were 1.661.49, 6.661.60, 6.160.49, and 6.50.70, respectively. For the S5 treatment group, the weight gains were 1.500.67a, 7.000.70b, 6.001.12ab, and 5.50.62b, respectively. For the sixth group of animals, weight gains were 1.660.98, 5.551.52, 4.830.83, and 5.330.49 for each group, respectively. Weight increases made it clear that total feeding of treated feed containing urea and molasses is not acceptable, but giving animals fresh green fodder in half portions did not have any negative effects on performance or feeding costs while also utilising waste.

Keywords: Performance, leftover feed, molasses, palatability, urea, vrindavani

1. Introduction

India, a developing country in tropical south Asia, has a severe shortage of cereal grains, dry fodder, and green fodder. 35.6% of green fodder, 10.95% of dry agricultural leftovers, and 44% of concentrate feed components are currently in short supply. Increased productivity, the use of underutilised feed resources, the expansion of land area, or imports can all help close this gap. The largest dairy animals, the bovine, primarily eat green fodder, then dry roughage, and then a concentrate mixture. The largest input component of the entire cost of maintaining and producing dairy animals is the cost of feeding them (60–70%). In addition to forests and the related grasslands and sources of animal feed, the net cultivable area is around 142 million hectares (Singh *et al*., 2014) [20]. Farmers cannot spare area for the production of fodder to feed the cattle since there is intense pressure on land for crop production in order to meet the growing demand for food grains for human consumption (Singh *et al*., 2014) [20]. Remaining feed from organised farms in India makes up bulk roughage, which is typically viewed as waste and dumped in crop fields. In the northern plains of India, the leftovers primarily consist of maize, jowar, bajra, berseem, and napier grass, while the composition of leftovers varies depending on the availability of fodder (Birthal and Jha, 2005) [22]. According to studies (Sahoo *et al*., 2004; Verma *et al*., 2006) [16, 21], when molasses and urea are given to animals with straw, feed intake, digestibility, and palatability of rice straw all rise. For this objective, numerous studies have been carried out, with successful outcomes, treating the inferior quality feed with urea, ammonia, and molasses at various inclusion levels. Due to the breakdown of connections between the lignin, hemicellulose, and cellulose, it was found that urea treatment might boost the nutritional content of straw by 46% (Wanapat *et al*., 2009) [22]. According to Singh *et al*. (2014) [20], the feeding procedures employing this feed have also increased the productivity of dairy cows. The majority of earlier research projects, according to a review of the literature, focused on the treatment of dry residues (such as wheat or rice straw) with the addition of urea as nitrogen or molasses as energy sources. However, no study has been done on the treatment of fresh leftover feed with high moisture contents (more than 50%).

The nutritious value and palatability of leftover feed may be improved by treating it with various urea, molasses, and salt mixtures. When there is a shortage of or a dry spell in the supply of fodder, the treated residual feed can also function as better feed. Additionally, it is anticipated that feeding these modified feeds to animals may save feeding costs without harming animal performance.

2. Material and methods

2.1. Study location: The ICAR-Indian Veterinary Research Institute's Cattle and Buffalo Farm in Izatnagar, India, which is situated at latitude 28° 22' north, longitude 79° 24' east, at an elevation of 169.2 metres above mean sea level, served as the study site.The area is part of the upper gangetic plain, and the climate there is subtropical with considerable humidity, especially in the winter. Winter, which lasts from November to February, is when the weather gets colder, whereas summer lasts from May to August.The majority of the 90 to 120 cm of yearly rainfall falls between the months of July and August.

2.2. Experiment design

Dairy animals were used to test the flavour and performance of various combinations of treated leftover feed and fresh fodder. The basic materials for the leftover feed included chaffed fodder sorghum, millets, maize, napier grass, and berseem (clover). To improve the nutritional content and palatability of the leftover feed, six combinations of urea, molasses, and salt were utilised (table 1). The treatment's viability was examined from December to April, and the weight growth of the animals in various treatment groups was contrasted.

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Table 1: Six different combinations of urea, molasses and salt used for treatment of leftover feed

Basal feed material (on fresh matter basis)	Chemical substance (on dry matter basis of basal feed)			Treated feed (end product)
	Urea	Molasses	Salt	
Leftover feed	1.5%	5%	0.5%	S1
	1.5%	5%	1.5%	S2
	1.5%	10%	0.5%	S3
	1.5%	10%	1.5%	S4
	Nil	5%	0.5%	S5
	Nil	10%	0.5%	S6

2.3. Choosing the right animals for experiments

24 crossbred animals (8 to 12 months old) were chosen and randomly divided into four groups, each with six animals: Group-1 (Gr-1) received 100% treated leftover feed; Group-2 (Gr-2) received 75% treated feed; Group-3 (Gr-3) received 50% treated feed; and Group-4 (Gr-4) received 100% treated leftover feed. or 100% green fodder, no processed feed used as a control. To assess the taste of each mixture, feeding was done for seven days in four different proportions (table-2) of treated and fresh green fodder.

Table 2: Trial feeding of various combinations of processed residual meal and green fodder

Feeds	E1 group	E2 group	E3 group	E4 Control
Green: leftover feed	0: 100	25:75	50:50	100:0
Concentrate feed	Served equally to each group (in accordance with the institute's feeding regimen)			

Palatability score was used to test the palatability of the treatment; all the 24 animals were weighed before and after each feeding trail and their weight gains were compared after the end of each trial.

2.4. Chemical analysis of feed: Leftover feed was analysed before and after treatment by proximate analysis to find outchanges in the nutritive values (crude protein, crude fibre, moisture, dry matter and ash content). The presence of fungal toxins *viz*. mycotoxin and ochratoxin were also tested in the treated feed.

2.8. Statistical Analysis: The data obtained from the experiments were analysed using the SPSS 20.0 software package.

3. Results

3.1. Performance of the animals

Performance of the experimental animals was measured by weighing them before and after starting the experiment and the results are shown in Table-3

Table 3: Animals' body weight after consuming various types of leftover meal

Feed	Parameter	Gr- 1 Treated: fresh feed (100:0)	Gr-2 Treated: fresh feed (75:25)	Gr-3 Treated: fresh feed (50:50)	Control Treated: fresh feed (0:100)
S1	IW (Kg.)	226.33±9.05	237.83±11.83	231.16±11.37	234.33±15.81
	FW (Kg.)	228.00±9.54	241.33±11.84	232.84±11.89	237.66±15.51
	WG(Kg.)	1.67±1.60	3.50±1.55	2.66±0.0.67	3.33±0.62
S2	IW (Kg.)	225.83±11.41	240.16±10.46	228.55±13.56	232.83±16.68
	FW (Kg.)	228.66±11.41	244.16±9.21	230.83±13.84	236.54±16.50
	WG(Kg.)	0.35±0.61	4.00±1.85	2.33±0.68	3.65±0.67
S3	IW (Kg.)	237.00±10.06	242.67±8.81	237.5±12.55	243.56±18.65
	FW (Kg.)	237.51±9.83	246.00±8.68	2401.33±13.04	247.16±18.45
	WG(Kg.)	0.50±0.55[a]	3.33±0.55[b]	2.82±0.70[ab]	3.66±0.80[b]
S4	IW (Kg.)	246.67±9.54	258.83±8.25	250.01±10.58	253.33±14.70
	FW (Kg.)	248.34±8.54	265.00±7.82	256.45±10.93	261.50±15.34
	WG(Kg.)	1.66±1.48	6.66±1.61	6.13±0.49	6.5±0.70
S5	IW (Kg.)	255.33±8.82	271±6.95	260.01±9.12	267.5±15.47
	FW (Kg.)	256.83±9.18	278.16±7.01	266.01±9.68	271±15.40
	WG(Kg.)	1.51±0.67[a]	7.00±0.60[b]	6.03±1.12[ab]	5.52±0.62[b]
S6	IW (Kg.)	255.33±12.73	283.66±9.24	278.16±10.90	285.84±18.50
	FW (Kg.)	261±13.57	289.16±9.06	282±10.82	288.16±18.32
	WG(Kg.)	1.64±0.98	5.55±1.53	4.88±0.83	5.32±0.49

Where, IW- Initial weight, FW= Final Weight, WG= Weight gain

In each group, the beginning body weight difference (IW) was not statistically significant. Gr-1 discovered a significant difference between Gr-3 and Gr-4 and control in terms of the final body (FW) and weight gain (WG) of the animals for F3 and F5. The weight growth in Gr-2 was determined to be better even than the control when it came to the proportion of treated and fresh feed, but the difference was not statistically significant. The comparable performance in Gr-2 to the control group may be attributable to the feed's higher nutritional values and higher acceptance than in other groups. The initial body weights of the control, Gr. 1, Gr. 2, and Gr. 3 animals in the third and fifth groups were not significantly different from one another. It was also determined that the final body of animals in various groups was not significant. In Gr-1, where animals were given 100% treated feed as opposed to control, Gr-2, but not Gr-3, the weight gain was considerably (p0.5) lower. The comparable performance in Gr. 2 may be attributable to the control group's higher nutritive values, acceptability, and greater palatability.

4. Discussion

4.1. A close study of the feed A proximate examination of the feed revealed a rise in nutritional value following each treatment, which was caused by the remaining feed's urea ammoniation, and an increase in the content of carbohydrates, molasses, and ash, which was caused by the presence of minerals in the salt and other contaminants in the premix. According to Gordon and Chesson (1983) [5] and Sarwar *et al.* (2010) [19], who discovered higher crude protein and total protein content of barley or wheat straw being treated with 4% urea, the content of crude protein and crude fibre has increased. The outcomes are consistent with those reported by Saadullah *et al.* (1980) [15], who found that rice straw's crude protein content increased from 2.9 to 5.9% when treated with 3% urea and to 6.7% when treated with 5% urea. Bulls fed urea-treated straw had elevated ruminal NH3-N levels, according to Hassan *et al.* (2011) [6]. While wheat straw was urea-ammoniated by Fike *et al* (1995) [3] and Dass *et al* (2000) [1], who found an increase in crude protein, Prasad *et al.* (1998) [13] observed increased digestible protein and digestible nutrients in rations containing either stacked or baled urea-treated rice straw. Only molasses and salt were used in treatments five and six, and because of their pleasant aroma and golden brown colour, their palatability was noticeably superior. According to Sahoo *et al.* (2002) [17], urea-treated wheat straw had the highest levels of organic matter, neutral detergent fibre, and hemicellulose digestibility. Similar findings have been reported in other publications, including Manyuchi *et al.* (1992) [9], Nisa *et al.* (2004) [11], Sarwar *et al.* (2004) [18], and Jabbar *et al.* (2008) [7].

4.2. Animal performance assessment: Although the animals' initial weights and final weights were not statistically different, the treatment groups for F3 and F5 feed had significantly lower weight gains than the other three groups, which may have been caused by the treated feed's lower palatability compared to fresh green fodder. The same performance in Gr-2 may be attributable to the control group's higher nutritional values, acceptability, and greater palatability of the diet (Garg *et al.*, 2006) [4]. However, in the current study, feed palatability was taken into account for performance evaluation together with weight gain. Kilic and Emre (2017) [8] revealed that the digestibility of wheat and soybean straw may be improved upon using specific additions. According to Mishra *et al.* (2012) [10], supplementing urea molasses block boosted cows' milk production, live weight, and body score considerably. Similarly, crossbred heifers (Pathak *et al.*, 2015) [12] and lambs (Rath *et al.*, 2001) [14] showed improved feed acceptability after being treated with molasses.

5. Conclusions

It was possible to process leftover feed using various ratios of urea, molasses, and salt without producing mycotoxins or ochratoxin-like fungi. This boosted nutritional values in terms of crude protein and fibre levels. When compared to the control group, the animals fed a diet that contained 50% treated feed and 50% fresh green forage gained weight equally well. The surplus feed can be effectively used to feed to different classes of dairy animals on farms to reduce the cost of rearing them and may also be a better option during a time of low fodder production.

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

6. Acknowledgements

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