International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2020; 8(1): 1772-1775
© 2020 IJCS
Received: 10-11-2019
Accepted: 12-12-2019

Dhawal Kant Yadav
Livestock Production and Management, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Panch Kishor Bharti
Livestock Production and Management, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Gyanendra Kumar Gaur
Livestock Production and Management, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

Amit Kumar Singh
ICAR- National Dairy Research Institute, Karnal, Haryana, India

Putan Singh
Division of Animal Nutrition, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India

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

Feasibility testing of treated leftover feed for its reutilization in crossbred dairy cattle

Dhawal Kant Yadav, Panch Kishor Bharti, Gyanendra Kumar Gaur, Amit Kumar Singh and Putan Singh

DOI: https://doi.org/10.22271/chemi.2020.v8.i1z.8521

Abstract
The study was conducted to assess the feasibility of treated left over feed and performance of crossbred dairy cattle at organized dairy farm for a period of 150 days during winter and spring seasons. A total of 24 crossbred animals (8-12 months of age) were selected and randomly allocated to four different groups(6 animals per group) *viz*. Group-1 (Gr-1): 100% treated leftover feed; Group-2(Gr-2): 75% treated feed; Group-3 (Gr-3): 50% treated feed and Group-4(Gr-4) or Control: 100% green fodder. The leftover feed F-1, F-2, F-3, F-4, F-5 and F-6 were treated with combination of 1% urea+5% molasses+0.5% salt, 1% urea+5% molasses+1% salt, 1% urea+10% molasses+0.5% salt, 1% urea+10% molasses+1% salt, 5% molasses+0.5% salt and 10% molasses+0.5% salt, respectively. Treatment of leftover feed was found to be quite feasible during winter and spring months which increased dry matter, crude protein, crude fibre and ash content. Proximate analysis was done to assess the nutritive values. Colour was golden brown and sweet smell in molasses treated feed and ammonical but acceptable odour in urea included treatment group. The leftover feed could efficiently be utilized for feeding to dairy animals under farm conditions. Feeding cost was reduced to almost during growing period without affecting the growth and performance of the animals.

Keywords: Feasibility, leftover feed, molasses, palatability, urea, Vrindavani

1. Introduction
India being a tropical south Asian developing nation has a large deficit of cereal grains, dry and green fodder. At present there is a shortage of 35.6% green fodder, 10.95% dry crop residues and 44% concentrate feed ingredients. This gap can be filled either by increasing productivity, utilizing untapped feed resources, increasing land area, or through imports. The bovine are the largest dairy animals which mainly subsist on green fodder followed by dry roughage and concentrate mixture. The feeding cost in dairy animals accounts for the highest input factor of the total cost of rearing and production (60-70%). The net cultivated area is around 142 million hectare in addition to forests and their associated grasslands and fodder sources (Singh *et al.*, 2014) [20]. There is high pressure on land for crop production in order to meet the growing demands of food grains for human consumption and hence farmers cannot spare land for fodder production to feed the cattle (Singh *et al.*, 2014) [20]. At many organized farm in India, leftover feed constitute bulk roughage which is generally considered as waste material and discarded in crop-fields. The composition of leftover varies depending upon the fodder availability however by and large the leftover consist mainly of maize, jowar, bajra, berseem and napier grass in northern plain region of India (Birthal and Jha, 2005) [2]. It has been reported that if molasses and urea mixture is supplied to the animals with straw then feed intake, digestibility and palatability of rice straw increases (Sahoo *et al*., 2004; Verma *et al*., 2006) [16, 21]. Various studies have been conducted for this purpose by treating the inferior quality feed with urea, ammonia and molasses with different inclusion levels which provided positive results. It was observed that urea treatment could increase nutritive value of straw by 46% (Wanapat *et al*., 2009) [22] due to breakage of bonds between the lignin, hemi-cellulose and cellulose. The feeding practices using these feed have also improved the productivity of dairy animals (Singh *et al*., 2014) [20]. From the perusal of literature, it is found that the most of earlier research works have been targeted on treatment of dry residues (wheat straw or rice straw) using supplementation of urea as nitrogen or molasses as energy sources but no study

has been conducted on treatment of the fresh leftover feed having high moisture contents (more than 50 percent). The treatment of leftover feed using different combinations of urea, molasses and salt may enhance its nutritive value as well as its palatability. The treated leftover feed can also serve as better feed during the scarcity or lean period of fodder availability. It is also expected that feeding of these treated feed may reduce the feeding cost without affecting the performance of animals.

2. Material and methods

2.1. Place of study

The study was conducted at Cattle and Buffalo Farm, ICAR-Indian Veterinary Research Institute, Izatnagar, India, which is located at latitude of 28° 22' north, longitude of 79° 24' East and altitude of 169.2 meter above the mean sea level. The location comes under upper gangetic plain region and has sub-tropical climatic condition with high humidity, especially during the winter season. Weather turns colder during winter stretching from November to February whereas summer ranges from May to August months annually. The annual rainfall ranges from 90 to 120cm and most of which are received during the months of July and August.

2.2. Design of experiment

The experiment was conducted in phases between Novembers to April. The leftover feed consisted of chaffed fodder sorghum, millets, maize, napier grass and berseem (clover) as raw material. Six combinations of urea, molasses and salt were used for treating the leftover feed (table 1) to increase its nutritive value and palatability. The feasibility of the treatment during the months of December to April was tested and weight gain of animals in different treatment groups was compared.

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%	0.5%	F1
	1%	5%	1%	F2
	1%	10%	0.5%	F3
	1%	10%	1%	F4
	Nil	5%	0.5%	F5
	Nil	10%	0.5%	F6

2.3. Selection of experimental animals

A total of 24 crossbred animals (8-12 months of age) were selected and randomly allocated to four different groups (6 animals per group) *viz*. Group-1 (Gr-1): 100% treated leftover feed; Group-2(Gr-2): 75% treated feed; Group-3 (Gr-3): 50% treated feed and Group-4(Gr-4) or Control: 100% green fodder, without use of treated feed.

Table 2: Feeding trial using different combination treated leftover feed and green fodder

Feeds	T1 group	T2 group	T3 group	T4 Control
Green : Treated leftover feed	0: 100	25:75	50:50	100:0
Concentrate feed	Provided equally in all groups (As per institute feeding protocol)			

2.4. Chemical analysis of feed

Leftover feed was analysed before and after treatment by proximate analysis to find out changes 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.

2.5. Feasibility testing

Leftover feed was mixed with urea, molasses and salt and packed in polybag of 25kg capacity in airtight condition for incubation period of 21 days, thereafter polybags were opened and feed were evaluated physically for smell, colour and texture. Moisture content was sufficient in the leftover feed so there was no requirement of water sprinkling.

2.6. Performance of the animals

Performance of the animals was evaluated based on weight gain before and after each feeding trail.

2.7. Statistical Analysis

The data obtained from the experiments were analysed using the SPSS 20.0 software package.

3. Results

The proximate analysis of leftover feed before and after treatment F1, F2, F6 has been presented in tables- 4.

Table 4: Nutritive values of leftover feed before and after treatment

Leftover feed	Treatment status	Moisture	Dry matter	Crude protein	Crude fibre	Ash
F1	Pre-treatment	65.45	34.55	4.32	8.54	6.58
	Post-treatment	61.67	38.33	6.70	11.37	11.65
F2	Pre-treatment	74.46	25.54	3.78	9.76	7.80
	Post-treatment	71.75	28.25	6.30	10.70	12.56
F3	Pre-treatment	69.93	30.07	4.20	14.20	11.00
	Post-treatment	63.98	36.07	6.70	14.60	13.60
F4	Pre-treatment	74.78	25.22	3.78	9.76	8.00
	Post-treatment	70.89	29.11	5.40	12.90	11.89
F5	Pre-treatment	62.78	37.22	5.50	14.20	11.00
	Post-treatment	67.56	32.44	6.10	16.50	13.60
F6	Pre-treatment	65.78	34.22	4.90	17.20	10.78
	Post-treatment	62.23	37.77	5.20	17.50	12.06

3.1. Feasibility of the treatments

The treatment of leftover feed was feasible during the winter and spring months of the year. The nutritional quality of the leftover feed increased after each treatment and there were no traces of mycotoxin and ochratoxin in any of the treated feed. Crude protein content increased due to increased nitrogen content following urea treatment where as crude fibre content increased which might be due to break down of ester bonds between the lignin, hemi-cellulose and cellulose. Ash content increased because of addition of salt and other impurities.

3.2. 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-6

Table 6: Change in body weight of animals upon feeding on different leftover feed

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)
F1	IW (Kg.)	227.33±9.05	237.83±11.81	230.16±11.37	234.33±15.80
	FW (Kg.)	229.00±9.54	241.33±11.89	232.83±11.89	237.66±15.52
	WG(Kg.)	1.66±1.60	3.50±1.56	2.66±0.0.66	3.33±0.61
F2	IW (Kg.)	226.83±11.41	240.16±10.47	228.55±13.57	233.83±16.68
	FW (Kg.)	227.66±11.41	244.16±9.22	230.83±13.83	237.54±16.50
	WG(Kg.)	0.33±0.61	4.00±1.84	2.33±0.67	3.66±0.67
F3	IW (Kg.)	237.00±10.06	242.66±8.81	237.5±12.56	243.55±18.65
	FW (Kg.)	237.50±9.83	246.00±8.69	240.33±13.04	247.16±18.45
	WG(Kg.)	$0.50±0.56^{a}$	$3.33±0.55^{b}$	$2.83±0.70^{ab}$	$3.66±0.80^{b}$
F4	IW (Kg.)	246.66±9.54	258.83±8.23	250.00±10.58	253.33±14.70
	FW (Kg.)	248.33±8.54	265.00±7.83	256.46±10.93	261.50±15.34
	WG(Kg.)	1.66±1.49	6.66±1.60	6.16±0.49	6.5±0.70
F5	IW (Kg.)	255.33±8.81	271±6.96	260.00±9.12	267.5±15.47
	FW (Kg.)	256.83±9.19	278.16±7.07	266.00±9.68	273±15.40
	WG(Kg.)	$1.50±0.67^{a}$	$7.00±0.70^{b}$	$6.00±1.12^{ab}$	$5.5±0.62^{b}$
F6	IW (Kg.)	258.33±12.73	283.66±9.29	276.16±10.90	284.84±18.50
	FW (Kg.)	260±13.57	289.16±9.09	281±10.82	289.16±18.32
	WG(Kg.)	1.66±0.98	5.55±1.52	4.83±0.83	5.33±0.49

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

The difference of initial body weights (IW) was non-significant in all the groups. The final body (FW) and weight gain (WG) of animals for F3 and F5 were found significant in Gr-1 in compared with control, however Gr-3 and Gr-4 were non-significant with control. Among the proportion of treated and fresh feed, the weight gain in Gr-2 was found superior even than control, however the difference was non-significant. The equivalent performance in Gr-2 than control might be due increased nutritive values of feed and better acceptability than other groups.In 3rd and 5th group the initial body weight of animals in control, Gr.1, Gr.2 and Gr-3 was non- significant among each other. The final body of animals in different groups were also found non-significant. The weight gain was significantly ($p<0.5$) lower in Gr-1 where 100 percent treated feed was offered to animals than control, Gr-2 but non-significant from Gr-3. The equivalent performance in Gr-2 might be due increased nutritive values of feed along with acceptability and better palatability in control group.

4. Discussion

4.1. Proximate analysis of feed

Proximate analysis of feed showed increase in nutritive value of the after every treatment which was due to urea ammoniation of leftover feed and increased content of carbohydrate, molasses, ash was due to minerals present in salt and other impurities present in premix. The increase in crude protein and crude fibre content is in agreement with Gordon and Chesson (1983) [5] and Sarwar *et al.*, (2010) [19] who found higher crude protein and total protein content of barley or wheat straw being treated with 4% urea. Results are also in line with Saadullah *et al.* (1980) [15] who reported increase in crude protein content of rice straw from 2.9 to 5.9% when treated with 3% urea and CP content increased to 6.7% when treated with 5% urea. Hassan *et al.* (2011) [6] reported high ruminal NH_3-N in bulls fed urea treated straw. Fike *et al* (1995) [3] and Dass *et al.*, (2000) [1] reported increase in crude protein by urea ammoniation of wheat straw whereas higher digestible protein and digestible nutrients were recorded by Prasad *et al.*, (1998) [13] in rations containing either stacked or baled urea treated rice straw. Treatments fifth and sixth contained only molasses and salt and they had sweet smell and golden brown colour so their palatability was comparatively better. Sahoo *et al.* (2002) [17] reported that organic matter, neutral detergent fibre and hemicellulose digestibility were highest in urea treated wheat straw. Similarly, many reports say that urea treated wheat straw increased the ruminal NH_3 concentration in (Manyuchi *et al.*, 1992; Nisa *et al.*, 2004; Sarwar *et al.*, 2004; Jabbar *et al*, 2008) [9, 11, 18, 7].

4.2. Performance evaluation of animals

Initial weights of the animals were non-significant, final weights were also non-significant but there was significant difference in weight gain of the animals in treatment groups for F3 and F5 feed in which lower weight gain than the other three groups were observed which might be due less palatability of treated feed than that of fresh green fodder. The equivalent performance in Gr-2 might be due increased nutritive values of feed along with acceptability and better palatability in control group (Garg *et al*, 2006) [4]. Kilic and Emre, 2017 reported that digestibility of wheat and soybean straw could be improved upon some additives however in present study feed palatability was taken in account for performance evaluation along with weight gain. Mishra *et al.*, (2012) [10] found that supplementation of urea molasses block significantly increased the milk yield, live weight and body score of cows. Similarly, the enhanced acceptability of feed

upon treatment with molasses was observed in crossbred heifers (Pathak *et al*., 2015) [12] and lambs (Rath *et al*., 2001) [14].

5. Conclusions

Treatment of left over feed using different combinations of urea, molasses and salt was feasible and increased nutritive values in terms of crude protein and fibre contents without production of fungal toxins like mycotoxins and ochratoxins. The animals fed on 50 percent treated feed and 50 percent fresh green fodder had equivalent palatability and weight gain in compared with control group. The leftover feed can efficiently be utilized for feeding to various classes of dairy animals under farm conditions to minimize the rearing cost and could also serve a better option during the scarcity period of fodder production.

6. Declarations of interest

The authors report no conflict of interest over the content of this paper.

7. Acknowledgements

The authors are thankful to the Director, ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar for providing all the necessary facilities during the study.

8. References

1. 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.
2. 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.
3. Fike GD, Simms DD, Cochran RC, Vanzant ES, Kuhl GL, Brandt RT *et al*. 1995 Protein Supplementation of Ammoniated Wheat Straw: Effect on performance and Forage Utilization in Beef Cattle, J Anim. Sci. 1995; 73:1595-1601.
4. 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.
5. 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.
6. 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. 2011; 24(8):1092-1099.
7. 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.
8. 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.
9. Manyuchi B, Orskov ER, Kay RNB. 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.
10. 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).
11. 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.
12. 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.
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. 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; 8(14):1078-1084.
15. Saadullah M, Haque M, Dolberg F. Unpublished data DANIDA/Bangladesh Agricultural University Straw Treatment Programme, 1979-1980.
16. 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.
17. 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.
18. 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.
19. 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
20. Singh S, Mishra AK, Singh JB, Rai SK, Baig MJ, Biradar N *et al*., Water requirement estimates of feed and fodder production for Indian livestock vis a vis livestock water productivity. Indian J Anim Sci. 2014; 10(84):1090-1094.
21. Verm 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.
22. 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.