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## Palatability assessment of treated feed with certain ingredients in crossbred dairy cattle under sub-tropical conditions

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### Abstract

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. The average palatability score of animals for F-1 feed in Gr-1, Gr-2, Gr-3 and Control was 3.43, 1.56, 1.53 and 1.00, respectively. The average palatability score of animals for F-2 feed in Gr-1, Gr-2, Gr-3 and Control were 2.79, 1.52, 1.50 and 1.00, respectively. The average palatability score of animals for F-3 feed in Gr-1, Gr-2, Gr-3 and Control were 2.66, 1.43, 1.40 and 1.00, respectively. The average palatability score of animals for F-4 feed in Gr-1, Gr-2, Gr-3 and Control were 3.06, 2.36, 2.06 and 1.00, respectively. The average palatability score of animals for F-5 feed in Gr-1, Gr-2, Gr-3 and Control were 3.10, 1.70, 1.66 and 1.00, respectively. The average palatability score of animals for F-6 feed in Gr-1, Gr-2, Gr-3 and Control were 3.10, 1.96, 1.83 and 1.00, respectively. The palatability score was found significantly ( $P < 0.05$ ) higher in Gr-1 than other treatment groups including control.

**Keywords:** Palatability, 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)<sup>[20]</sup>. 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)<sup>[20]</sup>. At many organized farms 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 (Birtal and Jha, 2005)<sup>[2]</sup>. 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)<sup>[16, 21]</sup>. 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)<sup>[22]</sup> 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

Palatability and performance evaluation of dairy cattle using different combinations of treated leftover feed with fresh fodder was taken out. 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. Feeding was done for 7 days in four different proportions (table-2) of treated and fresh green fodder to test palatability of each combination.

**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)			

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.

(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.

### 2.4. Chemical analysis of feed

Leftover feed was analysed before and after treatment by proximate analysis to find out changes in the nutritive values

### 2.5. Palatability testing

Palatability scores were given based on acceptance and time taken by animals to start feeding as mentioned below.

**Table 3:** Palatability score based on time to start feed intake

Palatability score	Criteria
1	If feed intake starts within 10 minutes
2	If feed intake starts in 10-20 minutes
3	If feed intake takes more than 20 minutes
4	No feed intake

### 2.7. Performance of the animals

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

### 2.8. Statistical Analysis

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

### 3. Results

#### 3.2. Palatability of the feed

Palatability of the treated feed in different groups were measured by using palatability scored as mentioned in table-5

**Table 5:** Average palatability scores of all the treatment groups

Groups	F1 feed	F2 feed	F3 feed	F4 feed	F5 feed	F6 feed
Group 1	3.43	2.79	2.66	3.06	3.7	3.1
Group 2	1.56	1.52	1.43	2.36	1.76	1.96
Group 3	1.53	1.50	1.40	2.06	1.66	1.83
Group 4	1	1	1	1	1	1

Palatability scores show identical trends in all the treatment groups. The high value of palatability score indicated that

feed acceptability was poor in treatment than control. From the results, it is evident that animals fed on 100 percent fresh feed in Gr-4 had better acceptability whereas Gr-1 with 100 percent treated leftover feed had the lowest acceptability. Among the treatments, the combinations of treated and fresh feed (in ratio of 50:50 and 75:25) gave better results in terms of feed acceptability without any adverse effect on performance of the growing animals.

#### 3.3. 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±0.66	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 <sup>a</sup>	3.33±0.55 <sup>b</sup>	2.83±0.70 <sup>ab</sup>	3.66±0.80 <sup>b</sup>
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 <sup>a</sup>	7.00±0.70 <sup>b</sup>	6.00±1.12 <sup>ab</sup>	5.5±0.62 <sup>b</sup>
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 3<sup>rd</sup> and 5<sup>th</sup> 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<sub>3</sub>-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<sub>3</sub> 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)<sup>[4]</sup>. 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)<sup>[10]</sup> 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)<sup>[12]</sup> and lambs (Rath *et al.*, 2001)<sup>[14]</sup>.

## 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

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