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Original Research Article

Evaluation of Effect of Hydrolyzed Molasses Treated Mustard Oil Cake on the Milk Yield and Milk Composition of Dairy Cattle

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A B S T R A C T

The study was conducted on fifteen dairy cattle which was randomly divided into three treatment groups namely UT,FT and MT. The groups were subjected to three dietary treatments namely UT (Concentrate mix with untreated MOC+ Molasses+ *ad lib* wheat straw); FT (Concentrate mix with formaldehyde treated MOC+ Molasses+ *ad lib* wheat straw) and MT (Concentrate mix with hydrolyzed molasses treated MOC+ *ad lib* wheat straw). The observation was recorded for two months. The parameters observed during the study period were milk yield, milk composition (fat, total solid, lactose, SNF and protein). The milk yield was significantly ($P<0.05$) higher in FT treated group followed by MT treated group as compared to control UT group. There was no significant different in milk fat among the different treated groups. The other components like Total solid, SNF, Lactose and protein was significantly ($P<0.05$) higher in MT and FT treated groups as compared to control UT group.

Keywords

Hydrolyzed molasses, Mustard oil cake, Milk yield, Dairy cattle

Introduction

Protein digestion in ruminants is dominated by microbial transformation in the fore-stomach. A varying proportion of feed protein is degraded into peptides, amino acids and ammonia, all of which can be used for the synthesis of microbial protein. The microbial protein synthesis is an energy dependent processes. Therefore, deficiency of dietary energy, especially during early part of lactation, results in correspondingly lower synthesis of bacterial protein in the rumen leading to reduced availability of protein for milk production. Therefore for sustaining higher level of milk yield and faster growth rate, ruminants need more dietary protein than the flora in the rumen can utilize. However higher dietary protein intake especially rumen degradable protein (RDP) often results in increasing loss of ammonia from the rumen. Excess ammonia is converted into urea in the liver, the major part of which is excreted through urine resulting in the loss of dietary protein. The increased ammonia levels also leads to reduced fertility besides causing stress on liver. Adequate protein supply to high yielding cows without stress from excess ammonia can be ensured by decreasing the degradability of dietary proteins. In most of developing countries including India, agriculture by-products, crop residues and grazing along with some protein and energy supplements are the chief feed source for ruminant livestock. Common protein supplements for ruminants are oil seed

cakes obtained as a by-product of the oil industry. Among them, mustard cake is the most commonly available protein supplement for livestock in northern parts of India (Kumar *et al.,* 2002 and Sirohi *et al.,* 2013). India is the second largest producer of rapeseed mustard in the world, contributing to one-fifth of the world's rapeseed mustard production (Kiresur, 1999). Mustard cake is one of the common used feed ingredient in ruminant diet and rich in many essential amino acids (e.g. methionine and lysine) but is known for high ruminal degradability of its protein content, thereby limiting its value as a ruminant feedstuff for high yielding dairy animals and fast growing meat animals (Chatterjee and Walli, 2003). The levels of rumen degradable protein (RDP) and rumen undegradable protein (RUP) in mustard oil cake is reported as 33% and 4% of DM, respectively, hence protection of mustard cake protein assumes significant importance.

Materials and Methods

The present study was conducted in the Division of Animal Nutrition of F.V.Sc & A.H., SKUAST-J,R.S. Pura, Jammu. Fifteen lactating dairy cattle were taken as experimental animals. They were randomly divided into three treatment groups namely UT,FT and MT. The groups were subjected to three dietary treatments namely UT (Concentrate mix with untreated MOC+ Molasses+ *ad lib* wheat straw); FT (Concentrate mix with formaldehyde treated MOC+ Molasses+ *ad lib* wheat straw) and MT (Concentrate mix with hydrolyzed molasses treated MOC+ *ad lib* wheat straw). The composition of concentrate mixture (Maize-25%, wheat bran-35%, Mustard oil cake-37%, mineral mixture-2%, common salt-1%) was formulated to meet the nutrient requirements of the animals as per ICAR (2013). The milk yield was recorded individually daily throughout the experimental period and then milk yield was calculated up to two months. The milk composition including fat, protein, lactose, total solid and SNF were analyzed forth nightly for the different treated group. The milk samples were analyzed by auto analyzer (Ultrasonic auto milk analyzer, Netco Pvt. Ltd).

Statistical analysis

The data generated was analyzed as described by Snedcor and Cochran (1994).

Results and Discussions

The weekly milk yield (Kg/d) of dairy cattle fed untreated/formaldehyde treated or hydrolyzed molasses treated mustard oil cake containing concentrate mixture is presented in Table 1.

The mean milk yield (Kg/d) of different treated UT, FT and MT groups of dairy cattle was 9.5±0.13, 12.6±0.17 and 12.2±0.15 respectively. The milk yield (kg/d) was significantly ($P<0.05$) higher in the FT and MT group as compared to control UT group. This is with agreement with the observation of Chatterjee and Walli (1998) and Garg *et al.,* (2005), who found that feeding of formaldehyde protected protein at higher levels in the ration of cross bred cattle and buffalo shows improved the milk yield.

The periodic milk composition (%) of dairy cattle fed untreated/formaldehyde treated or hydrolyzed molasses treated mustard oil cake containing concentrate mixture is presented in Table 2(a) and 2(b).

The mean fat percentage in the milk of different treated UT, FT and MT groups were 4.13±0.246, 4.84±0.158 and 4.58±0.136 respectively. There was no significant ($P>0.05$) difference between the different

treated groups periodically and among the groups which is in partial agreement to Clark *et al.*, (1974) who found that there was no any significant change in milk fat on feeding of FA treated SBM in cows. Rae *et al.*, (1983) also observed non significant effect on fat percent of milk in cows being fed FA treated canola meal.

Table.1 Weekly milk yield (Kg/d) of dairy cattle fed untreated/formaldehyde treated or hydrolyzed molasses treated mustard oil cake containing concentrate mixture

Weeks since onset of feeding trial	Treatments*			Period Mean ± SEM	P value
	UT	FT	MT		
I	7.9	8.5	8.3	8.2 ± 0.23^{A}	
II	8.3	10.0	10.2	9.5 ± 0.23^{B}	
III	8.8	11.8	11.2	10.6 ± 0.29^{C}	
IV	9.2	12.8	12.3	11.4 ± 0.28^{D}	
V	9.7	13.7	13.3	12.2 ± 0.27^{E}	
VI	10.5	14.3	13.8	12.9 ± 0.22^{F}	
VII	10.3	14.3	13.8	12.8 ± 0.24^{EF}	
VIII	10.4	14.4	13.9	12.9 ± 0.24^{F}	
IX	10.4	14.2	13.7	12.8 ± 0.24^{EF}	
Treatment Mean ± SEM	9.5 ± 0.13^{a}	12.6 ± 0.17^{c}	12.2 ± 0.15^{b}	11.5±0.10	0.000
				0.000	0.000

*UT: concentrate mix with untreated MOC + molasses;
FT: concentrate mix with formaldehyde treated MOC + molasses;
MT: concentrate mix with hydrolyzed molasses treated MOC
^{ABCDEF}Means bearing different superscripts within the column differ significantly
^{abc}Means bearing different superscripts within the row differ significantly

Table.2 (a) Periodic milk composition (%) of dairy cattle fed untreated/formaldehyde treated or hydrolyzed molasses treated mustard oil cake containing concentrate mixture

Treatments*/ Attributes	Periods					Treatment Mean ± SEM	P values		
	0 day	15th day	30th day	45th day	60th day		T	P	T xP
Fat									
UT	4.06	4.11	4.03	4.29	4.16	4.13±0.246			
FT	4.56	4.65	4.94	5.00	5.05	4.84±0.158			
MT	4.29	4.28	4.53	4.91	4.88	4.58±0.136			
Period mean ±SEM	4.30±0.244	4.35±0.261	4.50±0.277	4.73±0.260	4.70±0.230	4.52±0.112	0.055	0.695	0.999
Total solids									
UT	13.95	13.92	13.90	14.13	14.37	14.06^{A}±0.238			
FT	14.48	14.56	14.56	15.21	15.37	14.84^{B}±0.151			
MT	14.19	14.31	14.80	15.06	15.19	14.71^{B}±0.167			
Period mean ±SEM	14.21±0.216	14.26±0.228	14.42±0.259	14.80±0.278	14.98±0.278	14.53±0.116	0.015	0.140	0.993
Lactose									
UT	3.79	3.91	3.98	4.09	4.13	$3.98±0.057^{A}$			
FT	3.50	3.83	4.25	4.17	4.19	$3.99±0.128^{A}$			
MT	4.29	4.32	4.38	4.38	4.38	$4.35±0.048^{B}$			
Period mean ±SEM	3.86±0.130	4.02±0.111	4.20±0.112	4.21±0.108	4.23±0.117	4.10±0.053	0.004	0.085	0.772

*UT: concentrate mix with untreated MOC + molasses;
FT: concentrate mix with formaldehyde treated MOC + molasses;
MT: concentrate mix with hydrolyzed molasses treated MOC
^{ABC}Means bearing different superscripts within the column differ significantly
^{abc}Means bearing different superscripts within the row differ significantly

Table.2(b) Periodic milk composition (%) of dairy cattle fed untreated/formaldehyde treated or hydrolyzed molasses treated mustard oil cake containing concentrate mixture

Treatments*	Periods					Treatment Mean ±SEM	P values		
	0 day	15th day	30th day	45th day	60th day		T	P	T x P
SNF									
UT	7.54	7.66	7.56	7.92	7.99	7.73±0.079^{A}			
FT	7.42	7.98	8.43	8.35	8.22	8.08±0.173^{B}			
MT	8.36	8.45	8.35	8.74	8.67	8.51±0.094^{C}			
Period mean ±SEM	7.77±0.155	8.03±0.143	8.11±0.209	8.33±0.199	8.29±0.173	8.11±0.081	0.000	0.101	0.782
Protein									
UT	3.12	3.16	3.35	3.45	3.37	3.29±0.045^{A}			
FT	3.12	3.29	3.42	3.44	3.68	3.39±0.065 ^{A}			
MT	3.46	3.56	3.62	3.61	3.71	3.59±0.034 ^{B}			
Period mean ±SEM	3.23±0.062 ^{a}	3.33±0.064^{ab}	3.46±0.65^{bc}	3.50±0.64 ^{bc}	3.58±0.073 ^{c}	3.42±0.033	0.000	0.007	0.673

The total solids (%) was significantly (P<0.05) higher in the MT and FT groups as compared to control (UT) group. The mean lactose percentage of the milk for UT, FT and MT treated groups during the experimental trial was 3.98±0.057, 3.99±0.128, and 4.35±0.048. The lactose percentage was significantly (P<0.05) higher in MT and FT treated groups as compared to control (UT) group. The mean SNF percentage of the milk for different treated UT,FT and MT groups was 7.73±0.079, 8.08±0.173 and 8.51±0.094 respectively. The SNF (%) was significantly (P<0.05) higher in MT group as compared to FT and UT treated groups. The above result is in agreement with Chatterjee and Walli (1998) who also reported that SNF and TS yield improved significantly in the treated group due to increase milk yield. The mean protein (%) in the milk of different treated UT,FT and MT groups was 3.29±0.045, 3.39±0.065 and 3.59±0.034 respectively. The protein (%) was significantly (P<0.05) higher in MT group as compared to FT and UT group

It may be concluded that treated Acid hydrolyzed molasses can be used to treat mustard oil cake to increase bypass protein content. Hydrolyzed molasses treated MOC can be incorporated in ruminant ration to improve nutrient assimilation along-with positive effects over milk yield and milk composition.

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