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RESEARCH ARTICLE

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FEED COST OF MILK PRODUCTION AND PHYSIOLOGICAL REACTIONS IN CROSSBRED LACTATING COWS AS INFLUENCED BY FEEDING PROTECTED GROUNDNUT CAKE IN THE RATION.

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ABSTRACT

The study was undertaken on fifteen lactating crossbred cows to see the impact of three levels of formaldehyde treated of groundnut cake (T_1-0 Percent, T_2- 0.5 g formaldehyde per 100 g CP, T_3- 1.0g formaldehyde per 100 gm CP) in the concentrate mixture of ration on cost of feeding of animals and feed cost of milk production based on actual market prices. DMI/100kg body weight was significantly ($P<0.01$) higher in T_3 and T_2 as compared to T_1. However, the differences between T_2 and T_3 groups were non-significant. The TDNI per 100 kg body weight was significantly ($P<0.01$) higher in T_3 treatment as compared to T_2 and T_1 treatments. The average daily feed cost per animal on actual prices was Rs. 47.34, 48.16 and 50.78 in T_1, T_2 and T_3, respectively, While average feed cost per kg milk yield was Rs. 6.42, 6.73 and 5.75 in T_1, T_2 and T_3 groups, respectively.

Key words: Crossbred cows, feed cost, formaldehyde, Berseem, wheat straw, milk yield.

INTRODUCTION

Most of the Indian livestock feeding is dependent upon different crop residues, local grasses and grazing. In the developing countries of Asia and Africa, the feed inadequacy is the major impediment coming in the way of development of livestock sector. However, there is also an alternative way of increasing the nutrient supply to bovines in these countries, and that is, by modifying the feeds and the feeding conditions, and also by manipulating the digestive tract, or through better feeding management.

Several feeding strategies have been developed to improve production performance of livestock in India, but met with limited success, because of the cost involved in treatment or its field adoption and has found little acceptance by the farmers. Formaldehyde treatment has been used by several workers in India to reduce the protein degradability of highly degradable cake and also to study the impact of its feeding on the productive performance of dairy animals (Gupta and Walli, 1987, Pratihar and Walli, 1995 and Chatterjee and Walli, 2003).

However, information about optimum and economical levels of protected GNC in the ration of lactating cows is limited. Therefore, the present study was undertaken to know the feed cost of milk production and return over feed cost as influenced by different levels of protected protein in the ration of lactating cows based on actual market price.

MATERIALS AND METHODS

Fifteen lactating crossbred cows in early stage of lactation were randomly divided in to three groups of five animals each on the basis of their body weight and milk yield. 0.5g FA/100 gCP (B) 1.0g FA/100 gCP). All the animals were offered wheat straw *(Triticum aestivum) ad lib*. + 5kg green berseem *(Trifoliun alexandrinum).* The concentrate mixture (19.54% CP) fed to T_1 cows contained untreated GNC (30%), barley (32%), wheat bran (35%), mineral mixture (2%) and common salt (1%), while concentrate mixture (19.50%CP) used for T_2 cows had 0.5g formaldehyde (FA)/100g CP treated GNC (30%), barley (32%), wheat bran (35%), mineral mixture (2%) and common salt (1%), Similarly, concented mixture T_3 cows had (19.52 CP) 1.0 g FA/100 CP treated GNC (30%), barley (32%), wheat bran (35%), mineral mixture (2%) and common salt (1%). These three types of concentrate were fed to the cows as per their requirment (Ranjhan, 1998). The data of feed intake were recorded for two consecutive days at fortnightly interval. The milk yield was recorded weekly. Calculation of 4 percent fat corrected media (FCM) yield (Gaines, 1928) and (SCM)

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yield (Tyrrell and Reid, 1965) was also made. The feed cost of milk production was calculated based on actual cost of feed and fodder. The cost of wheat straw and breseem was Rs. 240 and Rs. 110 per quintal, respectively. Cost of concentrates I, II and III was Rs. 683.45, 694.45 and Rs. 703.65 per quintal, respectively. The farm price of milk was taken as Rs. 10.00 per kg. The samples of feed and fodder were analyzed for proximate priciples (AOAC, 1995).

Meteorological observations like maximum, minimum, dry and wet bulb temperatures of cows were recorded daily at 8.00 AM and 3.00 PM during the experiment. The relative humidity was calculated from dry and wet bulb thermometer reading using the hygrometric Tables (Indian Meteorological Department, Pune).Rectal temperature, respiring rate and pulse rate of lactating cows were recorded at 9.00 AM and 2.30 PM at fortnightly intervals during the experimental period. The rectal temperature (°C) was recorded by inserting the clinical thermometer in to the rectum and by touching the bulb of thermometer with the mucosa of rectum for one minute. Respiration rate was recorded by counting the movement of right flank (counts per minute) of the experimental animals. Pulse rate was measured by palpating coxygial artery (Bhatnagar and Chaudhary, 1960).

RESULTS AND DISCUSSION

The proximate composition (% DM basis) of berseem *(Trifoliun alexandrinum)*, wheat straw *(Triticum aestivum)* and concentrate mixtures are given in Table 1. The concentrate mixture fed to cows of T_1 group has 19.54% CP while that given to animals of T_2 and T_3 group had 19.50% and 19.52% CP, respectively. The chemical composition of green berseem and wheat straw used in the present study was similar to that reported by Sen and Ray (1971) and ICAR (1998).

Nutrient Intake

The average daily DMI (kg/day) and average daily dry matter intake (kg) at fortnightly interval under different treatments are given in Table 2 & 3. DM intake per 100 kg body weight was significantly (P<0.01) higher in T_2 and T_3 groups as compared to group T_1. These results are comparable to the findings of Bharadwaj *et al*. (2000) who reported increase in DMI. However, CPI was similar (P<0.05) in the three groups. These results are in agreement with Chaturvedi and Walli (2000) and Sahoo (2002) who reported non-significant effect on CP intake and DCP intake in lactating animals among the treatment. The average daily TDN intake was also similar among the different groups. Similar trend was observed by

Table 1: Proximate composition (% DM basis) of concentrate mixtures and fodders offered to lactating crossbred cows

Attributes	Green Berseem	Wheat Straw	Concentrate mixtures T_1	T_2	T_3
OM	87.52	89.15	92.43	92.40	92.41
CP	15.91	3.38	19.54	19.50	19.52
CF	24.69	32.90	8.14	8.09	8.05
EE	2.50	1.14	4.59	4.56	4.54
NFE	44.42	51.73	60.16	60.25	60.30

Table 2: Average dry matter intake (DMI) by lactating crossbred cows

Attributes	Treatments T_1	T_2	T_3
DM Intake			
DMI per day (kg)	9.32	9.67	9.92
	±1.27	±0.98	±1.92
DMI per 100 kg B.Wt. (kg)	2.41^b	2.51^a	2.57^a
	±0.05	±0.06	±0.06
Crude Protein intake			
CPI per day (g)	1029.62	1058.95	1135.12
	±173.52	±106.12	±337.72
CPI per 100 kg B.Wt. (g)	267.30	276.62	293.23
	±35.20	±40.64	±47.96
DCP Intake			
DCPI per day (g)	673.96	702.40	770.35
	±119.68	±80.12	±237.19
DCPI per 100 kg	175.02	183.52	198.80
B.Wt. (g)ss	±25.22	±28.91	±34.15
TDN Intake			
TDNI per day (kg)	5.34	5.60	6.03
	±0.64	±0.67	±1.18
TDNI per 100 kg	1.38^c	1.45^b	1.56^a
B.Wt. (kg)	±0.04	±0.01	±0.06

a,b,c., means with different superscripts in row differ significantly (P<0.05), (P<0.01)

Table 3: Average daily dry matter intake (kg) at fortnightly interval under different treatments

Fortnightly	Treatments T_1	T_2	T_3
I	8.63±1.50	8.75±0.89	9.09±1.66
II	9.19±1.22	9.60±0.90	9.83±1.83
III	9.45±1.29	9.96±1.03	10.17±1.91
IV	9.61±1.36	10.03±1.06	10.29±2.10
V	9.57±1.41	9.88±1.01	10.12±2.07
VI	9.48±1.37	9.82±1.03	10.03±2.01
Mean	**9.32±1.27**	**9.67±0.98**	**9.92±1.92**

Table 4: Feed cost (Rs.) of milk production under different treatment based on market prices of feed and milk during 100 days period

Particulars	Treatments		
	T_1	T_2	T_3
Berseem (kg/d)	5	5	5
Wheat straw (kg/d)	5.19	5.71	5.47
Concentrate (kg/d)	4.30	4.17	4.57
Feed cost			
Green berseem	5.50	5.50	5.50
	(11.62)	(11.42)	(10.83)*
Wheat straw	12.46	13.70	13.13
	(26.31)	(28.45)	(25.85)
Concentrate	29.39	28.96	32.16
	(62.07)	(60.13)	(63.32)
Av. Daily feed cost/animals	47.34	48.16	50.78
Milk yield (kg)	7.38	7.16	8.83
FCM yield (kg)	8.59	8.72	9.60
SCM yield (kg)	9.91	10.11	10.46
Feed cost per kg milk yield	6.42	6.73	5.75
Feed cost per kg FCM yield	5.51	5.52	5.29
Feed cost per kg SCM yield	4.78	4.76	4.86
Total returns from sale of milk	73.80	71.60	88.30
Mean daily return over feed cost from sale of milk	26.46	23.44	37.52

*Figures in parenthesis indicates percentage

Hosmani and Srivastava (1984) using formaldehyde treated soybean fed on buffalo calves. The TDNI per 100 kg body weight was significantly ($P<0.01$) higher in T_3 as compared to T_2 and T_1 groups. The higher TDN intake in T_3 may be due to higher daily DM Intake and palatability of the ration. In contrast to these results Chaturvedi and Walli (2000) and Sahoo (2002) reported non-significantly difference in TDN intake between untreated and formaldehyde treated groups.

Feed Cost:

The average feed cost of milk production is given in Table 4. The average total feed cost per animals per day in T_1, T_2 and T_3 groups was Rs. 47.34, 48.16 and Rs. 50.78, respectively. The feed cost per kg milk yield was Rs. 6.42, 6.73 and Rs. 5.75, respectively. The corresponding figure for per kg 4% FCM yield was Rs. 5.51, 5.52 and Rs. 5.29, respectively. The higher return over feed cost in T_3 inspite of higher total feed cost may be due to more production of milk. Feed cost per kg milk production was lower in T_3 (Rs. 5.75) as compared to T_2 (Rs. 6.73) and T_1 (Rs. 6.42). This shows that feeding of formaldehyde (1.0 g FA/100g CP) treated GNC can have beneficial effect in lactating cows. Similar results were obtained by Gulati *et al.* (2002) and Garg *et al*. (2004) in lactating cows fed various levels of protected protein (GNC) in the diets.

Physiological reactions:

The weekly maximum and minimum temperature and relative humidity recorded have been given in Table 5. The average rectal temperature, respiration and pulse rate of each group are presented in Table 6. Average body temperature in morning and evening in different groups was within the normal range for the cows. These results are similar as indicated by Singal (2001).

Table 5: Average weekly meteorological data during experimental period

Weeks	Temperature		Relative humidity (%)			
	Maximum	Minimum	Average	Morning	Evening	Average
I	28.8±0.91	7.77±0.98	18.28	76	26	51.0
II	26.57±1.43	12.2±1.35	19.38	82	40	61.0
III	25.23±2.10	9.67±0.75	17.45	74	32	53.0
IV	26.87±0.88	10.54±0.94	18.70	62	31	46.5
V	26.13±0.99	15.64±1.49	20.88	72	28	50.0
VI	31.86±1.15	18.80±0.89	25.33	60	22	41.0
VII	28.63±1.73	12.56±2.39	20.59	67	20	43.5
VIII	30.81±0.48	17.43±0.47	24.12	62	19	40.5
XI	32.21±0.29	20.36±0.22	26.28	58	17	37.5
X	35.93±0.09	22.71±0.35	29.32	53	16	34.5
XI	37.49±0.77	22.23±0.74	29.86	42	16	29.0
XII	37.36±0.66	24.29±0.88	30.82	39	15	27.0
XIII	37.06±0.52	26.17±0.44	31.61	38	16	27.0
XIV	38.9±0.44	26.04±0.53	32.47	39	15	27.0
Average	31.70±2.42	17.60±3.14	24.65±2.73	58.86	22.36	40.61

Table 6: Average daily rectal temperature (ºC), respiration and pulse rate of lactating crossbred cows during experimental period

Parameters	Treatments		
	T_1	T_2	T_3
Rectal temperature			
Morning	38.36±0.23	38.40±0.28	38.45±0.35
Evening	38.58±0.34	38.60±0.42	38.73±0.41
Average	38.47±0.20	38.50±0.27	38.59±0.23
Respiration rate/minute			
Morning	20.45^{b}±1.53	20.80^{b}±0.99	23.27^{a}±2.32
Evening	25.97^{b}±2.07	27.70^{ab}±2.28	29.81^{a}±0.84
Average	23.21^{b}±1.22	24.25^{b}±1.54	26.54^{a}±1.02
Pulse rate/minute			
Morning	57.50^{b}±0.77	59.70^{a}±1.28	60.27^{a}±1.33
Evening	61.43±2.81	62.10±3.30	63.53±4.18
Average	59.47±1.64	60.90±1.99	61.90±2.68

a,b, means with different superscripts in row differ significantly (P<0.05), (P<0.01)

Thus, based on the results obtained from the lactation trial, it could be concluded that feeding of 1.0 g FA/100 g CP treated GNC to lactating crossbred cows was beneficial. One reason might be that availability of protected protein in group (T_3) could meet the requirements of animals for optimum milk production. It was also more interesting to know through this study, that the higher milk yield was maintained in FA treated GNC (T_3) fed group throughout the experimental period ignoring the influence of stage of lactation. It also show that the cost of milk production was much cheaper on feeding formaldehyde (@1.0g FA/100g C P) treated GNC to milch cows.

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