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Effect of formaldehyde treated concentrate, urea and soybean meal on feed conversion efficiency and economics of milk production in cows

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ABSTRACT : Present investigation entitled "effect of formaldehyde treated concentrate, urea and soybean meal on feed conversion and economics of milk production in cows." was undertaken at Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeet, Akola. Feeding of 1.5 per cent formaldehyde treated 70:30 sugras : SBM concentrate mixture with 2 per cent added urea diet to lactating cows (T_3) was evaluated in relation to sugras untreated ration (T_1). It was noticed that DCPI/kg milk yield was influenced by the feeding treatments being less by 7.23 and 10.84 per cent. The average DMI and TDNI intakes were 1.37 and 0.867, 1.77 and 0.851, 1.17 and 0.778, 1.23 and 0.810 and 1.17 and 0.772 kg/kg milk yield under T_1, T_2, T_3, T_4 and T_5 groups, respectively, as a result the corresponding feed conversion efficiency emerged out as 73.14, 78.79, 83.73, 81.10 and 85.20 per cent, respectively, gross protein efficiency (GPE) was found comparatively more by approximately 7.33 to 7.92 per cent in T_3 and T_5 cows as compared to T_1, T_2 and T_4 group cows, the values being 41.33, 40.74, 48.66, 42.98 and 48.36 per cent in T_1, T_2, T_3, T_4 and T_5 groups, respectively. Moreover, similar trend was noticed in respect of net protein efficiency (NPE) under different treatments. The NPE values were 67.99, 62.66, 76.68, 66.26 and 76.94 per cent under T_1, T_2, T_3, T_4 and T_5 groups, respectively. On an average daily feeding cost worked out as Rs.49, 50, 52, 42 and 43/cow in T_1, T_2, T_3, T_4 and T_5 groups, respectively.

KEY WORDS : Formaldehyde, Sugras, Urea, Soybean meal, DMI, DCP, Milk yield, Feed conversion efficiency, Gross protein efficiency, Net protein efficiency, Economics

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INTRODUCTION

SBM is richer in protein as compared to GNC and other cakes on one hand and contained equal per cent (35) of naturally protected protein as that of GNC (36%) out of the total CP on the other hand. The formaldehyde treatment to SBM will result in supplement of 70 to 75 per cent UDP and 25 to 30 per cent RDP in the ration on of lactating cows, thereby increase supply of amino acid for milk synthesis (Gulati *et al.*, 2002). The USA alone has 50 per cent of the world acrage under soybean crop and soybean and its byproduct where firstly utilize in animal feed by them. Today soybean is the single largest oil seed crop grown in the world under varied agro-climatic condition.

During couple of years a remarkable change in the cropping pattern has been observed where the farmers preferred the cultivation of crops having low cost of

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production and remunerative selling price in the market. In this context soybean and sunflower have ranked on top position in cultivation programme in Maharashtra. The Government of Maharashtra never launched a programme either to improve or to expand soybean cultivation in the state. In spite of this fact 60.69 lakh ha. of land was put under soybean crop in Maharashtra during 2012-13 against an acrage of 12.70 lakh ha under sorghum crops. Naturally this production will be diverted for oil extraction which would generate large quantity of meal. Presently it is noticed that the meal generated in the country is exported to different countries for animal feeding instead of that this meal could find a place in animal feeding in the country to boost up the milk production. Moreover, feeding of formaldehyde treated meal could further help to raise the milk production of the same animals by about 15 to 17 per cent. Where a positive significant effect on increase in milk yield of cows, goats and sheeps was noticed due to feeding of formaldehyde treated SBM (Backer *et al.*, 1986; Socha 1991; Atwal *et al.*, 1995; Compeneere *et al*., 2010 and Doskey *et al*., 2012). Thus, an attempt has been made in the present study to enhance the rumen by pass protein value of soybean meal (SBM) by treating with 1.5 per cent formaldehyde/ 100 g CP and its feeding effect on lactating cows with the main objective to find out the feed conversion ratio and economics of feeding on milk production in cows.

MATERIAL AND METHODS

The present investigation entitled "effect of formaldehyde treated concentrate, urea and soybean meal on feed conversion and economics of milk production in cows." was carried out at Livestock Instructional Farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola for a experimental period of 90 days with 10 days prior pre-experimental period. Twenty five early to mid-lactation stage lactating cows were selected from the herd on the basis of nearness in stage of lactation, milk production and body weight. The selected cows were divided in the five groups on the basis of nearness in different productive characters.

The maintenance and milk production requirements of the cows were worked out on the basis of the thumb rules suggested by Prasad and Neeraj (2008) and Banerjee (2008). The cows in all the treatments (T_1 to T_5) were given 5 kg green Hy. Napier and one kg sugras milk ration grade 1 (17.60% CP) to fulfill the maintenance requirements. Treatments were planned like T_1 – Wheat straw + sugras concentrate (17.60 % CP) 40 per cent of milk yield (production ration), T_2 – Wheat straw + untreated 70:30 sugras:SBM mixture (27.47 %CP) 30 per cent of milk yield (75 % of production ration) + 2% urea of the production quantity, T_3 – Wheat straw + 70:30 sugras:SBM mixture (27.47 %CP) treated with HCHO at 1.5 g/100CP 30 per cent of milk yield (75% of production ration) + 2% urea of the production quantity, T_4 - Wheat straw + untreated 70:30 sugras:SBM mixture (27.47 %CP) 20% milk yield (50% of production ration)+ 3% urea of the production quantity and T_5 – Wheat straw + 70:30 sugras:SBM mixture (27.47 %CP) treated with HCHO at 1.5 g/100CP 20 per cent milk yield (50% of production ration) + 3% urea of the production quantity.

The digestibility trial was conducted at the end of seventeenth week's trial. The digestibility trial was conducted for a period of 14 days, out of which first seven days were preliminary period and rest of seven days as collection period. The cows were offered measured quantity of feed and leftover was measured. During collection period the dung voided in 24 hrs by individual cow was collected manually and measured to know the weight of dung voided. Individual sample of dung was collected and kept for DM estimation every day. All the seven days dried samples of individual cow were mixed together to form composite sample for analysis of proximate principles.

Milk yield was recorded separately for morning and evening milking of individual cow for whole experimental period. Milk samples were collected once a week during morning and evening milk from individual cow. The composite samples were prepared for estimating fat, protein, SNF and TS contents. Fat content was determined weekly by using standard Gerber method as described in ISI: 1224 (Part - I), 1977. Protein per cent was determined weekly by formal titration method as recommended in ISI: 1479 (Part - II), 1961. The solids-not-fat content of milk was determined weekly by difference method as per Indian Standard Institution, IS: 1183 (1965). The total solid content of milk was determined weekly as per the methods prescribed by Indian Standard Institution BIS – IS: 1183 (1965).

The feed conversion efficiency and protein efficiency were worked out by using the formulae suggested by

Jumah *et al.* (1965).

$$\text{FCE (\%)} = \frac{\text{Total milk production}}{\text{Total dry matter intake}} \text{ x } 100$$

$$\text{Gross protein efficiency} = \frac{\text{Amount of protein in milk / day (g)}}{\text{Amount of DCP intake / day (g)}} \text{x} 100$$

$$\text{Net protein efficiency} = \frac{\text{Milk yield(g) x Protein (\%)}}{\text{DCP intake (g) - DCP for maintenance}}$$

Economics of feeding was judged on the basis of daily cost of feeding and feed cost per kg weight gain. The cost of feeding was calculated by considering the rates of roughages approved by the university and purchase rate of concentrate mixture. The processing charges were work out on the basis of labour requirement, electricity, consumption and other miscellaneous charges. The data were arranged in Factorial Randomized Block Design (FRBD) and analyzed by standard statistical method as per Amble (1975).

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Feed conversion efficiency :

Feeding of 1.5 per cent formaldehyde treated 70:30 sugras:SBM concentrated mixture with 2 and 3 per cent added urea neither influenced feed intake and its digestibility as well as nutrient supply to body as per feeding norms nor milk production in relation to quality and quantity in cows. However, it seems now necessary to evaluate this feeding strategy in terms of efficiency of nutrient utilization and feed conversion efficiency for milk production as these parameters have direct bearing on monitory returns from the cows. With this view the data with regards to nutrient utilization per kg milk production and feed conversion efficiency for productive purpose are tabulated in Table 1.

The average DMI was 1.37, 1.27, 1.17, 1.23 and 1.17 kg per kg milk production in T_1, T_2, T_3, T_4 and T_5 groups, respectively. The past workers like Chaturvedi

Table 1: Feed conversion efficiency on different feeding treatments

Particular	Feeding treatments				
	T_1	T_2	T_3	T_4	T_5
Feeding attributes (kg)					
Total DM intake	717.30	700.20	706.50	630.90	648.90
Total DCP intake	43.65	46.71	46.80	40.86	40.86
Total TDN intake	454.50	469.80	471.60	414.00	426.60
Total water intake	2522.70	2501.10	2523.60	2454.30	2489.40
Efficiency of nutrient utilization per kg milk yield					
DMI	1.37	1.27	1.17	1.23	1.17
CPI	0.130	0.137	0.128	0.127	0.120
DCPI	0.083	0.085	0.077	0.080	0.074
TDNI	0.867	0.851	0.778	0.810	0.772
TWI	4.801	4.533	4.166	5.348	4.861
Conversion efficiencies					
DMI kg/d/cow	7.97	7.78	7.85	7.01	7.21
Milk yield kg/d/cow	5.83	6.13	6.73	5.69	6.15
4% FCM kg/d/cow	5.95	6.21	7.07	5.90	6.36
DMI:Milk	0.731	0.787	0.857	0.811	0.852
DMI:FCM	0.750	0.798	0.901	0.842	0.882
Feed conversion efficiency (%)	73.14	78.79	85.73	81.10	85.20
Gross protein efficiency (%)	41.33	40.74	48.66	42.98	48.36
Net protein efficiency (%)	67.99	62.26	76.68	66.26	76.94

and Walli (2000); Yadav and Chaudhary (2004) and Bugalia and Chaudhary (2008) reported the requirement of DM per kg milk yield in between 1.03 to 1.26 kg on feeding HCHO treated concentrate to cows which was significantly lower by 7.20 to 13.69 per cent that that of untreated control feeding (1.11 to 1.46 kg). on the other hand Sahoo and Walli (2005) and Guru *et al.* (2006) observed significantly less DMI per kg milk yield on feeding treated concentrate to goat being 1.16 and 1.02 kg against 1.32 and 1.25 kg under control group. These results are in agreement with present trend as in the present results also requirement of DMI per kg milk yield was less in T_3 and T_5 groups against T_1 control group.

Similar trend was noticed with regards to utilization of DCP for milk production where T_3 cows needed less DCP by 7.23 and 9.41 to 3.75 per cent over that of T_1 and T_2/T_4 groups, respectively. Thus, the trend does indicate that in spite of the higher DCP intake in T_3 cows as compared to T_1 cows, the cows needed less DCP per kg milk yield which is explained on the facts that higher milk production in T_3 by 15.43 and 9.43 per cent than that of T_1 and T_5 cows, respectively appears to be a cause for this trend as higher DCP intake gets compensated through higher milk production. The CPI intake/kg milk yield was found more or less equal in T_3, T_4 and T_5 groups being, 0.128, 0.127 and 0.120 kg, respectively while CPI intakes were practically equal between T_1 (0.130 kg) and T_2 (0.137 kg). The present trend on CPI requirement to produced one kg milk is concurrent with results of Yadav and Chaudhary (2004); Guru *et al*. (2006) and Bugalia *et al.* (2008) where they reported the requirement of CPI between 118 to 180 g per kg milk yield on HCHO treated concentrate feeding as compared to requirement of 121 to 240 g per kg milk yield on untreated concentrated feeding in cows and goats which appeared lower by 2.48 to 25 per cent in treated group against that of untreated group. In the present study the requirement of CPI was 120 to 128 g/kg milk yield on feeding HCHO treated diet against a requirement of 127 to 137 g under feeding untreated diet to cows.

Beside this T_3 cows required 0.778 and 4.166 kg of TDN and water to produced one kg of milk, respectively which appeared lower by 10.26 and 6.60 per cent than that of T_1 control group while equal TDNI and lower water intake over that of T_5 group. Moreover, TDNI of 0.772 kg in T_5 group was also lowered by 10.95 per cent than that of T_1 control group. Similarly the TDNI observed in T_2 and T_4 groups to produced one kg of milk were nearer to T_1 control group, being 0.867, 0.851 and 0.810 kg/kg milk yield in T_1, T_2 and T_4 groups respectively while it was 0.772 kg in T_5 group. The requirement of TDN/kg milk yield reported by Yadav and Chaudhary (2004); Guru *et al*. (2006) and Bugalia and Chaudhary (2008) as 0.623 and 0.642, 0.720 and 0.970 and 0.670 and 0.730 kg by feeding HCHO treated and untreated GNC to cows, bypass protein to goat and til cake to cows, respectively appear to be marginally lower than that of present requirements.

As a result, the milk and 4 per cent FCM yields per kg DMI were more in T_3 group, being 0.857 and 0.901 kg, respectively against corresponding yield of 0.721 and 0.750 kg in T_1 control group and 0.852 and 0.882 kg in T_5 group, respectively. This situation had direct reflection on feed conversion efficiency of cows, being 73.14, 78.79, 85.73, 81.10 and 85.20 per cent in T_1, T_2, T_3, T_4 and T_5 groups, respectively.

The many past workers like Chaturvedi and Walli (2000); Yadav and Chaudhary (2004); Sahoo and Walli (2005) and Bugalia *et al.* (2008a) reported higher feed conversion efficiency on feeding formaldehyde treated concentrate to cows, buffaloes and goats where they noticed the efficiency ranging from 80.14 to 88.04 per cent on HCHO treated concentrate feeding against between 79.18 to 82.09 on feeding untreated diet. The GPE values were 41.33, 40.44, 48.66, 42.98 and 48.36 per cent in T_1, T_2, T_3, T_4 and T_5 groups, respectively. The same trend was maintained in respect of net protein efficiency (NPE) which worked out as 67.99, 62.26, 76.68, 66.26 and 76.94 per cent under T_1, T_2, T_3, T_4 and T_5 groups, respectively. This means for each 100 g of DCP above maintenance, there was approximately 76 g of protein secretion in milk under HCHO treated T_3 and T_5 groups against the secretion of approximately 68, 62 and 66 g of protein per 100 g DCP intake in T_1, T_2 and T_4 groups cows, respectively. Moreover, the GPE reported by Yadav and Chaudhary (2010) on feeding HCHO treated GNC and untreated GNC to cows as 46.84 and 43.89 per cent for producing 8.83 and 7.38 kg of milk with 3.9 per cent protein, respectively, seems to be nearer to that of present values. While the NPE observed by them appeared to be substantially lower (51.80 and 48.53%) as compared to present values on treated and untreated concentrate feeding. Beside this GPE reported by Chaudhary and Gupta (2002) as between 42.62 to

45.15 in buffaloes also do support the present trend, but NPE observed by them in between 53.17 to 58.78 per cent appears to be lower than that of present values. Probably milk yield CPI and its digestibility coupled with protein content of milk could be considered as factors to influence protein efficiency in animal. Moreover Gupta and Tripathi (1982) opined that forage type, type and amount of concentrates fed, animal type and stage of lactation could be the factors to influence on protein efficiency. This explanation justifies the variation between past reported values and present trend.

Economics of feeding :

On this background SBM a highly protein rich feed (49% CP) was subjected to 1.5 per cent formaldehyde treatment so as to increase its utility for milk production. However any new feeding approach must be economical easy for use and easily available for wide application at the door of the farmer. In reference to these views economics of feeding HCHO treated 70:30 sugras:SBM mixture with added urea ration to lactating cows was worked out and results are shown in Table 2.

(Cost of feed and fodders (Rs.): Wheat straw @Rs.150/q, Hy.Napier Rs.200/q, Sugras Rs.983/q, Soybean meal Rs.2250/q, 70:30 Sugras : SBM mixture Rs. 1348/q, urea Rs. 418/q, formalin 40% Rs. 115/l).

It is evident from Table 2 that the total expenditure to maintained a cow yielding 5 to 7 kg of milk/d over a period of 90 days was Rs.44.14, 45.18 and 46.80 on feeding T_1 control diet, untreated 70:30 sugras :SBM concentrate with 2 per cent added urea (T_2) and same as T_2 but concentrate treated with 1.5 per cent formaldehyde (T_3), respectively, indicating more expenditure of Rs. 104 and 266 under T_2 and T_3 treatments as compared to T_1 control group. This trend is justified on the basis of (1) in spite of saving in the quantity of concentrate feeding to the level of 15.90 per cent in T_2 and T_3 over that of T_1.

On an average daily cost of feeding worked out as Rs.49, 50, 52, 42 and Rs.43/ cow in T_1, T_2, T_3, T_4 and T_5, respectively. This trend did indicate that feeding cost/d/ cow was higher by 6.12 per cent in T_3 and lower by 12.24 per cent in T_5 in reference to T_1 control group. However, the examinations of results in the context to feeding cost per kg milk yield in cows, a different picture is emerged out. It was noticed that feed cost per kg milk yield was Rs.7.72 and 6.99 on feeding HCHO treated 70:30 sugras:SBM concentrate with 2 per cent (T_3) and 3 per cent (T_5) urea supplemented diets, respectively against an cost of Rs. 8.40 in T_1 control group indicating an saving of 8.09 and 20.17 per cent in feed cost per kg milk yield in T_3 and T_5 treatments, respectively. In contrast feeding cost per kg milk yield in T_5 treatment was lower by 10.44 per cent as compared to T_3 treatment. The curtailment in the quantity of concentrate (1.14 kg/d/cow) in T_5 in reference to T_3 (1.75 kg/d/cow) resulted in

Table 2: Economics of feeding untreated and formaldehyde treated concentrates to cows

Particulars	T_1	T_2	T_3	T_4	T_5
Wheat Straw	2,922.75 (19.49)	3098.25 (20.66)	3172.50 (21.15)	3071.25 (20.48)	3084.75 (20.57)
Hy.Napier	4,500.00 (22.50)	4,500.00 (22.50)	4,500.00 (22.50)	4,500.00 (22.50)	4,500.00 (22.50)
Sugras	14464.85 (14.72)	4423.50 (4.50)	4423.50 (4.50)	4423.50 (4.50)	4423.50 (4.50)
70:30 Sugras:SBM	-	10312.20 (7.65)	10615.50 (7.88)	6472.44 (4.68)	6915.24 (5.13)
Urea	-	58.52 (0.14)	66.88 (0.16)	58.52 (0.14)	62.70 (0.15)
Formaldehyde	-	-	372.60 (3.24)	-	242.65 (2.11)
Processing cost	180	200	250	200	250
Total cost for 5 cows (Rs.)	22067.60	22592.47	23400.98	18725.71	19478.84
Total cost per cow (Rs.) over 90 days	4414.00	4518.00	4680.00	3745.00	3896.00
Feed cost/d/cow (Rs.)	49.00	50.00	52.00	42.00	43.00
Milk yield kg/d	5.83	6.13	6.73	5.69	6.15
Fat %	4.14	4.09	4.33	4.24	4.23
4% FCM kg/day	5.95	6.21	7.07	5.90	6.36
Feed cost/kg milk (Rs.)	8.40	8.15	7.72	7.38	6.99
Cost/kg FCM (Rs.)	8.23	8.05	7.35	7.12	6.76

(Figures in parenthesis shows quantity in quintals fed over 90 days to 5 cows)

reduction of feed cost/d by Rs.9 in T_5 over that of T_3 treatment which had directly reflected on the feeding cost per kg milk yield in T_5 treatment. Moreover, it was also noticed that feeding cost per kg milk yield was lower on feeding HCHO treated 70:30 sugras:SBM concentrate with 2 per cent (T_3) and 3 per cent (T_5) urea supplement diets against the feeding of respective untreated rations (T_2 and T_4), the cost being Rs.7.72 (T_3) vs. 8.15 (T_2) and Rs.7.38 in T_4 vs. Rs. 6.99 in T_5. Probably the higher milk yields on feeding HCHO treated diets to cows as compared to feeding of untreated diets might have compensated the cost structure in respect of additional expenditure incurred on formaldehyde treatment. The present trend is collaborative to Bandeswaran *et al*. (2004) as they noted lower cost of feeding soybean straw complete feed, HCHO treated GNC and sesame cake, respectively.

Thus, it appears from the results that feed cost/kg milk and 4 per cent FCM were lower on feeding HCHO treated 70:30 sugras:SBM with 3 per cent urea supplement (T_5) diet over that of feeding HCHO treated concentrate with 2 per cent added urea diet (T_3) to cows. However, it seems necessary to evaluate the different feeding treatments in terms of potential gain in reference to monitory returns from the sale of milk obtained from the cows. For this purpose the procurement policy adopted at Govt. Milk scheme in Maharashtra is consider which is related to fat content of milk with minimum 8.5 per cent SNF content for cow milk. As per the policy for every increase of 0.1 per cent in fat fetch a additional bonus price of Rs. 0.20 over the base price prescribed for 3.5 per cent fat content of cow milk. Considering this principle the gross monitory income obtained at different feeding treatments were calculated taking in to consideration daily milk yield and its fat content. The data generated in this respect is tabulated in Table 3.

It is evident from Table 3 that gross monitory income was more from T_3 and T_5 group by 18.04 and 6.68 per cent respectively over T_1 control group, indicating more daily income of Rs. 18.62 and 6.89 from T_3 and T_5 group/d/cow, respectively over that of T_1 control group. Moreover, in spite of the lower feeding cost per kg milk yield, the gross income from T_5 group was lower by 10.65 per cent than that of T_3 group. This means a benefit of Rs. 11.73/d/cow would be obtained from T_3 group over that of T_5 group. This trend had emerged out on account of higher milk production with more fat content in T_3 group over that of T_1 and T_5 groups. Thus, the trend did indicate that feeding of 1.5 per cent formaldehyde treated 70:30 sugras:SBM concentrate mixture with 2 per cent urea supplement proved beneficial to raise the gross income over that feeding HCHO treated 70:30 sugras:SBM mixture with 3 per cent urea supplement. However, feeding of HCHO treated diet either with 2 per cent or 3 per cent urea supplement improved the monitory benefits over that of feeding respective untreated diets (T_2/T_4), as the gross income was more in T_3 by 13.35 per cent over that of T_2 and by 8.08 per cent in T_5 over T_4 treatment. Moreover, surprisingly the gross income gain in T_4 treatment was less than that of T_1 control group. Probably lower intake of dry matter and concentrate in T_4 group compared to T_1 group might have adversely affected the milk production in cows.

Thus, the results on economics of feeding reveals that feeding of 1.5 per cent formaldehyde treated 70:30 sugras:SBM concentrates (27.47 CP) with 2 or 3 per cent urea supplementation diets to cows had a potential to increase the milk production in cows yielding 5 to 7 kg of milk/d and thereby increasing daily monitory returns.

Conclusion :

It was noticed that DCPI/kg milk yield was influenced by the feeding treatments being less by 7.23 and 10.84 per cent on feeding T_3 HCHO treated concentrates with 2 per cent added urea and T_5 with 3 per cent added urea to treated concentrates over that of

Table 3 : Gross income by sale of milk on different feeding treatments

Treatments	Milk yield (Kg)	Fat %	Rate/kg (Rs.)	Total income (Rs.)	% increase over T_1
T_1	5.83	4.1	17.70	103.19	-
T_2	6.13	4.0	17.50	107.27	3.95
T_3	6.73	4.3	18.10	121.81	18.04
T_4	5.69	4.2	17.90	101.85	-01.34
T_5	6.15	4.2	17.90	110.08	6.68

T_1 diet feeding to cows. Similarly DMI and TDNI requirements to produce one kg of milk were also lowered on feeding T_3 and T_5 ration to cows. The average DMI and TDNI intakes were 1.37 and 0.867, 1.77 and 0.851, 1.17 and 0.778, 1.23 and 0.810 and 1.17 and 0.772 kg/kg milk yield under T_1, T_2, T_3, T_4 and T_5 groups, respectively, as a result the corresponding feed conversion efficiency emerged out as 73.14, 78.79, 83.73, 81.10 and 85.20 per cent, respectively. Gross protein efficiency (GPE) was found comparatively more by approximately 7.33 to 7.92 per cent in T_3 and T_5 cows as compared to T_1, T_2 and T_4 group cows, the values being 41.33, 40.74, 48.66, 42.98 and 48.36 per cent in T_1, T_2, T_3, T_4 and T_5 groups, respectively. Moreover, similar trend was noticed in respect of net protein efficiency (NPE) under different treatments. The NPE values were 67.99, 62.66, 76.68, 66.26 and 76.94 per cent under T_1, T_2, T_3, T_4 and T_5 groups, respectively.

On an average daily feeding cost worked out as Rs.49, 50, 52, 42 and 43/cow in T_1, T_2, T_3, T_4 and T_5 groups, respectively. However, examination of results on the basis of feeding cost/kg milk yield it was noticed that feeding cost/kg milk yield was Rs.7.72 and 6.99 on feeding HCHO treated 70:30 sugras:SBM concentrate with 2 per cent T_3 and 3 per cent T_5 urea supplemented diets, respectively against a cost of Rs.8.40 in T_1 control group, thereby saving of 8.09 and 20.17 per cent in feed cost/kg milk yield in T_3 and T_5 over that of T_1 control group. The maximum daily income was more by Rs. 18.62/cow as compared to control which was highest amongst the groups.

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