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Effect of Bypass Protein on Milk Production and Economic of Lactating Crossbred Cows

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ABSTRACT

An On-Farm Trial was conducted on 24 lactating crossbred cows for assessment of feeding formaldehyde treated mustard cake (bypass protein) on milk production and economic analysis of lactating cow. Cows were divided into three groups having 8 cows each, treatments were farmers' practice (FP); (Control): The lactating animals under this group were fedas per the feeding schedule of the farmers (5 kg. dry roughage as rice straw + 6 hrs grazing as local grass and 4 kg. commercial concentrates), T1: The lactating animals under this group were fed as per farmers practice with 12% mustard cake of total diet was provided to the cow by replacing the same amount of commercial concentrates andT2: The lactating animals under this group were fed as per farmers practicewith 12% formaldehyde treated mustard cake of total diet was provided to the cow by replacing same amount of commercial concentrates. The average daily milk yield of lactating cows under FP, T1 and T2 was 8.58, 8.82 and 9.85 kg per cow, respectively. Differences between FP and T2 were significant. The daily increase in milk yield was 1.27 kg and 1.03 kg in cows fed T2diet over the cows fed FP and T1diet, respectively. The B: C ratios for FP, T1 and T2 groups were 2.6, 3.0 and 3.3, respectively. The feed cost reduced in T2 group by Rs. 8.64 and increased milk production by 1.27 kg in respect to FP group.

KEYWORDS

Mustard cake, formaldehyde, bypass protein, milk yield

INTRODUCTION

Mustard cake is available in Kishanganj District of Bihar to fed dairy animals. On dry matter basis, 30.25% crude protein is present in mustard cake. In India, oilseed cakes constitute the major protein sources in the ration of dairy animals (Sahoo *et al.*, 2006).There is hardly any scope for increasing fodder production, since the area under fodder cultivation has remained static at 4.5% for the last several decades, due to the pressure of increasing human population. Against a total annual requirement of more than 40 million tonnes, less than 20 million tonnes protein meals are produced annually in India. It becomes imperative that these precious feed resources are utilized effectively, so that their utilization efficiency is improved for enhancing livestock productivity (Sohoni, 2007).In ruminants, absorbed amino acids may be provided directly from the diet, from rumen microbes or endogenous secretions (Satter and Roffler, 1975). The amount of amino acids available for absorption in the small intestine is a total of that available from the microbial proteins and those proteins, which remain undegraded in the rumen but is subjected to enzymatic digestion in the lower digestive tract (Gulati *et al.*, 2002). Delivery of protein or amino acids directly to the postruminal digestive tract to escape rumen breakdown enhanced milk and milk protein production (Clark, 1975).

Protein sources differ in their rumen degradability. Some protein meals contain naturally available rumen bypass protein (30 to 50 % of total CP) *viz.* cottonseed meal, toasted soybean, toasted groundnut meal, maize gluten meal etc., which can be used as bypass protein feeds. The cost of these ingredients is high, whereas rapeseed meal, sunflower meal, guar meal etc. are available at a cheaper rate but rumen by-pass protein content in these meals is low. Such protein meals having high rumen degradability can be subjected to heat or chemical treatment for increasing the level of rumen by-pass protein value (Walli, 2005).The discovery by McDonald (1948), about soluble dietary proteins is extensively degraded to ammonia in the rumen, led to the concept of protection of prote in against microbial degradation. The most promising approach seems to be the modification of dietary protein by formaldehyde (HCHO) treatment (Faichney, 1971).Utilization efficiency of protein meals could be improved if they are subjected to suitable chemical treatment by process known as bypass protein technology, in which the proportion of protein degraded by rumen microorganism is reduced, thereby in creasing its availability to the ruminant animal post ruminally (Garg *et al.*, 2007).The mustard cake is one of the cheapest protein supplements for livestock, having an excellent amino acid profile (Chatterjee and Walli, 2002), but highly degradable in rumen (Sampath, 1990). Therefore, an On Farm Trial was conducted to study the effect of feeding formaldehyde treated mustard cake (as bypass protein) on milk production and cost of feeding in the lactating cow.

MATERIALS AND METHODS

Work plan

An On Farm Trail was conducted to study the effect of feeding formaldehyde treated mustard cake (bypass protein) on milk production and economic analysis of lactating cow. The mustard cake was taken from the local market of Kishanganj, Bihar and grinded in 1.0mm size. Mustard cake was treated with formaldehyde as

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per the procedure given by Sahoo *et al.* (2006). The formaldehyde treated mustard cake was mixed thoroughly and sealed in plastic bags and stores at room temperature (25°C) for 15days to make as bypass protein.

Experimental Design

The experiment used 24 lactating crossbred cows at adopted villages for the trial. All selected animals were 2nd lactating period and the trail started after one month of calving yielding 8.0-9.0 kg milk per cow per day. Cows were divided into three groups having 8 cows each for assessment of feeding formaldehyde treated mustard cake (bypass protein) on milk production and cost of feeding in lactating cow. The treatments were farmers' practice(FP) *i.e.,* Control: The lactating animals under this group were fed as per the feeding schedule of the farmers (5 kg dry roughage as rice straw + 6hrs grazing as local grass and 4 kg commercial concentrates), T1:The lactating animals under this group were fed farmers practice with 12% mustard cake of total diet was provided to the cow by replacing equal amount of commercial concentrates and T2: The lactating animals under this group were fed with farmers practice Twelve percent formaldehyde treated mustard cake of total diet was provided to the cow by replacing equal amount of commercial concentrates. The feeding trial was for 1month and the average milk yield was observed weekly. After proper mixing, milk sample from each cow was transferred to a sample bottle for analysis of fat, total solids and SNF, contents as per BIS (1981). The feeding cost under different treatments groups was calculated and the net return was tabulated. Data of feed, grass and straw intake and milk yield were analyzed for mean, standard deviation and P-value by one-way analysis of variance (ANOVA) by using computer statistical package SPSS version 16.

Fig. 1: Formaldehyde treated mustard cake

Fig.2: Lactating animal under T2 group

RESULTS AND DISCUSSION

The chemical composition of feedstuffs used for preparing the ratio is presented in Table 1 and the average feed intake of experimental cows is presented in Table 2.

Table 1: Average proximate composition of different feed stuffs (% DM basis)

Feed stuffs	DM	OM	TA	CP	CF
Concentrate mixture	86.8	91.24	8.76	14.67	8.65
Mustard cake	91.82	89.44	10.56	34.66	9.22
Formaldehyde treated mustard cake	86.14	90.17	9.83	34.86	10.01
Straw	85.42	88.35	11.65	4.68	17.06
Local grass	86.71	88.05	11.95	14.74	3.14

Highest straw intake was observed for T2 (4.92 kg) followed by T1 and FP (4.75 and 4.49 kg, respectively). Green grass intake of experimental cows was almost similar (11 kg). Similarly, the highest concentrate intake was noted in T1 (4.28 kg) followed by T2 and FP (3.93 and 3.69 kg, respectively). Likewise, dry matter intake was higher in T2 (13.58 kg) followed by FP (13.23 kg) and T1 (13.06 kg).Voluntary intake of straw was found highly significant (P<0.001) in formaldehyde-treated mustard cake fed group (T2) (4.92 kg) than that of the mustard cake fed group (T1) (4.75 kg). Similarly, mustard cake significantly (P<0.001) affect the concentrate mixture intake (4.28 kg for T1) than that of formaldehyde-treated cake group (T2) (3.93 kg) Table 2. Green grass intake of all groups was almost similar (11 kg). A similar effect was observed by Garg *et al.*(2002) when only animals in the experimental group were fed one kg protected fat/protein supplement, total dry matter intake was increased significantly (P<0.05) compared to animals under control group.

Table 2: Feed intake of experimental cows

Technology options	Straw (Kg)	Grass (Kg)	Concentrate (Kg)	DM intake (kg/day)
FP	4. 49 ±0.71	11.08±3.75	3.69±0.32	13.23
T1	4. 75±0.63	11.23±3.84	4.28±0.69	13.06
T2	4. 92±0.80	11.54±3.80	3.93±0.21	13.58

Effect of mustard cake based ratios on production and economic performance of lactating crossbred cows

The average daily milk yield, milk composition and net income per lactating cow under different treatments groups were presented in Table 3.These data were showed that the average daily milk yield of lactating cows under FP, T1and T2 was 8.58, 8.82 and 9.85 kg per cow respectively. The higher milk yield was observed in T2; however, differences between the FP and T1 were non-significant(P<0.05) but differences

between the FP and T2 were significantly (P<0.05) higher. Daily increase in milk yield was found to be 1.27 Kg and 1.03Kg in cows fed T2diet over the cows fed FP and T1diet respectively. Similar findings were reported by Garg *et al.*(2002a) and Atwal *et al.*(1995).They concluded that the milk production was significantly increased during week 7 to 16 of lactation for cows fed treated soybean meal in the diet. Further, average increase in milk production was also significantly higher in T2 as compared to FP group and T1 group. Kunju *et al.* (1992) reported that the milk production was observed increasing in accordance with the level of bypass protein feed intake. However, the maximum response was noticed in cows that were fed with 12% formaldehyde treated mustard cake feed. The average milk fat content of cows under FP, T1 and T2 was 4.42, 4.54 and 4.70%, respectively. The higher fat% was observed in T2 and the differences among the treatments were significant (P<0.05). Milk fat increments were found to be 0.12% and 0.28% in cows fed T1 and T2 diet respectively over the cows fed control diet (FP). Chaturvedi and Walli (2001) ware observed similar significant effect on average milk fat (%) due to feeding of bypass protein. The average total solids content under FP, T1 and T2 were 12.83, 13.02 and 13.34%. The total solids % among the treatments were significant (P<0.05). Kumar *et al.* (2005) reported that total solids (%) in milk differed significantly (p<0.05) among the groups and were found to be higher for cows fed LUDP+HP diet followed by HUDP+HP diet. Significant effect of bypass protein feeding on total solids contents was reported by Chaturvedi and Walli (2001) and Sampath *et al.* (2005). Keery and Amos (1993) were reported that there was non-significant effect on total solids (%)due to feeding bypass protein.

Table 3: Effect of mustard cake based rations on production and economic performance of lactating crossbred cows

Technology options	Milk production (kg/day±SE)	Milk composition (%)			Cost of production (Rs./day/cow)	Gross income (Rs./day/cow)	Net income (Rs./day/cow)	B:C Ratio
		Fat	Total solids	SNF				
FP	8.58±0.21	4.42	12.83	8.38	112.00	300.30	188.30	2.6
T1	8.82±0.21	4.54	13.02	8.43	101.92	308.70	206.78	3.0
T2	9.85±0.22	4.70	13.34	8.46	103.36	344.75	241.39	3.3

The gross income was Rs. 300.30,308.70 and 344.75 per day/cow inFP, T1 and T2 group, respectively. The daily feeding cost of a cow was Rs. 112.00, 101.92 and 103.36 under FP, T1 and T2 groups, respectively. Daily net income from a cow was Rs. 188.30 in FP group, Rs. 206.78 in T1 group while Rs. 241.39 for T2 group. The B: C ratios for FP, T1 and T2 groups were 2.6, 3.0 and 3.3 respectively. Garg*et al.*(2003) reported similar findings that animals in control group 1.0 kg with untreated rapeseed meal and in the experimental group with 1.0kg protected rapeseed meal. There was an increase in net daily income by Rs. 9.44 due to feeding of 1.0 kg protected rapeseed meal in lactating cows. On feeding 1.0 kg protected sunflower meal in lactating crossbred cow, the net average daily income increased by Rs. 9.61 this finding was reported by Garg*et al.*(2002a). In another experiment, Garg*et al.* (2002b) reported that the highest net daily income was Rs. 10.18 per cow by feeding 1 kg bypass fat/protein supplement. The feed cost reduce in T2 group by Rs. 8.64 and increase in milk production was 1.27 kg with respect to FP group.

CONCLUSION

The result suggested that the *formaldehyde*-treated mustard cake can be used as a bypass protein source for lactating dairy animals under field condition. Supplementation of 12% formaldehyde treated mustard cake by replacing equal amount of commercial concentrates to crossbred cows yielding daily 9.85 kg milk resulted in Rs. 53.09 more daily returns per cow. In crossbred lactating cow formaldehyde treated mustard cake could play an important role in doubling farmers' income through significantly improved performance of the cows and profit of the farmers by enhancing milk yield and reducing feed cost.

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