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EFFECT OF FEEDING PROTECTED PROTEIN ON MILK PRODUCTION AND COMPOSITION OF LACTATING COWS

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The availability of essential amino acids in the blood of lactating ruminants is a critical factor in regulating milk yield. In normal digestive processes, the primary source of essential amino acids is from microbial protein or dietary protein, which are not degraded in the rumen. To obtain the maximum economic benefit from such supplements it is important that about 75% of the protein is to be protected from ruminal degradation, which is necessary for milk production (NRC, 1989; Garg, 1998). Evidence is also accumulating to suggest that lysine and methionine are most limiting amino acids for milk protein synthesis in many dairy diets (Schwab, 1995; Xu *et al.*, 1998). Various chemical and physical processing procedures have been used to develop protected protein supplements. The aldehyde treatment can be used to optimize the RDP/UDP without changing the ADIN/ NDIN and thus enhance the post-ruminal supply of essential amino acids. Present study examines the effect of feeding aldehyde treated protein meal on quantity and quality of milk in lactating cows.

Materials and Methods

A feeding trial was conducted on 18 crossbred (Holstein-Friesian X Jersey) cows, yielding 8-10 kg milk per animal per day. The animals were divided into two groups of 9 each, based on milk yield, fat % and stage of lactation and were fed daily standard basal ration. The chemical composition of feeds and fodder was carried out as per AOAC (1984) and Goering and Van Soest (1970). In addition to basal ration, animals in the control group were fed 0.5, 1.0 and 1.5 kg untreated sunflower meal (*Helianthus annuus*; CP 28%) and animals in the experimental group were fed 0.5, 1.0 and 1.5 kg of protected sunflower meal (CP 28%, UDP 74% of CP, ADIN 1.68%, NDIN 2.13%). Each treatment was given for a period of two weeks. Protected and unprotected sunflower meals were analyzed for essential amino acids (Connell *et al.*, 1987), by ion-exchange chromatography (Pharmacia Biochrom 20 amino acid analyser model : 80-2108-18124, System, 1998). Sunflower meal was treated with aldehyde in sealed chambers where it underwent formation of complexes, resisting degradation in the rumen. The protein meal was tested for degree of protection using *in vitro* rumen incubation procedure (Ashes *et al.*, 1984). The protein degradation was measured by analyzing ammonia nitrogen level in strained

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rumen liquor, at the end of incubation (Scott and Ashes, 1993; Gulati *et al.*, 1999). Milk yield (kg), fat and protein (%) were recorded in both the groups. The data were analyzed statistically (Snedecor and Cochran, 1968).

Results and Discussion

Chemical composition of feeds and fodder (Table 1) revealed that the NDIN and ADIN contents were very low. Thus, cell wall bound nitrogen level was non-significant in all the feeds and fodder offered to animals during trial period. Approximately 0.95 g of methionine is present in one litre of milk. On feeding one kg unprotected sunflower meal, methinonine availability would be only 0.52 g, whereas, from one kg protected sunflower meal, it will be 1.31 g. On protection, the availability of essential amino acids for absorption is increased significantly, as shown in Table 2.

On feeding 0.5 kg untreated sunflower meal in control group and 0.5 kg treated sunflower meal in experimental group, daily average milk yield in kg was 7.2±0.21, 8.0±0.16, fat % 4.0±0.06, 4.2±0.04 and protein % 3.3±0.01, 3.5±0.01 ($P<0.05$), respectively. On feeding 1.0 kg untreated sunflower meal in control group and 1.0 kg treated sunflower meal in experimental group, daily average milk yield in kg was 6.6±0.20, 7.7±0.18 ($P<0.05$), fat % 4.0±0.02, 4.2±0.05 ($P<0.01$) and protein % 3.5±0.0, 3.8±0.01 ($P<0.01$), respectively, while on feeding 1.5 kg untreated sunflower meal in control and 1.5 kg treated sunflower meal in experimental group, daily average milk yield in kg was 6.2±0.21, 7.2±0.19 ($P<0.05$), fat % 3.9±0.04, 4.2±0.03 and protein % 3.4±0.00, 3.7±0.01 ($P<0.01$), respectively. Increase in milk yield and fat % were significantly ($P<0.01$, $P<0.05$) higher in experimental group (Garg *et al.*, 2002 a, b).

Table 1 - Chemical composition (% on DM basis) of feeds and fodder fed to crossbred cows

Parameter	Maize Green	Jowar Straw	Cattle Feed
Crude protein (CP)	8.28±0.03	5.12±0.01	22.60±0.13
Ether extract (EE)	1.43±0.00	1.40±0.01	3.09±0.01
Acid detergent fibre (ADF)	40.38±0.11	41.68±0.12	12.27±0.12
Acid detergent insoluble Nitrogen (ADIN% of CP)	1.10±0.00	1.00±0.00	1.00±0.00
Acid detergent lignin (ADL)	4.35±0.02	4.12±0.01	1.44±0.01
Neutral detergent fibre (NDF)	61.10±0.15	61.78±0.16	20.25±0.16
Neutral detergent insoluble Nitrogen (NDIN% of CP)	1.80±0.00	1.60±0.00	2.10±0.00
Cellulose (C)	32.70±0.10	32.70±0.12	9.06±0.10
Hemi cellulose (HC)	20.72±0.06	20.10±0.10	7.98±0.12
Total ash (TA)	7.85±0.02	5.81±0.03	10.34±0.08
Silica (S)	3.33±0.01	4.86±0.01	1.77±0.00

Table 2 - Level of essential aminoi acids available for absorption in bypass protein feed

Essential Amino Acids	Unprotected sunflower meal (g/kg)	Protected sunflower meal (g/kg)
Cysteine	0.73	1.84
Methionine	0.52	1.31
Isoleucine	1.33	3.32
Leucine	2.02	5.06
Phenylalanine	1.25	3.12
Lysine	1.14	2.85
Histidine	0.67	1.69
Arginine	2.34	5.85

It was observed that on feeding 1.0 kg protected sunflower meal, compared to unprotected, maximum net daily gain was Rs.9.61 per animal per day, which was the highest as compared to other two groups where net daily income was Rs.8.05 on feeding 0.5 kg and Rs.8.99 on feeding 1.5 kg treated sunflower meal.

Summary

The aim of this study was to observe the effect of supplementing protected protein on milk production and composition in crossbred cows. Although milk yield, fat and protein per cent increased at all the three levels of supplementation of protected protein meal, net daily income was found to be maximum on feeding 1.0 kg protected meal, compared to unprotected.

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