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Influence of Bypass Fat Supplementation on Productive Performance and Economics of Lactating Cows

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ABSTRACT

The present experiment was conducted on 20 healthy lactating cows of nearly similar age and stage of lactation to study Bypass fat supplementation on Productive Performance and Economics in lactating cattle in Unnao district. Cows were divided into 2 groups (10 cows in each group), which T_1 was fed through farmers practices (control) (Use of concentrate, wheat straw and fodder) and T_2 group in addition to farmers practices was supplemented with Bypass fat (20 g/day milk yield for 60 days and Fenbendazole 3 gm tablet used orally as dewormer at once). The results revealed that the milk yield and fat percent was significantly higher ($P<0.05$) in T_2 group as compared to T_1. However, the Protein and SNF percent was non-significantly but numerically higher in T_2 group as compared to T_1. The economics status of supplementation of bypass fat was 24 Rs/day /animal with 77.41 per cent more return over the farmer's practices (T_1). Based on the observations the bypass fat supplementation to lactating cows is beneficial in terms of increasing milk production, fat percent and higher over return.

Keywords: Bypass fat, Economics, Lactating cows, Nutrient compositions, Productive performance

INTRODUCTION

Nutrition plays an important role for optimum expression of genetic potential of livestock (Tiwary *et al.,* 2010). Milk production in the small holder dairy sector is mostly constrained by shortage of affordable appropriate nutritional regimes and overall management (Ngongoni *et al.,* 2009). Economic output of milk production and hence of dairy farming can be maximized by acquiring calve from each cow per year, pre-requisite of acceptable reproductive efficiency. One of the several reasons, the poor nutrition is one of the major attributes that led to the low productivity of dairy cows of the India. Lack of good-quality fodder, fodder availability around the year and inadequate feed resources were the main constraints for poor nutrition of dairy cows in the country (Perera and Jayasuriya, 2008).

The technology of bypass fat protects the nutrient from degradation and bio-hydrogenation in rumen with increase in the energy density of the diet enabling the animals to meet their energy and essential fatty acid requirements expressing their milk production potential to the fullest extent (Krishna and Reddy, 2009). Additional fat fed as bypass fat does not interfere with rumen fermentation process, but supplies more energy (2.25 times of protein and carbohydrate) to the animal for more milk synthesis after being digested in abomasum's and small intestine with absorption from the small intestine (Bobe *et al.,* 2007; Garg *et al.,* 2008).

During lactation, the amount of energy required for maintenance of body tissues and milk production often exceeds the amount of energy available from the ration

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(Voigt *et al.*, 2006), thus forcing mobilization of body fat reserves to satisfy energy requirement.

Feeding bypass fat to lactating animals is another alternative as it provides a dense source of non-fermentable energy. In this way, animal can get more energy at low dry matter intake. However, fat feeding presents certain problems. Unsaturated fatty acids strongly inhibit activity of carbohydrate-splitting microorganisms which can interfere rumen function. Fats, as salts of long chain fatty acids improve rumen fermentation and have increased digestibility (Sirohi *et al.*, 2010). Responses to supplementation of dairy cow diets with rumen-bypass fat have been variable. Therefore, the objective of this study was to determine the effect on milk yield, milk compositions, Economics of feeding bypass fat to lactating cows in farmers' field condition.

METHODOLOGY

The lactating cows (n=20) of varying calving intervals, milk production (3-7 liter per day), similar body weight (310-380 kg) and age ranging from 34 to 66 months were selected for this study, in year 2019, at the village Arerkala (26.753'N and 80.432'E) in Miyaganj block of Unnao district, Uttar Pradesh. All the animals were identified by different farmers of the village level. For the study, animals were divided into two groups: T_1 (n=10) was Farmers practices (Mustard cake, wheat grain, wheat straw and seasonal green fodder) kept as a control group, T_2 (n=10) 20 g/ltr milk yield/day bypass fat supplement (commercial product) for 60 days with Fendendazole 3g tablet use orally as a dewormer before starting experiment.

During the trial period, the cows were allowed to green fodder (Berseem) on *ad libitum* basis in the morning and evening, along with wheat straw as roughage. Mustard cake and wheat grain as a concentrate was also offered to animals according to their productivity while water was available on *ad libitum* basis. Cows were fed individually to meet the requirements on respective diets as advocated by Kearl (1982). Experimental animals were housed with stanchions in covered area and kept free in open paddock at farmer's field.

The chemical composition of samples (Dry Matter, Organic Matter, Crude Protein, Neutral detergent fibre, Acid detergent fibre, Ether Extract and Total Ash) was determined by the methods described by Association of Official Analytical Chemists (AOAC, 2000) manual. Daily milk production of each cow was recorded and weighed by digital weighing balance. Milk samples, consisted of proportional volumes of morning and evening milk, were taken after cleaning and disinfection of teats and discarding the first streams of foremilk. Milk samples were collected in 50 ml sterile plastic vials at 0, 15, 30, 45 and 60 days of experiment during the lactation period. The fat percent was determined in milk samples by using Gerber's fat test according to BIS (1977). Total solids was done by Badcock's formula and Solid not fat was done according to Prasad *et al.* (1999) and milk yield of cows was recorded daily in morning and evening.

The experimental results were presented as Mean ± SEM (standard error mean). The data on dry matter intake, average daily gain and milk parameters were analyzed statistically using one way ANOVA technique as per Snedecor and Cochran (1994) and means were separated for significance by using Tukey Kramer range tests.

RESULT AND DISCUSSION

The nutrient compositions of feeds used in the experiment are shown in Table 1. The average dry matter intake of animals was 8.87 kg/day/animal and the average of roughage to concentrate ratio was maintained to be 62:38. The ether extract content of bypass fat was 89.46 per cent, indicating that the supplement was quite rich in energy content. Dry matter intake (DMI) was higher for group T_2 as compared to T_1 (control) (Table 2), however, the data were non-significant. The higher DMI may be due to additional bypass fat supplementation, which resulted in slight enhancement of concentrate intake and also changed the roughage concentrate ratio slightly, varying from 60.56:39.44 in the T_1 group to 64.11:35.89 in T_2 group. Kumar and Thakur (2007) and Garg *et al.*, (2008) had also observed similar level of nutrient after addition of bypass fat to the experimental animals when compared with the control.

Table 1: Chemical composition of feeds and fodders (% DM basis) used in the experimental ration

Particulars	Concentrate		Wheat straw	Green Fodder (Berseem)	Bypass Fat
	Mustard cake	Wheat grain			
OM (%)	91.7	97.1	89.25	87.66	89.00
CP (%)	34.9	12.3	3.52	18.68	0
EE (%)	9.4	1.9	0.52	2.92	89.46
NDF (%)	7.9	13.9	80.60	45.79	0
ADF (%)	4.7	3.7	49.00	28.62	0
Hemicellulose (%)	3.2	1.5	31.60	17.17	0
Ash content (%)	8.3	2.9	10.75	12.34	10.54

Table 2: Voluntary feed intakes of lactating cows

Particulars	T2 (Farmer practice with bypass fat supplement)	T1 (Farmer practice)	Significance
Initial Body Weight (kg)	345.14±17.25	340.24±15.21	NS
Final Body weight (kg)	369.29±13.76	362.65±14.25	NS
Average Body weight (kg)	357.22±16.06	351.45±15.45	NS
Dry Matter Intake (kg/day/animal)			
Berseem fodder	14.78± 0.73	16.60± 0.81	NS
Wheat straw	2.74± 0.12	2.95±0.13	NS
Concentrate	3.61± 0.09	3.90± 0.15	S
Bypass fat	0.086± 0.01	-	-
Total DMI	8.95± 0.58	8.80± 0.49	NS
DMI %	2.51	2.50	NS
Roughage: Concentrate ratio	64.11:35.89	60.56:39.44	-

Feeding of bypass fat resulted in significant ($P<0.05$) increase in milk yield. Milk yield was increased by 13.15 per cent in T_2 group over the T_1 group. Similarly, Naik *et al.* (2007) and Garg *et al.* (2008) also reported significant improvement of milk yield in ruminants. Milk fat percentage differed significantly higher ($P<0.05$), whereas milk protein and SNF were numerally higher in T_2 group as compared to T_1 group during experimental (Table 3). Milk fat per cent showed a clear cut rise with the bypass fat supplementation (Mishra *et al.*, 2004; Garg *et al.*, 2008). However, milk protein level decreased in some experiments (Polidori *et al.*, 1997). But, like this study milk protein level was similar in all other experiments. The study has made it clear that our lactating cows do need the bypass fat supplement in their diet incorporated, in order to meet their energy requirements fully to express their milk production potential. This was demonstrated by the highly significant increase in milk yield, fat percentage and TS (Total solids) percentage in milk as a result of feeding the bypass fat supplement (Table 3).

The daily feed cost was higher in T_2 group as compared to T_1 group. Higher feed cost was on account of feeding bypass fat 117 Rs/animal/day. The data on daily realizable receipt (Table 4) from sale of milk (Rs/animal) and ROFC was higher in T_2 as compared to T_1 group. This is the reflection of higher milk yield in T_2 as compared to T_1 group. When the economics of milk production on feeding bypass fat 20 g/kg milk yield it was observed that increase in daily income by 24 Rs/day /animal as compared to T_1 group and 77.41 per cent more return over the T_1 (Control).

Table 3: Milk production and composition of milk in lactating cows

Particulars	T2 (Farmer practice with bypass fat supplement)	T1 (Farmer practice)	Result
Milk yield (kg/day)	4.30± 0.17	3.80± 0.16	S
Fat %	3.74± 0.12	2.92± 0.10	S
Protein %	3.10± 0.14	3.14± 0.14	NS
SNF %	8.40± 0.53	8.35± 0.51	NS
Total Solids % (TS)	12.14± 0.51	11.27± 0.48	NS
Percent increase in milk yield	13.16	-	-

Table 4: economic of return over feed cost (ROFC)

Particulars	T2 (Farmer practice with bypass fat supplement)	T1 (Farmer practice)
Daily cost of feeding (Rs/animal)	117	113
Daily realizable receipt (Rs/animal)	172	144
Daily return over feed cost (Rs/animal)	55	31
Net difference in ROFC over Farmer practice (Rs/animal/day)	24	-
% more return over Farmer practice	77.41	-

CONCLUSION

It can be concluded that bypass fat supplementation to lactating cows is beneficial in terms of milk production, fat percent and more return over the farmer's practices. However, dry matter intake was not significantly affected. Therefore, livestock holders need to be aware about the impact of bypass fat supplementation in lactating cows. So that they include bypass fat in animal feed to raise their income as well as health of livestock.

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REFERENCES

AOAC (2000). Official Methods of Analysis. 17th Edn, Association of Official Analytical Chemistry, Arlington, Virginia, USA.

BIS (1977). Fat determination by Gerber method part-I, milk (fat revision) 1224, part-II 1977. Bureau of Indian Standards. ISI, Manak Bhawan, 9 B.S.Z. Marg. New Delhi : pp. 67.

Bobe, G., Zimmerman, S., Hammond, E.G., Freeman, A.E., Porter, P.A., Luhman, C.M. and Beitz, D.C. (2007). Butter composition and texture from cows with different milk fatty acid compositions fed fish oil or roasted soybeans, *Journal of Dairy Science*, **90**, 2596–2603.

Garg, M.R., Sherasia, P.L., Bhanderi, B.M., Gulati, S.K. and Scott, T.W. (2008). Effect of feeding bypass fat supplement on milk production and characteristic of buffaloes, *Indian Journal of Dairy Science*, **61**(1), 56–61.

Kearl, L.C. (1982). Nutrient Requirements of Ruminants in Developing Countries. 1st Edn. International Feedstuffs Institute, Utah State University, Logan, Utah, USA : pp.381.

Krishna Mohan, D.V.G. and Reddy, Y.R. (2009). Role of bypass nutrients in small holder animal production. In: Proc. Animal Nutrition Association World Conference, New Delhi, India. pp. 45–48.

Kumar, B. and Thakur, S.S. (2007). Effect of supplementing bypass fat on the performance of buffalo calves, *Indian Journal of Animal Nutrition*, **24**(4), 233–236.

Mishra, S., Thakur, S.S. and Tyagi, N. (2004). Milk production and composition in crossbred cows fed calcium salts of mustard

oil fatty acids, *Indian Journal of Animal Nutrition*, **21**(1), 22–25.

Naik, P.K., Saijpaul, S. and Rani, N. (2007). Preparation of rumen protected fat and its effect on nutrient utilization in buffaloes, *Indian Journal of Animal Nutrition*, **24**(4), 212–215.

Ngongoni, N.T., Mapiye, C., Mwale, M., Mupeta, B. and Chimonyo, M. (2009). Sunflower based rations for small medium milk producing dairy cows, *Pakistan Journal of Nutrition*, **8**(4), 377-383.

Perera, B. and Jayasuriya, M. (2008). The dairy industry in Sri Lanka: current status and future directions for a greater role in national development, *Journal of the National Science Foundation of Sri Lanka*, **36**, 115–126.

Prasad, J., Neeraj and Tyagi, A.K. (1999). Principles and Practices of Animal Nutrition, Kalyani Publisher, Ludhiana.

Sirohi, S.K., Walli, T.K. and Mohanta, R.K. (2010). Supplementation effect of bypass fat on production performance of lactating crossbred cows, *Indian Journal of Animal Sciences*, **80**(8), 733–736.

Snedecor, G.W. and Cochran, W.G. (1994). Statistical Methods. Affiliated East west Press Pvt. Ltd, pp. 466–490.

Tiwary, M.K., Pandey, A. and Tiwari, D.P. (2010). Mineral status of animals in relation to different physiological stages in Haridwar district of Uttarakhand, *Food Science Technology*, **1**(1), 1-9.

Voigt, J., Kuhla, S., Gaafar, K., Derno, M. and Hagemeister, H. (2006). Digestibility of rumen protected fat in cattle, *Slovak Journal of Animal Science*, **39**: 16–19.