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Research Article

EFFECT OF BYPASS FAT SUPPLEMENTATION ON MILK YIELD, MILK FAT, MILK PROTEIN, SOLID NOT FAT AND TOTAL SOLID IN LACTATING MURRAH BUFFALOES

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ABSTRACT

Eighteen early lactating Murrah buffaloes were randomly divided into three groups to study the effect of bypass fat supplementation on milk yield, milk fat, milk protein, solid not fat and total solid. Control group T_1 was fed with a basal diet without bypass fat and treatment groups T_2 and T_3 were supplemented with bypass fat @100g/day/animal and 150g/day/animal, respectively. On two consecutive days at weekly interval milk production and composition were recorded for individual animal and the experiment continued for a period of three months. The result revealed that the average daily milk yield and 6% fat corrected milk increased significantly ($P<0.05$) in group T_3 as compared to group T_1. Milk fat per cent and total solid increased significantly in groups T_2 and T_3 as compared to group T_1. There was no effect of bypass fat on milk protein and solid not fat.

Key words: Bypass fat, Murrah buffaloes, milk production, milk composition

Livestock is an integral part of India's agricultural economy and plays a multifaceted role in providing livelihood support to the rural population. Most of the animals in developing countries including India are fed on agriculture by-products and low quality crop residues, which have inherent low nutritive value and digestibility. The shortage of feed resources coupled with their poor nutritive value lowers the productivity of dairy animals. Demand for energy is very high during early stage of lactation but supply does not commensurate with demand thus affecting the production potential of animal (Sirohi *et al.*, 2010). Hence, during early lactation, dairy animals are often forced to draw on body reserves to satisfy energy requirements thereby leading to substantial loss in body weight which adversely affects production, resulting in lower yield (Kim *et al.*, 1993). Cereal grains and fats play an important role as sources of energy in the ration of dairy animals but due to use of cereals for human consumption and monogastric animals the alternate source of energy in dairy ration is supplemental fat (Saijpaul *et al.*, 2010). Inclusion of unprotected fat in dairy ration is limited to 3% of dry matter (DM) intake, beyond which digestibility of DM and fibre are reduced (NRC, 2001). Besides, unprotected fat has depressing effect on rumen cellulolytic microbial activity (Ranjan *et al.*, 2010).

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By protecting the fats from ruminal degradation, the fat content of the ration can be increased up to 6-7% of the DM intake. It is stated that supplementing ration of lactating animals with bypass fat enhances energy intake in early lactation which reduces deleterious effect of acute negative energy balance on lactation (Tyagi *et al.*, 2010). The present work was under taken to study the effect of supplementing bypass fat on milk yield and its composition in Murrah buffaloes.

MATERIALS AND METHODS

The experiment was conducted for the period of three months at Buffalo Farm, Department of Livestock Production Management, LUVAS, Hisar to study the effect of supplementation of bypass fat on milk yield and composition in early lactating Murrah buffaloes. Eighteen apparently healthy buffaloes were divided randomly into three groups based on their milk production (milk yield 8.6 litres) and average days post partum (avg. days post partum 23 days, varied from 23.6 days in T_1, 23.8 days in T_2 & 24.5 days in T_3). All the animals were dewormed and disinfested for ectoparasites before the start of the experiment adopting standard protocol. Group T_1 (control) was fed with a basal diet (green maize, wheat straw and conventional concentrate mixture) without any supplement and treatment groups T_2 and T_3 were fed with basal diet supplemented with bypass fat @100g/day/animal and 150g/day/animal, respectively. Bypass fat was added and

Table 1
Chemical composition of feed ingredient (on DM basis)

Ingredients	DM	CP	CF	EE	Ash	OM	NFE
Wheat straw	95	2.85	35.61	1.02	12.97	87.03	47.55
Green maize	23	7.71	28.30	3.11	9.11	90.89	51.77
Maize	88.08	9.13	2.52	3.44	2.83	97.17	70.16
Ground nut cake GNC)	93.47	40.23	9.43	9.05	8.9	91.1	25.86
Barley	93.80	10.03	8.03	1.86	4.35	95.65	75.73
Mustard cake	90.20	35.10	6.97	8.31	9.94	90.06	39.68
Wheat bran	88.60	14	7.99	4.3	93.64	6.36	59.79

mixed in concentrate mixture uniformly in morning and fed individually to each animals of treatment group. The roughage:concentrate ratio of the diet was 60:40. Chemical composition of the feed ingredients is presented in Table 1 and ingredients of concentrate mixture are presented in Table 2. Information about milk production and milk composition were collected for individual animal on two consecutive days at weekly interval.

Sample Collection and Analysis: Feed samples were collected from each group at weekly interval. The feed samples were analyzed for proximate principles as per AOAC (2005). Animals were hand milked twice daily (6.00 h and 18.30 h) and the yields were recorded. The milk samples were drawn at two consecutive days at weekly intervals from individual animals during both times of milking. After thorough mixing the samples of both times milking, a sample of 100 ml was taken by means of a dipper and transferred to a sample bottle with rounded corners (to avoid lodging of the milk solids) up to 3/4th level, and then bottle was corked tightly by a rubber stopper. The sample bottles were labelled properly. Milk samples were analyzed for milk composition in lactoscan milk analyser. For the conversion of whole milk into 6% fat corrected milk (FCM), the equation derived by Rice (1970) was used:

$$6\% \text{ FCM (kg)} = (0.4\ M+15\ F)/1.3$$

Where, M=Milk yield in kg, F=Weight of fat contained in it

Statistical Analysis: The data were analyzed statistically using standard methods (Snedecor and Cochran, 1994). The data were expressed as Mean±SE and were analyzed by one-way ANOVA using general linear model of SPSS version 16 and Duncan's multiple range tests was applied to test the significance. Significance was declared when P value was less than 0.05.

RESULTS AND DISCUSSION

Milk Yield and FCM: The effect of feeding bypass fat on milk yield and its composition is depicted in Table 3. The average daily milk yield and 6% fat corrected milk was significantly (P<0.05) increased in T_3 group as compared to control. The results indicated that milk yield increased by 0.96% in group T_2 and 5.39% in group T_3 on supplementation of rumen protected fat to lactating murrah buffaloes. These result are in agreement with Naik *et al.* (2009), Tyagi *et al*. (2009), Thakur and Shelke (2010), Sirohi *et al.* (2010), Gowda *et al*. (2013), Parnerkar *et al*. (2011), Wadhwa *et al*. (2012) who reported that on supplementation of bypass fat in the diet of dairy animals, the milk yield increased by 5.5-24.0%. Increased milk yield observed in bypass fat group may be attributed to increased energy density of the ration resulting in reducing the deleterious effect of negative energy balance (Mervat-Foda *et al*. 2009; Shelke and Thakur, 2011). Feeding of calcium salt of palm oil fatty acids and soybean oil fatty acids increased FCM in dairy cows and buffaloes, respectively (Dhiman *et al.* 1995; Thakur and Shelke, 2010).

Milk Fat (%): There was significant (P<0.05) improvement in milk fat percent due to feeding of bypass. The milk fat percent in T_2 and T_3 groups was more compared to that in T_1 group. The results indicated that milk fat increased by 0.41% and 0.45% on supplementation of rumen protected fat to lactating murrah buffaloes. The result of this study corroborated with the results of Sklan *et al*. (1991), Thakur and Shelke (2010), Sirohi *et al.* (2010), Parnerkar *et al.* (2011) who also reported that milk fat percentage increased on

Table 2
Ingredient of concentrate mixtures

Ingredient (kg/100kg)	Experimental groups		
	T_1	T_2	T_3
Maize	25	25	25
Groundnut cake (GNC)	15	15	15
Barley	20	20	20
Mustard cake	10	10	10
Wheat bran	27	27	27
Mineral mixture	2	2	2
Salt	1	1	1
Total	100	100	100

T_1=Control group; T_2=Fed 100g/day/animal bypass fat; T_3=Fed 150g/day/animal bypass fat

Table 3

Effect of feeding bypass fat on milk yield and composition

Observations	Experimental groups		
	T_1	T_2	T_3
Initial milk yield (Ltr.)	11.45±0.80	11.11±1.06	11.22±0.52
Milk yield (Ltr.)	12.43±0.16	12.55±0.26	13.10±0.12
6% FCM (Ltr.)	13.68±0.22	14.31±0.28	15.12±0.22
Milk fat (%)	6.85±0.07	7.26±0.08	7.30±0.09
Milk protein (%)	4.34±0.03	4.32±0.04	4.35±0.04
SNF (%)	9.19±0.02	9.20±0.04	9.23±0.03
Total solid (%)	16.04±0.07	16.53±0.09	16.62±0.09

T_1=Control group; T_2=Fed 100g/day/animal bypass fat; T_3=Fed 150g/day/animal bypass fat

supplementation of bypass fat to lactating animals.

Milk Protein (%): Overall mean values (%) of daily milk protein pooled over periods were 4.34±0.03, 4.32±0.04 and 4.35±0.04 in treatment groups T_1, T_2 and T_3, respectively. Statistical analysis of data revealed that the difference among milk protein was non-significant indicating that milk protein was unaffected by supplementation of rumen protected fat to lactating Murrah buffaloes. This finding is in agreement with Naik *et al*. (2009), Tyagi *et al.* (2009), Thakur and Shelke (2010), Sirohi *et al*. (2010)

Solid Not Fat: There was no significant difference in SNF content among the treatments which indicated that SNF content was unaffected by supplementation of rumen protected fat in lactating Murrah buffaloes. This finding result is in agreement with Naik *et al*. (2009), Tyagi *et al.* (2009); Thakur and Shelke (2010), Sirohi *et al*. (2010).

Total Solid: Analysis of data revealed significant difference among total solid in different group. The results indicated that total solid content in milk was increased by supplementation of rumen protected fat to lactating buffaloes.

It may be concluded from this study that feeding of bypass fat significantly increases milk production, 6% FCM, fat percent and total solid in lactating Murrah buffaloes. Supplementation of bypass fat may improve the energy balance of lactating animals, maintain the production level and may alleviate problems of negative energy balance.

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