INTERNATIONAL JOURNAL OF ADVANCED BIOLOGICAL RESEARCH

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EFFECT OF RUMEN PROTECTED FAT SUPPLEMENTATION ON DRY MATTER INTAKE, PEAK MILK YIELD AND POST-PARTUM ESTROUS IN LACTATING MURRAH BUFFALOES

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ABSTRACT
Eighteen early lactating Murrah buffaloes were randomly divided into three groups to study effect of bypass fat supplementation on the dry matter intake, average peak milk yield and days of post-partum estrous. 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. The overall daily DM intake (kg/day) showed non-significant variation of 16.81, 16.53 and 16.87 kg in treatment groups T_1, T_2 and T_3, respectively. Daily DM intake per 100 kg BW was 3.08, 3.06 and 3.09 kg in treatment T_1, T_2 and T_3, respectively. Average peak yield were 13.73, 13.68 and 15.60 kg in T_1, T_2 and T_3, respectively, being significantly higher in T_3 ($P<0.05$). Average days to attain peak milk yield were 57.33, 62.17 and 61.33 days postpartum in T_1, T_2 and T_3, respectively. T_3 group showed post-partum estrous earlier compared to other groups. Mean values of daily DM intake per kg 6% FCM was significantly lower ($P<0.05$) in T_3 compared to the control. It may be concluded that the use of bypass fat is beneficial for higher peak milk yield and productive performance of buffaloes during early lactation.

KEYWORDS: Rumen Protected Fat, Murrah, Peak Milk Yield, Dry Matter Intake, Post-Partum Estrous.

INTRODUCTION
Most of the animals in developing countries like India are fed on agriculture by-products and low quality crop residues, which have got inherent low nutritive value and digestibility coupled with shortage of feed resources leading to low productivity of dairy animals. High producing buffaloes in early lactation do not consume sufficient dry matter to support maximal production of milk (Goff and Horst, 1997). Demand for energy is very high during early stage of lactation but supply is not commensurate with demand due to physiological stage. Limited intake may affect production potential of animal in the whole lactation length (Sirohi *et al.* 2010). Hence, during early lactation, dairy animals are often forced to draw on body reserves to satisfy energy requirements which results in negative energy balance; this leads to substantial loss in body weight which adversely affects production, resulting in lower yield (Kim *et al.* 1993). And the occurrence of health problems during the transition period is a major complicating factor for subsequent reproductive performance resulting in additional economic losses (Ferguson, 2001; Remppis *et al.*, 2011). Poor transitions also result in losses from milk income. Addition of fat to the dairy ration has profound effect on amelioration of negative energy balance in high yielders (Tyagi *et al.*, 2010). The inclusion of rumen-unprotected fat in dairy ration as recommended by NRC (2001) is limited to 3% of dry matter (DM) intake of animal, beyond which dry matter digestibility is reduced. But, by protecting the fats from ruminal-degradation, the fat content of the ration can be increased up to 6-7% of the DM intake without showing any negative effects. So, the present work was under taken to study the effect of supplementing bypass fat on the dry matter intake, average peak milk yield and days of post-partum estrous under different dietary treatments in Murrah buffaloes.

MATERIALS & METHODS
The experimental feeding trial was conducted for a period of 12 weeks at Buffalo Farm, Department of Livestock Production Management, LUVAS, Hisar to study the effect of supplementation of bypass fat on dry matter intake, average peak milk yield and days of post-partum estrous under different dietary treatments in early lactating Murrah buffaloes. Eighteen apparently healthy buffaloes were divided randomly into 3 groups based on their milk production (average milk yield of 8.6 litres) and the average 23 days post-partum. All experimental animals were housed in feeding stall having arrangements for individual feeding and watering. The animals were maintained under iso-managerial conditions and similar husbandry practices except the different feeding treatments. All the animals were dewormed and disinfested for ecto-parasites before the start of the experiment. Group T_1 (control) was fed with green maize, wheat straw and conventional concentrate mixture based diet without any supplemental fat. The concentrate mixture of basal diet (T_1) was formulated by using 25, 15, 20, 10, 27, 2 and 1 kg of maize, GNC, barley, mustard cake, wheat bran, mineral mixture and salt, respectively. 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 mixed in concentrate mixture uniformly in everyday and

fed individually to each animals of treatment group. The roughage: concentrate ratio of the diet was kept 60:40. The feed samples were analyzed for proximate principles as per AOAC (2005). Chemical composition of the feed ingredients and the basal concentrate mixture has been presented in Table 1. On the basis of feed and fodder consumption, DM consumed by the animals were estimated. The feed gain ratio is a measure of efficiency of utilization of feed. Feed conversion ratio was calculated by the amount of dry matter intake in kilogram (Kg) required for per Kg milk production by animals during the trial period. Conversion of whole milk into 6% fat corrected milk (FCM) was done by using the equation derived by Rice (1970):

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

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

Data obtained were subjected to statistical analysis as per Snedecor and Cochran (1994) using Completely Randomized Design (CRD). All the data were subjected to ANOVA using the General Linear Models procedure of SPSS-20 software. The mean differences among different treatments were separated by Duncan's multiple range tests. Consequently, a level of ($P<0.05$) was used as the criterion for statistical significance. Data pertaining to dry matter intake, average peak milk yield, average days to attain peak milk yield and average number of days of post-partum estrous in different dietary treatments has been presented in Table 2.

RESULTS & DISCUSSION

The overall mean values of daily DM intake (kg/day) pooled over periods were 16.81, 16.53 and 16.87 kg in treatment groups T_1, T_2 and T_3, respectively. The statistical analysis of data revealed that this difference among different group was non-significant. The mean values of DM intake ranged from 15.27 to 17.11 kg during experimental period indicating that period had significant effect on DM intake as the lactation proceed. The effect of interaction of treatments and period were found to be non-significant. The overall mean values of daily DM intake per 100 kg body weight pooled over periods were 3.08, 3.06 and 3.09 kg in treatment groups T_1, T_2 and T_3, respectively. The finding of present study indicated that DM intake was not affected by supplementation of rumen protected fat to lactating Murrah buffaloes whether it was total dry matter intake per day or dry matter intake per 100 kg body weight. These result are in agreement with Naik *et al*. (2007b; 2009a), Tyagi *et al*. (2009b), Thakur and Shelke, (2010) and Mudgal *et al.* (2012) who reported that supplementation of bypass fat in the diet of dairy animals, DM intake of dairy animals was not altered. However, Chouinard *et al.* (1997) reported that dry matter intake of the lactating animal decreased when the ration was supplemented with rumen protected fat. On contrary to this, Tyagi *et al.* (2009a) showed that there is increase in dry matter intake in dairy animals when fed bypass fat. These types of findings were not reported in the current study.

The mean values of peak yield of experimental buffaloes at were 13.73, 13.68 and 15.60 kg in treatment groups T_1, T_2 and T_3, respectively. Statistical analysis of data revealed that peak yield was significantly ($P<0.05$) higher in T_3 group fed 150g bypass fat per day per animal compared to the control group and the group fed 100g bypass fat per day per animal. But difference was non-significant between T_2 and T_1. This may be due to the energy sparing effect of bypass fat leading to non-mobilization of the body reserves. Similar results were obtained by Schneider *et al*, (1988) that bypass fat supplementation increased the milk yield and FCM yield, in early and peak lactation which may be due to the higher energy intake, more efficient use of fat by mammary gland and enhancement of tissue mobilization before peak production (Sklan *et al*., 1991). It has been reported that transfer efficiency of plasma fatty acids to mammary tissue decreases with the advancing lactation; therefore, increase in production is maximal during early and peak lactation than mid or late lactation (Grummer, 1988). Garg and Mehta (1998) also reported that bypass fat feeding had maximum effect on milk yield during the first quarter of the lactation leading to increased peak milk yield. The mean values of days to attain peak yield of experimental buffaloes differed non-significantly and were 57.33, 62.17 and 61.33 days postpartum in treatment groups T_1, T_2 and T_3, respectively. Statistical analysis of data showed that there was no significant effect of feeding bypass fat on the number of days taken by the animals to attain maximum milk production. The average number of days to come in post-partum estrous in experimental buffaloes was 56, 60 and 52.33 days in treatment groups T_1, T_2 and T_3, respectively. Buffaloes in T_3 group fed maximum bypass fat showed post-partum estrous earlier compared to other treatment groups although the difference was not significant in the current study.

The mean values of daily DM intake per kg milk pooled over periods were 1.37, 1.36 and 1.31 kg in treatment groups T_1, T_2 and T_3, respectively. It was lowest in T_3 but the statistical analysis of data revealed that this difference was non-significant. The effect of interaction of treatments and period was found to be non-significant. The results indicate that DM intake per kg milk was decreased by supplementation of rumen protected fat to lactating Murrah buffaloes due to increase in milk yield but up to 150g bypass per animal per day this effect was not significant in the present study. The mean values of daily DM intake per kg 6% FCM pooled over periods were 1.26, 1.20 and 1.14 kg in treatment groups T_1, T_2 and T_3, respectively. Statistical analysis of data revealed that the DM intake per kg 6% FCM was significantly ($P<0.05$) lower in the group fed highest (150g bypass fat per day per animal) comparatively. The mean values of DM intake per kg FCM ranged between 1.13 to 1.39 kg during experimental period indicating that period had significant effect on DM intake as the lactation proceeds. The results indicate that DM intake per kg FCM decreased by supplementation of rumen protected fat to lactating Murrah buffaloes due to increase in milk yield and fat percentage. This indicated better FCR in bypass fat supplementation groups.

It may be concluded that the findings in study show that use of bypass fat as an energy source is beneficial regarding productive performance of buffaloes. Some traits need further investigation to establish relation with reproductive performance of animals to study whether bypass fat supplementation is helpful in improving reproductive performance. Further research is necessary to find out the supplemental effect of the bypass fat on dairy animals fed various types of basal rations at different productive levels and stages of lactation.

TABLE 1. Chemical composition of feed ingredients and basal concentrate mixture (% 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	8.90	91.10	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	14.00	7.99	4.30	93.64	6.36	59.79
Basal concentrate mixture	94.00	18.01	6.46	4.50	7.81	92.19	57.79

TABLE 2. Effect of feeding bypass fat on dry matter intake, peak milk yield and estrous cycle in lactating Murrah buffaloes

ATTRIBUTES	TREATMENTS		
	T_1	T_2	T_3
DMI (Kg/day)	16.81 ± 0.09	16.53 ± 0.08	16.87 ± 0.10
DMI (per 100kg BW)	3.08±0.02	3.06±0.03	3.09±0.04
DMI (per kg milk)	1.37 ± 0.02	1.36 ± 0.03	1.31 ± 0.02
DMI (per kg 6% FCM)	$1.26^{a} \pm 0.02$	$1.20^{ab} \pm 0.02$	$1.14^{b} \pm 0.02$
Average Peak milk yield (kg)	$13.73^{a} \pm 0.56$	$13.68^{a} \pm 1.03$	$15.60^{b} \pm 0.37$
Days to attain peak milk yield	57.33 ± 6.50	62.17 ± 4.12	61.33 ± 4.77
Days to attain post partum estrous	56.00	60.00	52.33

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