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Effect of Supplementation of Bypass Fat During Pre and Post Parturient Period on Lactation in Crossbred Cows

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ABSTRACT

The present study was undertaken to evaluate the influence of supplementation of bypass fat during pre and post parturient period on lactation performance in crossbred cows. Twelve crossbreed lactating HF cows were divided into two equal groups *viz.,* Group T_0 (Control) and T_1 (treatment). Group T_0 received roughages and concentrate mixture prepared as per the practice of farm and group T_1 received same ration as per group T_0 and supplemented with bypass fat @ 30g/100 kg BW. The average DMI (kg) of cows from both the group was comparable during pre-partum and post-partum period. The average daily milk production, 4% FCM yield, TDN and DCP intake, milk fat and total solid percentage and specific gravity were significantly ($P<0.01$) higher for cows from treatment group than control. The feed efficiency in terms of DM, TDN and DCP required per kg FCM produced was significantly ($P<0.01$) better for cows from treatment group than control. The digestibility coefficient for all the nutrients and content of TDN and DCP were higher for group T_1. During pre-partum period, average BCS for control and treatment group was comparable, while during postpartum phase it was significantly ($P<0.05$) higher for treatment group (3.27) than for control (3.10).

Key Words: Bypass fat Composition, Crossbred cows, Milk, Postpartum, Prepartum, Yield.

INTRODUCTION

The supplementation of bypass fat not only increases energy intake but also increase unsaturated fatty acid content of buffalo milk and economic returns to dairy farmers. Diets containing supplemental fat often stimulate increased milk production because of increased energy intake, improved efficiency of utilization of energy or both. Bypass fat in the form of calcium salts of fatty acids (Palm oil and others) has been known to increase energy density of the ration without adversely affecting the dry matter intake and digestibility. It also helps to increase milk yield and milk fat percentage or both. Several workers studied responses to supplementation of bypass fat and reported to increase milk and FCM yield in lactating buffaloes and milk fat percentage in dairy cows (Sirohi *et al,* 2010). The positive effect of feeding Ca salt of fatty acids was more evident at the early lactation in buffaloes.

In India, several trials have been conducted on crossbred cattle and buffaloes on feeding of bypass fat, to see its effect on milk production. However, very scanty work has been conducted on effect of bypass fat supplementation simultaneously during prepartum and postpartum in dairy animals. Hence, the present experiment was undertaken to investigate the influence of supplementation of bypass fat during pre and post parturient period on lactation performance in crossbred cows.

MATERIALS AND METHODS

The trial involved twelve crossbred (Holstein Friesian x Desi) cows which were selected on the basis of daily milk yield (10-11 kg/day/animal), gestation stage (30-35 days before parturition) and lactation number (3-4). The selected cows were divided into two groups *viz.,* T_0 and T_1 of six each. Group T_0 served as control and received concentrate mixture routinely used on farm. Group

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T_1 served as treatment and fed as per control plus supplementation with bypass fat @ 30g/100kg body weight for a period of 30-35 days before parturition to two months after parturition. Chopped Guinea grass (*Megathyrsus maximus*) and Lucerne (*Medicago sativa*) was used as green forage in the experiment for both the groups. Conventional practice of feeding concentrate mixture (4.5- 5.0 kg/ animal/day) and roughages separately was followed throughout the experiment. The farm procured the feed ingredients from local market in bulk quantities. The concentrate mixture was prepared fresh every day by hand mixing on the farm and kept for soaking in water for 4 to 5 hr and fed in two instalments *i.e.,* at 3.30 AM and 3.30 PM, just before milking. The green roughage (Guinea Grass 14-15 kg/ animal/day and lucerne 15-16 kg/ animal /day) was offered to the experimental animals. The roughages to concentrate ration followed for feeding experimental animal on dry matter basis was 40: 60.

The bypass fat used in present study comprised of 85 % fat and 9% Calcium. The bypass fat was commercial product obtained from market. The product was present in free-flowing powder form and supplemented to experimental cows through concentrate mixture, daily. Concentrate mixture was given according to the level of milk production, to meet the maintenance and milk production requirements (NRC, 2001). Normal standards of hygiene, management, feeding practices, vaccination and deworming programs were followed for both the experimental cows throughout the experimental period. All the cows were weighed before the start of the experiment and thereafter at monthly interval throughout the experimental period. At the end of experiment digestibility trial of seven days duration was conducted by total collection method. The experiment lasted for 90 days.

The representative samples of concentrate mixture and green fodder used for feeding animals were collected, oven dried and pooled feed and faecal samples collected during digestibility trial were analysed. The analysis of feed samples for proximate principles and phosphorus was undertaken as per A. O. A. C. (2005) and calcium estimation as per Talapatra *et al* (1940). The milk yield of all the experimental cows was measured daily during entire experimental period. The composition of milk in relation to fat, protein, total solids, SNF and specific gravity was estimated at weekly interval by Akashganga Complete Milk Analyzer (M/s. Shri. Kamdhenu Electronics Pvt. Ltd., Gujarat). The 4% FCM yield was calculated by using Gain's formula.

The animal's body condition score (BCS) was recorded at fortnightly interval. Scoring system of 1 to 5 point scale using 0.25 increments for Holstein Friesian cows as per Ferguson *et al* (1994) and confirmed by Elanco (1997) was used to record BCS of individual cows. Observations of various parameters recorded during experimental period were tabulated and data were statistically analysed as per Snedecor and Cochran (1994) by using paired t test.

RESULTS AND DISCUSSION

The per cent ingredient composition of experimental concentrate mixture is given in Table 1. The average chemical composition of concentrate mixture, guinea grass and lucerne is presented in Table 2.

Table 1. Per cent ingredient composition of concentrate mixture.

Ingredient	Per cent composition
Maize	30.00
Cotton seed cake	32.00
Wheat bran	35.00
Mineral mixture	02.00
Salt	01.00
Total	100.00

Table 2. Average chemical composition (%DMB) of concentrate mixture, guinea grass and lucerne.

Nutrient	Concentrate mixture	Guinea Grass	Lucerne
Dry matter	45.22	24	17
Organic matter	95.35	90.89	88.5
Crude protein	15.71	8.60	21.50
Ether extract	5.58	1.52	2.05
Crude fibre	12.38	37	28
Nitrogen Free Extract	61.68	43.77	36.95
Total Ash	4.65	9.11	11.5
Acid Insoluble ash	1.08	3.2	2.4
Calcium	0.85	0.55	2.02
Phosphorus	0.36	0.32	0.30

The overall performances of cows from both groups are presented in Table 3. The dry matter intake (DMI) of treatment group was numerically slightly higher than control but non-significant indicating that the palatability of concentrate mixture was not affected due to the supplementation of bypass fat. Similar results were observed by Yadav *et al* (2015) and Sontakke *et al* (2014).

The average daily milk production of cows from the treatment group was significantly (P<0.01) higher than control group. This suggested that feeding of bypass fat in lactating cows was beneficial in increasing milk production. The higher milk yield in bypass supplemented cows might be due to higher ME intake through rumen protected fat. These results correlate with the findings of Rajesh *et al* (2014) who reported that the cows supplemented with prilled bypass fat @ 75 g/day/cow had significantly higher milk yield than crossbred cows from control group. Contrary to the present study Sontakke *et al* (2014) reported statistically non-significant effect of supplementation of bypass fat on milk production in crossbred cows. The average daily fat corrected milk (FCM) yield of cow from treatment group was significantly (P<0.01) higher than control group. The significantly higher FCM yield may be attributed due to higher energy intake, more efficient use of fat by mammary gland and enhancement of tissue mobilization before peak production. The findings of the present study were in accordance with Sirohi *et al* (2010) who reported higher FCM yield in lactating crossbreed cows supplemented with bypass fat @ 300 g/day/animal**.** Contrary to the present study Schauf and Clark (1989) reported statistically non-significant effect of bypass fat supplementation on FCM yield in crossbred cows.

The average total digestible nutrients (TDN) intake of cows from treatment group during pre-partum and post-partum period was significantly (P<0.01) higher than control group. Similar, trend was observed for average digestible crude protein (DCP) intake of cows. These results correlate with the findings of Patel *et al* (2013) and Shelke *et al* (2011).

The efficiency of feed utilization in terms of DM, TDN and DCP required per kg FCM produced was significantly (P<0.01) higher for cows from treatment group, receiving bypass fat supplement than control. The findings of the present study were in agreement with Tyagi and Thakur (2007) who reported better feed efficiency in terms of DM, TDN and DCP intake per kg FCM yield in crossbred cows supplemented bypass fat.

The data of milk composition showed that average milk fat %, total solid content % and specific gravity of cows from treatment group was significantly (P<0.01) higher than cows from control group. Similar results were reported by Yadav *et al* (2015) and Han *et al* (2011). The average milk protein and solids not fat (SNF) percentage of cows from both the experimental groups was comparable. Similar findings were observed by Rajesh *et al* (2014).

Table 3. Overall performances of cows from both the experimental groups.

Parameter	GroupT_0 (Control)	GroupT_1 (Treatment)	Results of t test
DMI prepartum (kg)	8.37	8.40	**NS**
DMI postpartum (kg)	10.12	10.31	**NS**
TDN intake prepartum (kg)	5.58	5.79	* *
TDN intake postpartum (kg)	6.74	7.11	* *
DCP intake prepartum (kg)	0.85	0.86	* *
DCP intake postpartum (kg)	1.03	1.06	*
Milk yield (kg)	15.11	16.50	* *
FCM yield (kg)	13.61	15.48	*
DMI (kg)/ kg FCM yield	0.74	0.67	* *
TDNI (kg)/ kg FCM yield	0.49	0.46	* *
DCPI (kg)/ kg FCM yield	0.075	0.069	* *
Milk Composition			
Milk protein %	3.35	3.36	**NS**
Milk fat %	3.35	3.60	* *
Milk SNF %	8.30	8.32	**NS**
Total solid %	11.65	11.92	* *
Specific gravity	1.028	1.029	* *
Body condition score prepartum	3.64	3.66	**NS**
Body condition score postpartum	3.10	3.27	*
Input output relationship			
Average daily milk production (Kg/cow)	15.11	16.50	-
Total cost of milk production (Rs./kg)	11.95	11.88	-
Average daily FCM Production (Kg/cow)	13.61	15.48	-
Total cost of FCM production (Rs./kg)	13.26	12.66	-
Daily income from milk sale** (Rs.)	528.85	577.50	-
Daily profit through sale of milk (Rs./ cow)	348.35	381.44	-
Extra profit over control (Rs./cow)	-	33.09	-

Cost (`/kg): Bypass fat - 90.00

*Non-Significant., * -- Significant at 5% level, ** -- Significant at 1% level.*

The average BCS for control and treatment group during prepartum phase was 3.64 and 3.66 which indicated statistically non-significant difference between for both the experimental groups. During postpartum phase, average BCS was significantly ($P<0.05$) higher for treatment group (3.27) than for control (3.10). This might be due to increase energy density of ration due to supplementation of bypass fat which in turn help in preventing negative energy balance conidian in animal. Findings of the present study corroborated with Rajesh *et al* (2014) and Naik *et al* (2009).

The average per cent digestibility coefficients, TDN and DCP contents for both groups Table 4.

Table 4. Average digestibility coefficients, TDN and DCP contents for both groups.

Nutrient	Control	Treatment	Results of t test
Dry matter	70.35	72.45	**
Organic matter	71.35	73.15	**
Crude protein	72.11	75.42	**
Crude fibre	60.23	62.55	**
Ether Extract	71.26	75.15	**
Nitrogen Free Extract	69.35	71.42	**
TDN %	66.65	68.95	--
DCP %	10.16	10.30	--

*** -- Significant at 1% level.*

The digestibility trial conducted during last week of the trial revealed that the digestibility of all the nutrients was significantly (P<0.01) higher for treatment than control group which was also reflected in higher TDN and DCP content of ration fed to group T_1receiving bypass fat supplement.

CONCLUSION

The economics of the study revealed that a net profit per day per cow was higher with bypass fat supplemented group than that of control group not receiving bypass fat. Thus, the results indicated that supplementation of bypass fat in treatment group was cost effective than control group. It is concluded that bypass fat supplementation @ 30 g/100 kg body weight per day was beneficial and cost effective in improving milk production, milk composition, nutrient intake, feed efficiency and digestibility of nutrients.

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