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EFFECT OF PRILLED FAT SUPPLEMENTATION ON MILK YIELD, COMPOSITION AND PLASMA HORMONES IN EARLY LACTATION CROSSBRED COWS

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ABSTRACT

To find out the effect of Prilled fat feeding on milk production, feed intake and plasma hormones in early lactation cows.Twelve lactating crossbred cows in early lactation were either maintained as per routine management practices (control group) or in addition were fed prilled fat @75 g/d for a period of 90 days (supplemented group). Blood, milk and feed samples were collected at weekly intervals. Plasma hormones, metabolites and milk composition were analyzed using standard method of analysis.Plasma glucose levels were similar in both the groups ($P > 0.05$), however NEFA decreased ($P<0.05$) in the supplemented group. Plasma growth hormone, ghrelin and leptin hormone levels was non-significantly different ($P>0.05$) between the groups. Milk yield increased ($P<0.05$) in supplemented group than the control group. Milk fat increased by 9% in the supplemented group however protein, lactose and SNF remain unaffected. Ether extract digestibility was higher ($P<0.05$) in supplemented group in comparison to control group.Prilled fat feeding augmented milk secretion of cows without affecting dry matter intake, milk composition and plasma hormone levels, however digestibility coefficients of ether extract improved.

Keywords: *Cows, feed intake, hormones, metabolites, milk yield, composition, prilled fat*

No. of Tables: 2 **No. of Figures: 3** **No. of References: 33**

INTRODUCTION

The amount of energy required for the maintenance of body tissues and milk production often exceeds the amount of energy available from the diet in the high producing dairy cows (Goff and Horst ,1997)) resulting in Negative Energy Balance (NEB). The postpartum metabolic adjustment of physiological events can be enhanced by providing energy density ration through incorporation of fat in diet of cows (Sirohi*et al*., 2010). To overcome the effect of NEB, Ca salt of fatty acid has been used by many researchers in cows (Erickson*et al*.,1992,Gargouri*et a*l., 2006 and buffaloes Shelke*et al*.,2011). The Prilled fat completely by pass the rumen and is broken down in the intestine by lipase enzyme, however literature on effect of prilled fat feeding is lacking in early lactations of cows reared in tropical climate. The present investigation was undertaken to measures the changes in plasma hormones, metabolites ,feed intake and milk yield in crossbred cows fed with prilled fat in early lactation.

MATERIAL AND METHODS

Experimental : Ten healthy crossbred cows at av. 20±5 days postpartum were selected from the Institute herd and was divided into two groups based on the similar milk yield as control and supplemented group.The experimental protocol and allotment of cows used in this experiment was duly cleared by the Institute Animal Ethic Committee. The cows of both the groups were fed ad lib. Green fodder (Jowar) and wheat straw during the experimental period (Table 1), while supplemented group cows were fed additionally with prilled fat @ 75g /day/cow from day 30 to 120 postpartum. The digestibility coefficients of various nutrients were determined at day 60 of lactation by conducting the digestibility trial. Blood samples were collected from jugular vein at fortnightly intervals on day 30, 45, 60, 90,105 and 120 in early lactation. Milk samples were collected fortnightly and analyzedfor fat**,** protein, lactose and SNF contents (Mega netco). Body weight and dry matter Intake (DMI) of cows were recorded at fortnightly intervals. The digestibility coefficients of nutrients were determined on day 60 of lactation (AOAC, 2005). Body condition score (BCS) was recorded at fortnightly intervals on a 5-point scale.Plasma glucose and non-esterifed fatty acid (NEFA) was estimated by Kits. Plasma hormones (growth hormone-GH, leptin, ghrelin) were measured by enzyme immune-assay kits. Statistical analysis of data was carried out using least square analysis (Stat 3 programme). Mean and standard error was calculated and the correlations among different variables were found out.

RESULTS

DMI varied non-significantly between groups, however DMI was significantly different ($p<0.01$) between fortnight of experiment. Digestibility coefficients of dry matter (DM) were similar in control and supplemented group (75.77 and 75.91%). The TDN intake was significantly more ($P<0.05$) in supplemented group in comparison to control. Digestibility efficient of EE was higher ($p<0.05$) in supplemented group as compared to control group (Table 2). The digestibility coefficients of OM, CP,

TCHO, NDF and ADF was non-significantly different in control and supplemented group, the respective values were 80.00, 66.92, 82.34, 65.83 and 59.68 and 79.59, 70.5383.47, 66.15 and 58.43 %. Body weight of cows were significantly different ($p<0.01$) between group, between fortnights ($p<0.01$) and between animal ($p<0.01$). BCS of supplemented cows was more in comparison to control. BCS varied in fortnights ($p<0.01$), between fortnight groups ($p<0.01$) and between animals ($p<0.01$). Average BCS of cows was 2.58±0.24 and 3.11±0.24 in control and supplemented groups, respectively. Average milk yield was less ($P<0.05$) in control group than the supplemented group (16.07±2.30 vs. 17.04±1.50 kg/d). Milk yield increased @ 6.03% in prilled fat supplemented cows (Table 3). The change in milk yield varied between fortnight ($p<0.05$) and between animals ($p<0.01$). Milk fat was more ($P<0.05$) in supplemented group then the control cows. Milk, lactose, SNF and protein content were not influenced by feeding of prilled fat.

Plasma glucose concentration was non-significantly higher ($P>0.05$) in control and supplemented group cows (Fig 2). Plasma NEFA was higher ($P<0.05$) in control in comparison to supplemented group cows and varied between group and fortnight ($p<0.05$). Plasma ghrelin and leptin varied non-significantly between group, fortnight and animal (Fig. 3). Plasma GH level was non-significantly higher ($P>0.05$) in supplemented group than the control group cows.

DISCUSSION

The higher milk production in supplemented group cows was attributed to more TDN intake in conjunction with prilled fat which increased the energy density of ration and reduced deleterious effect of negative energy balance as evident from lower NEFA levels. The significant increase in milk production in supplemental group cows corroborate findings of many researchers reporting an increased milk yield between 0.40-3.11 kg/d in bypass fed cows. (Shelke*et al* .,2011;Fahey *et al.*,2002;McNamara *et al*.,2003; Mishra *et al*., 2004 ;Salem andBouraoui, 2008 ;Tyagi*et al*.,2009) .However, no improvement in milk yield or milk fat content in by pass fat fed cows have also been reported which could be due to different degree of inertness and amount of dietary fat offered(Klusmeyer*et al*., l991; Sklan*et al*., 1992;Elliott*et al*.,1996). The increase in milk fat content in supplemented group cows was due to availability of more fatty acid (SFA and USFA) to the mammary gland and their incorporation into milk fat (Gulati*et al*.,2003). The non-significant effect of prill fat on DMI in supplemented group is in line with earlier findings in cows during early and mid-lactation (Grummer, 1993; Theurer*et al*., 2009; Stusinka*et al*.,2006;Thakur and Shelke.,2010; Silvestre et al., 2011;Singh *et al*., 2014).The high metabolic rate of utilization of glucose and homeostatic mechanism of animal body does not allow appreciable changes in glucose level on feeding of prilled fat which led to non-significant changes in plasma

glucose in supplemented group of cows in this study (Singh*et al*., 2014).

The non-significantly higher glucose level might have contributed in enhancement of milk yield as glucose is the main precursor for lactose synthesis. The lower NEFA level in supplemented group cows further suggest beneficial effect of prilled fat feeding in restricting the body reserve mobilization in early lactation of cows (Ganjkhanlou*et al*.,2009). Although an increase in mobilization on supplementation of bypass fat (Delbecchi*et al*., 2001) or decrease in body lipid mobilization during postpartum period have also been reported (Grumme, 1995; Grum*et al*., 1996). The non-significant changes in protein, lactose and SNF content further indicated no effect of prilled fat feeding on synthesis and secretion of milk constituents. It has been reported that total yield of milk protein is increased due to more milk yield in cows (Sklan*et al*., 1994;Naik*et al*., 2009). The digestibility of fat in ruminant diet is lower due to high content of non-fatty material and the small proportion of true fat in the total diet, which causes endogenous secretions to be relatively higher (Palmquist and Jenkins, 1980). The higher digestibility of EE in supplemented group could be attributed to more digestibility of prilled fat than the lipid components of basal diet (Palmquist, 1991). EE digestibility depends on the energy status of cow leading to either increased EE digestibility or no effect on digestibility of DM, CP, CF, NFE, NDF depending upon nature of the prilled fat and effect on rumen micro flora environment (Harrison *et al*.,1995). The comparable information on plasma ghrelin, GH, and leptin in prill fat fed cows in early lactation is lacking. GH is a galactopoietics in cows and buffalos (Singh and Ludri, 1994; Maqsood., 2003; Jyotsna and Singh, 2010) butprilled fat feeding did not influence their circulatory levels of GH in this study.

CONCLUSION

Based on the finding it was concluded that feeding of prilled fat in early lactation helps in improvement of body condition and body weight of cows without affecting digestibility of nutrients, hormone levels and milk composition, except fat content which increases significantly.

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Table 1:*Chemical Composition of Feeding ingredients offered to early lactation cows (% DM basis)*

Parameter	Concentrate	Green Fodder	Wheat Straw
Organic Matter (OM)	90.43	90.75	89.33
Crude Protein (CP)	21.65	6.56	1.88
Total Carbohydrate (T-CHO)	64.85	83.91	86.78
Ether Extract (EE)	3.92	1.64	0.66
Neutral Detergent Fiber (NDF)	28	59.04	78
Acid Detergent Fiber (ADF)	11.56	40.56	48.51

Table 2:*Mean (±SE) values of digestibility coefficient of nutrients in control and experimental KF cows fed with prilled fat in early lactation cows*

Attributes	Control	Treatment
Dry Matter (%)	75.77±0.65	75.91±0.78
Organic Matter (%)	80±0.62	79.59±0.72
Crude Protein (%)	66.92±1.71	70.53±1.33
Ether Extract (%)	69.05±row2.06[a]	82.56±0.94[b]
Total-Carbohydrate (%)	82.34±0.77	83.47±0.75
Neutral Detergent Fiber (%)	65.83±1.1	66.15±1.11
Acid Detergent Fiber (%)	59.68±1.03	58.43±1.33
Hemicellulose (%)	75.01±1.68	77.73±1.36

Values with different superscript differ (P<0.05) in a row

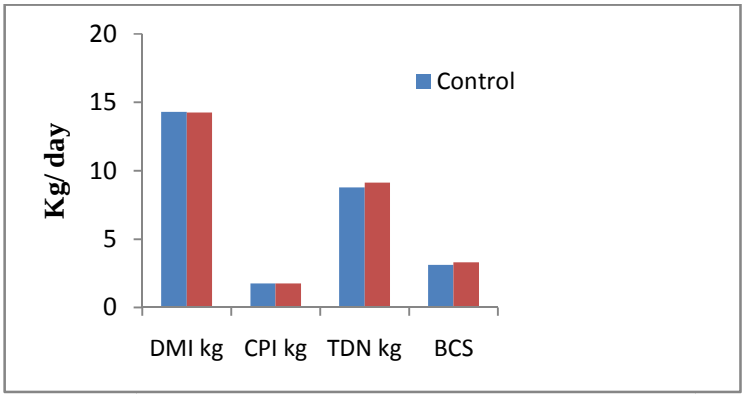

Fig 1: *Feed intake in control and prilled fat supplemented group of cows in early lactation*

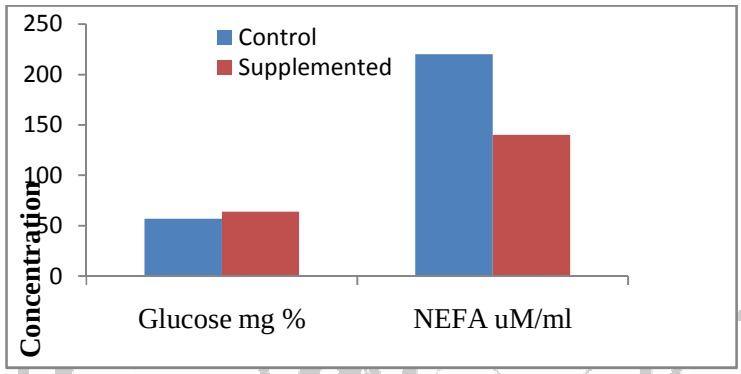

Fig 2: *Plasma glucose and NEFA level in control and prilled fat supplemented group of cows in early lactation*

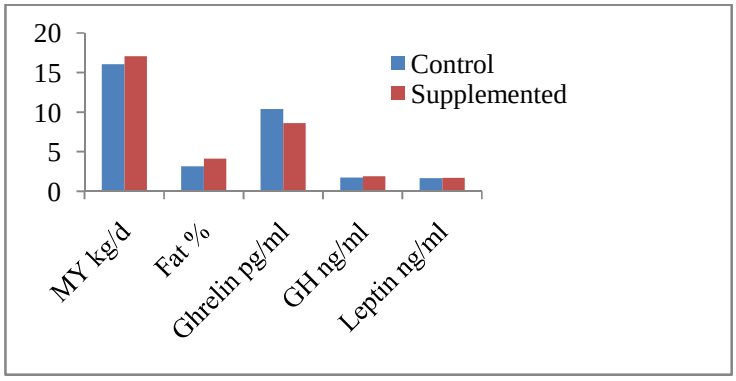

Fig 3: *Milk yield and hormonal changes in control and prilled fat supplemented group of cows in early lactation*

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