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On farm test on supplementation effect of bypass fat on production performances of lactating crossbred cows

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ABSTRACT : On farm trial was conducted on 20 lactating crossbred cows were randomly divided into two groups on the basis of milk yield (10 to 13 kg/day) and day of calving less than 60 days to see the effect of supplement bypass fat on milk yield and fat percentage for continuous three year (2012 to 2015). Cross bred cows were fed concentrate, green and dry fodder and wheat straw in control groups and addition of 100 grams of bypass fat was given in treatment group. Experimental feeding was continued up to 90 days. The average milk production and fat percentage was significantly higher in treatment group. Milk production efficiency was also significantly higher in bypass fat supplemented in comparison to control group. It was concluded that bypass fat supplementation @ 100 g per day per animal in cows significantly increase the milk production and fat percentage over the control group.

KEY WORDS : Bypass fat, Cow, Milk production, Fat percentage

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INTRODUCTION

Roll of bypass fat in diet of the high producing crossbred cows is very crucial for enhancing the energy density of the diet. Dietary fat, that resist lipolysis and bio hydrogenation in rumen by rumen micro-organism, but gets digested in lower digestive track, is known as bypass fat. 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 requirement expressing their milk production potential to the fullest extent (Krishna Mohan and Reddy, 2009). Additional fat fed as bypass fat does not interfere with rumen fermentation process, but supply more energy to animal for more milk synthesis after being digested in abomasums and small intestine with absorption from the small intestine this helps in increases unsaturated fatty acid in milk which can produce softer butter and safer milk for human consumption especially for heart patient (Bobe *et al*., 2007 and Garg *et al*., 2008). The present study was done to evaluate feeding of bypass fat on milk yield and fat percentage performance in cross bred dairy cows.

Basic concepts on fats and its classification (McDonald *et al.*, 2002) and composition of milk fat (Jensen, 2002) have been well documented (Naik, 2012). During early lactation, high producing dairy animals remain in considerable negative energy balance leading to metabolic stress and sub-optimal milk production (Bell, 1995 and Drackley, 1999). Addition of concentrates at higher level in ration of high producing dairy animals as a strategy for enhancing energy density of ration decreases fiber intake and leads to acidosis (Palmquist and Jenkins,

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1980) and milk fat depression (Jenkins and Mc Guire, 2006). Although, dietary fat has great potential to enhance energy density of the ration and then composition of the milk fat, various factors limit its use in large amounts in ration (Palmquist, 1994).

MATERIAL AND METHODS

Twenty lactating crossbred cows were selected from villages of Mehsana District with average milk yield of 10 to 12 kg and lactation stage below 60 days. The study was conducted during winter month of November to January for 90 days after the adoption period of two weeks for consecutive three years (2012-2015). The control animal fed concentrate, green and dry fodder and wheat straw whereas experimental group fed additional 100 grams bypass fat (Commercial product). The animals were kept in well-ventilated byres with access to fresh water and having separate mangers for fodder and concentrate. The animals were milked twice a day morning and evening and the concentrate (Total quantity divided into two parts) was given as each milking time. Bypass fat was added and mixed in concentrate uniformly in morning and fed individually to each animal. Milk sample from each animal in both groups were collected daily and analyzed for milk production and fat percentage at their village co-operative dairy regularly for 90 days. All the periodicals data with regards to milk yield and milk fat were statistically analyzed by paired 't' test with Systat 7.0 (1997).

RESULTS AND DISCUSSION

Feeding of bypass fat resulted in significant (P<0.01) increase in milk yield and fat percentage (Table 1 and 3). Milk yield and fat percentage increased by 5 per cent and 9 per cent in bypass fat fed group over the control group.

Effect of bypass fat on milk yield:

Effect of supplementation of bypass fat in dairy cows on milk yield and FCM yield is also influenced by parity of animal, which is more in primiparous cows than multiparous cows; however, for milk yield interaction is not significant but for FCM yield interaction is significant (Sklan *et al.*, 1994). Stage of lactation influences supplemental effect of the bypass fat on milk yield and FCM yield, which is generally increased in early and peak lactation (Schneider *et al.*, 1988), 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). Transfer efficiency of plasma fatty acids to mammary tissue decreases as lactation progresses; therefore, increase in production is maximal during early and peak lactation than mid or late lactation (Grummer, 1988). Garg and Mehta (1998) reported that bypass fat feeding had maximum effect on milk yield during the first quarter of the lactation, when feed intake is usually low and the effect was less prominent as lactation advanced, probably due to the DM intake start increasing after 6-8 weeks of calving. Further,

Table 1 : Milk production performance in cows

Year	Particulars	Control	Treatment group	Significance
2012-13				
	Average milk yield per animal	10.50 ± 0.96	10.90 ± 1.02	< 0.01
2013-14				
	Average milk yield per animal	12.30 ± 0.59	12.91 ± 0.63	< 0.01
2014-15				
	Average milk yield per animal	12.10 ± 0.48	12.80 ± 0.40	< 0.01
Pooled of three years	Average milk yield per animal	11.63 ± 0.59	12.20 ±0.62	< 0.01

Values in rows are significance at P < 0.01

Table 2 : Effect of supplementation of bypass fat on milk yield (kg)

Particulars	Bypass fat		Increase in MY		References
	Control	Treatment	Kg	(%)	
Milk yield	15.51	18.88	3.37	21.7	Naik *et al*. (2009)
Milk yield	17.57	18.65	1.08	6.2	Tyagi *et al*. (2009)
Milk yield	9.49	10.68	1.19	12.5	Thakur and Shelke (2010)
Milk yield	11.40	13.18	1.78	15.6	Sirohi *et al*. (2010)
Milk yield	17.80	19.00	1.20	6.8	Gowda *et al*. (2013)
Milk yield	11.17	12.04	0.87	7.8	Parnerkar *et al*. (2011)
Milk yield	20.42	21.55	1.13	5.5	Wadhwa *et al*. (2012)

Table 3 : Fat percentage performance in cows

Year	Particulars	control	Treatment group	Significance
2012-13				
	Average fat percentage per animal	3.91 ± 0.43	4.31 ± 0.36	< 0.01
2013-14				
	Average fat percentage per animal	4.01 ± 0.24	4.33 ± 0.26	< 0.01
2014-15				
	Average fat percentage per animal	3.81 ± 0.34	4.10 ± 0.30	< 0.01
Pooled of three years	Average fat percentage per animal	3.91 ± 0.25	4.23 ±0.21	< 0.01

Values in rows are significance at P < 0.01

production of the lactating animal is dependent on the amount of bypass fat supplemented in the ration. At higher level of supplementation of Ca-LCFA, increase in milk yield is quadratic, as it interferes with the digestion of other nutrients and impairs benefits of the supplemental fat on energy utilization (Chouinard *et al.*, 1997). There was increase in FCM yield of lactating cows, when Ca-LCFA was supplemented up to 6 per cent of the dietary DM, but, it decreased at 9 per cent of the dietary DM (Schauff and Clark, 1992). Supplemental effect of the Ca salts on milk production of dairy cows was influenced by the fatty acids composition of the Ca salts, which was further dependent up on the lactational stage of the animal. With increase in the unsaturation of the dominant fatty acids in Ca salts, milk yield increased linearly in early lactation (Chouinard *et al.*, 1998). However, milk yield was not affected by the dietary supplementation of Ca salts of CLA in lactating animals (Castaneda-Gutierrez *et al.*, 2005).

Similarly, Naik *et al.*, 2009; Tyagi *et al.*, 2009; Thakur and Shelke 2010; Sirohi *et al.*, 2010; Gowda *et al.*, 2013; Parnerkar *et al.*, 2011 and Wadhwa *et al*., 2012 also reported significant improvement in milk yield from 5.5 to 24 per cent (Table 3).

Effect of bypass fat on milk fat:

Among all components of milk, fat content is most sensitive to the dietary changes. Similar to milk yield, although there is no significant interaction with breed of cow, effect of supplementation of Ca-LCFA on milk composition tends to be greater in Holstein cows than Jersey cows (West and Hill, 1990). On supplementation of bypass fat to lactating animals, milk fat percentage is either increased (Sklan *et al.*, 1991; Thakur and Shelke, 2010; Sirohi *et al.*, 2010 and Parnerkar *et al.*, 2011) or decreased (Chouinard *et al.*, 1998) or not altered (Naik *et al.*, 2009 and Tyagi *et al.*, 2009). However, addition of bypass fat in diet generally increases the total milk fat yield due to increase in the milk production (Naik *et al.*, 2009). Further, supplemental effect of bypass fat on milk fat content is dependent up on the level and fatty acid profile of the Ca-LCFA. Milk fat percentage and yield decreases linearly with increase in the amount of dietary Ca soap; and Ca-LCFA from a saturated fat source have little influence on milk fat content (Chouinard *et al.*, 1997), while increase in unsaturation of dominant FA in Ca salts has a positive linear effect on the milk fat percentage of lactating cows (Chouinard *et al.*, 1998).

Mishra *et al.* (2004); Sklan *et al.* (1991); Thakur and Shelke (2010); Sirohi *et al*. (2010) and Parnerkar *et al*. (2011) also reported a clear cut rise in milk fat percentage with bypass fat supplementation.

Conclusion :

On Farm Test result showed that supplementation of bypass fat to high yielding crossbred cows is beneficial in terms of increasing milk yield and fat percentage. 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 stage of lactation. From available literature, it can be concluded that supplementation of bypass fat in the diet of dairy animals is very important to alleviate problems of negative energy balance without adversely affecting the dry matter intake and rumen fermentation.

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