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Reproductive efficiency in cows supplemented with rumen bypass fat pre - and post - partum

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Abstract
Infertility due to negative energy balance is a major problem among the high producing cows, resulting huge economic loss. This study aimed to assess the effect of pre- and post-partum bypass fat supplementation on the reproduction and production parameters of high yielding crossbred cows. The trial was conducted with five groups of six cows each (GI – control, GII- Supplemented with 200 g bypass fat daily pre-partum during last 30 days of pregnancy, GIII – 200 g bypass fat daily up to 90 days post-partum, G IV - Supplemented with -200 g bypass fat daily from 30 days pre-partum to 90 days post-partum), GV- Cows without any bypass fat supplementation and under Ovsynch protocol. The animals in GIII and GIV were observed to be superior in milk production parameters viz. peak yield (P<0.05), and day of attaining peak yield (P<0.01). There was a significant increase in conception rate in GIII and GIV compared to GI, G II and GIV (p<0.05). But there is no significant increase in conception rate in GIV compared to G III (p<0.05) the calving to conception interval was significantly reduced in those animals fed with bypass fat post-partum and pre post-partum combined. Calving to conception interval is significantly lower in GIV compared to GIII. The relative economic benefit in animals supplemented with bypass fat (GIII and GIV) were higher compared to others. But relative economic benefit is not significant in GIV compared to GIII. It was observed that bypass fat feeding post-partum is an economically viable and environment-friendly recommendation for improving the productive and reproductive performance of crossbred cows. On comparison post-partum feeding is a more viable recommendation compared to pre partum feeding and combined pre and post-partum feeding.

Keywords: conception rate, crossbred cows, techno-economics

Introduction
Though India stands top in milk production globally, in production efficiency parameters it stands very low. Infertility due to negative energy balance in high producing post-partum cows is a major problem in the country. Hormonal induction of oestrus using Prostaglandin F2α (PGF2α) and Gonadotropin-releasing hormone (GnRH) have been found to be beneficial in enhancing reproductive efficiency in cross-bred cows in the post-partum period under field conditions [1]. Many protocols are available using these hormones singly or in combination and definitely had positive impact on the reproductive efficiency ultimately beneficial to the farmer. Some earlier studies analysed the efficiency of these hormones in postpartum reproductive performance of dairy cattle [1, 2], but its efficiency when combined with dietary supplementation of bypass fats are not studied in detail till date, especially in crossbred cows. Moreover, these methods are costly and many times not recommended because of presence of hormonal residues in milk and loss of milk thereto.

Supplementation of bypass fat in the ration of dairy animals has been reported to have great positive impact on their production and reproduction performances [3]. It is reported that reproductive efficiency of dairy cows had improved by the supplementation of bypass fat, by increasing the conception rate and reducing the days open [4, 5]. But a detailed study on the improvement in the economic parameters of reproduction and techno-economic analysis of supplementation of bypass fat in crossbred cows of Kerala has not been studied in detail especially a comparison on pre- and post-partum supplementation.

Hence the present study is to evaluate the reproductive performance of high producing crossbred cows supplemented with bypass fat pre and post partum independently and combined. The techno-economic variables of supplementation of bypass fat have also been calculated and compared.

Materials and Methods

A total of 24 apparently healthy normally calved, crossbred cattle of similar age and parity having 3 to 3.5 out of 5 body score were selected from University Livestock Farm and Fodder Research Station, Mannuthy for the study.

The animals were randomly allotted to four groups having six cows each. All the animals in these four groups were fed as per standard feeding practices based on ICAR recommendations [6]. All the animals were fed with standard concentrate feed and Hybrid Napier as the sole roughage two times, daily in the morning and evening. Animals in Group I was not given any supplementation and kept as control.

The animals in Group II were supplemented with 200g bypass fat per day (Calcium salt of the long chain fatty acid) 30 days from expected day of calving along with compounded cattle feed, every morning.

The animals in Group III were supplemented 200g of bypass fat per day from 5th day of calving till 90th day along with compounded cattle feed every morning.

Animals in Group IV were supplemented with bypass fat 200g per day 30 days prior to expected days of calving and then from 5th day of calving up to 90th day.

Animals in Group V which were not given any fat supplementation subjected to Ovsynch protocol on day 45 of calving as described earlier [7]. Briefly, 10 µg of GnRH analog (Buserelin acetate - *Receptal, Intervet, India*) were administered intramuscularly (i/m) on day 45 post-partum followed by 500 µg Cloprostenol (*Pragma, Neovet, India*) on day 52 post-partum. A second dose of GnRH analog, 10 µg i/m on day 54 was administered, followed by timed artificial insemination at 16 h after the second dose of GnRH.

All the animals in Groups I, I, III and IV were inseminated during natural oestrus exhibited after day 45 post-partum. Animals in Groups V were subjected for timed AI.

Pregnancy was diagnosed on day 30 post-breeding by ultrasonography and confirmed on day 45 by per rectal examination. Embryonic loss if any was also ascertained. Number of AI for conception, day of achieving peak yield, peak yield (in Kg), cost of hormone and professional charges, cost of feeding bypass fat were calculated. The standard milk yields of animals were estimated using the regression formula, (Lactation yield = Peak yield x 215.5) developed by Kerala Veterinary and Animal Sciences university [8].

The techno-economic impact of bypass fat supplementation by virtue of improvement on reproductive performance and enhancement on production was also analyzed. The data recorded were analyzed statistically [9], using statistical software SPSS (*SPSS, Version 14, USA*).

Results and Discussion

Conception rate of animals

Conception rate the in the first insemination is furnished in Table 1. There was a significant increase in conception rate in GII and GIII (animals fed with bypass fat) compared to GI and GIV (p<0.05).

Among those animals not supplemented with bypass fat (group I and IV), only one animal each conceived, and the service period was 80 and 54 days, respectively. Among those animals supplemented with bypass fat, more than fifty percent animals conceived before 60 days. The service periods of all the experimental animals are given in Table 2.

Table 1: Conception rate observed in selected animals

S. No.	Group (n=6)	Pregnant	
		No.	%
1	I	1	16.67
2	II	2	33.33
3	III	3	66.67
4	IV	3	66.67
5	V	1	16.67

Calving to conception interval

Table 2: The calving to conception interval (CCI) in different groups

S. No.	Animal No.	Days of conception				
		GI	GII	GIII	GIV	G V
1	1	80	Nil	57	Nil	Nil
2	2	Nil	52	46	47	Nil
3	3	Nil	Nil	Nil	46	Nil
4	4	Nil	Nil	49	Nil	Nil
5	5	Nil	49	Nil	46	54
6	6	Nil	Nil	Nil	Nil	Nil

At the same time, the conception rate was higher for the III and IV groups than the other three groups. There was a considerable reduction in calving to conception interval in animals fed with bypass fat post-partum with respect to first insemination pregnancy outcomes. It is noteworthy that animals under hormonal treatment alone without bypass fat feeding did not provide any considerable results.

Previously, it was recognized considerable improvement in conception rate in animals supplemented with bypass fat [10-12]. Among crossbred cows also, it was observed that supplementation of bypass fat has considerably increased the conception rate and minimized the days open [13].

Two theories are reported in animals responsible for improving the conception rate through dietary supplementation of bypass fat. The important postulation is that obviously, fat feeding improves the energy status of animals, which augment the secretion of gonadotropins from the pituitary and promoting follicular growth [14]. Generally, cows in negative energy balance have prolonged post-partum anestrus [15] and reduced frequency of LH pulses, which is essential for the development of graffian follicles [16]. The increased energy provided by the dietary supplementation of fat improves the LH secretion, thereby improving the reproductive performance [11, 17]. Another hypothesis is that improvement in reproductive performance is independent of the energy status of animals. It was reported that fat supplementation increased a total number of follicles and increased the size of preovulatory follicles [18, 19] irrespective of the energy status of animals [13]. Our studies are concomitant to both the hypotheses, where the energy status of animals enhanced, which considerably improves the reproductive performance of animals.

Embryonic Loss

The incidence of embryonic loss was not noticed in any of the animals in GI, GII, and GIII, whereas as in GIV, one animal confirmed pregnant by ultrasonographic examination on day 30, was observed to be negative for pregnancy on day 60. Hence embryonic loss was confirmed in the animal which might be resulted from the negative energy balance in the animal, as reported earlier [20].

Peak milk production parameters

The mean days on which the animals came to peak production in group I, II, III, IV and V were 40.5, 38.12, 18.17, 17.99 and 32.17, respectively. Animals in group III and IV achieved peak yield significantly earlier compared to group I, II and V (p<0.05). But there was no significant difference between GIV and GIII (p<0.05). Similarly, the peak yield obtained were significantly higher in animals supplemented with bypass fat post partum compared to those did not supplement with bypass fat and those fed pre partum. There is no significant increase in GIV compared to GIII (p<0.05). The total lactation milk yield estimated using the regression formula developed by KVASU indicated that bypass fat feeding is beneficial in terms of total milk production also (Table 3).

The results of present are inconsistent with the earlier observations [12, 21-23] in cows and buffaloes [24, 25] which reported improvement of milk production in animals supplemented with rumen-protected fat.

Table 3: Milk production parameters of animals

S. No.	Group (n=6)	Day of achieving peak yield (Mean ± SE)	Peak yield obtained (Kg) (Mean ± SE)	Total Lactation Milk Yield* (Kg)
1	I	40.5 ± 3.60	14.08 ± 1.77	3034.24
2	II	38.12+_3.52	14.79+_1.08	3080.98
3	III	18.17_+3.32	15.13+_1.34	3260.52
4	IV	17.99+_3.12	15.41+_1.21	3298.74
5	V	32.17+_3.77	14.68+_1.07	3163.54

*Calculated based on the regression formula as per KVASU package of practices

Techno-economics of bypass fat supplementation

The economic advantages of different treatments were compared taking the non-fat feeding, non-hormonal treated group (GI) as standard. For estimating different cost benefit factors, the following values were considered. Cost of bypass fat – Rs. 240 per Kg; Cost of GnRH (5 ml) – Rs. 350; Cost of PGF 2α (2 ml) – Rs. 160; Professional charges for one visit – Rs. 200; Cost of milk – Rs. 43 per Kg; Savings on conception – Rs. 5000 per animal if conceived within study period.

The total cost incurred and the benefits of feeding bypass fat are summarized in Table 4. From the table, it can be seen that feeding bypass fat has a financial advantage over the other group. Same time it was also observed that feeding bypass fat alone is comparable to that combined with hormonal treatment in an economical point of view. On the other hand, the animals in group IV, which were undergone hormonal treatment alone did not yield considerable economic benefit.

These results are in concomitant with earlier study reports of better economic benefits from feeding bypass fat to dairy animals [26, 27].

The results of present study indicate that bypass fat feeding improves the production and reproduction performance of post-partum dairy animals. It can be concluded that bypass fat feeding is an economical and environment-friendly recommendation for improving the reproductive efficiency of high producing crossbred cows.

Table 4: The relative cost benefit analysis of feeding bypass fat in different groups

Sl. No.	Item	GI	GII	GIII	GIV	GV
I	Relative cost incurred (GI as standard)					
a	Cost of bypass fat (85 days @ 200 g daily - Rs. 240 per Kg	0	1440	4080	5520	0
b	Cost of Hormones (GnRH and PGF2α)	0	0	0	0	510
c	Professional charges (3 visits)	0	0	0	0	600
	Total relative cost	0	1440	4080	5520	1100
II	Relative Savings (GI as standard)					
a	Savings on conception (In GI – 5000; GII-15000; GIII- 20000; GIV – 5000)	0	5000	10000	10000	0
b	Savings from extra milk yield (Groups without fat feeding were taken as standard and the extra yield (Kg) in GII – 46.74; GIII – 226.28; GIV – 264.5; GV-129.3)	0	2009.82	9730.04	11373.5	5559.9
	Total savings	0	7009.82	19730.24	21373.5	5559.9
III	Relative benefit of fat feeding (Group)	0	5569.82	15650.04	15853.5	4449.9
	Relative benefit of fat feeding (Per Animal)	0	928.30	2608.34	2642.25	741.65

References

1. Nowicki A, Barański W, Baryczka A, Janowski T. OvSynch protocol and its modifications in the reproduction management of dairy cattle herds – an update. Journal of Veterinary Research. 2017; 61:329-336.
2. Kumar H, Booshan N, Barman P, Patra MK. Economics of hormonal treatment on estrous induction and fertility in anestrous buffaloes under rural conditions. Indian Journal of Veteterinary Research; 2010; 9:8.
3. Naik PK. Bypass fat in dairy ration-A review. Animal Nutrition and Feed Technology. 2013; 13:147-163.
4. Sklan D, Kaim M, Moallam U, Folman Y. Effect of dietary calcium soaps on milk yield, body weight, reproductive hormones, and fertility in first parity and older cows. Journal of Dairy Science. 1994; 77:1652-1660.
5. Naik PK, Saijpaul S, Sirohi AS, Raquib M. Lactation response of cross bred dairy cows fed indigenously prepared rumen protected fat - A field trial. Indian Journal of Animal Sciences. 2009; 79:1045-1049.
6. ICAR. Nutrient requirements of cattle and buffalo. ICAR, New Delhi, 2013.
7. Hagen NP, Lhermie G, Florentin S, Merle D, Frein P, Gyrard V. Effect of gonadorelin, lecirelin, and buserelin on LH surge, ovulation, and progesterone in cattle. Theriogenology. 2015; 84:177-183.
8. KVASU. Package of Practices Recommendations, Kerala Veterinary and Animal Sciences University, Pookot, Wayanad, Kerala, 2016.

9. Snedecor GW, Cochran WG. Statistical Methods, 8th Ed. The Iowa State University Press, Ames, Iowa, USA, 1994.
10. Ferguson JD, Sklan D, Chalupa WV, Kronfeld DS. Effects of hard fats on in vitro and *in vivo* rumen fermentation, milk production, and reproduction in dairy cows. Journal of Dairy Sciences. 1990; 73:2864-2879.
11. Sklan D, Tinsky M. Production and reproduction responses by dairy cows fed varying undegradable protein coated with rumen bypass fat. Journal of Dairy Sciences, 1993; 76:216-223
12. McNamara S, Butler T, Ryan DP, Mee JF, Dillon P, O'mara FP *et al*. Effect of offering rumen-protected fat supplements on fertility and performance in spring-calving Holstein-Friesian cows. Animal Reproduction. Science, 2003; 79:45-56.
13. Kaur H, Arora SP. Dietary effects on ruminant livestock reproduction with particular reference to protein. Nutritional Research. Review. 1995; 8:121-136.
14. Mattos R, Staples CR, Thatcher WW. Effects of dietary acids on reproduction in ruminants. Review of Reproduction. 2000; 5:38-45.
15. Randel RD. Nutrition and post-partum rebreeding in cattle. Journal of Animal Sciences. 1990; 68:853-862.
16. Schillo KK. Effects of dietary energy on control of luteinizing hormone secretion in cattle and sheep. Journal of Animal Sciences. 1992; 70:1271-82.
17. Hightshoe RB, Cochran RC, Corah LR, Kiracofe GH, Harmon DL, Perry RC. Effects of calcium soaps of fatty acids on post-partum reproductive function in beef cows. Journal of Animal Sciences. 1991; 69:4097-4103.
18. Wehrman ME, Welsh THJ, Williams GL. Diet-induced hyperlipidemia in cattle modifies the intrafollicular cholesterol environment, modulates ovarian follicular dynamics, and hastens the onset of post-partum luteal activity. Biology of Reproduction. 1991; 45:514-522.
19. Lammoglia MA, Willard ST, Oldham JR, Randel RD. Effects of dietary fat and season on steroid hormonal profiles before parturition and on hormonal, cholesterol, triglycerides, follicular patterns and post-partum reproduction in Brahman cows. Journal of Animal Sciences. 1996; 74:2253-2262.
20. Parmar SC, Dhami AJ, Hadiya KK, Parmar CP. Early Embryonic Death in Bovines: An Overview. Raksha Technical Review. 2016; VI(1):6-12
21. Fahey J, Mee JF, Murphy JJ, Callaghan DO. Effects of calcium salts of fatty acids and calcium salt of methionine hydroxyl analog on plasma prostaglandin F2 alpha metabolite and milk fatty acid profile in late lactation Holstein-Friesian cows. Theriogenology. 2002; 58:1471-1482.
22. Schroeder GF, Gagliostro GA, Bargo F, Delahoy JE, Muller LD. Effects of fat supplementation on milk production and composition by dairy cows on pasture, a review. Livestock Production Sciences. 2004; 86:1-18.
23. Tyagi N, Thakur SS, Shelke SS. Effect of bypass fat supplementation on productive and reproductive performance in crossbred cows. Tropical Animal Health and Production. 2010; 41:1749-1755.
24. Polidori F, Rossi CA, Senatore EM, Savoini G, Dell'orto V. The effect of bovine somatotropin and calcium salts of long chain fatty acids on milk from Italian buffalo. Journal of Dairy Sciences, 1997; 80:2137-2142.
25. Tyagi N, Thakur SS, Shelke SS. Effect of feeding bypass fat supplementation on milk yield composition and nutrient utilization in crossbred cows. Indian Journal of Animal Nutrition, 2009; 26:1-8.
26. Yadav G, Roy A, Singh M. Effect of prilled fat supplementation on milk production performance of crossbred cows. Indian Journal of Animal Nutrition, 2015; 32:133-138.
27. Mane SH, Fulpagare YG, Deokar DK, Kankhare DH, Adangle SA. Milk yield and composition in crossbred cows as influenced by feeding rumen protected protein and fat. Indian Journal of Animal Nutrition. 2016; 33:114-17.