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EFFECT OF STEAMING UP UPON MILK PRODUCTION AND REPRODUCTIVE PERFORMANCE IN CROSSBRED COWS

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ABSTRACT

Present study was conducted to evaluate the effect of steaming-up upon pre-calving and post-calving growth performance in crossbred cows at the dairy farm of Banaras Hindu University Varanasi in Uttar Pradesh. Twelve animals (S X J) (7 heifers and 5 cows) were assigned to two groups each having six animals. These animals were either first calvers or in second lactation. The cows in this groups had the same characteristics and attributes in respect of body weight, lactation and age. The age of experimental animals varied between 2-6 years. The average body weight of the two groups viz. Control group (T1) and Steaming-up group (T2) at the start of the experiment were 290.33kg and 290.66kg respectively. These animals were offered concentrate feed (20.1% crude protein) individually in the morning . Crossbred cows of Treatment group T2 (Steaming up group n=6) were fed additional feed @4kg concentrate and 5kg wheat straw per animal per day with similar composition during last weeks of gestation and control group T1 (n=6) without any additional concentrate feed. The cows in T2 produced 3.07±0.89 kg colostrum per cow compared to 1.78±0.65 kg per cow in T1. The average milk yield (kg/cow/day) in T2 and T1 were 6.48±2.56 and 4.19±0.9kg respectively. On the basis of FCM the milk yield in the two groups T2 and T1 were 7.73 and 5.12kg /cow/day. Steaming-up group cows had a peak yield of 8.4±3.4 and in control group 5.6 ± 1.41 kg. It took only 28.6±11.3 days to reach the peak yield in T2 compared to 31.5±19.06 days in T1. The cows with higher peak yield also took lesser number of days to reach the peak yield. Regarding reproductive performance, only three cows came into heat within 90 days past calving whereas none in Control group returned to heat by this period. It is thus concluded that steaming-up of cows with 4 kg of concentrate had a better effect on colostrums and milk yield, peak yield and reproductive performance compared to feeding 2kg of concentrate supplements.

Keywords : **Steaming, milk production, reproductive, cow**

India has the largest bovine population and ranks first in milk production in the world. In 2013-14, Indian milk production was about 138 million tonne taking the average per capita milk availability to 307g against recommended norms of 290 g/day/person. According to the 19th Livestock Census, there are about 300 million bovines of which, 190.9 million are cattle that includes 151.17 million indigenous and 39.73 million crossbred/exotic cattle. The indigenous cattle, in particular, have been instrumental in providing milk, milk products, draught power, bio-fertilizer and bio-fuel besides producing bio-molecules and other products beneficial for human health. (DARE & DG ICAR's Desk April-June 2015). However, it is often agreed that the first rank of India is because of not higher productivity of dairy animals but because of the higher population. The low productivity of cattle is primarily due to poor genetic potential, inadequate supply of nutrients or unscientific approach for feeding. In order to improve productivity and profitability in dairy farming there is need to adopt the scientific feeding strategies for dairy animals.

Extra feeding of nutrients (steaming-up) helps in enhancing the milk production of cows (Chicco *et a1. 1982,* Gargantini *et al.* 1984, Olson *et al.* 1998, Singh *et al.* 2003 and Khan *et l.*2002) also observed that cows with restricted level off feeding

produced slightly more milk than the cows that were on *ad lib.* diet during the last trimester of pregnancy. They do not always supplement milking animals with adequate quantity of concentrate but only a small quantity during milking. Supplementation with concentrates is a key aspect for improving productivity in tropical dairy production. Improved nutrition during the pre-mating period stimulates ovulation and conception rates (Robinson *et al.*, 2006). On the other hand, enhancing nutrition by supplementary concentrate diet during the late gestation period increases birth weights of calves and milk production from the dam (Sanh, 2009). According to some authors two-third of the live weight gain in a mature pregnant cow takes place during 90 day before calving which is most important because 50 percent of increase in weight takes place during this period. While the moderate body conditioning before calving seaming up may result in increased milk production on the other hand over conditioned cows may develop physiological imbalances and their productivity, including reproductive efficiency may also decline. Over conditioning of cows before calving may also cause economic loss to the dairy owners. As such the optimum state of body condition before calving has not yet been established. Divergent views are available in literature With a view to ascertain the optimum level of steaming up which may lend the desired body condition of cows before calving , The objectives were to evaluate effect of steaming-up upon the colostrums, milk production and post partum reproductive performance such as Birth weight of calves, Calving difficulties, Open days(return of heat period), Service required for conception in crossbred cows maintained at Institute of Agricultural Sciences dairy farm , Banaras Hindu University, Varanasi.

Materials And Methods

This investigation was carried out at the dairy farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, situated in the eastern part of Uttar Pradesh which extends from 80°30' E and 23°45'N to 28°30'N, it is situated at an altitude of 128.93m above the mean sea level and enjoy a subtropical climate. The average rainfall at Varanasi is about 1100mm per annum. Twelve crossbred (S x J) pregnant cows ranging from 2 years to 6 years of age were selected from the dairy farm. Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, during January-February. The selection animals were in their advanced stage of pregnancy (Six months of pregnancy). These animals were either first calvers or in second lactation. The animals were weighed using Avery Dial type weigh bridge. All weighments were done consecutively for two days in the morning before feeding the pregnant heifers and cows. The twelve animals (7 heifers and 5 cows) were assigned to two groups each having six animals. The cows in this groups had the same characteristics and attributes in respect of body weight, lactation and age. The age of experimental animals varied between 2-6 years. The average body weight of the two groups viz. Control (T_1) and Steaming-up Group (T_2) at the start of the experiment were 290.33kg and 290.66 kg respectively. The shed intended to house the experimental animals was given a thorough face lift by washing and using disinfectants. The floors were properly repaired by filling all cracks and crevices and cementing of barren walls, proper ventilation of the sheds was ensured. Mangers were properly cleaned and disinfected. Animals were housed in separate experimental pens. The two groups, thus formed were randomly assigned one of the two feeding regimes which is Control group (T_1) were offered 5 kg wheat straw and 2kg concentrate and Steaming-up group (T_2) were provided with 5kg wheat straw and 4 kg concentrate. The concentrate offered were procured from parag feed factory, Pradeshik Co-operative Dairy Federation (PCDF), Ramnagar, which contained 20.1 percent CP, 2.5 % Crude fibre, 4%sand and silica , 1% urea, 2% salt, 0.5% calcium, 0.5% phosphorus, 5000 IU/kg

vitamin A and D_3, and 2500 Kcal/kg M.E. value. The experimental animals thus selected were provided with the ration as described in the preceding paragraph. The animals were fed twice a day at 8.00AM. and at 2.00PM. They were also offered water twice a day. The coloustrum produced by cows were recorded for the 1st 5 days. Thereafter milk production for 3 months were recorded. In addition to the above observations peak yield of each cow and the day taken to attain it were also noted down. The animals were weighed immediately after calving, along with the weight of the new born calves. Parturition difficulties, if any were also noted. The weights of these experimental animals were also taken at the end of 90 days period. The feed intakes of all the animals under experiment were also recorded after calving. In order to compare the milk from the two groups, the whole milk was converted into fat corrected milk (FCM).

Result And Discussion

COLOSTRUM AND MILK YIELD: The animals in treatment T_2 (Steaming-up) group produced 15.36kg colostrums per cow in 5 days which was significantly higher than that produced in treatment T_1 (Control) group which was 8.93 kg per animal in 5 days. Table -1 shows the fortnightly milk production in the two treatment groups. The milk yield (kg per cow per day) during first 15days in T_2 was 6.85 which increased to 7.6kg in second fortnight and declined subsequently to 5.69 kg in the 6th fortnight. Similarly the milk yield per cow day in T_1 (Control) was 4.07kg during 1st 15days which peaked to 4.87kg in 3rd fortnight and declined subsequently. The overall milk yield per cow per day was 6.48±2.56kg in T_2 and 4.19±0.9kg in T_1 (Control) group. However, significant increase milk production due to higher feeding level was reported in the multiparous cows by chicco et al. (1982), Olson et al. (1998) and singh et al. (2003).

The total milk produced by cows in 90 days in T_2 (Steaming-up) group was 601.2 kg compared to only 390.0kg in T_1 (control) group. The average milk fat percentages in T_2 and T_1 were 5.3 and 5.5 respectively. To compare the milk produced by cows in two groups the total milk yield was converted into FCM (Table-2). The cows in T_2 produced 718.4 kg of FCM compared to 466.05 kg in T_1 (Control). The considerable reduction in milk yield in terms of FCM in T_1 (Control) group may be on account of higher fat percentage in the milk from this group.

Table 1: mean value of colostrum & milk production under study.

Particulars	Treatments	
	T_1 (Control) Group.	**T_2 (Steaming-up) Group.**
Colostrum kg/Cow/day	1.78±0.65	3.07±0.89
Days	**Milk Production (kg/cow/day)**	
5-20	4.07±1.05	6.85± 3.34
21-35	4.67±1.15	7.46±3.47
36-50	4.87±1.25	6.98±2.84
51-65	4.43±1.11	6.58±2.46
66-80	4.27±0.87	6.51±2.35
81-95	3.86±0.90	5.69±1.75
Overall average (kg/cow/day)	4.19±0.9	6.48±2.56

Table- 2: Average milk fat in different groups.

Particulars	Treatments	
	T_1 (Control) Group.	T_2 (Steaming-up) Group.
Average milk yield in 90 days (kg)	390.00	601.226
Milk fat (%)	5.5	5.3
Average milk fat	20.67	31.864
FCM (kg)	466.05	718.450

T_1 (Control) Group - FCM =0.4m+15F

0.4 x 390 + 15 x 20.67=466.05

T_2 (Steaming-up) Group - FCM=0.4m+15F

0.4 x 601.226 + 15 x 31.864 = 718.450

Table - 3 shows the FCM produced during different periods of time in groups T_2 and T_1 (Control). In T_2 the highest FCM produced (kg/cow/day) was 8.9 kg in second fortnight whereas it was 5.94 kg in third fortnight in T_1. The overall FCM (kg/cow/day) during first 90 days of lactation were 7.73 kg compared to 5.12 kg in the two groups T_2 and T_1 respectively.

A number of workers (Szule et al. (1992), Tvrznik et al. (1992), Zhbnov (1994), Nicolac and Stoica (1995) , Prasad and Tomer (1997), Ballard et al., (2001) and K.S. Das et al. (2007), K.V. Mithuna et al. (2015). have reported the higher yield suggests that the challenge feeding had a positive effect on milk yield and found a similar observation. Supplementing cows during late pregnancy helps cows to build up their body reserve so that higher milk is sustained in the subsequent lactation. The nutrient supplementation may lower stress during early lactation, and this may be the reason for significant increase in milk yield of the present study. The result obtained in our experiment also support the observations reported by earlier workers.

Table- 3 : mean value of FCM in crossbred cows under study.

Particulars	Treatments	
	T_1 (Control) Group.	T_2 (Steaming-up) Group.
Fat (%)	5.5	5.3
Days	**FCM Production (kg/cow/day)**	
5-20	4.95	8.18
21-35	5.78	8.9
36-50	5.94	8.32
51-65	5.41	7.85
66-80	5.21	7.77
81-95	4.72	7.77
Overall average (kg/cow/day)	5.12	7.73

PEAK YIELD: Pregnant cows which were given higher plane of nutrition during last 60-90 days before calving built up higher body reserve which is reflected in higher peak yield which is sustained for longer duration. Table-4 indicates that the cows in treatment T_2 had a peak yield of 8.4±3.46kg compared to only 5.66±1.41kg in Control group. Moreover it took only 28.6 days to attain the peak yield in T_2 compared to 31.5 days in T_1. Thus the animals in T_2 produced significantly more amount of milk compared to animal in treatmentT_1. Steaming up of cows during late gestation not only supports higher milk yield but also the peak yield is achieved earlier as has been observed in this experiment. Thus the total lactation yield is higher in cows provided with more amount of supplement.

Perusal of table-4 reveals another interesting fact that higher the milk production, lesser in the time to reach the peak yield. In our experiment the cow CB 229 with 14.0 kg peak yield took only 15 days to reach the peak yield whereas the cow HH335 with 3.8 kg peak yield took 69days to reach this level.

Table -4: Peak yield in different groups

Treatments							
T_1 (Control) Group.				**T_2 (Steaming-up) Group.**			
S.N.	Breed and brand No.	Peak yield (kg)	No of days taken to reach peak yield (days)	S.N.	Breed and brand No.	Peak yield (kg)	No of days taken to reach peak yield (days)
1.	CBH 261	5.0	12	1	CB 229	14.0	16
2.	CBH 233	5.0	15	2	CBH 251	4.0	48
3.	CBH 235	8.4	35	3	CBH 218	7.0	34
4.	HH 335	3.8	69	4	SH 397	6.6	22
5.	CB 149	6.0	22	5	HH 338	-	-
6.	HH 337	5.8	36	6	CB 216	10.4	23
Over all Mean ±SD		5.66± 1.41	31.5±19.06	Over all Mean ± SD		8.4±3.46	28.6±11.30

REPRODUCTIVE PERFORMANCE: The reproductive performance as indicated by inter service period are presented in table-5. It is pertinent to note that three of the six cows in T_2 returned to heat within 90 days of calving whereas none of the cows showed heat symptom in treatment T_1. Steaming up of cows during late pregnancy has positive reproductive behaviour post partum. Staples et al. (1990) reported that well fed cows during late pregnancy returned to heat earlier post calving. Rasby et al. (1990), Staples et al. (1990), Bruckental et al. (1996), Ki Kwangseok et al. (1996), Fordyce et al. (1997) and Domecq et al. (1997) have also observed that the days between calving to first estrus were fewer when pregnant cows were offered higher plane of nutrition.

Table -5: Number of days between calving and next service in different groups under study.

Treatment					
T1 (Control) Group.			T2 (Steaming-up) Group.		
S. N.	Breed and brand No. of Cow	Inter service period (days) [Until 90 days post calving)	S. N.	Breed and brand No. of Cow	Inter service period (days) [Until 90 days post calving)
1.	CBH 261	-	**1.**	CB 229	-
2.	CBH 233	-	**2.**	CBH 251	-
3.	CBH 235	-	**3.**	CBH 218	51
4.	HH 335	-	**4.**	SH 397	30
5.	CB 149	-	**5.**	HH 338	77
6.	HH 337	-	**6.**	CB 216	-
Mean ± SD		-	Mean ± SD		52.66± 19.22

Marstion (1995) and Zurek et al. (1995) have reported that when the energy balance in late pregnancy was low there was an inhibition of ovarian activity postpartum and hence cows took more number of days to return to heat. Similarly, Rosby et al. (1990) concluded that nutrition intake and / or as body condition score during late gestation influenced placental weight, fructose in amnionic fluid, and placental lactogen, oestrogen and oestradiol in plasma. Thus it is absolutely necessary to maintain good body condition during pregnancy to have better post partum reproductive performance.

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