



Effect of Challenge Feeding on Prepartum and Postpartum Dry Matter Intake in Sahiwal Cattle in the Arid Region of Rajasthan

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ABSTRACT

The present study was carried out with the objective of investigating the effect of challenge feeding on prepartum and postpartum dry matter intake in Sahiwal cattle. The present study was conducted on eighteen healthy, advance pregnant Sahiwal cattle from 60 days prepartum to 120 days postpartum. The animals were divided into two groups *i.e.* control and treatment on the basis of milk yield, parity and body weight. The animals in control group were given standard ration while in challenge fed (treatment) group, the animals were given additional amount of concentrate mixture. Both the groups were offered *ad libitum* dry fodder during entire period of study. The mean DMI (kg) in control and treatment group cows during prepartum period was 8.37 ± 0.35 and 9.34 ± 0.36 kg/d, respectively which did not differ significantly between treatments. The postpartum DMI was significantly higher ($P < 0.05$) in treatment group (11.04 ± 0.10 kg) as compared to control group (9.38 ± 0.06 kg).

Key words: Challenge feeding, Concentrate mixture, DMI, Postpartum, Sahiwal

INTRODUCTION

India has a great population of indigenous cows but the performance of these animals is not upto their genetic potentials. The lactation yield of our indigenous cattle is very low. In rural areas indigenous animals are often fed with low quality feeds and agricultural byproducts which have low nutritive value. In our country there is an acute shortage of green especially leguminous fodder as most of the land area is utilized for food grains production and the milch animals are deprived of good quality fodders. In addition to this, in India, concentrate feeding to animals is neglected during dry period as well as in milking stage due to poor economic condition of livestock farmers, so these dairy animals are deprived of essential nutrients. These nutrients are very much essential to fulfill the requirements of growth and maintenance of fetus, placenta and uterus as well as to replenish the body tissue losses due to milk production postpartum. This inadequacy of concentrate feeding along with low availability of good quality green and leguminous fodders is the major reason behind the poor productivity of our indigenous cattle population.

The period from two months pre-calving to three months post calving which includes the transition period is the most stressful period in the annual cycle of dairy cow. It is physiologically and nutritionally a very stressful period, particularly as feed intake is reduced, while the demand for support of foetal growth and initiation of milk synthesis are increased. During late gestation, feed intake is reduced (Hernandez-Urdenata *et al.*, 1976; Johnson and Otterby, 1981; Olsson, 1996; Murphy, 1999), particularly in the last few days of pregnancy. This period is very important for the animals to augment body reserve to meet the demands of growing foetus and to avoid negative energy balance peripartum. The scope of the present study was to investigate the response of the challenge feeding on prepartum and postpartum dry matter intake in Sahiwal cattle assigned to different feeding levels during the prepartum and postpartum period.

MATERIALS AND METHODS

The present study was conducted at the Livestock Research Station, Kodamdesar, RAJUVAS, Bikaner (Rajasthan) from 1st October'18 to 30 June'19. Eighteen (18) pregnant Sahiwal cattle were selected 2

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Table 1. Prepartum feeding schedule

Days prepartum	Control group	Treatment group (Challenge fed group)
60 days to 22 days	Forage - <i>ad lib.</i> Concentrate - 2 kg/day	Forage - <i>ad lib.</i> , Concentrate - 3.5 kg/day
21 days to 0 day	Forage - <i>ad lib.</i> Concentrate - 3.5 kg/day	Forage - <i>ad lib.</i> , Concentrate - 3.5 kg +250 gm/day till it reaches 1% body weight

months prior to calving according to data obtained from breeding records of animals. These pregnant animals were distributed into two groups based on parity, body weight and milk yield of previous lactations to maintain homogeneity among experimental animals. The same process was adopted until there were nine animals in each treatment group. The experimental animals were separated from the main herd 7-10 days before start of experiment to acclimatize these experimental animals in the new suggested environment.

During last two months of gestation specified quantity of concentrate according to treatment plans were offered to animals once in a day after weighing in spring balance in the morning (Table 1). Dry fodder was offered *ad libitum*. Wheat straw was the main sources of dry fodder provided to animals. Weighed quantity of dry fodder was provided once in a day in the morning. Some leftover was a must as an indicator of *ad libitum* feeding. The leftover was collected and weighed to record actual amount of feed consumed by the animals.

For a period of 120 days after the calving all the animals were given control and treatment diets as per feeding plan (Table 2). Postpartum concentrate feeding was done twice a day in two equal installments along

with sodium-bicarbonate to avoid bloat, tympany and indigestion due to overeating of concentrates. Dry fodder was provided *ad libitum* to animals.

Daily intake of concentrate and roughage was recorded for individual animals. Measured quantities of concentrates and roughage were offered to animals and the leftover was collected next day in the morning and weighed. The leftover was subtracted from the initial feed supplied to know the actual amount of feed consumed by an animal. Dry matter of dry fodder and concentrate were estimated by drying the samples at $100 \pm 1^\circ\text{C}$ overnight in hot air oven.

Statistical analysis

Data collected from this experiment were statistically analyzed as per Snedecor and Cochran (1994) for two groups by using statistical 't' test. Data were expressed as Mean $\pm$ S.E. For calculation of Mean and S.E, descriptive statistics was used. Comparable means differed significantly, if $P < 0.05$ i.e. at 5 % level of significance.

RESULTS AND DISCUSSION

The data on means $\pm$ SE of total daily dry matter intake per cow by control and treatment group during the prepartum period is presented in Table 4. The

Table 2. Postpartum feeding schedule

Days postpartum	Control group	Treatment group (Challenge fed group)
1 st two weeks	Forage - <i>ad lib.</i> Concentrate for maintenance - 2 kg/day, Forage - <i>ad lib.</i> Concentrate for maintenance - 2 kg/day	Concentrate for production - 1 kg/3 kg of milk Concentrate for production - 1 kg/3 kg of milk + 500 gm concentrate/day till free choice level
2 nd week onwards to 16 th week	Forage - <i>ad lib.</i> Concentrate for maintenance - 2 kg/day, Concentrate for production - 1 kg/3 kg of milk	Forage - <i>ad lib.</i> Concentrate - Free choice

Table 3. Mean±SE of daily dry matter intake (kg) from concentrate and dry fodder by control and treatment group during prepartum period

Weeks before calving	Feedstuff			
	Concentrate		Dry fodder	
	Control	Treatment	Control	Treatment
1.	1.77±0.003	3.10±0.004	6.06±0.10	6.21±0.16
2.	1.77±0.003	3.11±0.003	6.45±0.26	6.61±0.21
3.	1.77±0.002	3.11±0.002	6.78±0.17	7.31±0.23
4.	1.78±0.002	3.11±0.001	6.98±0.20	6.69±0.19
5.	1.79±0.001	3.12±0.001	6.76±0.18	6.49±0.22
6.	3.11±0.001	3.41±0.017	6.12±0.14	6.15±0.15
7.	3.07±0.003	3.49±0.020	5.41±0.31	5.16±0.26
8.	3.06±0.002	3.43±0.013	4.38±0.08	4.68±0.22
Overall	2.26 ^a ±0.075	3.23 ^b ±0.02	6.12±0.12	6.11±0.13

*Means bearing different superscripts differ significantly (P<0.05)

overall means of daily dry matter intake for the two month prepartum period were 8.37±0.35 and 9.34±0.36 kg for control and treatment group, respectively. The difference in the means of daily dry matter intake of the two treatment groups during the prepartum period were found to be non- significant but higher by about 970 gm per day in treatment group as the cows of treatment group were supplemented only one kg of concentrate mixture over the control group for most of the prepartum period. The means of daily dry matter intake per cow through concentrate mixture ranges from 1.77 to 3.06 kg for control group with an overall mean of 2.26 kg and from 3.10 to 3.43 kg for treatment group

with an overall mean of 3.23 kg during the prepartum feeding period (Table 3). The means of daily dry matter intake per day through dry fodder ranged from 4.38 to 6.06 kg for control group with an overall mean of 6.12 kg and from 4.68 to 6.21 kg with an overall mean of 6.11 kg for treatment group during the prepartum period. The dry matter intake from concentrate mixture was significantly (P<0.05) higher in the treatment group of cows as compared to control group of cows which was on expected lines as the treatment group of cows were offered additional amount of concentrate mixture as per the experimental plan. The mean daily matter intake through concentrate mixture intake

Table 4. Mean±SE of total daily dry matter intake (kg) by control and treatment group during prepartum period

Period (In weeks)	Control group	Treatment group
1.	7.82±1.06	9.31±0.95
2.	8.21±0.97	9.71±1.05
3.	8.55±0.99	10.42±1.00
4.	8.76±1.04	9.81±1.07
5.	8.53±1.10	9.60±1.04
6.	9.23±1.00	9.56±1.09
7.	8.48±1.04	8.65±1.06
8.	7.42±0.91	7.66±0.95
Overall	8.37±0.35	9.34±0.36

progressively increased from first to sixth week of feeding and then showed a decline in last two weeks before parturition in control group whereas in treatment group the mean daily matter intake through concentrate mixture intake progressively increased from first to seventh week of feeding and then showed a decline in last week before parturition. This decline in the dry matter intake from concentrate mixture prior to parturition may be attributed to stress caused by approaching parturition during which the appetite of animal falls drastically.

The mean daily dry matter intake from dry fodder per cow for the control and treatment group during prepartum period was 6.12 ± 0.12 kg and 6.11 ± 0.13 kg, respectively which did not differ significantly between the control and treatment group. The mean daily intake of dry fodder per cow for the control and treatment group during prepartum period was 6.31 ± 0.12

kg and 6.30 ± 0.13 kg, respectively. The dry matter intake through dry fodder in both the groups showed an increasing trend from first week to fourth week but declined continuously from fifth week to last week of prepartum feeding. Increased size of foetus resulting in decreased GIT capacity as well as high concentrate feeding are the possible reasons for this decline in dry fodder intake in last month of gestation.

The means of total daily dry matter intake per 100 kg body wt. during prepartum period of the animals of the control and treatment group were 2.13 ± 0.09 % and 2.37 ± 0.09 %, respectively which also did not differ significantly. The results obtained regarding dry matter intake during prepartum period in the present study are in agreement to those reported by Kale and Tomer (1991), Panigrahi *et al.* (2005), Kamboj *et al.* (2016), Naik *et al.* (2016) and Raval *et al.* (2019) who observed that feeding on a higher plane prepartum do not affect

Table 5. Mean $\pm$ SE of daily dry matter intake (kg) from concentrate and dry fodder by control and treatment group during postpartum period

Weeks after calving	Feedstuff			
	Concentrate		Dry fodder	
	Control	Treatment	Control	Treatment
1.	3.18 ± 0.18	4.05 ± 0.23	4.63 ± 0.32	3.88 ± 0.38
2.	3.87 ± 0.27	5.79 ± 0.37	4.73 ± 0.38	4.07 ± 0.48
3.	4.10 ± 0.27	5.93 ± 0.35	4.82 ± 0.44	4.31 ± 0.57
4.	4.33 ± 0.28	6.13 ± 0.39	4.88 ± 0.40	4.26 ± 0.57
5.	4.74 ± 0.27	6.53 ± 0.40	4.96 ± 0.43	4.37 ± 0.52
6.	4.86 ± 0.34	7.12 ± 0.39	5.13 ± 0.45	4.53 ± 0.67
7.	4.80 ± 0.35	7.42 ± 0.36	5.12 ± 0.46	4.53 ± 0.58
8.	4.75 ± 0.35	7.37 ± 0.35	5.16 ± 0.46	4.47 ± 0.61
9.	4.64 ± 0.35	7.27 ± 0.31	5.21 ± 0.48	4.58 ± 0.44
10.	4.44 ± 0.32	7.07 ± 0.22	5.25 ± 0.50	4.63 ± 0.61
11.	4.30 ± 0.28	6.97 ± 0.45	5.31 ± 0.32	4.69 ± 0.58
12.	4.16 ± 0.25	6.77 ± 0.46	5.26 ± 0.38	4.74 ± 0.60
13.	3.91 ± 0.27	6.63 ± 0.42	5.41 ± 0.32	4.69 ± 0.60
14.	3.83 ± 0.26	6.52 ± 0.42	5.60 ± 0.33	4.80 ± 0.55
15.	3.72 ± 0.19	6.38 ± 0.47	5.60 ± 0.29	4.96 ± 0.64
16.	3.52 ± 0.17	6.23 ± 0.45	5.78 ± 0.39	5.01 ± 0.52
Overall	$4.20^a \pm 0.08$	$6.51^b \pm 0.11$	$5.18^a \pm 0.10$	$4.53^b \pm 0.14$

*Means bearing different superscripts differ significantly ($P < 0.05$)

dry matter intake significantly. On the other hand, Vande Haar *et al.* (1999), Keady *et al.* (2001), Guo *et al.* (2007) and Ojha *et al.* (2015) have reported that higher feeding regime prepartum increased dry matter intake significantly.

The data on means $\pm$ SE of total daily dry matter intake per cow by control and treatment group during the postpartum period is presented in Table 6. The overall means of daily dry matter intake during 120 days of postpartum period were 9.38 $\pm$ 0.06 kg and 11.04 $\pm$ 0.10 kg for control and treatment group, respectively. The mean daily dry matter intake of the treatment group was significantly higher ($P<0.05$) than the control group during the postpartum period.

The mean daily dry matter intake from concentrate mixture per animal for the control and treatment group during the postpartum period was 4.20 $\pm$ 0.08 kg and 6.51 $\pm$ 0.11 kg, respectively (Table 5). The overall mean daily dry matter intake from concentrate mixture during postpartum period was significantly ($P<0.05$) higher for the treatment group

as the animals of treatment group were offered *ad lib.* concentrate mixture, whereas the control group was offered concentrate mixture based on their milk production. The total concentrate mixture intake per animal for the control and treatment group was 279.63 $\pm$ 18.42 kg and 460.91 $\pm$ 14.62 kg during 120 days postpartum period and significant difference was observed as shown in Table 7. As the milk yield of animals increased, the concentrate mixture intake also increased continuously from first to sixth week in control group and from first to seventh week in treatment group of postpartum experimental period to replenish the body tissue losses that occurred due high milk production. Thereafter milk yield gradually declined, therefore concentrate mixture intake also decreased continuously.

The mean daily dry matter intake from dry fodder per animal for control and treatment group of animals during the postpartum period was 5.18 $\pm$ 0.10 kg and 4.53 $\pm$ 0.14 kg (Table 5). The dry matter intake through dry fodder during postpartum period in control

Table 6. Mean $\pm$ SE of total daily dry matter intake (kg) by control and treatment group during postpartum period

Weeks after calving	Control group	Treatment group
1.	7.82 $\pm$ 0.17	7.93 $\pm$ 0.20
2.	8.61 ^a $\pm$ 0.15	9.85 ^b $\pm$ 0.16
3.	8.92 ^a $\pm$ 0.21	10.24 ^b $\pm$ 0.26
4.	9.22 ^a $\pm$ 0.17	10.39 ^b $\pm$ 0.22
5.	9.69 ^a $\pm$ 0.19	10.89 ^b $\pm$ 0.18
6.	9.99 ^a $\pm$ 0.18	11.65 ^b $\pm$ 0.29
7.	9.92 ^a $\pm$ 0.16	11.94 ^b $\pm$ 0.27
8.	9.91 ^a $\pm$ 0.14	11.84 ^b $\pm$ 0.29
9.	9.84 ^a $\pm$ 0.17	11.85 ^b $\pm$ 0.17
10.	9.72 ^a $\pm$ 0.20	11.71 ^b $\pm$ 0.21
11.	9.61 ^a $\pm$ 0.12	11.66 ^b $\pm$ 0.17
12.	9.42 ^a $\pm$ 0.15	11.52 ^b $\pm$ 0.17
13.	9.32 ^a $\pm$ 0.07	11.31 ^b $\pm$ 0.20
14.	9.43 ^a $\pm$ 0.10	11.32 ^b $\pm$ 0.15
15.	9.31 ^a $\pm$ 0.12	11.34 ^b $\pm$ 0.20
16.	9.30 ^a $\pm$ 0.30	11.24 ^b $\pm$ 0.13
Overall	9.38 ^a $\pm$ 0.06	11.04 ^b $\pm$ 0.10

*Means bearing different superscripts differ significantly ($P<0.05$)

Table 7. Mean±SE of total feed intake (kg) by control and treatment group during postpartum period

Control group		Treatment group	
Feedstuff	Intake	Feedstuff	Intake
Concentrate	279.63 ^a ±18.42	Concentrate	460.91 ^b ±14.62
Dry fodder	336.26 ^a ±5.25	Dry fodder	294.33 ^b ±4.93

*Means bearing different superscripts differ significantly (P<0.05)

group was significantly higher than treatment group. This difference in the amount of dry fodder consumed by control and treatment group may be due to the fact that animals of control group consumed less concentrate than animals of treatment group. The total dry fodder intake per animal for control and treatment group during postpartum period was 336.26±5.25 kg and 294.33±4.93 kg with a significant difference as shown in Table 7. The mean dry fodder intake per day for the control group (5.34±0.10 kg) was significantly higher than treatment group (4.67±0.14 kg).

The total dry matter intake/animal/day per 100 kg body weight basis for the eight week postpartum period was 2.38±0.02 % and 2.80±0.03 % for control and treatment group of animals, respectively. The differences in the total dry matter intake/animal/day per 100 kg body weight basis of control and treatment group during the postpartum period were significant (P<0.05). The results obtained regarding dry matter intake during postpartum period in the present study are in close agreement to those reported by Chaudhary and Jat (2013), Kamboj *et al.* (2016), Medhi *et al.* (2016), Naik *et al.* (2016) and Raval *et al.* (2019) who reported that dry matter intake increased significantly during postpartum period. On the other hand, Vande Haar *et al.* (1999), Keady *et al.* (2001), Agenas *et al.* (2003), Dann *et al.* (2006) and Guo *et al.* (2007) observed that feeding on a higher plane do not affect dry matter intake during postpartum, which is dissimilar to present study.

CONCLUSIONS

It is concluded that challenge feeding increased dry matter intake during postpartum. However, during prepartum period, Even though challenge feeding caused a numerical increase in dry matter intake the

differences were non-significant. The decline in dry matter intake in last week before parturition was least in treatment group as compared to control group due to challenge feed offered to treatment group as challenge feed reduce the stress.

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