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Evaluation of dry matter intake, body weight and body condition score of primiparous and multiparous Gir cattle

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Abstract

The main objective of this study was to examine effect of parity over Dry matter intake (DMI), Body weight (BW) and Body condition score (BCS) of Gir cattle. Present study was conducted among 12 apparently healthy Gir cows were divided into 6 multiparous and 6 primiparous in the research. Research was conducted on Bhestan Nandini farm (NGO), Surat. DMI was calculated fortnightly by subtracting the DM of offered feed and DM of residue left over within 24 hours during the day of DMI calculation. Multiparous cows (11.88 ± 0.15) have significantly ($p < 0.05$) higher DMI (kg.) than primiparous (10.69 ± 0.20). Perusal of data revealed that the amount of DMI was gradually increases from 1st fortnight to 4th fortnight in both groups of animals. BW of individual Gir cows was recorded starting from the day of parturition and then fortnightly throughout the experiment by using electronic weighing balance. BW (kg.) was significantly ($p < 0.05$) higher in multiparous cows (422.77 ± 14.61) as compared to primiparous (360.77 ± 10.17). This shows that multiparous cows have higher body weight and required higher amount of feed as compared to primiparous. BCS of animals under the study was recorded as per the BCS chart and non-significant between primiparous (2.92 ± 0.06) and multiparous (2.87 ± 0.05). However, BCS of both groups significantly differs within the parity. BCS of both groups gradually decreases from the day of parturition observation to 4th fortnight.

Keywords: Gir cows, parity, primiparous, multiparous, body weight, body condition score, dry matter intake

1. Introduction

In India cattle secured one of the major part of the livestock population. As per 19th Livestock census 37.28% of the livestock population belong to cows in which 79% of the cows population are indigenous. Gir is one of the best milch breed among indigenous cows. Total population of Gir cows is 51.12 lakh which contributes 3.38% of total indigenous cattle population of the country (GOI, 2013) [11].

According to the NRC (2001) [16] nutritional model, primiparous cows consume less feed than multiparous cows; which shows parity of cows also affects DMI. Feeding management for primiparous cows has become more important because the primiparous cow around parturition involves many adjustments like, she has to be milked for the first time, she needs to eat much concentrate, and she needs to grow herself while producing a large amount of milk (Olsson *et al.*, 1998) [17]. Animals are physically not mature at this stage. Primiparous cows at their first calving are in a different metabolic state to that experienced by multiparous cows as they require nutrients for their own continued growth in addition to their developing calf. Primiparous cows are typically smaller, produce less milk and have lower body weight than multiparous cows (Beauchemin and Rode, 1994) [2]. In several studies it was observed that, cows in their first lactation consume less feed and yield less milk than multiparous cows (Dado and Allen, 1994; Beauchemin and Rode, 1994; NRC, 2001) [8, 2, 16].

During the early postpartum period dairy cows mobilize fat and muscle to support lactation, during this stage changes over body weight and body condition score seen visibly. According to Kertz *et al.* (1991) [15] body weight loss was greater in multiparous cows and reached lowest at week 5 to 7 and then progressively increased until week 18; however primiparous cows reached their lowest BW at week 4 and stayed at that level until week 12. Iwama *et al.* (2004) [13] observed that in primiparous cows, BW and DMI were significantly lower than that of multiparous cows. BW and BCS have been the subject of considerable research.

For making managerial decisions an understanding of the effect of BW on milk production under grazing systems could be useful. Although there is a moderate correlation between BCS and BW ($r = 0.55$) was reported by Berry *et al.* (2006)^[6]. BW is also associated with maintenance requirements, as greater BW requiring more energy for maintenance (NRC, 2001)^[16]; because of that associations between BW and milk yield are not same as between BCS and milk yield.

Body condition score (BCS) is an easy and inexpensive method to evaluate the body tissue reserves of lactating cows and body weight (BW). During the early lactation period, milk production induces a negative energy balance by mobilization of body reserve that has been reported to affect the reproductive performance of dairy cows (Beam and Butler, 1999)^[6]. Some authors have documented significant associations between BCS and BW on dairy cow health (Berry *et al.*, 2007)^[5], fertility and milk production (Berry *et al.*, 2003; Hristov *et al.*, 2005)^[4, 12], acknowledging the importance of these measurable characteristics in dairy farm management. Previous research on Holstein- Friesian dairy cows revealed that the average change in BW per unit change in BCS (scale of 1 to 10) was 31 kg under New Zealand condition (Berry *et al.*, 2006)^[6].

The objective of the present study was to compare the differences in feed intake Body condition score (BCS) and Body weight (BW) of primiparous and multiparous Gir cows maintained on TMR based feeding. And compare postpartum changes in DMI, BCS and BW of dairy cows.

2. Materials and Methods

Primiparous and multiparous Gir cows were randomly chosen from a Bhestan Nandini farm, Surat which were calved between August to December, 2017 were used in this experiment. There were 6 animals in each group. All cows were managed in cattle shed which has tail to tail pakka concrete floor. All the multiparous and primiparous Gir cows were fed on TMR based diet twice daily as per the feeding schedule (morning and evening) followed on the farm. Milking was done twice daily at 2:30 AM and 2:30 PM hours by full hand milking method at the place itself. The experimental period was 2 months post-partum for each cow.

2.1 Dry Matter Intake (Kg.)

Dry matter intake (kg.) was recorded fortnightly in a month for both groups (primiparous and multiparous) of animals. Dry matter intake was calculated for TMR feed supplied by subtracting the Dry matter of offered feed and dry matter of residue left over within 24 hours during the day of DMI calculation.

2.2 Body Condition Score (BCS)

Body condition score (BCS) of animals under the study was recorded as per the body condition scoring chart (score 1-5) formulated by Edmonson *et al.* (1989)^[10]. Each area of the cow that was considered important in assigning an overall body condition score was examined individually for changes along a 1 to 5 scale, using 0.25-unit increments, functioning as a 17-point scale. Score of 1 indicated emaciated condition, and score of 5 indicated an obese condition. Animals were scored for BCS first time on day of calving followed by fortnight interval up to 2 months of parturition. Scoring was done by visual observation with palpation at 8 skeletal check points. The eight areas of the cow's body were examined and criteria within each area were used to indicate the body

condition. The eight locations (B1 to B8) examined were in three major regions.

1. Loin - B1 spinous processes, (the vertical prominances of the lumbar vertebrae); B2 depression between the spinous and transverse processes; B3 transverse processes (the transverse prominances of the lumbar vertebrae); B4 overhanging shelf formed by the transverse processes above the flank.
2. Pelvis - B5 tuber coxae (hooks) and tuber ischii (pin bones) bony prominances; B6 depression between the hook and pin bones; B7 depression between the hooks.
3. Tail head - B8 spinous and transverse processes of the coccygeal vertebrae and ischiorectal fossa (depression beneath the tail).

Thus, BCS of the all the animals was recorded at five stages as described in table-2.2.1:

Table 1: Post-partum BCS observations

Stages	Post-partum observation
1	On day of Parturition
2	1 fortnight
3	2 fortnight
4	3 fortnight
5	4 fortnight

2.3 Body Weight (BW)

Body weight (kg.) of individual Gir cows was recorded starting from day parturition and then fortnight interval throughout the experiment by using weighing balance.

Table 2: Post-partum body weight (BW) observations

S. No.	Post-partum observation
1	On day of Parturition
2	1 fortnight
3	2 fortnight
4	3 fortnight
5	4 fortnight

2.4 Statistical Analysis

The data on DMI, BW and BCS were subjected to statistical analysis by using SPSS (Statistical Package for Social Sciences, Version 20.0) software. Descriptive statistics specifying Mean±S.E was calculated for each group. One way ANOVA procedure was undertaken to compare means. Post Hoc multiple comparisons were made using Duncan Multiple New Range Test (DMNRT). Independent sample t-test was used for two group comparisons. Correlation between data of every fortnight observation of DMI, BW and BCS were calculated by using Pearson Correlation in SPSS software.

3. Results and Discussion

3.1 Dry Matter Intake (DMI)

One of the primary objectives of dairy producers is to promote dry matter intake to support milk production. Notable research to date has been focused on improving DMI of lactating dairy cows by changing the nutrient composition of feeds. However, the DMI of dairy cows is also affected by the feeding behavior of the cows, which is modulated by the environment, management practices, health, and social interactions.

The effect of parity on dry matter intake (DMI) in Gir cows during experiment at fortnight interval under study is presented in Table 3.1. Overall DMI significantly higher in multiparous cows (11.88±0.15 Kg.) as compared to

primiparous cows (10.69±0.20 Kg.). The maximum mean of DMI obtained on 4th fortnight in both groups. The minimum mean of DMI obtained on 1st fortnight in both groups. Moreover the mean of DMI gradually increases from 1st fortnight to 4th fortnight after parturition in both the groups. While comparing within the group the DMI of Gir cows showed no significant difference ($p > 0.05$) in both groups of the animals.

In present study DMI in group – 2 was overall significantly higher than the group – 1. Similar to present findings DMI after parturition was significantly higher in multiparous than primiparous has been reported by Kertz *et al.* (1991) [15],

Sniffen (1991) [20], Dado and Allen (1994) [8], Beauchemin *et al.* (2002) [3], Drackley *et al.* (2003) [9], Iwama *et al.* (2004) [13] and, Janovick and Drackley (2010) [14]. This might be due to multiparous cows with their larger body size (resulting in increased BW) and lactation demands require more feed, which likely contributes to increased feeding rate and increased DMI compared to primiparous cows. DMI gradually increases from 1st fortnight to 4th fortnight after parturition in both the groups might be due to high DMI supports the milk yield production which was also gradually increases.

Table 3: Effect of parity on DMI (Kg.) of Gir cows

Period (Fortnight)	n	Primiparous (Group - 1)	Multiparous (Group - 2)	t value	p value
1	6	10.33±0.46	11.67±0.31	-2.412	0.037
2	6	10.42±0.30	11.92±0.33	-3.378	0.007
3	6	10.83±0.44	11.92±0.33	-1.973	0.077
4	6	11.17±0.33	12.00±0.29	-1.890	0.088
Overall	24	10.69±0.20	11.88±0.5	-4.854	0.000

[Mean without superscript (a, b) in a column did not differ significantly within groups and conditions respectively at $p < 0.05$.]

3.2 Body Weight (BW)

The effect of parity on body weight (BW) in Gir cows during various fortnights under study is presented in Table 3.2.1. Overall BW was significantly ($p < 0.05$) higher in multiparous cows (422.77±14.61 Kg.) as compared to primiparous cows (360.77±10.17 Kg.). The mean BW of Gir cows did not differ significantly ($p > 0.05$) between group-1 and group-2 on different test day. While comparing within the group the BW

of Gir cows no significant difference ($p > 0.05$) was observed. In present study overall body weight in group – 2 was significantly higher than the group – 1. Dairy temperament after parturition was significantly higher in multiparous than primiparous cow. Similar finding was also reported by Iwama *et al.* (2004) [13], Berry *et al.* (2006) [6] and Poncheki *et al.* (2015) [18].

Table 4: Effect of parity on body weight (Kg.) of Gir cows

Period (Fortnight)	n	Primiparous (Group - 1)	Multiparous (Group - 2)	t value	p value
At the day of parturition (0 day)	6	363.50±23.44	424.67±35.27	-1.444	0.179
1	6	360.83±24.55	423.00±35.36	-1.444	0.179
2	6	359.83±25.04	422.50±35.22	-1.450	0.178
3	6	359.83±24.67	421.50±35.18	-1.435	0.182
4	6	359.83±24.67	422.17±34.86	-1.460	0.175
Overall	30	360.77±10.17	422.77±14.61	-3.483	0.001

[Mean without superscript (a, b) in a column did not differ significantly within groups and conditions respectively at $p < 0.05$.]

3.3 Body Condition Score (BCS)

The BCS system is idiosyncratic scoring method of evaluating the energy reserves of dairy animals which provides a better understanding of biological relationship between body fat, milk production and reproduction that helps in adopting the ideal managerial practices to derive maximum production and maintain better health status. The BCS system is a universally accepted, quick and inexpensive method to estimate the degree of fatness (Bittante *et al.*, 2004) [7].

The effect of parity on body condition score (BCS) in Gir

cows during various fortnights under study is presented in Table 3.3.1. Overall BCS was non-significant ($p > 0.05$) between primiparous cows (2.92±0.06) and multiparous cows (2.87±0.05). While comparing within the group the BCS of Gir cows there was significant difference ($p < 0.05$) seen in group 1 and 2.

In present study overall BCS in was non-significant between the groups. In contrast to present findings Berry *et al.* (2006) [6] and Minoru Sakaguchi (2009) [19] found significantly lower BCS in multiparous than primiparous.

Table 5: Effect of parity on body condition score of Gir cows

Period (Fortnight)	n	Primiparous (Group- 1)	Multiparous (Group- 2)	t value	p value
At the day of parturition (0 day)	6	3.18 ^b ±0.10	3.13 ^c ±0.11	0.339	0.742
1	6	3.01 ^{ab} ±0.11	2.99 ^{bc} ±0.10	0.143	0.890
2	6	2.87 ^{ab} ±0.13	2.85 ^{abc} ±0.10	0.113	0.912
3	6	2.80 ^a ±0.12	2.74 ^{ab} ±0.10	0.348	0.735
4	6	2.72 ^a ±0.12	2.64 ^a ±0.10	0.499	0.628
Overall	30	2.92±0.06	2.87±0.05	0.569	0.571

[Mean with superscript (a, b, c) in a column differs significantly within groups and conditions respectively at $p < 0.05$.]

4. Conclusions

The results from this study indicate that parity has significant effect over DMI and BW but it has no significant difference over BCS. First parity cows were lighter in weight and has lower DMI early lactation compared to multiparous cows. Monitoring body weight and body condition score at calving and in early lactation is a useful tool for management of dairy cows. In conclusion, the parity of cows affected the postpartum changes of the DMI and BW but not those of the BCS.

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