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Pre partum and post partum body condition scores (BCS) effect on milk production and reproduction in murrah buffaloes

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Abstract
In order to understand the biological relationship between body fat, milk production and reproduction, the BCS (body condition score) system is used to evaluate dairy animal's energy reserves. Murrah female buffaloes at Buffalo Farm, LUVAS were analysed for skeletal check points based on their anatomical features and fat reserves (visual perception). After reviewing the processes used for scoring dairy cows, a score chart for assessing buffalo body condition was prepared using a five-point scale. 110 Murrah female buffaloes in 1-6 lactations were observed to determine the average BCS of the breedable herd after each check point was observed thoroughly by sight. And a pilot experiment was conducted involving 33 Murrah buffaloes to study the pre partum (15 days prior to expected calving) and post-partum (upto 90 days) body condition scores (BCS in 15 days interval) on milk production and reproduction of the buffaloes. Results of this study revealed that the dry animals had higher BCS as compared to lactating animals but the difference was statistically non-significant (p>0.05). Results clearly indicated a negative correlation between BCS and lactation length upto 90 days. There was non-significant difference observed between groups for peak milk yield and days to attend peak yield.

Keywords: Body condition scores, skeletal check-points, breedable herd and pre-partum

1. Introduction
Various tropical and sub-tropical countries rely heavily on domestic buffalo for their agricultural economy, as well as a major source of meat, mainly from the culled males, females and calves (Suhail *et al.*, 2009) [23]. (Payne and Wilson 1999; Erat, 2011) [17, 12] state that the determination of an animal's body weight is essential for calculating the animal's feed requirements, tracking its growth, determining breeding age, estimating its marketing weight, and estimating its cash value. It is not possible to determine the energy reserves of animals using their body weight alone because the reserves differ about 40% between animals with the same body weight, which affects their performance directly or indirectly (Andrew *et al.*, 1994) [1]. As a solution to this problem, Lowman *et al.* (1973) [15] developed a body condition score system to guide feeding strategies of animals such that they are not too thin or too obese (Samarutel *et al.*, 2006) [20]. A body condition score (BCS) system assesses fat reserves in farm animals, especially over the back and pelvic regions of their bodies.
As the BSC system provides an immediate assessment of the animal's body state and is readily integrated into operational decision-making, it has quickly become an accepted method of estimating fatness (Drame *et al.*, 1999; Bittante *et al.*, 2004) [10, 7]. In addition to evaluating the nutrition program for dairy herds, it helps in identification of problems with lactating cow, such as ketosis and thin cow syndrome. Buckley *et al.* (2003) [8] and Bittante *et al.* (2004) [7] explain that the method primarily helps predict cow performance, ameliorate the management of body fat reserves for better health, productivity and reproduction.
Essentially, it assists in forecasting the performance of dairy cows, improves the management of body fat reserves for improved health, production and reproduction. Additionally, it is capable of estimating the body condition more accurately and relating it to milk production and other milk components, which would enable dairy farmers to increase production efficiency. Indian buffaloes are the main milk producers in the country, and their and their milk yield is nearly three times that of Indian cows. So, the buffaloes should be evaluated using a body condition scoring system to understand their current fitness and accordingly suggesting the appropriate feeding and management policies. As a result, assessing Murrah buffaloes body condition using body confirmation points is important for understanding the

pre-partum and post-partum body condition scores for milk production and reproduction. The feeding and management practices for optimal performance in the future will be suggested accordingly.

2. Materials and Method

The trial was carried out at the Buffalo farm of Department of Livestock Production Management College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar. One hundred and ten Murrah female buffaloes in 1~6 lactations were observed for this study to find the average BCS of the breedable herd. And a pilot experiment was conducted involving 33 Murrah buffaloes to study the pre partum (15 days prior to expected calving) and post-partum (up to 90 days) body condition scores (BCS in 15 days interval) on milk production and reproduction of the buffaloes. A score chart for assessing the body condition of buffaloes was prepared using a 5 point scale after reviewing the procedures currently used for scoring dairy cows. The chart was used to examine 5 skeletal check points as 1. Vertebrate at the middle of the back, 2. Rear view of the hook bones, 3. Side view between hookbone and pin bone, 4. Rear view of the cavity between tailhead and pin bone, 5. Angled view of the cavity between tailhead and pin bone. We recorded the scores of each buffalo at each check point and assigned an average BCS to each buffalo after each check point was thoroughly inspected by sight. One hundred and ten Murrah female buffaloes in 1~6 lactations were observed for this study to find the average BCS of the breedable herd. Besides a pilot experiment was conducted involving 33 Murrah buffaloes to study the pre partum (15 days prior to expected calving) and post-partum (upto 90 days) body condition scores (BCS in 15 days interval) on milk production and reproduction of the buffaloes. The animals were given an average BCS after scoring the five individual check points as described above 15 days prior to expected date of calving and then categorized into three groups. BCS data were collected and analysed on Gr-1 (BCS >4), Gr-2 (BCS 3.5-4) and Gr-3 (BCS <3.5) buffaloes to understand the effect of BCS on the above parameters such as peak yield, days to achieve peak yield, and days to first oestrous. Additionally, the same animals were subjected to periodic BCS (15 days interval) up to 90 days post-partum in order to determine how BCS affected the initial lactation curve.

It was routine management practice to milk the lactating buffaloes twice a day in a separate milking parlour. All buffaloes were housed loose in the present study. The BIS (1992) [6] standards were followed in preparing balanced concentrate mixtures from cereals, cakes, byproducts, mineral mixtures and salt. The experiment included the provision of a concentrated mixture twice daily, seasonal green twice during working hours and *adlib.* straw. All standard managemental practices and biosecurity measures were adhered to throughout the experiment. During the experimental period, we studied the following variables: body score condition, milk yield, peak yield, days to achieve peak yield and days to reach first oestrous.

Many developed and some developing countries use body condition scoring technique in order to assess the animal's condition efficiently and accurately. This study used a 0.5 increments BCS chart developed by Anitha *et al.* (2005) [2], to score buffaloes. For recording the body condition, the following points were taken into consideration:

1. Vertebra at mid of back
2. Cross Section of Hook bones
3. Line between Hook and Pin bone
4. Cavity between tail head and Pin bone

As shown in Figure 1, 110 buffaloes were observed at checkpoints by vision and palpation. During the experiment, the body condition score was observed on three times (i.e. at the beginning, mid and end).

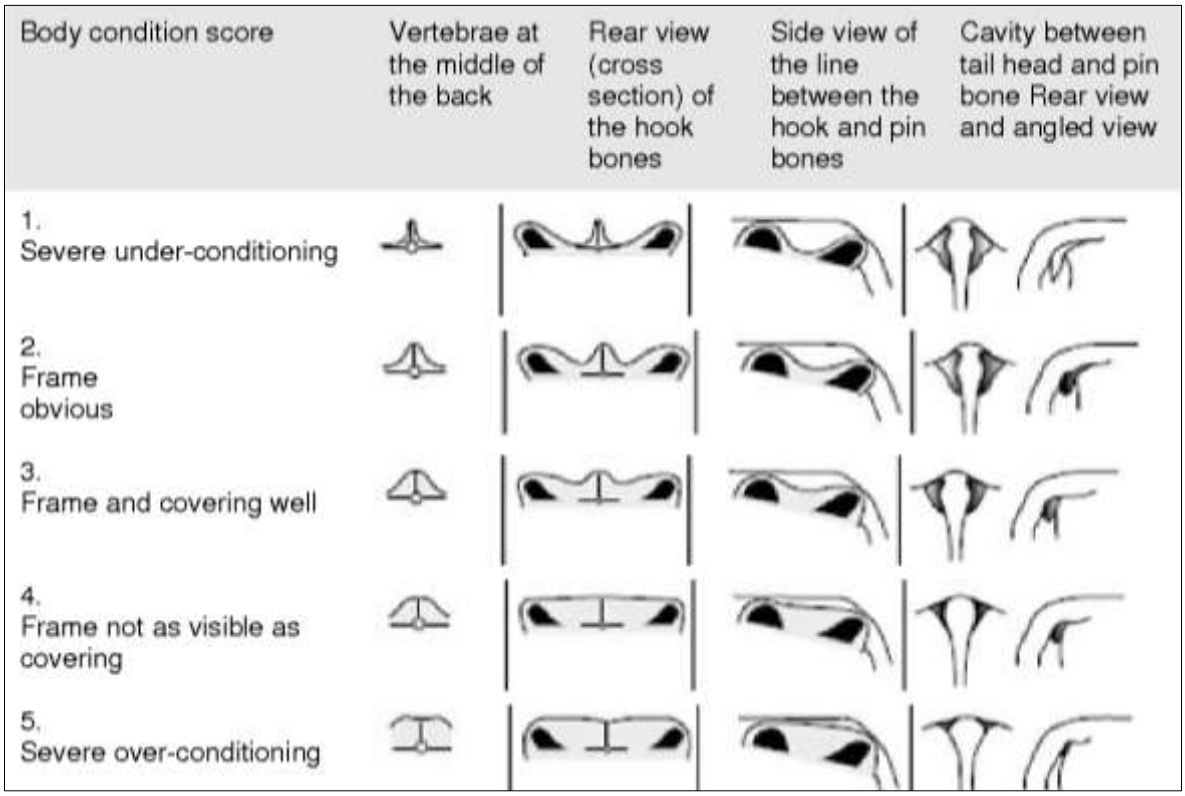

Fig 1: Body Condition Scoring board (Edmonson *et al.* 1989)

2.1 BCS in relation to productive and reproductive performance

To investigate how BCS at calving affects the reproductive performance of Murrah buffaloes, 33 Murrah buffaloes were sampled from the Buffalo farm of the Department of Livestock Production Management, College of Veterinary Sciences, LUVAS, Hisar. In pilot study the body condition score as well as milk yield, peak yield, days to achieve peak yield and days to reach first oestrous were observed from 15 days prior to expected calving and then 15 days interval upto 90 days.

3. Statistical Analysis

Analysis of variance was used to study the variation in peak yield, days to achieve peak yield and days to reach first oestrous among different BCS groups (Snedecor and Cochran, 1994) [21].

4. Results

The results of the overall BCS of the breedable herd (Lactating and dry animals) under the present study are graphically depicted in Figure 2 and found that the average BCS of herd was 3.68±0.06. As compared to lactating animals (3.62±0.08), dry animals had a higher BCS (3.84±0.10), but the difference was not statistically significant (p>0.05).

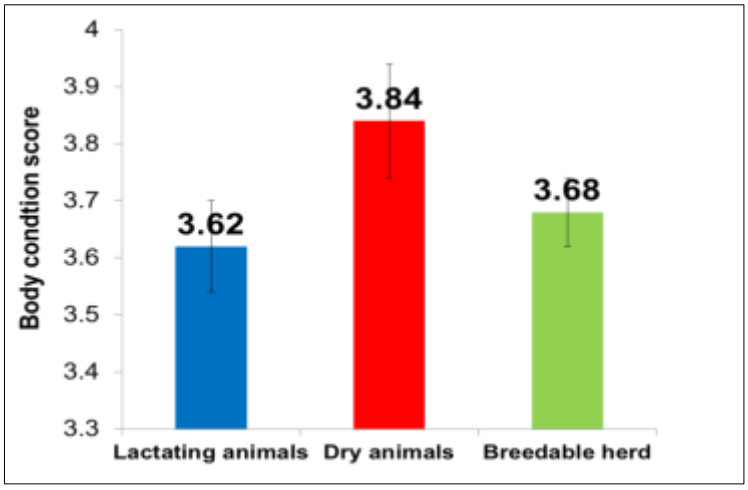

Fig 2: Body condition score of experimental animals

4.1 BCS in relation to productive performance

The perusal data of the productive performance of experimental lactating animals recorded at 15 days prior to expected calving and then 15 days interval upto 90 days during the study period is represented in tabular form in table 1 and graphically depicted in figure 3. Peak milk yield was observed on 51.63±4.12 day of lactation. Results clearly indicated a negative correlation between BCS and lactation length upto 90 days. BCS was significantly lowest (p<0.05) on 45th day (2.83±0.06) and 60th day (12.66±0.37) of lactation which coincided with the highest milk yield.

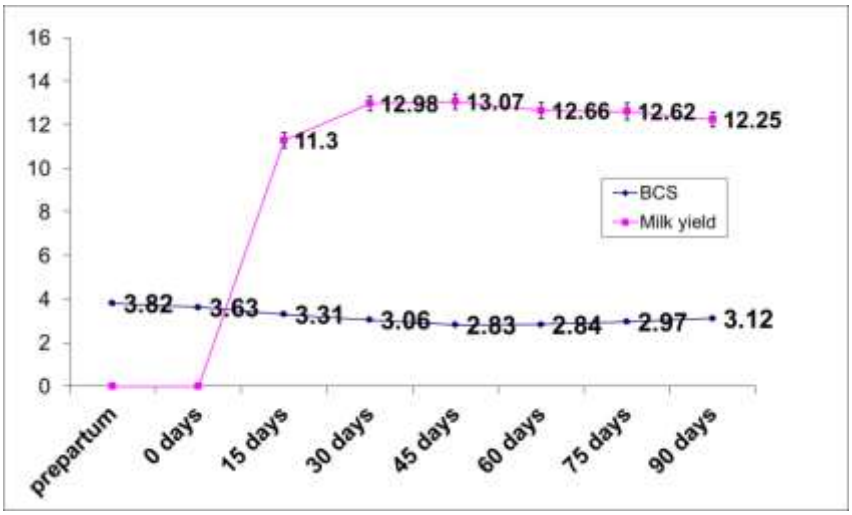

Fig 3: Relationship between BCSc and milk yield in the experimental lactating animals.

Table 1: Relationship between BCSc and milk yield in the experimental animals (prepartum and postpartum).

Traits	Days calving							
	-15	0	15	30	45	60	75	90
BCS	3.82±0.09^{a}	3.63±0.07^{b}	3.31±0.07^{c}	3.06±0.06^{d}	2.83±0.06^{e}	2.84±0.06^{e}	2.97±0.06^{de}	3.12±0.06^{cd}
Milk Yield	-	-	11.3±0.35^{b}	12.98±0.33^{a}	13.07±0.36^{a}	12.66±0.37^{a}	12.62±0.39^{a}	12.25±0.34^{b}

Means within different superscripts (a, b, c, d, e) in the same row differ (p<0.05)

4.2 BCS in relation to productive and reproductive performance

The effect of body condition scores on productive and reproductive performance *viz*. peak milk yield, days to attend peak yield and days to attend 1st oestrus of experimental lactating buffaloes have been presented in table no. 2 and similarly, depicted in the Figure 4. Peak milk yield and days to reach peak yield were not significantly different between the groups. But the values for both the parameters were better for Gr-2 (Peak yield: 14.61±0.44; days to attend peak yield: 43.5±6.06) having BCS 3.5-4. Gr-2 with BCS 3.5-4 showed significantly (p<0.05) lower days (75.88±16.27) to attend 1st postpartum oestrous as compared to Gr-1 (110.50±14.89) and Gr-2 (138.18±23.01).

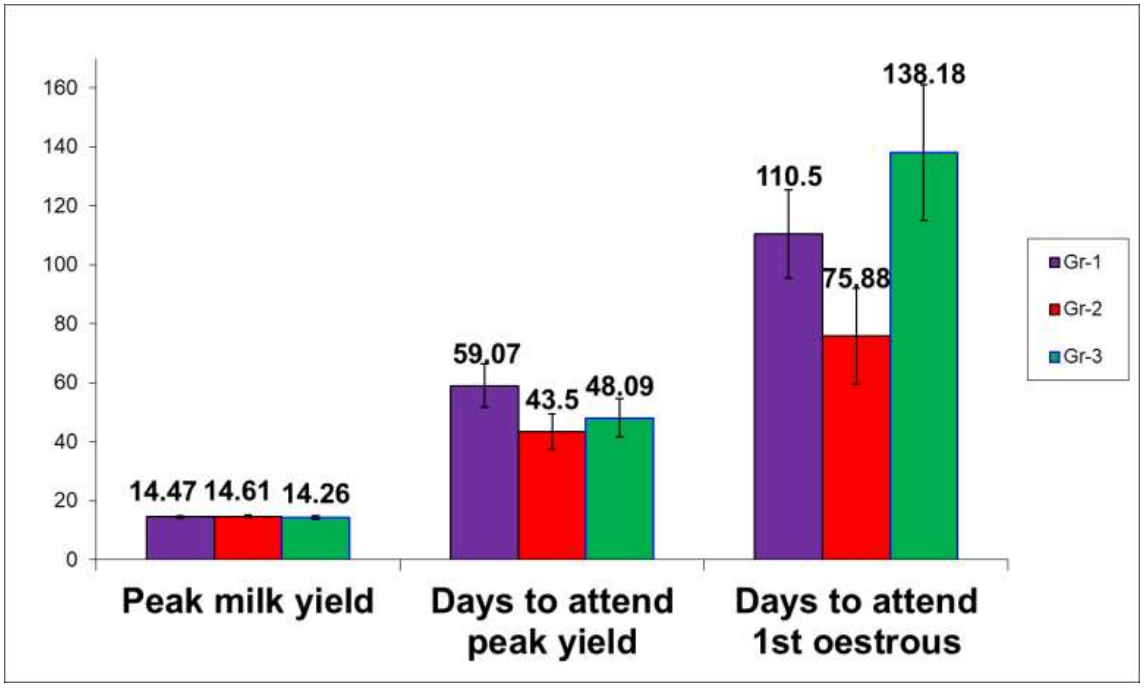

Fig 4: Relationship between BCS and peak milk yield, days to attend peak yield and days to attend 1st oestrus in the experimental lactating animals.

Table 2: Effect of BCSc on peak milk yield, days to attend peak yield and days to attend 1st oestrus in the experimental lactating animals.

Groups	Peak milk yield	Days to attend peak yield	Days to attend 1st oestrous
Gr-1 (14)	14.47±0.50	59.07±7.41	110.50±14.89^{ab}
Gr-2 (8)	14.61±0.44	43.5±6.06	75.88±16.27^{b}
Gr-3 (11)	14.26±0.49	48.09±6.41	138.18±23.01^{a}

Means within different superscripts (a, b) in the same column differ (p<0.05)

5. Discussion

Dairy animal's body condition is determined by how much fat they carry, or how much energy they contain. During lactation, a dairy animal's condition changes throughout the period. In early lactation, buffaloes lose body condition and mobilizing their body reserves due to negative energy balance. According to the results of the present study, the entire group's BCS decreased in post-partum period, with a significant difference found between the pre-partum and post-partum periods in body condition scores. The result of our study are in line with Studer (1998) [22] findings, who described that if a high-producing cow's body condition score decreases by 0.5 to 1.0 during lactation, it may experience anoestrus.

It was considered normal during lactation to lose about 1.0 condition score according to Popescu *et al.* (2009) [18]. Based on Dechow *et al.* (2002) [9], higher body condition scores were associated with better reproductive performance during lactation. Additionally, the present findings were consistent with those of Anitha *et al.* (2011) [3] who observed a decline in the BCS in Murrah buffaloes after birth. In a similar manner, Banos *et al.* (2004) [4] observed a decline in BCS during the first 2 to 3 months of lactation followed by further an improvement. It was also found in the Nagappa *et al.* (2014) [16] study that losses in body condition were higher for animals that calved at high body condition scores during the first two months of lactation compared to those which did not calves at high body condition scores. It has been demonstrated that body reserves are used to support the energy requirements for lactation during the first 90 days of lactation because nutrients obtained through the ration are insufficient. This study supports the findings of Ferguson *et al.* (1994) [13], who reported that animals with higher milk yields lose body condition during the first two months of lactation.

This study confirms a body condition score loss was also observed in early lactation with higher milk yield, in agreement with Ferguson *et al.* (1994) [13]. It was concluded from the present study that body condition at calving is crucial to achieving good reproductive performance. Studies on its interaction with reproductive performance found a significant effect (to reach 1st postpartum oestrous) on reproductive performance. A higher BCS led to a shorter interval between calving and first ovulation in cows of higher BCS, as Langley and Sherington (1983) [14] reported. According to the results, body condition at calving was a crucial factor in restoring ovarian function. It was noted that buffalos of BCS range 3.5-4 displayed early ovarian activity, which is a sign of good reproductive performance, whereas

buffaloes of BCS range <3.5 showed a longer period of ovarian activity resumption, indicating poor reproduction performance, which corroborates the findings of Beam and Butler (1997) [5] and Reksen *et al.* (2002) [19], who reported that luteal function was delayed in thinner cows. Similarly, another study by Anitha *et al.* (2011) [3] found that buffaloes in BCS group 3.5-3.99 resumed ovarian activity 29.33 days earlier, had a shorter (p<0.01) postpartum an oestrus period (46.66 days), had a shorter service period (58.83 days), required fewer services per conception (1.50), first service conception rate was higher (66.66%) with higher breeding efficiency (90.64%) than the other groups. The results of the present study revealed that the reproductive performance and milk production increased with BCS up to a score of 3.5-4 (Gr.2), but beyond this there was a decline. In summary, this study suggested that Murrah buffaloes should be fed to maintain a BCS of 3.5-4 during calving in order to maximize their reproductive and productive performance.

6. Conclusion

We found a close correlation between the body condition score of Murrah buffaloes and the variables including milk yield, peak milk yield and days to reach peak milk yield as well as days to attend 1st oestrous. It was inferred from the present study that milk yield (up to 90 days) and BCS are negatively correlated and buffaloes with BCS 3.5-4, 15 days prior to expected calving resulted highest peak yield, took less days to attend that peak and less days to attend 1st heat.

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