



Influence of Body Condition Score on Milk Production Parameters of Murrah Buffaloes

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Authors' contributions

This work was carried out in collaboration among all authors. Author AA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SRK and SJ managed the analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

The postpartum changes in Body Condition Score (BCS) studied from calving to four months of lactation in 40 Murrah buffaloes showed that BCS decreased from calving to two months of lactation and then gradually increased. Significant ($P < 0.05$) inverse relationship ($r = -0.96$) was observed between BCS and milk yield. The effect of BCS at calving (BCSc) on the milk production parameters were studied in 40 Murrah buffaloes divided into 4 groups of 10 buffaloes each based on BCSc (G1 – 2.5 to 2.99, G2- 3.0 to 3.49, G3- 3.5to 3.99 and G4- 4.0 to4.49). The total milk production (kg) upto 4 months of lactation, peak milk yield (kg), persistence, milk fat per cent, milk protein per cent and SNF per cent were 1030.93, 9.50, 1.65, 6.44, 3.39 and 8.99, respectively for G1 group, 1197.12, 11.60, 1.69, 7.54, 3.74 and 9.34 respectively for G2 group, 1658.67,16.50,1.77,8.62, 4.24 and 9.84, respectively for G3 and 1359.92, 13.75, 1.68, 9.37, 3.97 and 9.57, respectively for G4 group. Buffaloes of G3 group had significantly ($p < 0.01$) more milk yield, peak milk yield, milk protein and SNF compared to the other groups where as buffaloes of G4 group had significantly ($P < 0.01$) more milk fat.

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1. INTRODUCTION

The Body Condition Score (BCS) system is a subjective method to assess the body fat reserves and is used as an indirect indicator of energy balance [1,2]. The BCS is identified by researchers and farmers as an important factor in dairy bovine management [3]. The BCS of animal indirectly reflects the farm management or even more close to feeding management of the animal [4]. BCS is an universally accepted, non invasive quick and in expensive method to estimate the degree of fatness.

BCS of dairy cattle has been recognized as a valuable tool in predicting the productive performance [5]. The rate of increase in milk yield in early lactation is more desirable for the total milk yield and may more accurately reflect the dynamic biological changes experienced by the cows. Conclusions of studies which investigated the BCS and its relationships to milk yields were also variable [6,7,8]. The rate of increase in milk yields was also variable. Gransworthy [9] reported that the cows with higher BCSc lost more body condition during lactation, which could negatively influence their milk yield. Many studies on BCS system also reported the association of overly fat dry cows with postpartum complications and thin cows with reduced milk yield [10]. Primiparous cows can attain an ideal BCS at calving through sufficient prepartum management practices, even though a slight drop in the prepartum BCS may be a warning of post partum risk of poor productive performance [11].

In addition, although considerable research was conducted on BCS system in relation to milk production in dairy cows, studies in buffaloes are very limited. Dairy buffaloes perform well under the tropical conditions and BCS can be used as a marker for milk yield and quality [12]. India is the origin for the best buffalo breeds and Murrah buffalo is the highest milk producing buffalo breed in the world. But we are unable to derive maximum potential from Murrah buffaloes. There is a need to evaluate and document the effect of BCS on milk production and composition so as to suggest better management practices in order to derive optimum production performance from these buffaloes. Therefore the present work was carried out to assess the influence of BCS on milk production parameters of lactating Murrah buffaloes.

2. MATERIALS AND METHODS

2.1 Animals

The study was conducted in 40 lactating Murrah buffaloes maintained at Buffalo Research Station, Venkataramannagudem of West Godavari district of Andhra Pradesh state, India. The buffaloes were divided into 4 groups (G1, G2,G3, and G4) based on their BCS at calving (BCSc) with 10 buffaloes in each group. G1 includes buffaloes with BCSc 2.50-2.99, G2 includes BCSc 3.00-3.49, G3 includes 3.50-3.99 and G4 includes 4.00-4.49.

2.2 Postpartum Changes in BCS

The buffaloes were scored at monthly interval from calving to 4 months to study the postpartum changes in BCS using the BCS chart [13].

2.3 Milk Production Parameters

2.3.1 Milk production (kg)

The milk yield(kg) of the experimental animals was recorded from calving to 4 months twice daily at 4 AM and 4PM. The peak yield (kg) of the study animals was recorded from the farm data.

2.3.2 Persistence index

The Persistence Index (PI) was calculated according to the formula:

$$\text{Persistence Index (PI)} = \frac{A - B}{B}$$

A = milk yield in the first 120 days of lactation , B = initial yield of the first 45 days of lactation [14].

2.3.3 Milk fat, protein and SNF

Milk samples were analyzed for fat, protein and SNF in duplicate at the end of the study period i.e, 4 months after calving using IS:1224 [15], Part-1, 1997(fat), IS 1479 [16], Part II, 1961 (Protein) and IS: 1224-1958 [17] (SNF).

2.4 Statistical Analysis

The relation of post partum changes in BCS with milk yield was analyzed using correlation coefficient. The influence of BCS at calving on the milk production, peak yield, persistence index

and milk components was studied with help of ANOVA as per the procedures of Snedecor and Cochran [18].

3. RESULTS AND DISCUSSION

3.1 Post Partum BCS and Milk Yield

The BCSc values assigned at the time of calving ranged from 2.56 to 4.44 with a mean value of 3.50 ± 0.09 . The mean BCS decreased to 3.27 ± 0.08 by first month of lactation which was further decreased to 2.84 ± 0.09 by second month of lactation and thereafter increased to 3.04 ± 0.09 by third month which was further increased to 3.15 ± 0.09 by fourth month of lactation. The mean milk yield per day (kg) during the first, second, third and fourth months of lactation were 9.83, 11.15, 10.8 and 10.01, respectively with an overall mean milk yield of 10.45 kg per day. The study showed that BCS and milk yield were negatively ($P < 0.05$) correlated in lactating Murrah buffaloes. The inverse relation between postpartum BCS and milk production in the experimental animals is observed (Table 1).

The monthly postpartum changes studied showed that the BCS decreased from calving to second month of lactation which might be due to loss in body fat reserves which can be attributed to the effect of milk secretion and to a great extent to the peak milk yield. The recoupment in BCS from third month might be attributed to the lowered milk production as the lactation advanced. Based on these results, it can be predicted that the buffaloes might have regained the normal BCS which they had at BCSc by the end of lactation. These findings are in accordance with the trends observed by Gallo et al. [19] an Sarjan Rao et al. [20] in cows during early lactation. The inverse relationship observed between postpartum BCS and milk yield is also reported by Anitha et al. [5] in cross bred cows, Janus et.al. [21] in Black and White Polish H.F cows and Coenen et.al. [22] in dairy cows. Similarly studies in buffaloes also showed that milk yield decreased as BCS increased with advancing lactation [12]. In contrast Takeshi et.al. [23] reported no significant correlation between milk yield and change in BCS in early stage of lactation.

3.2 Body Condition Score at Calving and Milk Production Parameters

The study showed that the total milk production (kg) up to 4 months of lactation, peak milk yield (kg) and persistence of milk production of the

buffaloes of G1 group were 1030.93, 9.50 and 1.65, respectively. The buffaloes of G2 group had milk production of 1197.12kg, peak yield of 11.60kg and persistence of 1.69. The buffaloes of G3 group had milk production of 1658.67kg up to 4 months of lactation, peak yield of 16.50kg and persistence of 1.77 whereas, the G4 group had milk yield of 1359.92 kg, peak yield of 13.75 kg and persistence of 1.68 (Table 2). The study revealed that buffaloes with BCSc of 3.5-3.99 had significantly ($P < 0.01$) more total milk production up to 4 months after calving and peak milk yield compared to the other three groups. The persistence of milk production also showed similar trend but the results were not statistically significant. The results indicated that the total milk yield, peak yield as well as persistence index increased as the BCSc increased up to 3.99 but beyond that as the BCS exceeded the values decreased. Similar trend is reported by Sarjan Rao et al. [20] who observed the low persistence in cows with excess of BCSc. Mushtaq et al. [12] also reported that highest milk yield was recorded with moderate BCS in buffaloes. The results of the study are in tune with the findings of Rao and Anitha [24] and Banuvalli et. al. [25] who reported significantly more milk production and peak milk yield in dairy animals with BCS more than 3.5 at calving compared to animals with BCS less than 3.5 at calving. Singh et al. [26] also reported that FCM were positively correlated with BCS at calving. Patel et al. [27] reported that Murrah buffaloes with pre-calving BCS of 4.00 and above produced more total milk at 90days of lactation than buffaloes with pre-calving BCS of 3.25-3.75 and 2.50-3.00, though the difference was not significant. In contrast Delfino et al. [28] reported no differences for milk yield between buffaloes with high BCS (more than 3.5) at calving and low BCS (less than 3.5) at calving. Wang et al. [11] also reported no differences in production performance between various BCS groups of primiparous dairy cows.

The study revealed that the milk fat per cent, protein per cent and SNF per cent values for the buffaloes of G1 Group were 6.44, 3.39 and 8.99 respectively. The buffaloes of G2 group had milk fat, protein and SNF values of 7.54%, 3.74% and 9.34%, respectively. The buffaloes of G3 group had milk fat, protein and SNF values of 8.62%, 4.24% and 9.84%, respectively. The buffaloes of G4 group had milk fat of 9.37%, protein 3.97% and SNF 9.57% (Table 2). The results showed that buffaloes with BCS of 4.00-4.49 at calving had significantly ($P < 0.01$) more milk fat per cent

Table 1. Postpartum changes in BCS in relation to milk yield

Month of lactation	Mean BCS \pm SE	Mean milk yield / day (kg) \pm SE
1	3.27 \pm 0.08	9.83 \pm 0.28
2	2.84 \pm 0.09	11.15 \pm 0.29
3	3.04 \pm 0.09	10.8 \pm 0.32
4	3.15 \pm 0.09	10.01 \pm 0.37
Mean \pm SE	3.07 \pm 0.04	10.45 \pm 0.24

Table 2. Influence of body condition score at calving on milk production parameters in Murrah buffaloes

Parameter	G1	G2	G3	G4
Total milk production up to 4months of lactation (kg)	1030.93 ^d	1197.12 ^c	1658.67 ^a	1359.92 ^b
Peak milk yield (kg)	9.50 ^d	11.60 ^c	16.50 ^a	13.75 ^b
Persistence	1.65	1.69	1.77	1.68
Milk fat per centage	6.44 ^d	7.54 ^c	8.62 ^b	9.37 ^a
Milk protein per centage	3.39 ^d	3.74 ^c	4.24 ^a	3.97 ^b
Milk SNF per centage	8.99 ^d	9.34 ^c	9.84 ^a	9.57 ^b

Values with different super scripts are significantly different ($P < 0.01$)

compared to the other three groups. The results suggested that buffaloes should be maintained in good body condition at calving in order to augment fat per cent because the milk price is based on fat per cent. Similar findings were reported by Anitha et. al. [2] who observed that buffaloes with BCS of more than 4 at calving had more milk fat per cent. Singh et al [23] also found that milk fat was higher in groups with high BCS (4.22) than in groups with lower BCS (2.83). Delfino et. al. [25] also reported that buffaloes of high BCS group had a higher milk fat content ($P < 0.07$) than the low BCS group.

The present study showed that milk protein and SNF were significantly ($P < 0.01$) high in buffaloes with BCS of 3.50-3.99 compared to other three groups. Janus et al [21] also reported that increase in body condition scores from low to medium was accompanied by a significant increase in the content of protein. Similarly Mushtaq et. al. [12] found that BCS correlated positively with fat and protein which is in tune with the present findings. Patel et. al. [27] also reported that increase in calving BCS was accompanied by a significant increase in the content of fat, protein, lactose and total solid in the milk of Murrah buffaloes. In contrast, Roche et. al. [29] reported that BCS at calving has not significantly affected milk protein content averaged across the first 60 or 270 days of lactation.

4. CONCLUSION

The study suggested on ideal calving BCS of 3.5-3.99 in buffaloes to achieve better production, persistence and quality of milk.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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