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BP Meena
Department of Livestock Production Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

SC Goswami
Department of Livestock Production Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

V Kumar
Department of Livestock Production Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

AK Jhirwal
Department of Livestock Production Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

V Singh
Department of Livestock Production Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

V Sharma
Department of Livestock Production Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Correspondence
V Singh
Department of Livestock Production Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Study the relationship of body condition scores with production performance in Kankrej cattle

BP Meena, SC Goswami, V Kumar, AK Jhirwal, V Singh and V Sharma

Abstract

The present investigation was carried out with the total of 18 Kankrej cattle of 1st to 4th parity and distributed into three disparate groups, on the basis of their pre calving BCS (before 15 days of expected date of calving), namely G1(2.50 - 3.00), G2 (3.25 - 3.75) and G3 (4.00 and above) with six animals in every group. The average fortnight milk yield increased up to 60th day and thereafter declined up to 90th day in G1 group animals, which was significant ($p<0.05$). The average fortnight milk yield increased up to 75th day and thereafter declined up to 90th day in G2 group animals, which was non-significant. In G3 group animals, the average fortnight milk yield increased up to 60th day and thereafter declined up to 90th day, which was also found to be non significant. G3 group animals had highest average fortnightly cumulative Milk yield (lit.) in entire study period. Highest 305 days predicted lactation milk yield (1739.16 Kg /lactation) and average peak yield (12.50 Kg/ animal) was obtained in G3 group animals and the lowest predicted lactation milk yield (1332.56 Kg/lactation) and average peak yield (9.50 Kg per animal)) was in G1 group animals. The 305 days predicted lactation milk yield in G2 group animals was 1635.04 Kg /lactation and average peak yield (11.20 Kg/ animal). The G3 group animals also attained their peak yield in 46 days compared to G2 and G1 group animals with 50.50 and 52 days, respectively. The persistency of milk production was highest in G2 group animals with 66.35% than in G1 and G3 group animals.

Keywords: Persistency, fortnightly, peak yield, cumulative, predicted

Introduction

Milk is the primary product of livestock sector and has placed India on the 1st position in global ranking. The cattle herds include a variety of purebred animals such as Sahiwal, Red Sindhi, Tharparker, Kankrej and majority of crossbred. India is the native tract for the best milk producing cattle breeds.

The body condition scoring (BCS) is an idiomatic estimate of the energy reserves in adipose tissues of a dairy cow. It is an acceptive, non-invasive, quick and inexpensive method to estimate degree of fatness. It is a means of accurately determining body condition of dairy cows, independent of body weight and frame size. It is evinced that the profile of lactating cows in milch barn is different e.g. some may be in early lactation and the others may either be in mid or late lactation. The observations on body condition status of animal will help the manager to adopt corrective management measures, thus enabling to improve the production profile of an animal. Hence, body condition scoring may be used as an efficient tool in this regard. Although many may consider this as a nutritional management practice, but changing BCS have implications on milk yield, health, reproduction, longevity and overall profitability of an animal. (Mishra *et al.,* 2016) [4].

The dairy animals use their body reserves as an energy source in early lactation to support high milk yield that is why adequate amounts of nutrients must be stored in body tissues during late lactation. In early lactation the energy intake does not keep pace with continuously rising milk yield as a result energy deficit increases. This leads to a competitive situation among milk yield, fertility and health of the dairy cow because these traits are linked with energy requirement (Coenen., 2014) [2].

Materials and Methods
Experimental design
Eighteen Kankrej cattle were allocated into three different groups based on their pre-calving BCS (15 days prior to expected date of calving) namely G_1, G_2 and G_3 with six animals in every group. (Table 1)

Table 1: Grouping of the cattle based on their pre-calving BCS

Grouping of the cattle based on their pre-calving BCS Groups	No. of animals	BCS
G_1	6	2.50 - 3.00
G_2	6	3.25 - 3.75
G_3	6	4.00 and above

Production parameter
1. Milk yield
Daily milk yield (lit.) up to 12 weeks of lactation was measured every day both morning and evening.

2. Peak milk yield
Peak milk yield was obtained from the computed data of the farm.

3. Predicted Lactation yield
Predicted Lactation yield (305 days) was calculated by using ratio factor estimation.

Factor = Av.305 days milk yield / milk yield in 90 days

The lactation yield upto 12 weeks will be multiplied by the corresponding ratio factor to obtain estimates of lactation yield.

4. Persistency of milk production
Persistency of the individual lactation curve were calculated by using the method proposed by Prasad *et al.* (1999) [8]. Persistency was calculated by using the formula as follows:

Persistency = (Average milk production during post peak period / Peak yield)

5. Fat Corrected Milk yield (FCM)
The FCM was calculated by using the formula:

4%FCM = 0.4 total milk + 15 total fat (Thomas and Sastry, 2012) [14]

Analysis of data
The collected and tabulated data was analyzed by using SPSS 20.0.

Results and Discussion
Production parameter
Milk yield
Changes in average fortnightly Milk yields (Kg) with different BCS groups in Kankrej cattle are presented in table 2.

Table 2: Average fortnightly milk yield (Kg) with different BCS groups in Kankrej cattle

Fortnight Intervals (days)	Average Milk yield of animals in BCS groups (Kg)		
	G1	G2	G3
15	53.60aA±1.25	60.66bA±1.45	66.13cA±1.08
30	106.93aE±2.91	114.00bB±4.15	120.91cB±4.1
45	114.12aD±3.77	135.22bC±4.22	148.58cC±4.06
60	116.38aD±4.15	155.28bD±5.01	168.23cD±1.6
75	107.75aC±4.51	164.03bE±2.64	165.75bE±2.25
90	101.83aB±3.97	162.67bE±2.08	161.50bE±2.41

Different superscript in a column (capital letter A, B, C) differ significantly (*p*<0.05) Different superscript in a row (small letter a, b, c) differ significantly (*p*<0.05)

The average fortnight milk yield increased up to 60th day and thereafter declined up to 90th day in G1 & G3 group animals, respectively, which was found significant (*P*<0.05) upto 45th

days and 60 days onwards where as in G3 group it was significant (*P*<0.05) upto 75th days. The average fortnight milk yield increased up to 75th day and thereafter declined up to 90th day in G2 group animals, which was significantly (*P*<0.05).

The G3 group animals had highest milk yield followed by G2 and G1 group animal, although the variation in milk yield was found to be non significant. Further from 75th to 90th day, G3 group animals had highest milk yield followed by G2 and G1 group of animal, which was found to be significantly high in G3 whereas non significant differences were found between G1 and G2 group. The 90 days average milk yield was 605.71±7.77, 743.20±4.87 and 790.53±3.57 Kg /animal in G1, G2 and G3 groups, respectively. There was significant difference between the groups.

The average cumulative Milk yields at fortnight intervals in different groups of Kankrej are presented in table 3. The G3 group animals had highest average fortnight cumulative Milk yield (Kg) in entire study period that of G2 and G1 group of animals.

Table 3: Average fortnightly cumulative milk yield (Kg) in Kankrej cattle with different BCS groups

Fortnight Intervals (days)	Average cumulative Milk yield of animals in BCS groups (Kg)		
	G1	G2	G3
15	53.60a±1.25	60.66b1.45	66.13c±1.08
30	160.53a±2.20	174.66b±1.28	187.05c±1.30
45	267.46a±3.31	288.66b±2.63	307.96c±2.80
60	381.58a±4.80	423.88b±3.04	456.55c±2.73
75	497.96a±6.65	579.16b±4.00	624.78c±3.08
90	605.71a±7.77	743.20b±4.87	790.53c±3.57

Different superscript in a row (small letter a, b, c) differ significantly (*p*<0.05)

Similar findings were reported by (Moira *et al.*, 1978) in dairy cow, (Gransworthy *et al.*, 1987; Roche *et al.*, 2007; Roche *et al.*, 2009; Musthaq 2010) [3, 11, 10, 1] in Niliravi buffalo and (Bannuvalli *et al.*, 2014) [1] in crossbred dairy cow.

However, (Pryce *et al.*, 2000) [9] observed a higher feed intake and milk yield in thin cows at the time of calving compared to obese cows, which is in disagreement with the present study.

The average fortnight daily milk yield (Kg) in Kankrej cattle with different BCS groups are presented in table 4.

Table 4: Average fortnightly daily milk yield (Kg) in Kankrej cattle with different BCS groups

Fortnight Intervals (days)	Average daily Milk yield of animals in BCS groups (Kg)		
	G1	G2	G3
15	3.56aA±0.081	4.03bA±0.098	4.40cA±0.071
30	7.12aC±0.079	7.59bB±0.11	8.06cB±0.11
45	7.60aD±0.10	9.01bC±0.11	9.90cC±0.11
60	7.75aD±0.11	10.3bD±0.13	11.21cE±0.04
75	7.18aC±0.12	10.93bE±0.07	11.04bDE±0.06
90	6.78aB±0.10	10.83bE±0.05	10.76bD±0.06

Different superscript in a column (capital letter A, B, C, D, E) differ significantly (*p*<0.05), Different superscript in a row (small letter a, b, c) differ significantly (*p*<0.05)

The average fortnight daily milk yield (Kg) increased up to 60th day and thereafter decreased gradually in G1 group of animals, in G2 group of animals the increasing pattern continued up to 75th day. However, the differences were significant (*P*<0.05).

The average fortnightly daily milk yield (Kg) in G3 group animal's also increased up to 60th day and thereafter decreased during the study period. The significant ($P<0.05$) increase were observed from 15th day to 60th day.

There was no significant difference in average fortnightly daily milk yield between the different three groups.

Predicted lactation yield (305 days)
The predicted lactation yield of different BCS groups in Kankrej cattle are presented in table 5.

Table 5: Milk yield traits

S. No.	Milk yield traits	BCS groups		
		G1	G2	G3
1.	Peak yield (Kg)	9.5	11.2	12.5
2.	Days to attain Peak Milk yield (Kg)	52	50.5	46.16
3.	Predicted lactation Milk yield (305 days) (Kg)	1332.56	1635.04	1739.16
4.	Persistency (%)	63.75	66.35	63.24

The result of the study indicated that highest predicted lactation milk was obtained in G3 group animals with 1739.16 Kg /lactation and the lowest predicted lactation milk yield was in G1 group animals with 1332.56 Kg/lactation. The predicted lactation milk yield in G2 group animals was 1635.04 Kg/lactation. There was significant difference between the G1 and G2 groups.

Peak yield
The peak milk yield of different BCS group in Kankrej cattle are presented in table 5.

The highest average peak yield was recorded in G3 group animals with 12.5 Kg /animal at test day yield followed by 11.2 and 9.5 Kg/animal at test day in G2 and G1 groups yield, respectively. The G3 group animals attained their peak yield in 46.16 days compared to G2 and G1 group of animals which attained the same by 50.5 and 52 days, respectively.

Similar findings were reported by (Moira et al., 1978; Takeshi et al., 2011) [5, 13].

Persistency (%)
The persistency of production in different BCS group in Kankrej cattle are presented in table 5.

The persistency of milk production was highest in G2 group animals with 66.35% than that of in G1 and G3 groups of animals with 63.75% and 63.24%, respectively.

Similar findings were reported by (Moira et al., 1978; Takeshi et al., 2011) [5, 13].

Fat Corrected Milk (FCM) yield (Kg)
The average fortnightly Fat Corrected Milk yield (FCM) in Kankrej cattle with different BCS groups are presented in table 6.

Table 6: Average fortnightly Fat Corrected Milk (FCM) yield (Kg) in Kankrej cattle with different BCS groups

Fortnight Intervals (days)	Average FCM yield of animals in BCS groups		
	G1	G2	G3
15	77.07aA±0.43	83.76bA±0.69	88.33cA±0.41
30	96.57aE±1.81	104.15bB±1.64	108.49cB±1.96
45	98.26aDE±1.58	111.96bC±1.26	116.91cC±2.18
60	99.00aD±1.75	119.51bD±2.18	123.79cE±1.02
75	95.6aC±1.97	123.21bE±1.31	122.34cF±1.27
90	93.53aB±1.6	122.54bE±0.69	120.41cD±1.1
Total	560.03a±2.87	665.13b±2.80	680.27c±2.29

Different superscript in a column (capital letter A, B, C, D, E, F) differ significantly ($p<0.05$)
Different superscript in a row (small letter a, b, c) differ significantly ($p<0.05$)

The average fortnight FCM in G1 group animals increased up to 60th day and thereafter declined up to 90th day, which was significant.

The average fortnight FCM (Kg/animal) in G2 group of animals, increased up to 75th day significantly and thereafter declined up to 90th day, which was found to be non significant. In G3 group animals, the average fortnight FCM increased up to 60th day and thereafter declined up to 90th day, which was found to be significant.

The average fortnight FCM (Kg/animal) from calving to 90th day in G3 group animals had highest FCM followed by G2 and G1 groups of animal, although the variation in FCM was found significant ($P<0.05$). Further from 75th to 90th day, the animals of G2 group had highest FCM followed by the animals of G3 and G1 group animal, which was found significant ($P<0.05$). The total 90th day FCM were 560.03±2.87, 665.13±2.80 and 680.27±2.29 Kg/animal in G1, G2 and G3 groups, respectively.

Similar finding were reported by (Prasad and tomar, 1996; Singh et al., 2015) [7, 12].

Conclusion
The result of this study revealed that overall production performance of G1 (2.50-3.00) and G3 (4 and above) group were found decreased whereas G2 (3.25-3.75) group with moderate BCS showed better performance. However the overall milk yield was higher in G3 group but the persistency of milk production found higher in G2 group. Hence it may be concluded that kankrej cattle to be selected for the best production performance should possess the BCS in the range of 3.25 -3.75.

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