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EFFECT OF BEDDING SYSTEMS ON BODY CONDITION SCORE AND MILKYIELD IN CROSSBRED COWS

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ABSTRACT

The present study was undertaken to evaluate the effect of different bedding systems on body condition score (BCS) and milk yield in crossbred dairy cows. Twenty-four crossbred cows with six animals in each group at the cattle farm of the Instructional Livestock Farm Complex, Pookode was selected for the study, from February 2018 to January 2019 spread over three different seasons such as summer months (Feb-May), monsoon months (June-Sep), and post-monsoon months (Oct-Jan). The control group (T_1) was maintained on concrete floor without any bedding materials. In T_2, rubber mats were provided on concrete floor. In T_3, coir pith, and in T_4, dried solid manure (DSM) on concrete floor were provided as bedding. Results revealed that the BSC of cows reduced to lowest 'thin' score, 3.00 ± 0.14 in cows maintained on concrete floor and the improved to 'fatty' score with highest mean value, 4.01 ± 0.18 for cows on rubber mat with significant difference (P <0.05). Ideal BCS, with an 'Average' score3.32 ± 0.07 and 3.34 ± 0.11, were found in cows reared on coir pith and DSM. The cows maintained on rubber mats and DSM had the mean milk yield of 9.26 ± 0.20 kg and 9.48 ± 0.22 kg, respectively, indicating their superiority over the concrete floor. Thus, the cows reared on coir pith, and DSM had ideal BCS with increased milk yield.

Keywords: Crossbred cows, Bedding systems, Body condition score, Milk yield

INTRODUCTION

As of 2020, India is the top country globally, accounting for 33.33 percent of the number of cattle and buffaloes possessing 305.4 million animals (FAO STAT, 2020). As per the 20th livestock census in 2019, out of the 13.40 lakhs cattle in Kerala, 93.79

percent are crossbreds. Even though the crossbred cows are better milk producers, efficient feed convertors, and more docile, they are more vulnerable to climatic stress and diseases. So, they demand better care and welfare in comfortable housing with soft beddings. Cow comfort under intensive management system is economically important as it significantly affects feed intake, production, and reproduction. The World Organisation for Animal Health (OIE, 2008) has propounded freedom from physical and thermal discomfort by providing access to shelter and a comfortable resting area as important measures of welfare for dairy cows. The most commonly used bedding materials in cow housing systems are sawdust, wood shavings and sand, straw, peanut shells and woodchips (Leso *et al.,* 2020; Oliveira *et al*., 2019). Coir pith, a ligno-cellulosic biomass obtained during the extraction of coir fibre from coconut husk, is a comfortable and best suited material for animal friendly bedding. It is ideal as bedding for cows due to its moisture absorbing quality and soft bed cushioning effects. (Leach *et al.,* 2015). Interest in using recycled manure solids (RMS) as a bedding material for dairy cows has grown in commercial milk producers for most farms. The highest milk yield was recorded with moderate BCS (3.00) in Holstein Friesian crossbred dairy cows (Hossain *et al*., 2015). Rowbotham and Ruegg (2015) reported that the management in organic bedding materials increased the milk yield of dairy cows. Hence, the effect of different bedding systems on body condition score (BCS) and milk yield in crossbred dairy cows was studied.

MATERIALS AND METHODS

The experiment was conducted at cattle farm of the Instructional Livestock Farm Complex (ILFC), Pookode, Wayanad district in Kerala state. The period of study was one lactation period (10 months) from February 2018 to January 2019, spread over three different seasons as described by Biya (2011), such as summer months (Feb-May), monsoon months (June-Sep), and post-monsoon months (Oct-Jan). Twenty-four crossbred dairy cows in early stage of lactation in the age group of 4-6 years were selected for the study. The animals were divided into four groups with six animals in each group as uniformly as possible with regard to body weight, parity and milk yield.

The animals were let loose in the shed except during feeding and milking time throughout the experiment. Floor space of 13 sq. m and manger space of 1.2 m length and 0.6 m width were provided per cow. Dung was removed in the morning and evening. Animals were washed outside the shed during the trial period. Animals

were fed as per ICAR (2013) standards and were tied during feeding. Experimental animals were dewormed when necessary. Daily concentrate was fed at 5.00 A.M. and 2.00 P.M., and roughage at 10.00 A.M. and 3.00 P.M. Water was provided *ad libitum*. All the treatment groups including control were housed in the same shed in a face-to-face arrangement.

In the control group (T_1), six experimental animals were maintained on the concrete floor in the existing management system without any intervention in bedding materials. In (T_2), rubber mats on concrete floor of 1.2 m x 1.8 m x 0.025 m dimensions were used for six experimental animals. The Rubber mat used in the experiment was 16 mm thick, 6'×4' in size, and had 40 kg weight. In (T_3), coir pith and in (T_4), dried solid manure (DSM) on the concrete floor was provided at the rate of 7.5 cm as bedding. The moisture content of the coir pith and DSM was maintained below 25 percent above which the wet material was replaced by dried bedding (Li *et al.,* 2008). All other activities, including the feeding regime, were followed as per routine practice.

The cows were grouped according to their body condition score before the start of the study, in such a way that the mean average body condition scores of different groups were homogenous. Since the measurement of body condition score is ordinal, comparison between treatment in each season and between seasons for each treatment was made by Kruskal Walli's ANOVA followed by Mann Whitney U test, as pair wise comparison. The health of animals was assessed based on BCS of cattle as per Smijisha (2012), in a five-point scale at monthly intervals.

Preparation of chart and BCS card

A preliminary chart was prepared after reviewing and applying the procedures currently used for body condition scoring in the United States of America (Edmonson *et al*., 1989) and in India (Kumar, 2011). Diagrams were added to the text to convey the gradation of body changes and to reduce the dependence on written descriptions. The chart consisted of detailed changes in conformation for body locations to be identified as important in body condition scoring of cattle. The preliminary chart was made, considering the different anatomical regions after reviewing all existing BCS score cards in different scales.

Precision of the chart evaluated by different group of observers

The precision of the chart was evaluated by sixteen assessors; each scored 24 cows at the cattle farm. Sixteen assessors were considered into four groups.

Group 1: Four scientists from the animal science departments.

Group 2: Four personnel (veterinary graduates) having some experience in condition scoring of cattle.

Group 3: Four beginners (Para technical staff) who had never condition scored cattle/ seen the chart prior to trial but familiar with cattle.

Group 4: Four field veterinarians having more than 10 years of experience in field conditions.

Design

The sixteen assessors were given the scoring chart one day before the trial, and the chart design was discussed before arriving at the farm. The assessors were moved from cow to cow, viewing each animal and assigning a score to each body location. All the animals were in head-restrained condition. The observers were given the score card and chart just before entering the cattle yard a brief explanation was given to each of them to clarify their doubts. The observers in each group scored the animals at a time, and all the groups completed the scoring within a week. All of them scored independently without any discussion within the group. Twenty-four cows were rescored using the same procedure without reference to the previously assigned scores. BCS score card is attached as Fig. 1.

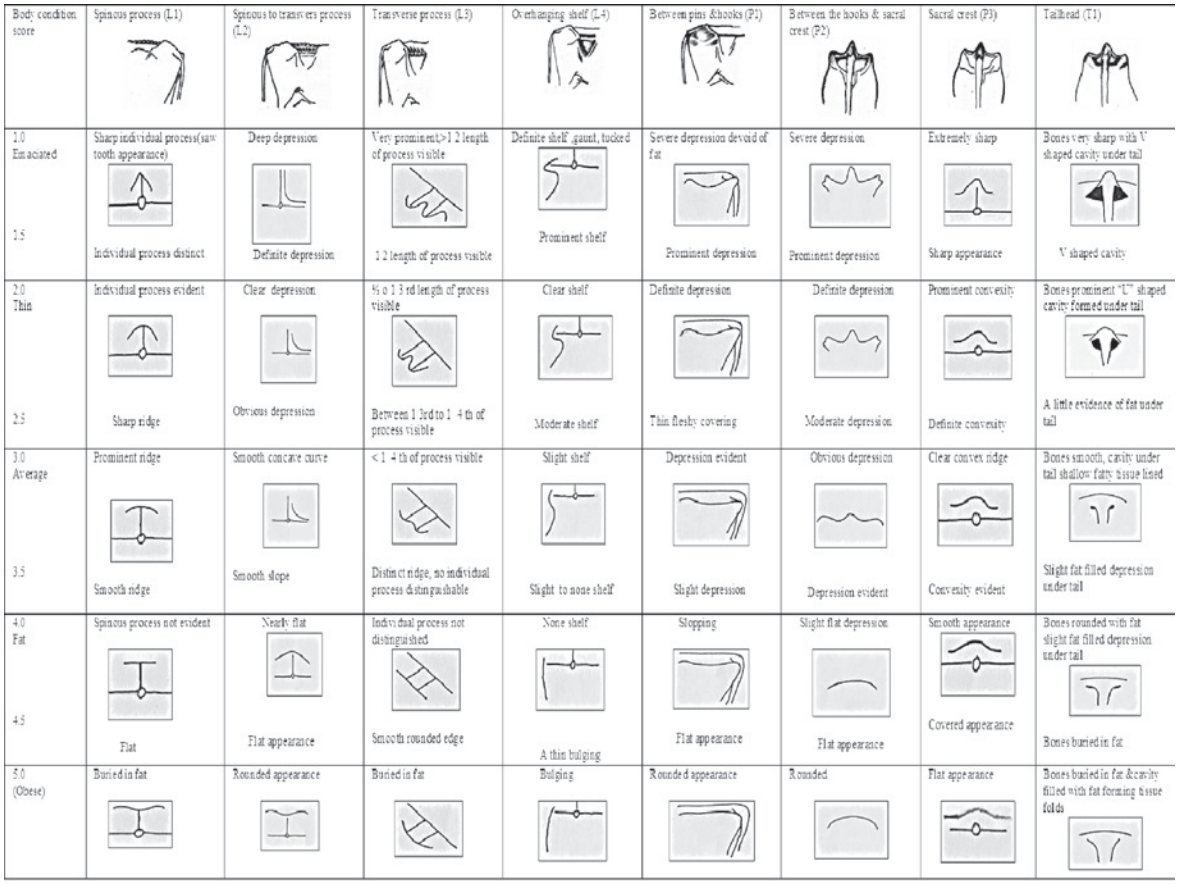
Data on daily milk yield (kg) was recorded in all experimental animals both in the morning (05.30 A.M.) and in the afternoon (02.30 P.M). Two-way ANOVA with interaction effect was performed to study the effect of different bedding materials and seasons on milk yield of cows.

RESULT AND DISCUSSION

Body condition score (BCS)

The mean BCS of animals was analysed and presented in Table 1. The results revealed that the BSC reduced to lowest 'thin' score, 3.00 ± 0.14 in cows maintained on the concrete floor and the improved to 'fatty' score with highest mean value, 4.01 ± 0.18 for cows on rubber mat with significant difference (P <0.05). Ideal BCS, with the 'Average' score 3.32 ± 0.07 and 3.34 ± 0.11 was found in cows reared on coir pith ad DSM. The findings of Hossain *et al*. (2015) are in agreement with the present study which recorded highest milk yield (13.45 ± 1.80 kg/day) with moderate BCS (3.00) followed by lower (2.75 to 2.25) and higher (3.25 to 4.00) in Holstein Friesian crossbred dairy cows. Also, the noted milk protein, lactose, TS, and SNF increased with increasing BCS up to 4.0. Westin *et al*. (2016) described Holstein cows with BCS ≥ 3.5 lay down on average 1 h/d longer than cows with BCS ≤ 2.25, which complements the study. Berry *et al*. (2007) determined the increased body condition score (BCS) was

Fig 1. Body condition score card



associated with reduced somatic cell score (SCS) with greater effect in Jersey cows than in Holstein-Friesians, which supports the present study.

During monsoon, the BSC was optimum 3.32 ± 0.09, which reduced in summer 3.16 ± 0.14 and improved in post monsoon, 3.58 ± 0.11. Heins *et al*. (2019) contradict the study that evaluated the cows in the outdoor (straw pack) and indoor compost bedded pack barn housing systems were not different for body weight (528 vs. 534 kg) and BCS (3.22 vs. 3.23), respectively, in winter.

In addition, Chaplin *et al*. (2000) stated that there was no difference in weight loss or BCS between cows on ethylene vinyl acetate (EVA) mats and mattresses of loose rubber crumb with a polypropylene cover.

Milk yield

The mean daily milk yield of cows in different bedding materials is presented in Table 2. The results revealed that the type of bedding material, season, and the interaction between seasons and bedding materials significantly alter the mean milk yield of cows (P <0.001). The F-value for the interaction (76.12) and between groups (672.40) and seasons (4066.99) were found

Table 1. Mean body condition score in treatment groups

Treatments(n=24)		Body condition score (Mean ± SE)		
		Summer	Monsoon	Post-monsoon
T_1	Concrete	3.00 ± 0.14^{c}	3.06 ± 0.11^{c}	3.18 ± 0.07^{d}
T_2	Rubber mat	3.38 ± 0.18^{d}	3.65 ± 0.1^{c}	4.01 ± 0.18^{c}
T_3	Coir pith	3.16 ± 0.18^{cC}	3.24 ± 0.02^{bB}	3.56 ± 0.10^{aA}
T_4	DSM	3.12 ± 0.08^{c}	3.33 ± 0.14^{c}	3.58 ± 0.10^{b}

Means with different superscripts a-c in rows, differ significantly (P <0.01) and A-C in columns differ significantly (P <0.05)

Table 2. Mean daily milk yield in different seasons

Treatments(n=24)		Daily milk yield (Mean± SE) (kg)			
		Summer	Monsoon	Post monsoon	Overall
T_1	Concrete	7.36 ± 0.07^{cB}	9.31 ± 0.03^{cA}	9.30 ± 0.03^{dA}	8.66 ± 0.22
T_2	Rubber mat	8.23 ± 0.01^{bC}	9.28 ± 0.03^{cB}	10.28 ± 0.03^{cA}	9.26 ± 0.20
T_3	Coir pith	8.35 ± 0.04^{aC}	10.3 ± 0.04^{aB}	11.28 ± 0.03^{aA}	9.98 ± 0.30
T_4	DSM	8.28 ± 0.01^{abC}	9.75 ± 0.03^{bB}	10.41 ± 0.05^{bA}	9.48 ± 0.22
(Mean± SE)		8.05 ± 0.09^{c}	9.66 ± 0.09^{b}	10.32 ± 0.15^{a}	9.34 ± 0.13

Means with different superscripts (a-d in rows, A-C in columns) differ significantly (P <0.05)

to be statistically significant.

The cows maintained on concrete floor had the lowest daily milk yield, while the cows on coir pith had the highest yield. The rubber mat and DSM had the mean milk yield of 9.26 ± 0.20 kg and 9.48 ± 0.22 kg, respectively, indicating their superiority over the concrete floor. The percent increase in milk yield was 19.50, 17.21, 15.33, and 12.14 on coir pith, DSM, rubber mat, and concrete floor, respectively. Kremer *et al*. (2007) complemented the present study, who reported greater activity and better overall health of high-yielding dairy cows on elastic rubber flooring than on concrete flooring, in a loose housing system with no difference in milk yield. The cows on coir pith had the highest yield while the cows on concrete floor resulted in lowest daily milk yield. The findings of Singla *et al*. (2007) are in agreement with this study who reported the mean milk yield of 21.27, 19.13, 18.81, and 18.16 L/animal/day in paddy straw bedding material of depth 30 cm, 20 cm, 10 cm, and concrete floor with improved udder health, milk quality and quantity during the winter season.

The rubber mat and DSM had the mean milk yield of 9.26 ± 0.20 and 9.98 ± 0.22 kg, respectively, indicating their superiority over the concrete floor. The results are in accordance to Barberg *et al*.

(2007), who noted an increase in herd milk production of 955 ± 315 kg/cow per year in compost bedded pack than bedded with dry fine wood shavings or sawdust. Astiz *et al*. (2014) revealed similar reports who analyzed milk yield/day (38.38 ± 7.3 vs. 36.70 ± 7.5 L/d) in compost bedding and straw-bedded, respectively in Holstein cows, which encouraged the implementation of compost bedding systems in dairy farms.

From Table 2, it may also be noted that the mean milk yield of cows maintained on different bedding materials was influenced by the seasonal variations as the differences of seasonal means within the cow groups were statistically significant. Moreover, the mean values for different seasons ranged from 8.05 ± 0.09 kg in summer to 10.32 ± 0.15 kg post-monsoon. Singh *et al*. (2015) obtained the average highest seasonal milk production of 9.22 and 9.02 litres in Sahiwal and crossbred, respectively in winter season and Haryana in summer season (8.261 litres) with a highly significant differences in seasonal variation and milk production performance. Tomas *et al*. (2016) evaluated highest milk yield in lactating dairy cows in spring (29.27 kg) and lowest in the autumn (24.58 kg) with no significant differences. The mean of cows maintained on different bedding materials was influenced by the seasonal variations as the differences of seasonal means within the cow groups are statistically significant. Fregonesi and Leaver (2001) disagreed, who assessed no significant differences between systems in milk production in cows bedded in straw yard system and cubicle system.

SUMMARY

The body condition score of cows reduced to lowest 'thin' score, in cows maintained on concrete floor and then improved to 'fatty' score with highest mean value, for cows on rubber mat with a significant difference. Ideal BCS, with an 'Average' score was found in cows reared on coir pith ad DSM. The milk yield was higher in cows maintained on rubber mats and DSM than on concrete floor and rubber mats. Thus, the cows reared on coir pith, and DSM had ideal BCS with increased milk yield.

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