

EFFECT OF BODY CONDITION SCORE ON MILK YIELD AND COMPOSITION OF BOKANI DAIRY COWS

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ABSTRACT

The study was conducted on the Erbil Dairy Herd of the Erbil city, to evaluate the effect of body condition score of Bokani dairy cow on milk composition. Milk samples were examined weekly for milk yield and milk fat, protein percentage, fat / protein ratio, lactose, solids not fat (SNF) and freezing point for sixty days. Body condition score of individual cows was recorded in a 1-5 scale. Milk samples were collected from individual cow. Samples collected from cows having similar body condition score were mixed together to make composite sample. The results revealed that the body condition score was affected milk yield and fat percentage significantly ($P<0.01$). This score was also influenced the percentage of milk protein, fat/protein ratio, lactose, solids-non-fat (SNF) and freezing point ($P<0.05$). In conclusion, the body condition score is an important indicator to predict the milk yield traits in dairy cows and can be used as a marker for milk yield and milk quality in dairy cows.

Key words: cow, body condition score, milk yield, milk composition, freezing point

عزالدين

مجلة العلوم الزراعية العراقية - 2022: 53(2): 373-377

تأثير درجة حالة الجسم في إنتاج الحليب و مكوناته لأبقار بوكاني

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المستخلص

إجريت هذه الدراسة على قطع أبقار الحليب في مدينة أربيل ، لتقييم درجة حالة جسم بقرة بوكاني الحلوب على مكونات الحليب. تم فحص عينات الحليب أسبوعياً من حيث إنتاج الحليب ونسبة دهن الحليب والبروتين ونسبة الدهون / البروتين واللاكتوز والمواد الصلبة غير الدهنية (SNF) ودرجة التجميد لمدة ستين يوماً. تم تسجيل درجة حالة الجسم للأبقار الفردية في مقياس 1-5. في خلال جمع عينات الحليب من كل بقرة. و خلطها من الأبقار التي لها نفس درجة حالة الجسم معاً لعمل عينة مركبة. أظهرت النتائج أن درجة حالة الجسم قد أثرت على الحليب ونسبة الدهون تختلف معنوياً ($P < 0.01$) و كذلك نسبة بروتين الحليب ونسبة الدهون / البروتين واللاكتوز والمواد الصلبة غير الدهنية (SNF) و درجة التجميد ($P < 0.05$). يمكن الاستنتاج ان درجة حالة الجسم تعد مؤشراً مهماً للتنبؤ بصفات إنتاج الحليب في أبقار الحليب ويمكن استخدامها كمؤشر لإنتاج الحليب ونوعية لدى ابقار الحليب.

الكلمات المفتاحية : بقرة، درجة حالة الجسم، إنتاج الحليب، مكونات الحليب، درجة التجمد

INTRODUCTION

Many dairy producers have cattle that are too fat or too thin for their stage of lactation. Failure to recognize these cows and take action costs dearly for disease treatments, losses in milk production, and decreased fertility (14). As a preventive measure, body condition scoring (BCS) has long been a powerful tool reflecting the fat reserves carried by the animals (2). Body condition score is a subjective measure of the amount of metabolizable energy stored in a live animal (8, 20) and it has been widely accepted by scientists and producers as the most practical method for assessing changes in energy reserves in dairy cattle (5). The breed differences regarding body condition score is widely investigated (5, 11). Higher BCS have been found in Jerseys in comparison to Holstein, it scores found a decrease in body condition as the percentage of Holstein genes increased in crossbred dairy cows. However, change in body condition scoring reflects only fat depletion in dairy breeds, while in dual-purpose it reflects a change in muscle tissue (17). One of the easiest and less expensive methods of evaluating the nutritional status of the dairy cows is the used of milk composition variables (1, 22) especially fat-protein-ratio (6, 12). The body condition is usually judged through a 5-point scale, with 1 equivalent to an extremely thin cow, while 5 to a cow having excessive fat reserves (16). Edmonson et al (8) developed using 0.25 increments system in dairy cows. The objective of this study therefore was to determine the effect of body condition score on milk yield and milk composition of Bokani cows.

MATERIALS AND METHODS

This experiment was carried out at the Erbil Dairy Farm in the Erbil city. The data were recorded from July to September in 2020. A total 12 Bokani cows of first, second and fourth calving were selected for the study. All of the selected cows were individually scored

using a 5 item scoring system, according to the body condition scoring system developed by Edmonson et al. (8). In this system, the scoring interval was 0.25 and the scores varied between 1 (emaciated), 2 (thin), 3 (moderate), 4 (fat) and 5 (obese). All cows scored 40 - 45 days after calving, cows weigh between 450 and 500 kilograms. The dairy cows were raised natural and paddock–shown alfalfa pasture, while hay and barley supplemented, were fed according to their body weight and production. The water and salt blocks were kept available to animals freely. The animals were milked twice a day. Daily milk yield (kg) was recorded once a week for this study purpose. Approximately 250 ml milk samples were collected in bottles stored in the icebox and transported the laboratory. The milk components include fat, protein, fat / protein ratio, lactose, solids not fat (SNF) and freezing point were studied in relation to body condition scoring and determined by Lactostar “FUNKE GERBER” Labortechnik (12/05) machine (Germany) at the Food Technology Laboratory of Agriculture Engineering Sciences. All data were analyzed using CRD (Completely Randomized Design) by the SAS institute program (19). Duncan's multiple range tests were used to compare differences among the treatments.

RESULTS AND DISCUSSION

Results in Table 1 show the relationship between body condition score and milk yield in the selected herd. The milk yield was significantly affected by body condition score ($P < 0.01$). The overall highest average of milk yield (16.68 ± 1.25 kg) was recorded with fat body condition score (4.00) followed by lower (2.75 to 4.25) and higher (3.75 to 3.00). The present findings were also similar to that of Markusfeld et al (13) and Roche et al (18) were reported a significant rise in milk yield with an increase of body condition score at calving.

Table 1. Effect of body condition score (BCS) on milk yield (kg) in Bokani dairy cows (Mean±SE)

BCS	No. of Animals	Milk Yield (Kg)		
		Morning	Evening	Total
2.75	2	6.63±0.38 b	6.87±0.39 b	13.50±0.79 b
3.00	1	5.16±0.51 c	5.48±0.37 c	10.64±0.71 c
3.25	2	5.69±0.47 bc	5.84±0.40 bc	11.53±0.73 bc
3.50	1	4.44±0.39 d	4.64±0.37 d	9.08±0.82 d
3.75	2	4.77±0.35 cd	5.18±0.40 cd	9.95±0.74 cd
4.00	1	8.03±0.59 a	8.65±0.55 a	16.68±1.25 a
4.25	3	5.62±0.38 bc	6.01±0.36 bc	11.63±0.70 bc
S. L		**	**	**

a, b, c, d: values with different superscripts vary significantly ($P < 0.01$)., BSC: Body Condition Score

Body condition score significantly affected the fat ($P < 0.01$), protein, fat/protein ratio and lactose contents in dairy cows ($P < 0.05$) (Table 2.). Highest fat ($5.35 \pm 0.207\%$) percentage was recorded with poor body condition score (2.75). Protein contents increased ($3.63 \pm 0.112\%$) with increasing body condition score up to (4.25), while lactose showed an opposite trend and maximum milk fat/protein ratio (1.737 ± 0.102 and 1.631 ± 0.100) in thin body condition score (2.75 and 3.00 respectively). According to Mushtaq et al (14) reported that the body condition score of buffalo and cow correlated positively with fat and protein and negatively with lactose contents. Duchacek et al (7) stated that the development of the fat to protein ratio used as an indicator of negative energy balance. Furthermore, Fahey et al (9) reported that cows in negative energy balance will show an increase in percentage milk fat and a decrease in milk protein. In addition, Berry et al (4) mentioned that cows with a more extensive loss of body condition score

produced more milk with a higher fat to protein ratio. The highest value of this ratio (1.62) was observed in the first week of lactation. Later, it decreased to 1.08 in the seventh week, and then it slightly increased and became stabilized around the value of 1.2. Aysan et al (3) reported that the body condition score was caused milk lactose and urea significantly ($P < 0.05$) in cows; but were not affected milk fat, protein, urea nitrogen, casein, total solid, density, solids-non-fat, acidity, free fatty acids, citric acid, freezing point ($P > 0.05$). The results were also in agreement with Hossain et al (10) stated that the results, BCS significantly affected ($P < 0.05$) milk yield, milk fat and ash content in crossbred Holstein Friesian dairy cows. According to, Singh et al (21) reported that an increase of body condition score at calving had a significantly ($P < 0.05$) effect on daily milk yield and milk composition, with non-significantly affect being observed on udder health status of dairy animals. Thus, body condition score at calving can be used as a reliable criterion in the selection of crossbred cows and Buffaloes for higher milk production with better udder health status.

Table 2. Effect of body condition score on compositions in Bokani dairy cows (Mean±SE).

BCS	No. of Animals	Fat%	Protein %	Fat / Protein Ratio	Lactose%
2.75	2	5.35±0.207 a	3.08±0.106 b	1.737±0.102 a	4.22±0.193 a
3.00	1	4.78±0.158 ab	2.93±0.110 b	1.631±0.100 a	3.98±0.155 a
3.25	2	3.97±0.138 b	3.24±0.112 ab	1.225±0.092 ab	4.45±0.191 a
3.50	1	4.08±0.135 ab	3.19±0.110 ab	1.279±0.096 ab	4.38±0.159 a
3.75	2	3.99±0.125 b	3.24±0.105 ab	1.231±0.090 ab	4.46±0.170 a
4.00	1	3.31±0.124 c	3.11±0.115 ab	1.064±0.072 ab	4.29±0.181 a
4.25	3	3.55±0.131 bc	3.63±0.112 a	0.978±0.055 b	4.47±0.182 a
S. L		**	*	*	*

a, b, c, d: values with different superscripts vary significantly ($P < 0.01$), ($P < 0.05$)., BSC: Body Condition Score

Figure 1. shows the relationship between body condition and solid not fat (SNF) % in Bokani dairy cows. The results showed a significant ($p < 0.05$) increases the percentage of SNF (8.44, 8.40 and 8.35) in (3.75, 4.25 and 3.25)

body condition score respectively. Figure 2. refers to the relationship between body condition and freezing point in Bokani cows. The results of freezing point percentages were significantly ($p < 0.05$) higher in (3.75, 4.25, 3.5 and 3.25) body condition score respectively compared with the different body condition score.

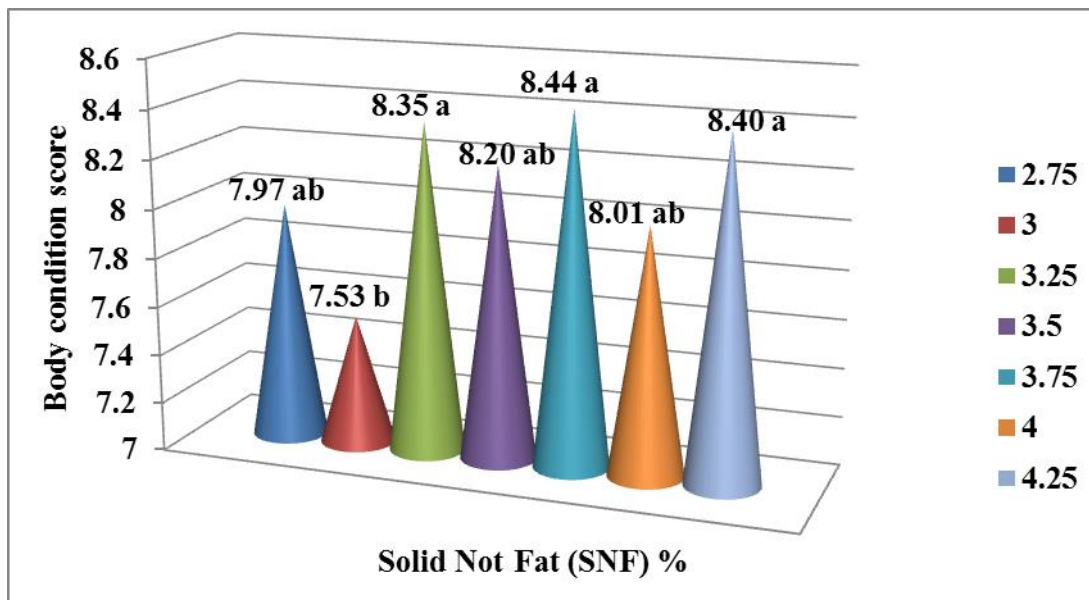


Figure 1. Relationship between body condition and solid not fat (SNF) % in Bokani cows
^{a,b}. Mean values within a row having different superscripts differ significantly at ($p < 0.05$).

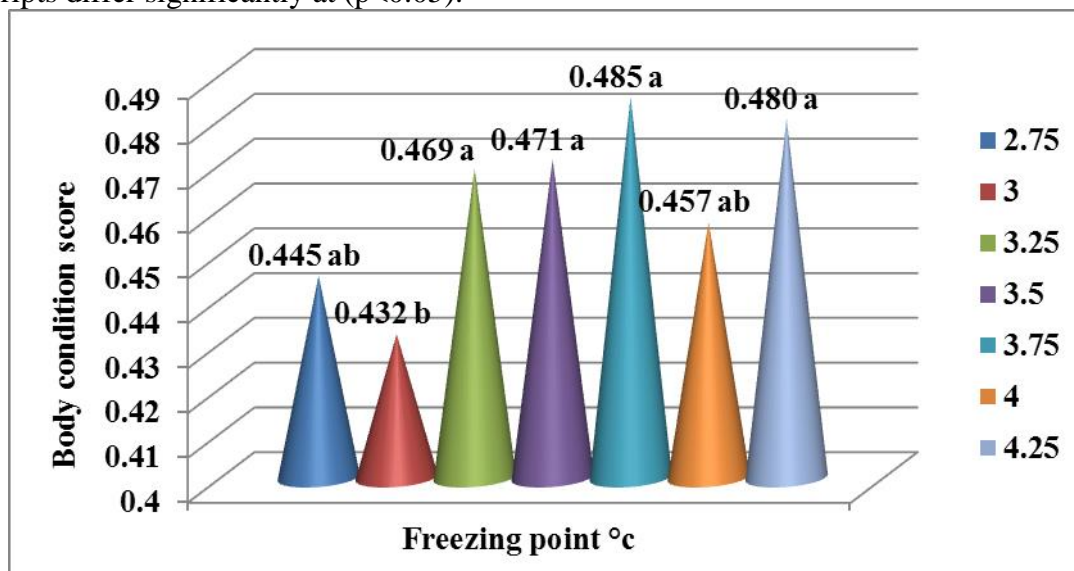


Figure 2. Relationship between body condition and freezing point in Bokani cows
^{a,b}. Mean values within a row having different superscripts differ significantly at ($p < 0.05$).

CONCLUSION

The body condition scoring is a practical and useful tool of management in dairy flocks; it affects the productivity, reproduction, and health of the animal. Each stage of lactation has its recommended body condition score; through, over and under conditioned dairy cow may undergo a variety of dangers. Body condition score is a simple but useful procedure, which can help producers make management decisions regarding the quality and quantity of feed needed to optimize performance, and routine scoring of the body condition of dairy cows can help detect

potential problems that might cause a decrease in milk production.

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