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BODY CONDITION SCORE AND IT CORRELATION WITH RANK AND AGE OF LACTATION IN HOLSTEIN LIVESTOCK FROM ROMANIA

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Abstract

Body Condition Score (B.C.S.) is a good indicator for estimating the reserves, especially of energy, that the dairy cows have to support milk production. In general, the values that this indicator can take vary between 1 and 5 with the evolution of lactation over time, but also from one cow to another. Good dairy cows have difficulties maintaining B.C.S. at an optimal level, especially during the first and second lactation period, since the ingestion capacity of nutrients they have is exceeded by the body's need for milk production. For this reason, the negative energy balance is installed. In order to cope with this period, animals dispose their body fat, thus setting up the negative energy balance, a phenomenon that significantly affects certain zootechnical efficiency parameters such as productive longevity, lactation duration, calving interval, etc. Nutritionists can mitigate this impact by optimizing ratios also taking into consideration this parameter. The present paper aims to determine the correlation between the rank and age of lactation with the value of B.C.S.

Key words*: Body condition score, body fat, good indicator, optimizing ratios, negative energy balance.*

INTRODUCTION

BCS is a very good indicator for estimating how the dairy cow organism will cope with the production effort and, at the same time, it is also a good parameter for assessing the efficiency of farm feeding technology management (Tedeschi et al., 2006). The ideal situation is where the cows have a body condition score of approx. 3 throughout the productive life (if the reference scale takes values between 1 and 5) and without too much variation correlated with the physiological state.

As we have previously mentioned, the most common method of assessing BCS is to label animals on a scale of 1 to 5 (M'Hamdi et al., 2012), where 1 is associated with an emaciated cow and 5 with an overweight animal that has health and reproduction problems (fig. 1 and 2). The BCS dynamics of a cow can also provide information about its welfare due to the correlations that exist between it and the factors of influence such as food quality and quality, ambient temperature, water quality, vital space, adaptability to the exploitation system, etc.

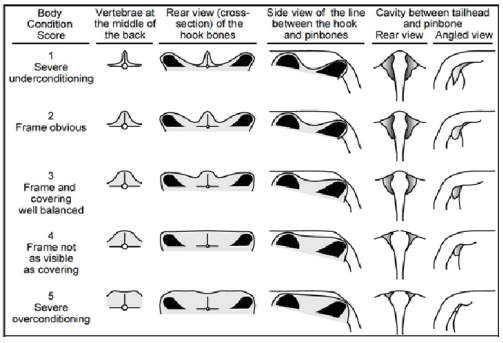

Figure 1. Evaluation of BCS on a scale of 1 to 5 (spiritedrose.wordpress.com)

Classically, animal marking is done with the help of specialists in assessing animal body condition.

These people assess the degree of development of fat deposits at certain points of the cow's body by means of semiological methods such as inspection and palpation.

This method has some degree of subjectivity. For this reason, with the development of precision technologies, a series of automatic BCS assessment methods have emerged.

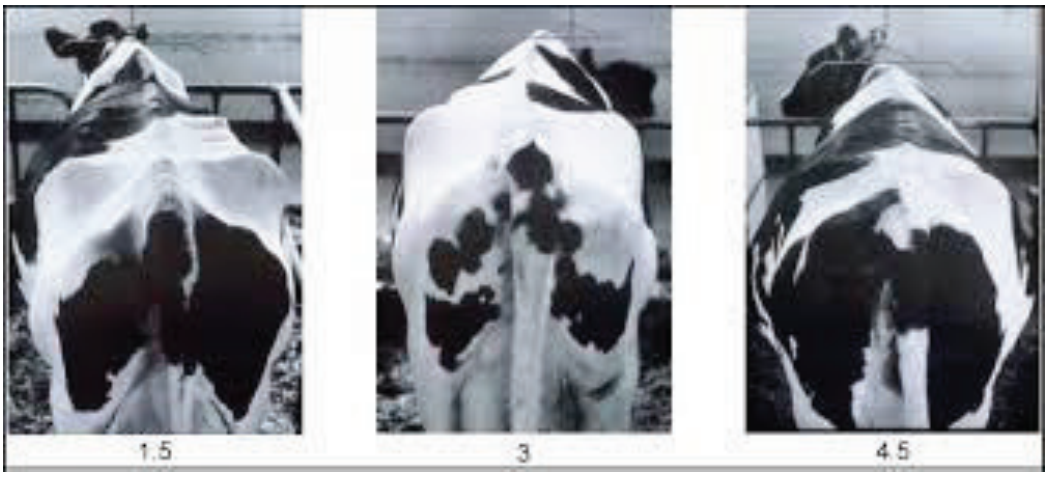

Figure 2. Appearance of some cows and the score obtained as a result of BCS evaluation(bizplan-uz.com)

MATERIALS AND METHODS

In order to determine the correlation values between BCS and the age of lactation or its rank, 2,564 Holstein lactating cows exploited in 8 farms in Romania (Table 1) were evaluated. Of these, only 1,415 generated accurate information to make calculations, and the rest of the records (27.34%) were removed either due to measurement errors or because of lack of information. The study was conducted on dairy cows being between the first and the eighth lactation, and with a lactation age between the day 1 and day 1,357.

Table 1. Cow distribution on farms

FARM	Livestock	%
Farm 1	199	10.68%
Farm 2	158	8.48%
Farm 3	16	0.86%
Farm 4	251	13.47%
Farm 5	120	6.44%
Farm 6	198	10.63%
Farm 7	330	17.71%
Farm 8	39	2.09%
Farm 9	199	10.68%
Farm 10	353	18.95%
TOTAL	1863	100.00%

BCS measurement was done with a BodyMat V equipment (figure 3) produced by Ingera Company that can accurately estimate the body condition of the cows, as well as weight or other physiological parameters using a picture (fig. 4) analysis algorithm (ingera.ch).

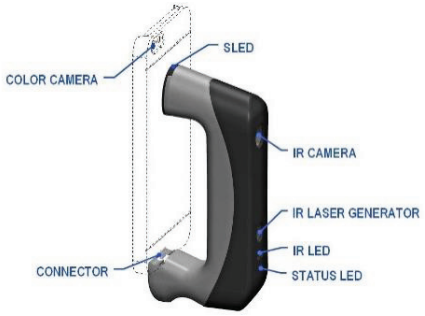

Figure 3. BodyMat V (ingera.ch)

Figure 4. BodyMat V in action (ingera.ch)

The device can connect to a smartphone and features an integrated laser generator, capable of collecting 3D images and interpreting and compiling data about the animal. The package contains the BodyMat Vet, a smartphone, two chargers (one for the actual d, vice and one for the smartphone) and earphones (fig. 5).

Figure 5. BodyMat Vet packge (docs.wixstatic.com)

After downloading the data, they are sent to a computer, and then can be exported to Excel.

RESULTS AND DISCUSSIONS

The gross data collected from the field were synthesized and systematized in Table 2. Out of the 1,415 cows for which BCS was evaluated, 43.33% were lactating first, 30.88% at second lactation, 12.27% at third lactation, 6.93% at fourth lactation, and 6.15% of herd at fifth lactation or more.

Table 2. Synthesation and systematisation of data

SPECIFICATION	n	X	s	Sx	V
Lactation rank	**613**	**1.00**	**0.00**	**0.04**	**0%**
Cow age (years)		3.04	0.93	0.12	31%
BCS value		2.87	0.56	0.12	19%
Lactation age (days)		254.60	169.56	10.28	67%
Lactation rank	**437**	**2.00**	**0.00**	**0.10**	**0%**
Cow age (years)		3.81	0.65	0.18	17%
BCS value		2.58	0.57	0.12	22%
Lactation age (days)		179.78	149.25	8.60	83%
Lactation rank	**180**	**3.00**	**0.00**	**0.22**	**0%**
Cow age (years)		5.19	1.02	0.39	20%
BCS value		2.61	0.64	0.19	24%
Lactation age (days)		192.22	140.42	14.33	73%
Lactation rank	**98**	**4.00**	**0.00**	**0.40**	**0%**
Cow age (years)		6.53	0.94	0.66	14%
BCS value		2.64	0.56	0.27	21%
Lactation age (days)		205.52	139.04	20.76	68%
Lactation rank	**87**	**+ 5**	**0.94**	**0.62**	**16%**
Cow age (years)		8.50	1.49	0.91	18%
BCS value		2.60	0.60	0.28	23%
Lactation age (days)		167.98	134.53	18.01	80%
Lactation rank	**1415**	**2.06**	**1.33**	**0.05**	**64%**
Cow age (years)		4.13	1.76	0.11	43%
BCS value		2.72	0.59	0.07	22%
Lactation age (days)		214.83	159.89	5.71	74%

For cows at first lactation, a BCS with an average value of 2.87 ± 0.56 was recorded. The average age of the cows was 3.04 ± 0.93 years and the mean lactation age was 254.90 ± 169.56 days. For BCS a coefficient of variability of approx. 19% was measured, this value meaning that, for this group of cows, BCS has a relatively medium variability.

For second lactation cows, BCS recorded a value of 2.58 ± 0.57, with a 22% variability coefficient (average variability). This can be justified by the fact that at the second lactation the cows are much stronger. Their average age was 3.81 ± 0.65 years, and lactation averaged 179.78 ± 149.25 days.

In the case of the third lactation, there was an average age of 5.19 ± 1.02 years and an average lactation age of 192.22 ± 140.42 days. BCS was 2.61 ± 0.64 with a 24% variability.

Fourth lactation cows recorded an average BCS of 2.64 ± 0.56 with a coefficient of variation of 21%. They have an average age of 6.53 ± 0.94 years and an average lactation age of 205.52 ± 139.04 days.

For cows that were in the fifth or more lactation, similar data were recorded, BCS having a value of 2.60 ± 0.60 and a coefficient of variation of 23%. The average age of cows was 8.50 ± 1.49 years, and the average lactation age was 167.98 ± 143.53 days.

Overall, the study population recorded an average BCS of 2.72 ± 0.59 with a 22% variability coefficient. The average age was 4.13 ± 1.76 years, and the mean lactation was at the 214.83 ± 159.89 day.

Figure 6 shows the visual relationship between the BCS value and the age evolution of the animals. Considering its aspect, it can be stated that the studied cows have, throughout their productive life, optimum conditions of exploitation although trend line has a slightly downward trend.

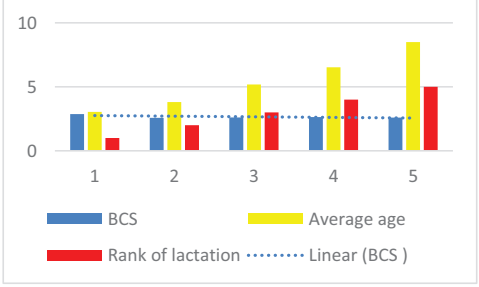

Figure 6. Evolution of BCS over age

Considering its aspect, it can be stated that the studied cows have, throughout their productive life, optimum conditions of exploitation though trendline has a slightly downward trend.
Table 3 summarizes the BCS situation in the 8 farms.

Table 3. BCS situation in the studied farms

Specification	X	s	Sx	V
Farm 1				
Cowas age	4.84	2.04	0.34	42%
BCS	2.58	0.61	0.18	24%
Average lactation age	241.49	173.90	17.12	72%
Lactation rank	2.52	1.62	0.18	64%
Farm 2				
Cowas age	**4,23**	**1,68**	**0,34**	**40%**
BCS	**2,37**	**0,52**	**0,19**	**22%**
Average lactation age	**131,73**	**129,54**	**10,31**	**98%**
Lactation rank	**2,63**	**1,28**	**0,21**	**49%**
Farm 3				
Cowas age	6.04	3.27	1.46	54%
BCS	2.65	0.58	0.64	22%
Average lactation age	194.29	120.53	47.12	62%
Lactation rank	3.18	2.55	0.77	80%
Farm 4				
Cowas age	**4.32**	**1.97**	**0.27**	**46%**
BCS	**2.60**	**0.52**	**0.16**	**20%**
Average lactation age	**222.47**	**155.26**	**14.04**	**70%**
Lactation rank	**2.33**	**1.46**	**0.15**	**63%**
Farm 5				
Cowas age	3.08	0.68	0.22	22%
BCS	3.16	0.52	0.22	16%
Average lactation age	217.92	111.76	15.45	51%
Lactation rank	1.22	0.58	0.09	48%
Ferma 6				
Cowas age	**5.15**	**1.91**	**0.82**	**37%**
BCS	**2.58**	**0.34**	**0.41**	**13%**
Average lactation age	**181.85**	**105.75**	**29.12**	**58%**
Lactation rank	**1.00**	**0.00**	**0.16**	**0%**
Farm 7				
Cowas age	4.36	1.84	0.31	42%
BCS	2.86	0.60	0.20	21%
Average lactation age	229.60	165.09	16.28	72%
Lactation rank	2.10	1.35	0.15	64%

Table 3. BCS situation in the studied farms (continuation)

Specification	X	s	Sx	V
Farm 8				
Cowas age	**3.80**	**1.26**	**0.20**	**33%**
BCS	**2.72**	**0.55**	**0.14**	**20%**
Average lactation age	**227.12**	**179.06**	**12.09**	**79%**
Lactation rank	**1.89**	**0.93**	**0.10**	**49%**

Concerning the average age of the cows per farm, the minimum was recorded on the farm 5 (3.08 ± 0.68 years) and the maximum in farm 3 (6.04 ± 3.27 years).
The minimum BCS was recorded on farm 2 and had the value of 2.37 ± 0.52 and a coefficient of variability of 40% (high variability). Maximum BCS was recorded on farm 5 and had a value of 3.16 ± 0.52 and a 16% variability coefficient (mean variability).
The mean age of lactation was recorded on farm 2 (131.73 + - 129.54 days), and the maximum on farm 1 (241.49 ± 173.90). Interestingly, there were minimal values in farm 2 for both the median age of lactation and BCS. This is explained by the negative energy balance phenomenon that occurs during the first two stages of lactation and which negatively affects the body condition of the cows. From this point of view, we can divide the lactation curve into 3 phases: the ascending phase (the first 40 to 50 days after calving), the plateau phase (the next 50 days) and the descending phase (from 90 –100th day after calving to the end of lactation) (Grosu and Rotar, 2015).In very good dairy cows, the first 2 phases after calving can cause major nutritional imbalances that can affect the rest of their productive life (fig. 7). During this period, the nutritional needs exceed the intake capacity of the cows and thus the negative energy balance is installed. This means that the cow will consume its own fat reserves to support the evolution of milk production, and in time will lose weight and vigor.
For lactation to have a lesser negative impact on the cow's body, it is recommended to maintain BCS around 2.75-3.25. In the case of the studied livestock, the results are centralized in Table 4.

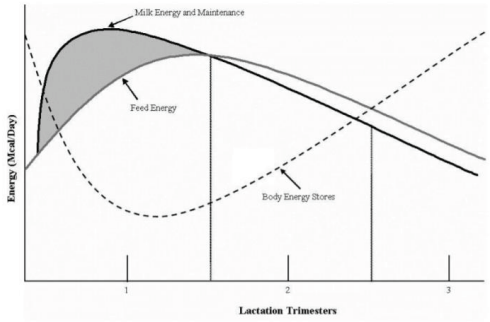

Figure 7. Energy utilisation during lactation (Hoffman et al., 2000)

Table 4. BCS in the 3 phases of lactation

Specification	n	X	s	Sx	V
Phase I	249	2.43	0.57	0.15	23%
Phase II	162	2.36	0.49	0.19	21%
Phase III	1004	2.84	0.56	0.09	20%

It is noted that between the first two stages of lactation, BCS decreases by about 2.88%, and between the second and third phases it increases by 20.34%. The BCS value during the third lactation phase is 16.87% higher than the value recorded during the first phase.
From the perspective of the correlation between BCS and the age and the rank of lactation, the data from table 5 was obtained.

Table 5. BCS correlations

with the	Value
age of lactation	+0.42
rank of lactation	-0.15

As expected, BCS has a positive-medium correlation with age of lactation and negative-low with its rank.

CONCLUSIONS

BCS is an important indicator for the assessment of lactation evolution.
The livestock studied here has an optimal BCSvalue (2.72 ± 0.59 with a CV of 43%).
BCS has a positive-medium correlation with age of lactation and negative-low with its rank

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