RESEARCH ON THE INFLLUENCE OF THE CALVING INTERVAL ON MILK YIELD

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Abstract

The paper goal was to study the influence of the calving interval on milk yield for the Romanian Brown breed, using 950 lactations, of which: 573 lactations (60.31 %) belonged to the over 400 days calving interval and 377 lactations (39.69%) belonged to the 351-400 days calving interval. The calving interval varied between 446.41±18.94 days, the highest length for the 51 dairy cows which had parturition in September and 373.49 ±14.28 days, the shortest length for 53 cows which calved in October. The average calving interval for the cows with a calving interval longer than 400 days accounted for 425.58±14.10 days, while the average calving interval for the cows with this reproductionindicator between 351 and 400 days was 358.65±10.07 days. For the cows whose calving interval was longer than 400 days, milk yield accounted for 4,682.5±124.92 while for the cows whose calving interval varied between 351 and 400 days registered 4,240.0±215.10 kg. The calculations revealed a gross product of Lei 6,087 per lactation in case of cows whose calving interval was longer than 400 days and Lei 5,512 in case of the cows whose calving interval varied between 351-400 days. For an average difference of 66.93 days calving interval between the two calving interval size groups taken into consideration, the milk yield difference accounted for 442.50 kg in the benefit of the cows with the calving interval longer than 400 days. Also, a difference of Lei 575 was recorded in the favor of the cows with calving intervals longer than 400 days because they registered higher a milk yield. This means Lei 8.59 additional income per cow and calving interval day longer than 400 days.

*Key words***:** *calving interval, dairy cows, economic efficiency, milk yield*

INTRODUCTION

Milk yield and milk fat content are the main factors that drive the economic profitability in dairy farming. As long as, the heritability of the milk characters is very low, ranging between 0.2-0.3, this means that the growth of milk yield depends mainly of the environmental factors among which feeding is recognized to be the major one. But, among the non genetic factors affecting milk yield, we have to also include age at calving, calving interval, days dry, calving month/season, cow health, milking frequence, herd and parity, agro-ecological conditions where the farm is operating [4, 5, 9, 11, 13,14].
Less attention was paid by research to the link which could exist between the length of the calving interval and milk yield [2, 3, 6, 8,10, 12, 16, 18, 19], most of the studies were focused on calving interval as the key

reproduction indicator [15] and just a few approached the aspect of profitability [1,7,17]. The length of the calving interval could also affect the number of offspring and meat production.
More than this, calving interval is mentioned as a factor causing errors in bulls breeding value estimation [16].
In this context, the paper aimed to study the calving interval and milk production for the Romanian Brown breed, in order to establish in what measure the length of the calving interval affect milk yield and gross product coming from milk production.

MATERIALS AND METHODS

In order to carry out the research study, the data about milk yield per lactation and calving interval from a population of Brown dairy cows from various farms of Romania were collected. The data were divided into two sub

categories by calving interval size groups as follows: over 400 days calving interval and 351-400 days calving interval. The total number of lactations counted for 950, of which: 573 lactations (60.31 %) belonged to the over 400 days calving interval and 377 lactations (39.69%) belonged to the 351-400 days calving interval.

The average, standard deviation and coefficient of variation were statistically determined both for milk yield and calving interval, according to the following mathematical formulas:

Average Parameter (AP),

$$AP = \frac{X_1 + X_2 + ...X_n}{n},$$ (1)

where n = the number of variables and X= indicator taken into account (milk yield/calving interval)

***Variance of variables, S², *** $S^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})}{n-1}$, (2)

Standard Deviation, S, S =

$$\left(\sqrt{\frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}} \right)$$ (3)

Variation Coefficient, $V_{\%}$, $V_{\%} = \frac{S}{\overline{X}}$ x 100 (4)

In the paper it was also calculated the gross product coming from milk/cow in terms of current milk price (Lei 1.3/milk kg) and the difference of gross product was pointed out in close relationship with the length of the calving interval as an expression of the profitability.

RESULTS AND DISCUSSIONS

The distribution of calving intervals by calving month was the following one: January 74 (7.78%), February 73 (7.68%), March 162 (17.05 %), April 118 (12.42 %), May 100 (10.52 %), June 82 (8.63%), July 63

(6.63%), August 48 (5.05 %), September 51 (5.36%), October 53 (5.57 %), November 64 (6.73 %) and December 62 (6.52 %) as presented in Table 1.

Calving interval parameters by calving month.

The figures from Table 1 show that the calving interval varied between 446.41 ± 18.94 days, the highest length for the 51 dairy cows which had parturition in September and 373.49 ± 14.28 days, the shortest length for 53 cows which calved in October.

In 8 months: January, February, April, June, July, August, September and November, the calving interval was longer than 400 days and in only 4 months of calving: March, May, October and December the calving interval it was less than 400 days.

The variation coefficient of the calving interval varied between 36.71 % in case of the calvings in December and 21.30 % in case of the calvings in August.

Table 1.Parameters of calving interval by calving month

Calving month	N	$\overline{X} \pm s_{\overline{x}}$	S	V%
1	74	414.24±12.95	113.98	27.51
2	73	404.19±14.45	123.45	30.53
3	162	392.08±10.56	134.40	34.27
4	118	422.04±9.64	104.76	24.62
5	100	398.24±10.39	103.90	26.08
6	82	423.28±11.81	106.89	25.25
7	63	417.04±15.43	122.42	29.35
8	48	427.33±13.15	91.05	21.30
9	51	448.41±18.94	135.24	30.29
10	53	373.49±14.28	103.99	27.84
11	64	440.98±16.64	133.16	30.19
12	62	386.96±18.05	142.07	36.71
Total	950	408.94±13.85	117.94	28.84

Source: Own calculations

Regression of the calving interval by calving month was r = +0.383, small and less significant, according to the regression function: Y = 409.65 + 0.363 x.

Calving interval parameters by calving interval size group are presented in Table 2.

The average calving interval for the cows with a calving interval longer than 400 days accounted for 425.58±14.10 days, while the average calving interval for the cows with this

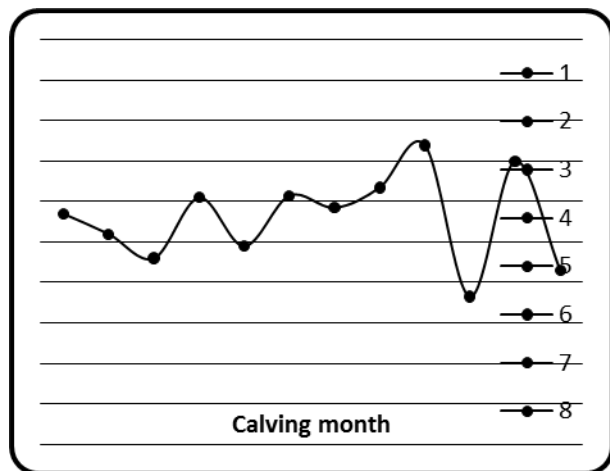reproduction indicator between 351 and 400 days was 358.65±10.07 days.

Fig.1.Distribution of calving interval by calving month

Table 2.Calving interval parameters by calving interval size group

Calving interval size group	N	$\overline{X} \pm s_{\overline{X}}$	S	V%
Over 400 days	573	425.58±14.10	116.61	27.40
351-400 days	377	358.65±10.07	120.94	33.72

Source: Own calculations

The variation coefficient varied between 27.40 % in case of calving intervals higher than 400 days and 33.72 % in case of the calving interval varying between 351-400 days (Table 2).

Milk yield parameters pointed out differences determined by the length of the calving interval. Taking into account the all 950 lactations, the average milk production was 4,506.89±136.09 kg. For the cows whose calving interval was longer than 400 days, milk yield accounted for 4,682.5±124.92 while the cows whose calving interval varied between 351 and 400 days registered 4,240.0±215.10 kg milk.

The variation coefficient for milk yield recorded 19.90 % in case of calving intervals longer than 400 days and 28.66 % in case of calving intervals ranging between 351-400 days (Table 3).

Gross product from milk by calving interval size group. For all the 950 lactations, gross product coming from milk accounted for Lei 5,858 per lactation taking into account the average milk price imposed by processors, Lei 1.3/milk kg. The calculations revealed a gross product of Lei 6,087 per lactation in case of cows whose calving interval was longer than 400 days and Lei 5,512 in case of the cows whose calving interval varied between 351-400 days (Table 4).

Table 3.Milk yield parameters by calving interval size group

Milk yield (kg)	Calving interval		
	Over 400 days N=573	351-400 days N=377	Total N=950
$\overline{X} \pm s_{\overline{X}}$	4,682.5±124.92	4,240.0±215.10	4,506.89±136.09
S	932.14	1,215.46	994.25
V%	19.90	28.66	22.06

Source: Own calculations

Therefore, for an average difference of 66.93 days calving interval between the two calving interval size groups taken into consideration, the milk yield difference accounted for 442.50 kg in the benefit of the cows with the calving interval longer than 400 days.

Also, a difference of Lei 575 was recorded in favor of the cows with calving intervals longer than 400 days because they registered higher a milk yield. This means Lei 8.59 additional income per cow and calving interval day longer than 400 days (Lei 575: 66.93 days calving interval).

Research results obtained by other authors pointed out similar remarks. In the USA, the extended calving had a good impact on

production and profitability for the high yielding cows at 1st lactation. The primiparous and multiparous cows with a longer calving interval were advantaged by USD 0.19 and, respectively, USD 0.12/day of calving interval in net returns [1].

Other results concluded that, on the contrary, a shorter calving interval could contribute to a higher production and profitability [7].

An Israelian study revealed that the net return per day for the primiparous cows was by USD 0.21 higher per day than in case of the control cows for the 1st 150 days of the 2nd lactation. The multiparous cows were advantaged by USD 0.16 per day compared to the control cows. [17]

In Romania, in case of the Black and White Breed it was found that a calving interval of 350-400 days assured the highest milk yield, while a longer one than 400 days as well as a shorter one than 351 days had a negative impact on milk performance [2].

Table 4.Gross product coming from milk by calving interval size group

Specification	MU	Calving interval			Total N=950
		Over 400 days N=573	351-400 days N=377	Difference	
Milk yield	Kg	4,682	4,240	4,682-4,240= +442	4,506
Milk price	Lei/kg	1.3	1.3	1.3	1.3
Gross product from milk	Lei	6,087	5,512	575	5,858

Source: Own calculations

CONCLUSIONS

Calving interval is an important environment factor with a high importance for increasing milk production.

In general, a calving interval longer than 400 days could affect milk yield as well as a shorter calving interval.

However, the recent studied revealed that longer calving interval for primiparous could be in the benefit of an additional net return per day of calving interval.

This study also concluded that Lei 8.59 additional income per cow and calving interval day could be obtained by Brown breed cows if their calving interval was longer than 400 days.

A longer calving interval could be useful for increasing milk production in specific thresholds which are at the farmers' management decision taking into account their farming conditions.

ACKNOWLEDGMENTS

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